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Address of Bangladesh Orthopaedic Society Office:

National Institute of Traumatology & Orthopaedic Rehabilitation (NITOR)

Sher-e-Bangla Nagar, Dhaka-1207, Bangladesh.

Tele-Fax: +88 - 02 - 9135734

PABX: +88 - 02 - 9144190-4, Ext-280

Mobile: +88 - 01917-665140

web: www.bosbd.org

e-mail: bos_bdortho@yahoo.com,



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Hardware Removal: Indications and Expectations

Although hardware (Implant) removal is commonly done, it should not be considered a routine and safe procedure always. The decision to remove hardware has significant economic implications, including the cost of the procedure, as well as work time lost and possible complications. The clinical indications for implant removal is not well established. There are very few available data in literature to guide whether implant removal is appropriate or not. Implant removal may be challenging and can lead to complications, such as neurovascular injury, refracture, infection or recurrence of deformity. When implants are removed for pain relief, the results are unpredictable. Current literature does not support the routine removal of implant to protect against allergy, pain or carcinogenesis. Surgeons and patients should be aware of appropriate indications and have realistic expectations of the risks and benefits of implant removal.

Hardware removal is frequently undertaken for symptoms attributed to the presence of hardware. In addition, concern about systemic and local effects of retained implants have led many patients to request hardware removal. Many patients are concerned about their implant which sometimes interferes with investigations such as MRI, CT scan or bone scan if they needed in future. Although many orthopaedic surgeons view the procedure as a routine part of care, it is sometimes more challenging and prone to complications than the initial surgery.

Although there is little debate that implant should be removed in the setting of implant failure, infection, nonunion, there is little consensus on routine hardware removal in the setting of healed fracture without any complications. Furthermore, it is not clear how long patients should be protected from significant loads after hardware removal.

To make the best decisions regarding implant removal, orthopaedic surgeon must be familiar with the potential risk of refracture or nerve injury, pain caused by implant or not, metal sensitivity, quality of implant, carcinogenesis and possibility of implant detection by security devices in airports or places where modern security devices are used like VIP gathering, important places which requires highest security by authorities concerned.

SURGICAL COMPLICATIONS:

Any surgical procedure carries inherent risks, including wound complications, iatrogenic injury to vessels, soft tissues and nerves and anesthetic complications. In their report on implant removal, Richards et al, 1992, noted that on implant removal of 86 patients, 3% complication rate including one refracture, one radial nerve injury and one infection. Sanderson et al, 1992 reported an overall 20% complication rate in their series of 188 patients. The most common complication was infection, followed by nerve injury. They recommend senior surgeon supervision of forearm implant removal, unsupervised junior surgeons produced 3 permanent nerve injury in their series.

Lang Kancer and Ackroyd 1990, Reported on 55 patients who had forearm plate removal. They noted a 40% complication rate including 4 infection, 5 poor scars, 17 nerve injury and 2 refracture and 1 delayed wound healing. They recommended that leaving asymptomatic implant in place and not delegating the procedure to inexperienced surgeons.

PAINFUL HARDWARE:

Persistent pain after radiographic evidence of fracture union commonly leads to implant removal. It is important to consider whether the patients may reliably expect pain relief after implant removal. Brown et al, 2001, examined functional outcome and pain relief after removal of implant from ankle fracture and reported that out of 39 patients reporting pain, 22 underwent removal of implant and only 11 (50%) of those have had improved lateral ankle pain relief. Following removal of intramedullary nail is similarly unpredictable. In their report of 17 patients with removal of nail from femur, Dodenhoff et al, 1997 noted that only 11 experienced pain relief. With tibial implants, knee pain is a common indication for nail removal. Kearing et al, 1997 showed a 45% rate of complete relief, 35% partial relief and 20% no relief of pain after nail removal. So, no patients should be guaranteed that complete pain relief is possible after removal of nail.

METAL ALLERGY:

Implant with nickel or chromium coating causes allergic response in a small segment of population about 10%-15%.

A patient who has metal sensitivity or nickel allergy may report nonspecific deep generalized pain over an area of implant. It is very difficult to differentiate this nonspecific pain from other pain. Additionally, it is not known whether there is cause and effect relationship between metal sensitivity and implant loosening. When there is implant loosening, low grade infection should be kept in mind and implant should be removed if the fracture is united. So loosening of implant & possible implant sensitivity is an indication of implant removal.

CARCINOGENICITY:

The great majority of data related to cancer risk and metallic implants is found in the total joint literature. Gillespie et al, 1988, reported a 70% increase in haematopoietic cancer over the general population in their retrospective review of 1358 total joint replacement patients over a 10 years period. Those results have not been duplicated in other studies. However, in the largest study to date, Signorello et al, 2001, conducted a nationwide cohort study in Sweden to examine cancer incidence in 116,727 patients who underwent total hip replacement from 1965 to 1994. Overall they found no increase in risk of cancer compared with general population. So risk of carcinogenicity associated with metallic implant appears to be very small and does not warrant the routine removal of implant.

PAEDIATRIC PATIENTS:

The general practice is to remove implants from paediatric patients. Kahle 1994 reported an overall complication rate of 13% in paediatric hardware removal. There is no clear data in the literature regarding routine removal of paediatric implant but the child has long expected years to live and both children and their parents become concerned about the possible risks of keeping implant and these become the indication of removal. But as with any elective procedure parents need to be aware of the risks and benefits of hardware removal in the paediatric population.

SUMMARY:

Implant removal although a common operation should not be a routine procedure and should not be undertaken lightly. Although it is clearly indicated in some patients, the routine removal of implant is not supported by the literature and exposes the patient to unnecessary costs and complications. Even patients reporting with implant related pain, removal does not guarantee relief and may be associated with further complications including infection, refracture, nerve damage and worsening pain. No data till now suggest that retaining implant has potential risk of neoplasm. It is important to understand the expected benefit from the procedure as well as to know the inherent risks.

More research is needed regarding the timing and expected benefit of removing implant as well as direct and indirect costs of the procedure.

Prof. Ram Dew Ram Kairy

Chairman, Journal Committee, BOS

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Original Article



Intra – Articular Hyaluronic Acid Injection in the Treatment of OA – Knee, Clinical Efficacy & Economic Implications : A Possible Alternative Answer before TKR

Md. Golam Sarwar¹, MA Gani Mollah¹, Dulal Ch. Datta², Moazzem Hossain³, Nitto Ranjon Roy³, Mollah Ershadul Haque⁴, Zara Rahman⁵

ABSTRACT

To evaluate the efficacy of intra-articular viscosupplementation therapy with hyaluronic acid for pain relief of knee osteoarthritis, we conducted analysis of randomized, double-blinded, placebo-controlled trials of 68 cases. We searched systematically for randomized, double-blinded, placebo-controlled trials of hyaluronic acid for pain relief of knee osteoarthritis. Studies reporting pain visual analogue scale (VAS) differences were included in this analysis. Changes in pain were measured by VAS for placebo and treatment, and summary estimates ANCOVA of 50 feet walk test (mm) VAS for all completed subjects were calculated at 2,4, 8, 10 and 16 weeks after the last intra-articular injection. Sources of heterogeneity were assessed using information on quality score and VAS change in pain with activity or rest. Heterogeneity across the studies was significant in all analyses ($P < .01$); therefore a random effect model was used. Pain was measured either on activity or at rest. 68 trials (20 hyaluronic acid and 20 hyaluronic acid with TA & 28 cases by naproxen as placebo control) allowed calculation of the summary estimate of difference in change of VAS pain at 2,4,8,10,16 weeks. The summary estimates of VAS differences between therapy and placebo (naproxen): at 2,4,8,10 & 16 weeks were 28.2,22.4,20.04,19.6 & 17.60 for hyaluronic acid and 33.4,28.0,26.14,24.7 & 26.99 for hyaluronic acid with TA. Here mean value was 9.39 ($p > 0.001$) which is a difference of approx. one third of standard deviation (Hyaluronic acid as adjusted means). Intra-articular viscosupplementation was moderately effective in relieving knee pain in patients with osteoarthritis at 4 to 8 and 8 to 10 weeks after the last injection and better result in steroid combination but not after 16 week.

Key words: OA – Knee, Intra – Articular Hyaluronic Acid Injection, Economic Implications, TKR

INTRODUCTION

Treatment with intra articular viscose supplementation with hyaluronic acid is an important component of the management of OA of the knee for carefully selected patients. This option should be reserved for those whose pain has not responded to adequate treatment with systemic therapeutic agents (acetaminophen, non steroidal anti-inflammatory drugs [NSAIDs], cyclooxygenase-2 [COX-2] inhibitors), topical agents, or to lifestyle modifications such as weight reduction and exercise.

Hyaluronic acid injections may also be indicated when knee surgery must be delayed for middle-aged persons.

Several I/A hyaluronic acid formulations are now available that vary in their physical properties, duration of effect & treatment schedules.

Although their mechanism of action are not completely understood but numerous clinical trials, researches & analysis shows that it can relieving OA related pain & improving joint functions. Data analysis shows that I/A hyaluronic acid preparations provide OA pain relief greater than treatment with NSAIDs, I/A corticosteroids, arthroscopic lavage, physical therapy and exercise. Multiple courses of I/A injection are needed for long term pain relief.

1. Assistant Professor, Department of Orthopaedic Surgery, NITOR, Dhaka
2. Consultant, Department of Orthopaedic Surgery, NITOR, Dhaka
3. Clinical Assistant, NITOR, Dhaka
4. Consultant, Border Guard Hospital, Pilkhana, Dhaka
5. Bioelectrical Engineering Hofstra University, 1000 Fulton Avenue Hempstead, New York 11549

Correspondence: Dr. Md. Golam Sarwar, Assistant Professor, Department of Orthopaedic Surgery, NITOR, Dhaka

I/A hyaluronic acid are well tolerated and are associated with a low incidence of adverse effects. Local adverse events associated with I/A hyaluronate products are typically mild to moderate in severity, transients in nature and subside within day.

OA is a degenerative Joint disease that causes pain & loss of mobility of a joint. It can greatly diminish the quality of life of sufferers. OA is the most common condition in elderly people & is the 2nd to CVD that produce chronic disability. This is an active disease with a complex underlying degenerative pathogenesis. Synovial joints are enclosed in capsules containing a thick slippery liquid called synovial fluid. Capsules are lined with a membrane, synovial membrane.

The Bones ends are covered in a smooth layer of a tough rubbery substance –cartilage.

SYNOVIAL FLUID HAS FOUR IMPORTANT FUNCTIONS

- It keeps the bones slightly apart, protecting their cartilage covering from wear & tear
- It absorbs shocks
- It lubricates & helping it to work freely as well as easily
- It acts as a filter

The most important component of synovial fluid is a substance called sodium hyaluronate. This substance performs filter for inflammatory molecules in extra-cellular matrix –it looks a dense mesh that remains elastic & flexible, in spite of its density & intra woven structure (dish spaghetti).

HYALURONATE INJECTION

Is a viscose, elastic preparation of a highly purified, non-inflammatory high molecular weight fraction of sodium hyaluronate.

It contains 10mg/ml of sodium Hyaluronate dissolve in physiological chloride phosphate buffered P^H 7.0-7.5 made up of repeating disaccharide unit of N-acetyl-glucosamine and sodium gluconate linked by α 1-3 & α 1-4 glycoside bonds.

After proper skin preparation that should not contain ammonium salts (chlorohexidine/ povidone solution), this medication usually given to the affected joint directly usually once a week.

There may need to remove extra fluid from the joint before injections the medication. We usually remove extra fluid & await 3 days for injection. Dosage is used on patients

condition, response to treatment usually 3-5 injections/ weekly. It does not inject to vein or artery. After receiving an injection of hyaluronate patient advised to avoid any activity that put stress on knee such as – jogging, tennis, heavy lifting, standing on feet more than one hour for 48 hours.

Side effects that observe are swelling, redness, bruise, signs of inflammation at the site of injection. Sometimes patients may experience serious side effects including back pain, severe headache, fast heartbeat, fever, tingling sensation & G I complains.

Injection Technique

Hyaluronic acid is supplied prefilled syringes. The recommended injection schedule is one injection per week for five weeks. Repeat courses of viscosupplementation can be performed after six months.

A knee joint can be injected several ways. One approach is to have the patient lie supine on the examination table with the knee flexed 90 degrees (Figure 1). In this position, the anterior portions of the medial and lateral joint lines



Fig-1

can easily be palpated as dimples just medial or lateral to the inferior pole of the patella. Often, the medial joint line is easier to palpate and define and can be chosen as the site of injection. Alternatively, the knee joint can be approached with the knee extended, again with the patient lying supine (Figure 2). Most commonly the superolateral edge of the patella is the site of injection, but other quadrants of the knee near the patellar edges can also be chosen. With this approach (knee in extended position), the needle is generally aimed under the patella.

Whichever approach is used, the actual injection site can be marked with a fingernail imprint or the barrel of a pen. Next, sterile preparation with a povidone iodine preparation (Betadine) and alcohol can be performed. A 22- to 25-gauge needle can be used for the injection. Local anesthesia with lidocaine before the injection can



Fig.-2

be used, but with a small gauge needle this is not always necessary. Alternatively, an ethyl chloride spray can be used for local anesthesia. Following puncture through the skin and into the joint space, the injection is accomplished. If resistance is encountered, redirection of the needle may be necessary.

If effusion is present, aspiration of the joint is recommended before the injection to prevent dilution of the injected hyaluronic acid. The aspiration can be performed at the same site as the injection, as previously described

No excessive weight-bearing physical activity should take place for one to two days following injection. Otherwise, no specific post-injection instructions are necessary.

Clinical Study:

The use of sodium hyaluronate as a treatment in OA of the knee.

Study Design:

This study was double-masked controlled, multicenter prospective clinical trial with three to five treatments as summarized in table no. 1. A total of 68 subjects with moderate to severe knee pain were randomized into three treatment groups in a ration 1:1:1.4- Hyaluronate, Hyaluronate+ Tri-amcinolone acetamide or naproxen

Table-I

<i>Route</i>	Hyaluronate 20	Hyaluronate + steroid 20	<i>Naproxen 28</i>
<i>I/A</i>	Josocain 1% + Hyaluronate (20mg/2ml)	Josocain 1% + Hyaluronate (20mg/2ml)+ Tri-amnicilone	500 mg x bd
<i>Orally b.d.</i>		acetamide 40mg	<i>orally</i>

Table-II

Incidence of adverse reaction

<i>Adverse reactions</i>	Hyaluronate n=20	Hyaluronate + TA 20
Inj. Site Pain	12	14
Redness, Joint Pain	5	2
Swelling, Headache &	1	2
G.I. Complains	1	0
Others – (Fever)	1	0

Table-III

Demographic Characters of the Patient:

<i>Demographic Variable</i>	<i>Treatment</i>			
	Hyaluronic acid N – 20	Hyaluronic acid +TA N – 20	Naproxen N – 28	Total N - 68
<i>Age - (Yrs.)</i>				
Mean+SD.				
Range	32 – 84	34 - 84	30 – 80	30 - 84
<i>Gender</i>				
Female –	12	10	20	42
Male -	8	10	08	26
<i>Weight (kgs)</i>				
Mean SD				
Range	58 – 110	60 – 98	52 - 100	
NSAIDS (ob)	18 (%)	10 (%)	22 (%)	
<i>Physical therapy (N%)</i>	5 (%)	12 (%)	6 (%)	

Table-IV

Clinical results :

<i>Evaluation</i>	<i>Success</i>	<i>Results</i>
100 mm VAS for Pain during 50 foot walk	A Statistically significant reduction on mean VAS for Hyaluronic acid, when compared to placebo(naproxen) at week 16	At week 16 deference between Hyaluronic acid vs NSAIDs was 9.39 (P<0.001) which is a difference of 1/3 rd of standard deviation
Subjects Categorical assessment of Pain (0=none, 5= disable) During 48 hours preceding visit	No. of patients treated with Hyaluronic acid showed improvement at week 16	At week 16 Subjects Categorical assessment of Pain showed Hyaluronic acid treated subject experience less pain

Table-V*Level of Pain by treatment group at baseline and week 16*

	Number (0%) of Subjects in Category					
	Hyaluronic acid		Hyaluronic acid +TA		Naproxen	
	Baseline	16w	B	16	B	16
None =0	1 (%)	1	1	2	0	2
Slight=1	1 (%)	3	1	7	1	4
Mild=2	3 (%)	10	2	6	5	6
Mode=3	3 (%)	4	2	3	6	4
Severe =4	12 (%)	2	14	2	16	12
	20 (%)	20	20	20	28	28

The outcome of knee pain reported by patients on activity or at rest, measured using a VAS of 100 mm. The results of the clinical trials were recorded as the mean differences of change from baseline between the treatment and placebo groups.

Table-VI

ANCOVA OF 50 Foot Walk Test (mm) VAS by Weekly For All Completed Subjects:

	2	4	8	10	16
Hyaluronic acid	28.2	22.4	20.04	19.6	17.60
Hyaluronic acid & TA	33.4	28.0	26.14	24.7	26.99
Hy Vs H. TA	5.2	6.4	3.90	5.1	9.39*

*(P<0.001)

Difference Between: Hyaluronic acid & Hyaluronic acid – TA Means was 9.39 (P<0.001) which is a difference of Approx. one third of standard deviation (Hyaluronic acid as adjusted means).

Study Population:

The demographic of trial population were comparable across treatment groups with regard to age, sex, weight, height, OA, prior use of NSAIDs & prior physical therapy.

Evaluation Schedule:

All Patients were advised to discontinue NSAIDs medication for 2 weeks, then initial screening the patient was done with baseline evaluations. The baseline evaluation included assessment of primary effectiveness criteria; measurement of pain during a 50-foot walk test using a 100 mm visual analog scale (VAS), a categorical assessment of pain (0-5) during 48 hours preceding visits.

All Subjects who fulfilled entry requirement, received the first injection after randomization. All subjects received lidocaine 1%, with one group Hyaluronic acid alone, other group Hyaluronic acid + TA weekly for a total of 5 injections (weeks 0-5). The naproxen 500mg to be taken orally b.i.d for 16 weeks subsequent visits & evaluations took places at weeks 2, 4, 8, 10 & 16. Safety and effectiveness criteria were assessed & recorded at these periods.

CLINICAL RESULTS

The 68 randomized, placebo-controlled, double-blinded clinical trials that met our inclusion criteria are summarized in TABLE 3. The treatment was administered weekly. The control group in 28 trials received naproxen orally as placebo.

For this trial overall success for effectiveness was defined as may be all of the success criteria listed in table No VI using score from week 16.

ADDITIONAL ANALYSIS

An analysis of study completed was performed as follows: Success was defined as (1) achieving a 20 mm decrease in the VAS for the 50 foot walk test by week 2.

(2) Maintaining this improvement throughout the week 16.

In these analysis greater proportions of hyaluronic acid related subjects no. 20, no pain to slight pain 4 out of 20 & hyaluronic acid & TA - group 9 out of 20. In hyaluronic acid & TA group pain was significantly reduce than other groups. Since patients were not followed beyond 16 weeks, it is unknown how long pain relief continues.

The cost effectiveness of I/A hyaluronate are well established, cost savings, as it reduce the use of NSAIDs & possibility of delaying TKR in developing country like Bangladesh.

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Outline of Primary TKR

Abdus Salam¹, M. Amjad Hossain², Tanvir Hasan³, Ananta Kumar Sen⁴, MG Sarwar¹, MA Sabur¹

ABSTRACT

Joint Replacement Surgery is commonly performed as an adult reconstructive procedure all over the world and it is time demanding. Though orthopedic surgery started in Bangladesh immediately after liberation, joint replacement surgery started a little late and yet to take its footing. Total Knee replacement, or knee arthroplasty, is a surgical procedure to replace the weight-bearing surfaces of the knee joint to relieve the pain and disability. While osteoarthritis re-mains the most common indication for total knee replacement, the number of primary total knee arthroplasties performed annually has increased exponentially over the last 55 years. Outcomes have improved with the use of careful preoperative assessment, a range of component options, and operative technique guided by clear surgical goals. Informed consent of any patient contemplating total knee arthroplasty must be obtained by discussing the risks and benefits and explaining that between 80% and 85% of patients are satisfied after the procedure. We perform TKR of 82 patients and 86 knees. Our Place of Study was in NITOR & LABAID Hospital Ltd. Dhaka, Bangladesh. Period of study: January 2008 to January 2013. Follow-up Period: 18 months to 56 months. There were 34 male (41.46%) and 48 female. (58.53%). The lowest age incidence was 46 years and the highest age incidence was 88 years. Functional outcome obtained Excellent- 76.74% (66 cases) Good- 13.95% (12case) Fair – 4.65% (04case) Poor – 4.65% (04case).

Keywords: AO-Knee, Joint Replacement Surgery, Primary TKR,

INTRODUCTION

In the 1860s, Fergusson performed a resection arthroplasty of the knee. Verneuil performed the first interposition arthroplasty using joint capsule. Other tissues were subsequently tried, including skin, muscle, fascia, fat, and even pig bladder. The first artificial implants were tried in the 1940s as molds fitted to the femoral condyles following similar designs in the hip.

While osteoarthritis re-mains the most common indication for total knee replacement, the number of primary total knee arthroplasties performed annually has increased exponentially over the last 55 years. Outcomes have improved with the use of careful preoperative assessment, a range of component options, and operative technique guided by clear surgical goals. Informed consent of any patient contemplating total knee arthroplasty must be obtained by discussing the risks and benefits and explaining that between 80% and 85% of patients are satisfied after the procedure.

In 1971, Gunston importantly recognized that the knee does not rotate on a single axis like a hinge. His polycentric knee replacement had early success with its improved kinematics over hinged implants but was unsuccessful because of inadequate fixation of the prosthesis to bone. The highly conforming and constrained Geomedic knee arthroplasty introduced in 1973 at the Mayo Clinic. The total condylar prosthesis was designed by Insall at the Hospital for Special Surgery in 1973. In 1993, Ranawat et al reported a rate of survivorship of 94% at 15 years of follow-up, which is the most impressive, reported to date. Good knowledge of relevant and related anatomy is the pre requisite for a good surgical approach, dissection, technique and eventual outcome.

BIOMECHANICS:

Kinematics – Longitudinal Alignment

- a) Anatomical axis of femur: passes along the femoral shaft axis, pyriform fossa to intercondylar notch.
- b) Anatomical axis of tibia: passes along the tibial shaft axis, intercondylar eminence to tibial plafond center.

1. Assistant Professor, Department of Orthopaedic Surgery, NITOR, Dhaka
2. Professor & Chief Consultant, Lab Aid Specialized Hospital, Dhaka
3. Medical Officer, Lab Aid Specialized Hospital, Dhaka
4. Registrar, Lab Aid Specialized Hospital, Dhaka

Normally, the anatomical axes of the femur and the tibia form a valgus angle of $60 (\pm 20)$.

- c. Mechanical axis of femur : passes from the center of the femoral head to the center of the intercondylar notch.
- d. Mechanical axis of tibia : passes from the center of the tibial plateau to the center of the tibial plafond. The mechanical axis of the tibia usually corresponds to the anatomical axis (unless there is tibial deformity).
- e. Mechanical axis of the lower limb: Is defined as a line drawn on a standing long leg AP roentgenogram from the center of the femoral head to the center of the talar dome.

Normally, this passes through or near the center of the knee joint. This axis is in 30 of valgus from the vertical axis of the body while standing in two legged stance. In a normal knee, the tibial articular surface is in 30 varus to the mechanical axis, and the distal femoral surface is in a corresponding 90 valgus to the mechanical axis.

ROTATIONAL ALIGNMENT:

Difficult to discern radiographically. As the proximal tibial cut is performed perpendicular to the mechanical tibial axis, instead of the anatomically correct 30 varus, to obtain a rectangular flexion gap, the femoral component must be rotated externally 30 external rotations with respect to the posterior femoral condylar axis. The aim of the knee replacement is to recreate the normal biomechanical axis and kinematics of the limb. Thus, tibial components are generally implanted perpendicular to the mechanical axis of the tibia, with posterior tilt dictated by the flexion – extension gaps, whilst the femoral component is usually implanted in 5 to 60 valgus, the amount necessary to re establish a neutral limb mechanical axis.

METHODS AND SURGICAL PROCEDURE:

Preoperative Clinical Assessment

a. On Admission

1. The patient is preferably admitted two days prior to the surgery,
2. Detailed history. Special emphasis is placed on history of varicose veins, DVT or PE in the past.
3. Status of the adjacent hip and ankle joints is noted. Quadriceps / Hamstring muscle strength is noted.
4. Pre anesthetic check up.

5. Blood needs to be arranged for surgery, Pre-operative transfusion is avoided.

6. Anti-coagulants, anti-platelet aggregatory drugs, NSAIDs are stopped 48 hrs prior to surgery, Disease Modifying Rheumatic Drugs (DMARDs) are stopped at least one week in advance.

- b. Preoperative joint assessment.

- c. Consent from patient party.

- d. Overnight fasting, early morning wash. Avoid shaving the part, paint the limb (groin to toes) with betadine, and drape with sterile sheets, check and mark the side to be operated.

PREOPERATIVE PREPARATION:

OT Requirements.

- Operation room to be sterilized overnight.
- Check laminar air flow.
- Check instrument sets- autoclave them
- Check implant component inventory
- Keep extra bone cement.
- C-arm and bone fixation sets on standby.
- Trained and synchronized OT staff available, and working under team leader.

Peroperative:

Surgical Approaches:

1. Midline Approach-medial Para patellar
2. Lateral Approach.

Surgical Technique:

- a) Patient Position.
- b) Skin incision
- c) Deep incision and approach.
- d) Structures cut and removed : Medial and lateral menisci, anterior cruciate ligament, portion of retro patellar fat pad obstructing approach, any overlapping or loose entophytes, inflamed synovial tissue.
- e) Patellar Eversion.
- f) Primary Tibial Bone cut.
- g) Extramedullary jig is placed aligning the medial 1/3rd of the tibial tuberosity to the axis of the 2nd metatarsal (with the ankle in neutral position), this line also passes through the center of the ankle joint.
- h) Alignment rod confirms mechanical axis placement of this jig.

- i) Stylus is affixed to jig, so as to cut either 8mm (From normal unaffected lateral tibial plateau) using either slotted or non slotted guides. Here, jig is fixed to bone with 2 pins (at 0 marks)
- j) First tibial cut is taken with saw and osteotome (through slot or on surface as selected).
- k) Block is placed on surface to ensure uniformity of cut, else it is smoothed.
- l) Tibial sizing is now achieved with tibial tray.
- m) Anterior posterior femoral bone cuts.
- n) Checking Flexion extension Gap, and Mechanical Alignment.
- o) Femoral Notch and Chamfer Cuts.
- p) Trial implantation and Reduction
- q) Check for Alignment, Stability and Tracking.
- r) Preparation for Tibial Tray.
- s) Patellar Preparation and Patellar Tracking
- t) Wound Lavage (The entire bony surface is lavaged using the pulsatile lavage system to expose the porous surfaces thus enhancing bone-cement interlock and remove blood clots and fat droplets)
- u) The surface is then dried and covered with sponges to accept cement.
- v) Final Component implantation.
- w) Cementation of the different components can be done either one by one (2 stage) or together.
- x) Wound closure (The wound is then lavaged with saline and closed in layers.)

Implant Systems and Designs: Implants are of many designs like fixed-bearing and mobile bearing and also PCL substituting and retaining types. The components include the femoral implant (right and left, PCL substituting or retaining, sizes 1.5, 2, 2.5, 3, 4 and 5), the tibial tray

(same, i.e. universal for right and left, sizes matching the femoral component), the patellar button (eccentric, dome-shaped with three pegs), and the standard PFC – Sigma insert (with post – and cam mechanism)

SCORING

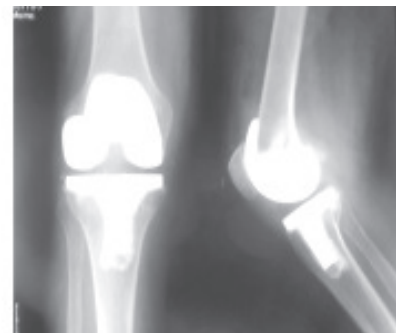
Knee Society Score takes into account pain, range of motion, stability, and the use of support while walking. The following table represents the calculation that needs to be done. Following imbalance may be faces:

1. Too tight in extension and too tight in flexion.
 - a) Use of thinner tibial insert on
 - b) Additional tibial resection.
2. Too Tight in flexion and satisfactory extension: can be corrected by.
 - a) Downsizing femoral component by one.
 - b) Removal of posterior osteophytes, loose bodies.
3. Tight in extension and satisfactory flexion.

This situation is overcome by step by step capsular release from posterior femur. If not corrected additional distal femur can be resected. First periosteal elevator is used to elevate capsule from posterior femur. ACL, PCL attachment are removed from femur. Extension gap is measured and if more release require, release gastrocnemius origin from femur.

RESULT:

Period of study: January 2008 to January 2013. Follow-up Period: 18 months to 56 months. There were 34 male (41.46%) and 48 female. (58.53%). The lowest age incidence was 46 years and the highest age incidence was 88 years. Functional outcome obtained Excellent- 76.74% (66 cases) Good- 13.95% (12 case) Fair – 4.65% (04 case) Poor – 4.65% (04 case).



Sex distribution of patients(n 110)

Sex	frequency	percentage (%)
Male	34	41.46
Female	48	58.53
Total	82	100

Mean follow-up period was 18-56 months.

Result	frequency	Percentage (%)
Excellent	66	76.74%
Good	12	13.95%
Fair	04	04.65%
Poor	04	04.65%
Total	86	100

CONCLUSION

Key to successful TKR is to balance flexion, extension gap and proper ligament balance. Before operation should have to assess if any deformity like fixed flexion contracture varus, valgus deformity present or not because these may affect flexion, extension gap. Further incremental improvements in knee arthroplasty engineering, implant design, and material science will continue to improve bearing surface tribology, implant fixation, and implant longevity.

These advances will all help meet the main surgical goals of total knee arthroplasty: to correct limb alignment, preserve joint line position, balance the soft tissues in the coronal plane, balance the flexion/extension gap in the sagittal plan, and create a Q angle that facilitates satisfactory patella tracking.

Preoperative assessment and planning will also help meet these goals by ensuring patient expectations are realistic and informed consent has been obtained after a full discussion of the risks and benefits of surgery.

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Original Article

Correction of Cubitus Varus Deformity by Supracondylar Lateral Closing Wedge Osteotomy

MS Alam¹, SA Jonayed², R Karim³, UK Roy⁴, H Khalid⁵, KM Hossain⁶, A Rahman⁷

ABSTRACT

The purpose of this study was to evaluate our experience in treating cubitus varus deformity with closing lateral wedge osteotomy. During the period 2004 to 2011, thirty five patients underwent supracondylar osteotomies for the correction of cubitus varus deformity. The results of surgery were assessed in 34 patients. The indication for osteotomy was cubitus varus deformity that was cosmetically unacceptable to either the child or the parents. All patients were treated with removal of an appropriate wedge of bone from the lateral side of the lower humerus and then closing the gap. Physical examinations for the gross carrying angle and the postoperative scar were assessed. Carrying angle and range of movement were used as criteria to categorize the results. Surgery results were excellent in 29, good in 5 patients. The follow up ranged from 1 to 7 years, with an average of 4 years (mean 3.5 years). Lateral closing wedge osteotomy is a safe and effective method of correcting cubitus varus deformity in the majority of patients.

Keywords: Cubitus Varus Deformity, Supracondylar, Wedge Osteotomy

INTRODUCTION

Cubitus varus deformity is the most common long-term complication of supracondylar fracture of the humerus in children. Reported in 58% of patients, its occurrence is higher in fractures originally managed conservatively^{1,2}. Although cubitus varus does not cause functional disability, surgery is often required for cosmetic reasons. Many surgical techniques to correct an established cubitus varus deformity are described in literature^{3,4,5}. These include closing wedge, opening wedge, dome pentalateral, and three-dimensional

osteotomies⁶⁻¹³. The purpose of this study is to report our experience in treating this deformity with closing lateral wedge osteotomy.

METHOD

During the period 2004 to 2007, thirty five patients underwent supracondylar osteotomies for the correction of cubitus varus deformity. The indication for osteotomy was cubitus varus that was cosmetically unacceptable to either the child or the parents. All patients were treated with removal of an appropriate wedge of bone from the

1. Associate Professor, Department of Orthopaedic Surgery, NITOR, Dhaka.
2. Medical Officer, Department of Orthopaedic Surgery, NITOR, Dhaka.
3. Registrar, Department of Orthopaedic Surgery, NITOR, Dhaka.
4. Clinical Registrar, Department of Orthopaedic Surgery, NITOR, Dhaka.
5. Registrar, Bangladesh Medical College & Hospital, Dhaka
6. Jr. Consultant (Ortho). Lauhojong General Hospital, Munshigonj.
7. Assistant Professor, Department of Orthopaedic Surgery, NITOR, Dhaka.

Correspondence: Dr. MS Alam, Associate Prof. of Orthopaedic Surgery, NITOR, Dhaka.

lateral side of the lower humerus followed by then closing the gap. Anteroposterior (AP) radiographs of both elbows were taken with the elbows in full extension and supination. The carrying angle of each elbow was measured both pre & post operatively. Preoperative planning included a tracing of the AP radiographs of the injured and uninjured sides. The former was reversed 180° and superimposed on the latter so that the desired correction angle could be estimated precisely. A template was made as per requirement pre-operatively. After exposure multiple drill hole made over humerus as per template. After removal of wedge, distal fragment can be rotated in any direction to correct any rotation. After correction of rotation, lateral wedge reduced & stabilized by pre bending reconstruction plate & screws which ensures rigid fixation. Surgery was performed via a lateral elbow approach.

Postoperatively, all patients had their upper limb immobilized by a long-arm splint with 90° elbow flexion for a 3-week interval, after which they began active ROM exercises. All the patients were asked to return to the hospital for clinical and radiographic evaluations. Physical examinations for the gross carrying angle and the postoperative scar were assessed. Subjective opinions about the gross appearance of the surgically treated elbow and the postoperative scar were recorded. Anteroposterior and lateral radiographs of the elbow were obtained and the carrying angles were measured. The Charts were reviewed and the operative time, blood loss, neurologic complications, wound healing time all were recorded. Carrying angle and range of movement were used as criteria to categorize the results. A result was considered excellent when the correction of the varus deformity was within 5° of the contra-lateral elbow and motion was within 5° of the preoperative flexion and rotation arcs (Fig 2). A good result meant that the corrected elbow was in a valgus position and motion was within 10° of the preoperative motion arcs. A poor result was assigned to any case with a residual varus deformity and loss of more than 10° of preoperative motion arcs. Clinical and radiographic assessments of the upper extremities of patients were performed before surgery. Complaints of cosmesis, range of motion (ROM), pain, and loss of muscle power were all assessed routinely.

RESULT

Cosmetic appearance was the major concern in all patients for surgical correction. There was no history of pain, stiffness, weakness, or functional limitation of motion in any of the operated patients. The pre-operative range of movement of the involved elbow was normal in Twenty six patients. Nine patients had 10°-15° hyperextension of the elbow.

Pre-operative carrying angles of the cubitus varus deformity ranged from -22° to -34°, with an average of -28.2°. All the lateral closing wedge osteotomies were done smoothly. The operative time ranged from 50 minutes to 75 minutes, with an average of 54 minutes. Intra-operative blood loss was an average of 20 mL. No postoperative nerve palsy occurred. All patients were given perenteral antibiotics for three days & oral antibiotics for ten days.

No reconstruction plate had to be removed before union of the osteotomy. In all 35 patients, correction of the deformity was maintained well through the healing stage. No loosening of fixation or loss of obtained correction had occurred, and no revision surgery was needed. Osteotomies had healed uneventfully by the fifth postoperative week and full ROM of the elbow was achieved within 2 months after surgery. The postoperative carrying angle measured at follow up ranged from 6° to 15° valgus with an average of 12.7° valgus. The patients were satisfied with the cosmetic outcome except for one who complained about the operative scar with good correction of the deformity. Categorizing these results, excellent in 29 patients and good in 5 patients.

The results of surgery were assessed in 34 patients (Table 1). One patient was lost to follow-up. There were twenty boys and fourteen girls. Their ages at operation ranged from 9 to 14 years (mean, 12.5 years). The average interval between the injury and the corrective supracondylar osteotomy was 3.1 years (range, 2-4 years). Right-elbow injuries occurred in fifteen cases, and in the remaining nineteen cases injury was to the left elbow. The follow-up period ranged from 1 to 7 years (mean, 3.5 years). All fractures were caused by accidental falls on the outstretched arm.

Table-I
Patients Data

Pt's no.	Age (yrs)	Sex	Time from fracture to opn. (months)	Duration of follow up (months)	Carrying angle (deg)			Range of motion (deg)		Result		
					Pre-operative	Follow up	Normal	Pre-operative Flexion/Extension	Post-operative Flexion/Extension			
1	11	M	28	53	-24	12	14	135	10	135	5	Excellent
2	9	M	37	38	-32	9	12	140	5	140	5	Excellent
3	13	F	35	46	-25	12	15	132	5	130	5	Excellent
4	12	M	29	34	-28	6	12	130	0	130	0	Good
5	10	M	24	23	-34	10	13	135	5	130	5	Excellent
6	9	F	40	38	-32	15	16	126	5	125	5	Excellent
7	13	M	34	67	-25	7	13	135	10	130	10	Good
8	14	M	27	49	-30	10	13	140	5	140	0	Excellent
9	12	F	37	84	-27	14	15	135	15	135	10	Excellent
10	11	F	46	65	-23	13	14	130	10	125	10	Excellent
11	13	M	38	57	-28	9	15	132	0	130	0	Excellent
12	11	F	39	60	-30	8	15	135	5	135	5	Good
13	10	F	43	34	-27	12	14	135	5	130	5	Excellent
14	11	M	32	45	-26	9	12	130	10	125	10	Excellent
15	13	F	28	34	-23	13	13	138	5	135	5	Excellent
16	10	F	39	76	-34	12	15	125	5	120	5	Excellent
17	12	M	48	67	-28	14	15	140	10	135	10	Excellent
18	14	M	37	23	-33	10	16	135	5	135	5	Good
19	11	M	28	34	-31	10	14	135	0	135	0	Excellent
20	9	F	43	48	-22	12	13	130	5	125	5	Excellent
21	13	M	42	64	-24	11	13	137	10	135	10	Excellent
22	14	M	24	48	-32	10	15	134	10	130	10	Excellent
23	13	F	37	20	-26	8	14	130	5	130	0	Excellent
24	11	M	32	32	-23	8	14	130	15	130	10	Good
25	13	F	28	64	-24	13	15	135	5	130	5	Excellent
26	10	F	41	18	-31	12	13	135	10	135	5	Excellent
27	13	M	39	32	-23	10	12	140	5	135	5	Excellent
28	9	M	27	46	-24	9	15	128	5	125	5	Excellent
29	12	F	41	12	-27	13	15	130	10	125	10	Excellent
30	12	F	37	20	-33	9	12	135	5	130	5	Excellent
31	13	M	38	14	-26	13	14	140	5	135	5	Excellent
32	14	M	46	17	-27	12	14	135	5	135	5	Excellent
33	11	M	32	21	-23	13	15	130	5	130	5	Excellent
34	13	M	29	24	-28	11	15	135	5	135	5	Excellent



Fig.-1(a) : Preoperative anteroposterior radiograph of 14 year-old boy left-sided cubitus varus deformity of 35°.



Fig.-1(b) :Preoperative clinical appearance



Fig.-2: Per-operative appearance

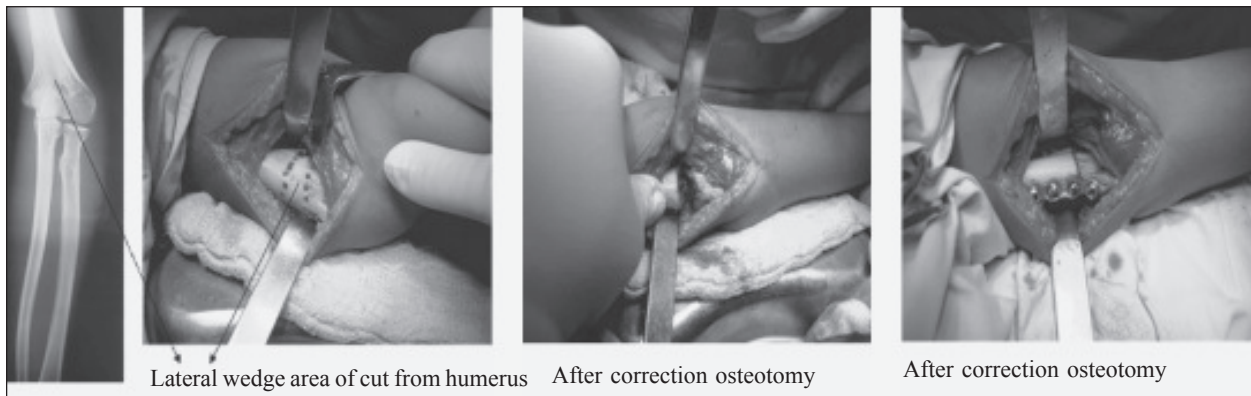


Fig.-3



Fig.-4: Post-operative X-ray after 2 yrs



Fig.-5: Clinical appearance after 2 yrs

DISCUSSION

Various osteotomies and fixation modalities have been described for the correction of cubitus varus deformity secondary to elbow fractures. The lateral closing wedge osteotomies and the dome osteotomies have shown good success rates, albeit with some problems^{14,15}. Wong et al reported a poor cosmetic appearance of the elbow in many patients because of bulging of the lateral epicondyle, which was more prominent if there was atrophy of the flexor muscles of the forearm¹⁶. More recently, Voss et al. claimed that no patient in their series was disturbed by the cosmetic appearance of the lateral stepoff, although many were aware of its presence¹⁷. In our series, all patients were satisfied with the cosmetic appearance of the operated-on elbow. The tendency to form an unsightly scar is reported to be due to direct crossing of the Langer skin lines by the standard longitudinal incision¹⁴.

A hypertrophic scar was observed in only one patient. Although rotation of the humerus may be ugly, the rotational deformity without any other deformity, contrary to some reports, cannot be cubitus varus or prominence of the lateral condyle, and such a deformity would be easily compensated for by a rotation of the shoulder joints¹⁸. Neurapraxia is one of the postoperative complications of the lateral closing wedge osteotomy⁸⁻¹⁴. Fortunately, there was no postoperative nerve palsy seen in our series. Our study considered patient satisfaction as well as clinical assessment in evaluating the results of lateral closing osteotomy. Our results demonstrate that a lateral closing wedge osteotomy can achieve a good correction of cubitus varus without unsightly scar in the majority of patients. Thirty out of thirty four (88.23%) in our series had excellent and good results with very negligible residual deformity.

CONCLUSION

Lateral closing wedge osteotomy is a safe and effective method of correcting cubitus varus deformity in the majority of patients.

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Original Article

The Evaluation of Results of Treatment of Fractures of Distal Radius by Close Reduction with Percutaneous Pin Fixation with Pin-in-Plaster Technique

M.A. Gaffar¹, Qamrul Alam Saleh², Partho Sharoti shome³, Md. Jahangir Hossain⁴

ABSTRACT

The purpose of this study was to evaluate the results of treatment of wrist fractures with percutaneous pin fixation with Pin-in-plaster technique. A prospective study was conducted on 36 patients with distal radius fracture who were treated with percutaneous Kirschner wire (K-wire) fixation and pin- incorporated in plaster . The surgical indications of this technique included displaced extra-articular fracture, intra-articular fracture without significant comminution, and articular step-off less than 2 mm. Bony union was achieved in all patients; the satisfactory rate was 88.7%. Pin-in-plaster technique is effective for maintaining reduction during bone healing. The procedure provides the ability to achieve anatomic reduction and then maintains this reduction through an adequate method of immobilization.

Keywords: Distal radius fracture, Percutaneous pinning, Pin-in-plaster

INTRODUCTION

Distal radius fractures (Broken wrist) are the most common type of orthopaedic fracture due to fall onto an outstretched hand. Some surgeons advocate treatment by manipulation and plaster immobilization¹⁹. Many recommend operative intervention as the only methods to obtain anatomical reduction, and some have proposed that the best functional result will only be achieved by obtaining as near an anatomical radiographic result as possible¹². Although a study by Young and Rayan²³ found favorable outcomes in low-demand older-aged patients despite deformity, most authors agreed that radial shortening more than 4 mm and radial dorsal angulation of more than 11° would reduce range of motion of the wrist. Furthermore, wrist pain was the most complaint among those patients^{2,7,12}.

In most displaced fractures of the radius, loss of reduction is likely to occur unless accurate management is provided to prevent further displacement. Inadequate fixation might result in gradual shortening at the fracture site during the healing process, even with excellent reduction. Percutaneous pinning and casting are simple procedures familiar to most surgeons. This article describes a technique that combines percutaneous Kirschner wire (K-wire) fixation, casting, and external fixation with presentation of treatment results.

MATERIALS AND METHODS

Thirty six patients with distal radius fractures who were treated with percutaneous K-wire fixation and pin-in-plaster technique were included in the study. The patients received treatment at North East Medical College & Private

1. Associate Professor, North East Medical College, Sylhet
2. Associate Professor, NITOR, Dhaka.
3. Professor, MAG Osmani Medical College, Sylhet.
4. Registrar, North East Medical College & Hospital, Sylhet.

Correspondence: Dr. M.A. Gaffar, Associate Professor, North East Medical College, Sylhet

clinics in Sylhet during the period of May 2010 to April 2011. Surgical indications for this technique included displaced extra-articular fracture, intra-articular fracture without significant comminution, and articular step-off less than 2 mm. The surgery excluded oblique volar fractures, significant dorsal comminution involving more than one third of the anteroposterior diameters of the radius, open fracture, bilateral fractures, and multiple fractures. The patients with multiple injuries were also excluded. All patients sustained closed distal radius fractures. Twenty-three patients were women, and 13 were men. The average age at the time of surgery was 61 years (range=44–83 years). Eleven cases were caused by a road-traffic accident, and twenty five fractures resulted from falls. The left wrist was affected in 16 patients and the right wrist in 20 patients.

Preoperative radiographs were assessed for fracture pattern, degree of comminution, and articular fragmentation. All of the cases were evaluated & using the Arbeitsgemeinschaft für Osteosynthesefragen (AO) classification¹³. According to the AO classification, there were 11 A2 fractures, 5 A3 fractures, 1 C1 fractures, 14 C2 fractures, and 5 C3 fractures.

OPERATIVE TECHNIQUE

To be included in this study, all the patient was scheduled for operative treatment either the same day or within 48 hrs. of injury. The technique is usually applied under brachial plexus block, and reduction of the fracture is then attempted by manual traction, aiming to restore the normal radial and volar tilt of the distal radial epiphysis. Fingertrap traction is not used ; the patient's forearm is maintained parallel to the floor, manipulation of the

fracture is then performed, with flexion of the elbow at 90 degrees. The quality of the reduction is then checked with fluoroscopy in A-P and lateral projections, by rotating the C- arm around the wrist while the patient's hand is held steadily. Osteosynthesis is then performed with two 1.2 or 1.5 mm diameter K-wires.

The K-wires should be introduced at the styloid process of the radius , holding the drill parallel to the ground, while the K-wire is held at 45° angle to the longitudinal axis of the radius. Image intensification fluoroscopy was used to assist the insertion of the K-wires throughout the entire procedure . When the angle between the K-wires and the

axis of the radius at the styloid process is less than 45°, piercing the medial cortex of the radius above the fracture often becomes impossible, as the Kwire slides into the medullary cavity, which will result in decreased stability. Metaphyseal fractures of the radius are more stable when two parallel K-wires connect four opposite points on the radius cortex ; in fractures with a punch-fragment, a K-wire is inserted transversely, after reduction of the fracture¹². Reduction of the punch fragment is often very difficult^{12, 17} . An attempt to reduce it can be made with a percutaneous K-wire used as a lever, pushing the fragment upwards. Very rarely a dorsal access between the 4th and 5th extensor compartments is required. When a satisfactory reduction of the fragment is not achieved in this way, open reduction and plate fixation is necessary. At the end of surgery the K-wires are bent and cut away from the skin, so as to avoid pressure lesions, and for the same reason a cast is made with slight ulnar deviation of the wrist.. Sponge padding with an occlusive dressing was applied to prevent skin irritation. All procedures were carried out under full sterile preparation and draping. A well-fitted pin-in-plaster was applied for external immobilization. Usually a total of four K-wires were used with this technique.

In patients below 60 years of age who do not have comminuted fractures, a below-elbow cast may be sufficient if the bones are considered sufficiently strong by the surgeon at the time of introduction of the K-wires. If the above requirements are not fulfilled, the cast should also immobilise the elbow. In our study patients, we found that it should not be necessary to manipulate the wrist with pronation or wrist flexion to obtain or hold the reduction. Image intensification fluoroscopy was used to assist the reduction and to assess the accuracy of the reduction.

The wire insertion was performed with a power K-wire driver to allow the surgeon to hold part of the reduction with one hand during K-wire insertion. After percutaneous pinning for distal radius fracture was finished, a K-wire was inserted into the base of second metacarpal bone. Another K-wire was inserted into the junction of the distal and middle thirds of the radial shaft. The patients were hospitalized overnight to observe distal circulation of the fingers. The patients underwent follow-up at our outpatient department at 2-week intervals following hospital

discharge. The healing of the fracture was assessed both clinically and radiographically at each follow-up. Usually, by 6 weeks, clinical and radiographic examination demonstrated progression of fracture healing. The percutaneous wires and the pin-in-plaster were usually removed after 6 weeks of immobilization on an out patient basis without local anesthesia. Instruction about active-assisted wrist motion was demonstrated to the patient. Physiotherapy was arranged because distraction across the wrist possibly could delay the return of motion and strength. A custom-made protective splint was applied after the removal of the cast. The splint could be removed for bathing and exercise. The use of the splint was not needed after 4 to 6 weeks, after which time, the fracture was solidly healed. Most patients favored the splint for protection.

The functional results and radiographic results were evaluated. The treatment complications were recorded. After bony union, patients underwent further follow-up for 1 year. Wrist function was evaluated at 6 months and 1 year using Solgaard's modification¹⁷ of the scoring system described by Gartland and Werley³ (Table 1). The functional outcome was easy to evaluate with simple instruments in this scoring system. The residual deformity and the subjective evaluation were recorded in the same way as the original scoring system. The range of motion was measured using a goniometer to measure dorsal and volar flexion, radial and ulnar deviation, and supination and pronation, and the sum was calculated as the percentage of the unaffected wrist. The grip strength was measured with a gripper, and the result was classified using a nomogram. The final results of the patients with excellent and good functional outcome were considered satisfactory.

RESULTS:

The average follow-up was 13 months (range=09–21 months). All of the fractures healed in our study group. Excellent results were noted in 21 patients, good in 11, fair in three, and poor in one patient. Most of the patients returned to their preinjury activity level with a 88 % satisfaction rate (Fig. 2). There were three patients rated as fair, which correlated with radial shortening, especially on the step-off of the radio-ulna joints. There were two cases of pin tract infection in which the removal of the pin-in-plaster in an earlier stage was necessary. Both cases responded well to antibiotic treatment and wound care after the removal of the wires. At the time of last follow-up, there was no recurrent infection, and the functional results were good in both cases. One case had unsightly tethered scars at the site of radial pin insertion, but the functional result was excellent at the time of follow-up.

Table-I

Functional scoring system modified after Gartland and Werley

		Points
Deformity	Prominent ulnar styloid	1
	Radial deviation	1–2
	Dinner-fork deformity	1–3
	Maximum	6
Subjective evaluation	No pain, no limitation of motion	0
	Slight pain, slight limitation of motion	2
	Occasional pain, some limitation of motion, weakness	4
	Pain, limitation of motion, activities restricted	6
Range of motion	Maximum	6
	Limitation of motion <20%	0
	Limitation of motion 20–50%	2
	Limitation of motion >50%	6
Grip strength	Stiffness of wrist	6
	Maximum	6
	Normal (within 2 SD)	0
	2–4 SD	2
Complications	4–6 SD	4
	<6 SD	6
	Maximum	6
	None or minimal	0
Total score	Slight crepitation	1–2
	Severe crepitation	3–4
	Median nerve compression	1–3
	Pulp-palm distance 1 cm	3
	Pulp-palm distance >2 cm	5
	Pain in distal radio-ulnar joint	1–3
	Maximum	16
	Excellent	0–2
Good	3–7	
Fair	8–18	
Poor	19–39	

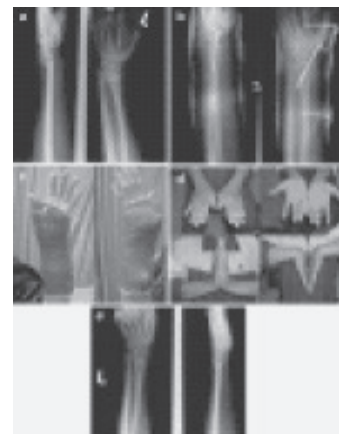


Fig-1 : a. The anteroposterior and lateral radiographs of the wrist in a 65-year-old man show displaced distal radius fracture. b Radiographs of the wrist show fracture fixation with K-wires. c Photographs of wrist fixation with pin-in-plaster. d Nearly full.

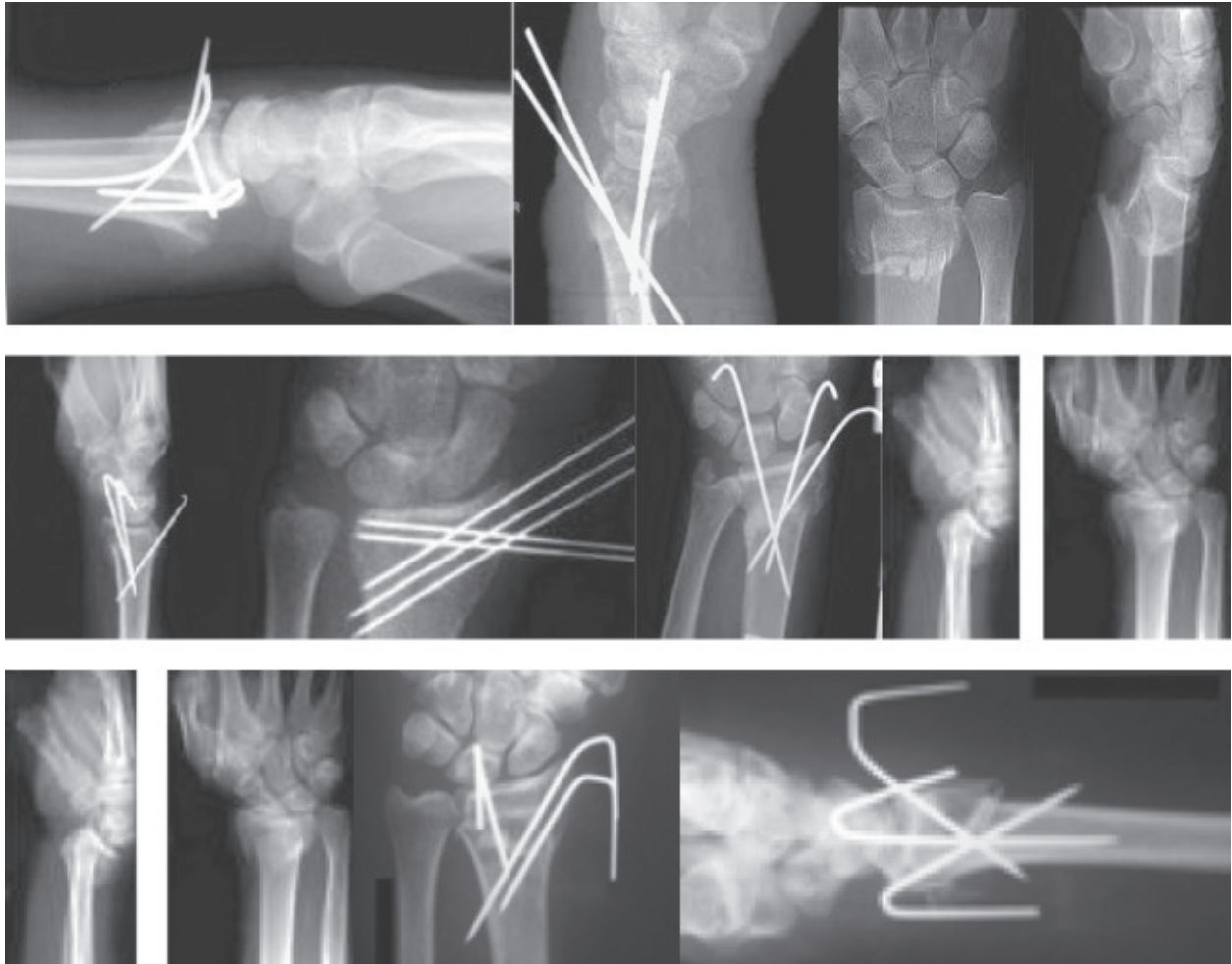


Fig.-2

DISCUSSION:

Distal radius fracture is a common injury. The importance of anatomic reduction has been demonstrated by clinical studies as well as by laboratory assessment of force and stress loading across the radiocarpal joint^{8,20}. In fractures with articular surface displacement greater than 2 mm, radial shortening greater than 5 mm, or dorsal angulation more than 20°, suboptimal results have been reported in previously published studies^{8,11}. Therefore, every effort should be made to restore normal length, alignment, and articular surface congruency of the distal radius.

An accurate reduction in the fracture is the first step in the treatment of the distal radius fracture. After anatomic reduction in the fracture is achieved, many methods are available to maintain alignment and prevent further displacement. The methods of immobilization include casting, percutaneous pinning, external fixation, internal fixation with plate, or internal fixation combined with external fixation depending on the different types of

fractures. Every method has its advantages and some limitations.

The most common traditional treatment of distal radius fractures in osteoporotic patients is closed reduction and cast immobilization. Three-point fixation with a well-fitted cast is essential for adequate immobilization. However, extreme flexion should be avoided because carpal tunnel pressure will be increased. This is associated with increased wrist flexion and ulnar deviation when the distal fracture was immobilized with a cast. Although cast immobilization alone avoids surgery and complications related to pin placement and pin removal, casts cannot maintain distraction to correct length or control the rotation of the distal fragment when comminution is present²¹. Loss of reduction usually happens after 2 weeks of casting despite a perfect initial anatomic reduction². Gartland and Werley obtained a 68.3% satisfactory result, and Sarmiento et al. reported an 82% satisfactory result treated with the casting technique¹⁵. Spira and Weigl

reported a 51.4% unsatisfactory result with reduction and use of cast in the treatment of comminuted fracture of distal radius with articular involvement¹⁸. Closed reduction and percutaneous pinning relies on intrafocal manipulation and pinning or manual traction, reduction, and pinning, to hold the fracture in an appropriate anatomic alignment. Clancey reported a 96.4% satisfactory result in 30 patients treated with percutaneous pinning if the articular surface of the radius was not comminuted into more than two fragments¹. However, the tenting effect is not strong enough in comminuted fracture, which often results in subsiding and dorsal angulation. Anatomic studies reveal the risk of injury to the sensory branch of the radial nerve with percutaneous pinning through the snuffbox⁵.

External fixation has been popular for the treatment of displaced fractures of distal radius, and the radial length and dorsal tilt have improved significantly with this method^{10,14,22}. External fixation can be supplemented with percutaneous wires through the radial styloid for certain intra-articular fractures. The external fixator could maintain radial length more efficiently than the percutaneous pinning and casting group, but volar tilt was not generally restored⁶. Pin tract infection is another problem that should be concerned.

The pin-in-plaster technique is a combination of percutaneous pinning, casting, and external fixation. The potential biological advantage is that it allows treatment of the fracture with minimal manipulation and devascularization of the bone. Adjacent soft tissue supports structures, including tendons and the joint capsule. After closed reduction in our study patients, the fractures were fixated directly with percutaneous K-wires. Because K-wire fixation seldom provide sufficient stability to allow for early motion and often necessitate use of a cast or splint, the addition of two K-wires incorporated into the pin-in-plaster could increase stability of the fracture fixation. Extreme wrist flexion and ulnar deviation could be avoided with this technique. Extreme wrist flexion might cause potentially uncorrectable wrist stiffness and also is associated with an increased risk for median nerve compression resulting in carpal tunnel syndrome¹⁰. Pin-in-plaster relies on ligamentotaxis to maintain the reduction. Yet, excessive traction across the wrist ligaments, which leads to stiffness, can be avoided. Postoperatively, the pin-in-plaster functioned as a neutralization device, preventing fracture collapse and decreasing the biomechanical demands on the internal fixation hardware. This procedure can be performed for both intra-articular and extra-articular fractures. Green reported an 86%

satisfactory result with this technique used in the treatment of 75 patients with severely comminuted intra-articular fractures⁴. The technique is so easy that most surgeons become familiarized with this procedure in a relatively short time. The wires usually can be withdrawn in the outpatient department with relative ease when healing is sufficient.

Despite the above advantages, there were some disadvantages of the pin-in-plaster technique for the treatment of distal radius fracture. There was the risk of injury to the sensory branch of the radial nerve while percutaneous pinning through the snuffbox. Limited incision should be used to protect the distal radial sensory nerve branches from injury. Problems in peripheral circulation might occur if the cast is too tight. Pin tract infection can be an occasional problem because pin tract care is impossible in the pin-in-plaster. Frequent follow-up to assess any sign of pin tract infection is mandatory. The occurrence of pin tract infection can be controlled successfully after removal of the K-wires and initiation of treatment with oral antibiotics and pin tract care. Another problem of pin-in-plaster was poor tolerability in a few patients in our study. The fracture might lose reduction if removal of the pin-in-plaster was performed in an earlier stage before callus formation was strong enough to allow early range of motion of the wrist. A short-arm splint was necessary if the pin-in-plaster was removed in an earlier stage for any reason. Rehabilitation was usually necessary, since wrist stiffness was common immediately following cast and pin removal. However, almost all of the patients could achieve good range of motion of the wrist after a period of physical therapy.

One of the most frequently stated complications associated with most intra-articular fracture is the development of posttraumatic osteo-arthritis. In the radio-carpal and distal radio-ulnar joints, the reported incidence of arthritis was variable. However, radiographic findings correlated poorly with symptomatic complaints⁹. There was no incidence of posttraumatic arthritis reported in our patient population because long-term follow-up is not available. Additionally, the need for secondary salvage is unknown. At least, in the short term, the technique of combined fixation seems capable of restoring reasonable joint function for extra- and intra-articular fracture of the distal radius.

The average union state of the volar tilt angle was 3.93° compared with 3.97° in the immediate post reduction state. We consider that the pin-in-plaster technique can efficiently stop radial shortening and dorsal tilting during the time of bone healing. Most of our study patients achieved excellent to good functional results 6 months after removal of the pin-in-plaster.

CONCLUSION

Percutaneous pinning incorporated with pin-in-plaster fixation is an excellent technique for both extra-articular and intra-articular fractures in cases without severe comminution of the distal radius. The technique involves a minimal procedure that provides anatomic reduction, fracture fixation, and maintenance of reduction with an adequate method of immobilization.

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Treatment of Frozen Shoulder by Intra-Articular Steroid

MA Faisal¹, S Borhanuddin², Md. Golam Sarwar³, NK Datta⁴, MM Haque⁵, M Jamaluddin⁶, Rahat BH⁷

ABSTRACT

Frozen Shoulder is an extreme painful condition in which the shoulder is completely or partially unmovable (stiff). Treatment may be painful and consists of physical therapy, medication, hydrodilatation or surgery. Among them intra articular steroid injection is safe and dramatic improvement of symptom relieving pain & stiffness and increasing range of movement. In this study 50 patients were treated by intra articular steroid injection. Among 50 patients excellent result was observed in 30(60%) and good result was seen in 19 (38%) patients and no improvement is seen in 1(2%) patient.

Key Words : Frozen shoulder, Intra articular steroid, Stiffness.

INTRODUCTION

Frozen shoulder occurs about 2% of the general population. It most commonly affects people between age 40 to 70 years and occurs in women more often than men¹. Risk factors for frozen shoulder include diabetes, stroke, connective tissue disorder and heart disease². Treatment

of frozen shoulder by intra articular steroid injection gives good result for significantly relieving pain, stiffness and increasing range of movement. Intra articular steroid injection is a blessing for the patients who are frustrated due to long term taking of oral analgesic, physiotherapy and others.

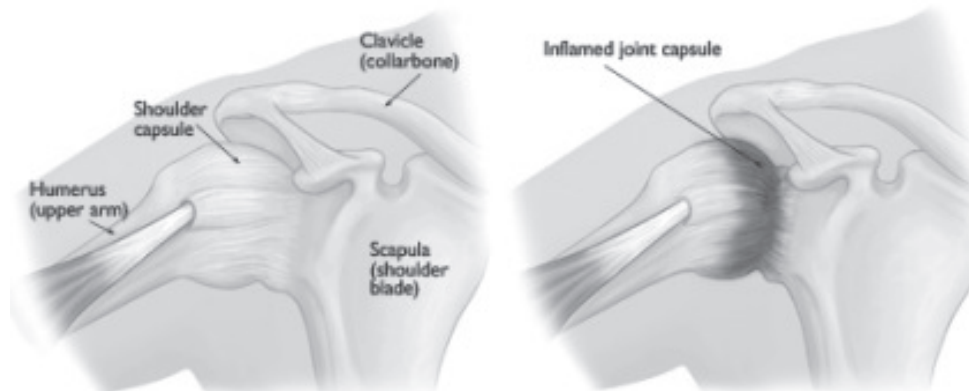


Fig.-1: Shoulder capsule become thick, stiff and inflamed.

1. Junior Consultant, Central Police Hospital. Dhaka.
2. Senior Consultant, Central Police Hospital, Dhaka.
3. Assit. Professor, Department of Orthopaedic Surgery, NITOR, Dhaka.
4. Professor & Chairman, Department of Orthopaedic Surgery. BSMMU, Dhaka.
5. Medical Officer, NITOR, Dhaka.
6. Assistant Professor, Department of Orthopaedic Surgery. Cox's Bazar Medical Collage.
7. Research Assistant and Epidemiologist, SSMC & Mitford Hospital, Dhaka.

Correspondence to: Dr. Mohammad Ali Faisal, Junior Consultant, Department of Orthopaedic Surgery, Central Police Hospital, Dhaka.

MATERIAL AND METHOD

In this prospective type of interventional study 50 patients were treated by intra articular steroid injection at Central Police Hospital, Rajarbag, Dhaka and private chamber, during the period of 1st January 2011 to 31st December 2011. A brief history was taken from each patient and a full clinical examination was done. Laboratory investigation like complete blood count, Random blood sugar, Rose – walar test, serum uric acid, X-Ray of shoulder joint were done to exclude other pathology. Diagnosis was made by localization of impairment, passive abduction not exceeding 55^o, external rotation restricted from zero to 50^o. A minimum follow up was for 3 months and maximum duration of follow up was for 6 months.

Treatment was given by Intra articular steroid injection. Sterile technique is recommended during when performing injection³. This extra care is needed to minimize the risk of iatrogenic infection. In this study intra articular steroid injection was given in glenohumeral joint through posterior approach. Two injections were given to the patient two weeks interval. The joint is easily accessible with the patient sitting, the patient arm resting comfortably at the side and the shoulder internally rotated across the waist⁴. Essential land mark to palpate before performing this injection includes coracoid process, Acromion⁵. The preloaded 10cc syringe (2% lidocaine 2 ml+1ml triamcinolone) was inserted two finger breaths inferior and medial to the posterolateral corner of the acromion and was directed antero-medially towards the coracoid process.



Fig.-2: Procedure of insert intra articular steroid injection

RESULTS:

A total 50 cases were studied. Out of 50 cases 28(56%) were female and 22(44%) were male. Age range of patients was 41 to 70 years and average age from 52 to 55 years.

Right shoulder joint involvement was 21 (42%) and left in 27 (54%) and bilateral in 2 (4%) The common presenting complaints pain and stiffness were found in every patient (100%), and sleep disturbance was found in 35 (70%) patients, difficulty in self dressing and combing were present in 40 (80%) patients. Among 50 patients excellent result was observed in 30 (60%) and good result was seen in 19 (38%) and no improvement is seen in 1 (2%) patient.

Table-1

Demographic profile of patient.

Number of patient - 50	
Sex	
Male	22 (44%)
Female	28 (56%)
Age	
Range	41-70
Average	52-55
Symptom	
Pain, Stiffness and restricted movement	50 (100%)
Sleep disturbance	35 (70%)
Difficulty in self dressing & combing	40 (80%)
Length of follow up (Month)	
Average	4.5
Minimum	03
Maximum	06

Table-II

Functional Outcome of the study.

Result	Reliving symptom	Number	Percentage
Excellent	Relive Pain, Stiffness & increase range of movement	30	60%
	Relive Pain, Stiffness & mild increase range of movement	19	38%
Poor	No Improvement	1	2%

DISCUSSION:

Among 50 patients the high number was female 28 which was (56%). It occurs most typically during 5th to 6th decades that is 41 to 60 years. In this study 82% belong to this age range. In this study right shoulder joint involvement was 21 (42%) and left in 27 (54%) and bilateral in 2 (4%). Among 50 patients pain stiffness and restricted

movement were found in every patient which was 100%. Sleep disturbance was present in 35 (70%) of patients. Difficulty in self-dressing and combing were present in 40 (80%) of patients.

Among 50 patients all patients (100%) were treated previously long term by non steroidal anti-inflammatory drugs, physiotherapy (more than one months) & others, but no improvement was seen at all.

Among 50 patients 30 (60%) those who were excellent outcome, relive from pain, stiffness & increase range of movement of shoulder joint. 19 (38%) patients those who were good outcome, relive from pain, stiffness and mild increase range of movement. 1(2%) patient have no improvement.

CONCLUSION

Intra articular steroid injection which is generally safe with minimum risk to the patient can help reliving pain, stiffness and increasing range of movement of shoulder joint. Intra articular steroid injection should be considered after other therapeutic intervention such as non steroidal anti-

inflammatory drugs, physiotherapy & activity modification have been tried⁶.

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Intercondylar T Fractures of the Distal Humerus

Md. Iqbal Qavi¹, Md. Abdus Sabur², Md Aminul Haque Pathan³, Md. Serajus Saleheen⁴,
Abdul Maleque⁵, Md. Shahinul Islam⁶

ABSTRACT:

In this paper we review a series of 12 Intercondylar T fractures of the distal humerus that were treated by open reduction over a period of three and a half years. The fracture patterns were classified according to the system of Muller et al, and the results were recorded according to motion, pain, and disability. At a mean follow-up of two years, six results were rated as excellent; four as good; one as fair and one as poor. Complication included transient ulnar nerve palsy in one patient. This study attempts to rationalize the operative management of these fractures regarding the choice of surgical approach, choice of implants and timing of mobilization of elbow.

Keywords: Intercondylar T Fractures, Distal Humerus, surgical approach, choice of implants, timing of mobilization

INTRODUCTION:

Management advocated for intercondylar T fractures of the distal humerus varies widely in the literature, ranging from olecranon traction to open reduction and internal fixation¹⁻⁷. Non-operative management of this fracture often leads to either a pseudarthrosis with gross instability or a painful stiff elbow. Moreover accurate reconstruction of the articular surface is not always possible by closed manipulation. Consequently, there is a consensus gradually building up in the literature that these fractures should preferably be treated by open reduction and internal fixation. To obtain acceptable postoperative results it has to be followed by early mobilization of elbow^{3,5,7,8}. However, authors recommending open reduction differ widely in respect to the extent and type of internal fixation, choice of surgical approach and timing of mobilization of elbow^{6,8,9,10}.

This study attempts to rationalize them by analysing our experience of surgically managing intercondylar fractures of the distal humerus followed by early mobilization.

MATERIAL AND METHODS:

This study involves 12 patients with intercondylar T fractures of the distal humerus. The mode of injury was fall onto the elbow or a road traffic accident. Two of the patients had multiple fractures elsewhere in the body. There were 10 men and two women with an average age of 38 years (range, 18-56 years). There was a marginal preponderance of right-sided involvement. By the classification of Muller et al.¹⁰, four fractures were classified as C1 type, six as C2 and the remaining two as C3. All the fractures were simple injuries except for one patient who had a Gustilo type II open injury. All the fractures except two were operated on within two weeks of the injury. One of the remaining two with an open injury was operated on at 5 weeks after the wound healed. The last case reported to us after 4 months. There was a pseudarthrosis with gross instability and a completely stiff elbow, consequent to failed non-operative treatment.

All the patients were operated on in the lateral position with their forearm hanging by the side over a pillow placed against the patient's chest. Extra-articular trans-olecranon

1. Professor (c.c) of Orthopaedic Surgery, National Institute of Traumatology and Orthopaedic Rehabilitation (NITOR), Dhaka
2. Assistant Professor of Orthopaedic Surgery, NITOR, Dhaka
3. Registrar, NITOR, Dhaka
4. Clinical Assistant, NITOR, Dhaka
5. Medical Officer, NITOR, Dhaka
6. Resident, NITOR, Dhaka

Correspondence: Dr. Md. Iqbal Qavi, Professor (c.c) of Orthopaedic Surgery, National Institute of Traumatology and Orthopaedic Rehabilitation (NITOR), Dhaka

dorsal approach was used in all cases. Extra-articular osteotomy of the olecranon was performed to reflect the triceps proximally. The articular surface was reconstructed with special emphasis on trochlear components and it was stabilized with a 4-mm cancellous screw. A 2-mm reconstruction plate was contoured in both the planes to fit the posterior flat surface of the lateral column of the distal humerus. This was used to fix the articular fragment to one of the columns. It was supplemented with another reconstruction plate or tensionband wire with K-wire for stabilizing the medial column. The olecranon osteotomy was stabilized using a 4-mm lag screw with supplementary tensionband wire (Fig.-1). A suction drain and a plaster of Paris back slab was routinely used in all the patients. The operative time averaged less than 2 hours.

The plaster back slab was discarded after 2 weeks. Patients were asked to mobilize their elbow actively depending upon the stability of internal fixation achieved pre-operatively. Patients were reviewed clinically and radiologically at regular intervals. Average follow-up was 2 years (range, 1-3.5 years).

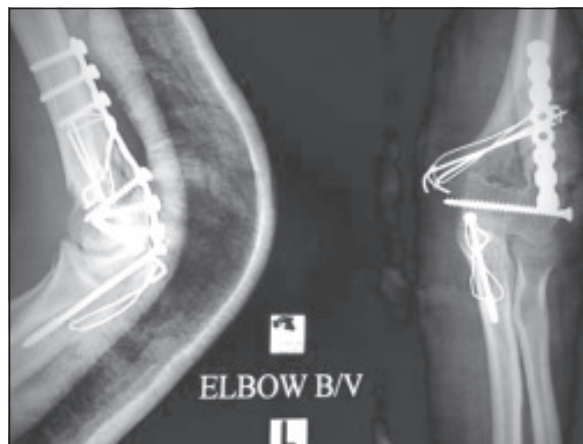


Fig.-1: Post-operative radiograph of patient.

RESULTS:

All the fractures including the osteotomies of the olecranon had united by 10-12 weeks. The complications included transient ulnar nerve paralysis in one patient which recovered spontaneously by the third week. No patient developed myositis ossificans. One patient had clinically apparent postoperative cubitus varus but it did not cause any disability.

The patients were evaluated using a rating scale incorporating motion, pain and disability (Table-I). A loss of full extension of the last 5° was seen in most of the cases. Excellent grading was achieved in 6 patients with

an arc of flexion >110°, and no pain or disability. Four patients were graded as good, with range of motion at the elbow of >75°. The patient who had an open injury (Gustilo Type II) and delayed operation at 5 weeks had an arc of flexion of 60°, pain with activity and moderate disability. Only one of the patients with pre-operative pseudarthrosis was graded as poor with an arc of flexion at the elbow being <60°, but in this case also there was some useful functions of the limb.

Table-I
Evaluation criteria

Rating	Motion	Pain	Disability	No. of patients
Excellent	Normal or near normal >110°	None	None	6
Good	Slight limitation >75°	Occasional	Minimum	4
Fair	Moderate limitation >60°	With activity	Moderate	1
Poor	Marked limitation <60°	Variable	Severe	1

DISCUSSION:

Intra-articular fractures of the distal humerus in adults are difficult to treat because of the nature of the injury. There are very few series in the literature with a large number of cases due to the small incidence of these fractures. The non-operative approach to these fractures cannot ensure good reconstruction of the articular surface or permit early mobilization of the elbow. Operative management, on the other hand, is often criticized because of the additional trauma and inherent difficulty in securing stable fixation of small fragment¹¹. However, the past decade has witnessed significant advancements in surgical techniques and implants to ensure stable osteosynthesis of small intra-articular fragments¹². Consequently more and more surgeons now tend to manage these complex fractures operatively though they all differ in their surgical approach and choice of implants.

Most previous series^{7,8,13} have used the classification of Muller et al.¹⁰ for these fractures and it was also used in the present study. Some author^{1,14} have advocated subdivision of C1 fractures into undisplaced and displaced types. However, this distinction is advocated more by those recommending the non-operative approach for the undisplaced group¹⁴. As operative management offers a

distinct advantage over non-operative in ensuring early mobilization of the elbow even in undisplaced C1 fractures, we feel that there is no advantage of separating these two types.

This study agrees with Jupiter et al.¹³ that the trans-olecranon approach with the patient's arm hanging by the side over the arm-rest offers excellent exposure for the distal humerus including the articular surface, which is so essential for good reconstruction, especially in type C3 fractures. However, it does entail creating another intra-articular fracture with its own concomitant complications^{12,13}. In this series, all the twelve extra-articular osteotomies of the olecranon united without any complication. We avoided intra-articular trans-olecranon approach, and found that extra-articular trans-olecranon approach provided adequate exposure for all types of intercondylar T fractures. Supplementing the 4-mm lag screw with tensionband wire for fixation of the olecranon osteotomy provided additional protection for early mobilization of the elbow.

The usual choice of implant has been the 3.5-mm reconstruction plate or 1/3rd tubular plate^{7,10,13}.

However, it is technically very difficult to apply the 1/3rd tubular plate onto a thin supracondylar crest. Sanders et al.⁹ advocated the use of a 3.5-mm DCP. We found that 2-mm reconstruction plate, which was easier to contour, applied to the lateral column and supplementary fixation of the medial column either by 2-mm reconstruction plate or tensionband wire with K-wire provided stable fixation.

Transient ulnar nerve paraesthesia were encountered in one of the patients in the present study. Ulnar nerve involvement has been reported in most studies as a common complication both with non-operative and operative management⁷⁻¹⁴. Jupiter et al.¹³ advocated anterior transposition of the ulnar nerve. We feel it is best to leave the ulnar nerve undisturbed in its bed, and any fixation on the medial column can be done either anterior (in case of tensionband wire with K-wire) or posterior (in case of reconstruction plate) to the ulnar nerve. Clinically significant heterotopic new bone formation has been reported as a complication in some series^{7,12}. The absence of postoperative myositis ossificans in the present series can possibly be attributed to careful sharp dissection without disturbing the brachialis muscle and only active mobilization of the elbow.

Early mobilization of the elbow has been universally accepted as a ground rule to ensure an satisfactory final outcome^{1,3,8}. It is reaffirmed by the present study, as an

excellent range of motion was achieved in all patients where early mobilization was possible due to stable internal fixation. In fact, all patients with a relatively lesser range of motion at the elbow were either old patients or those with a poor postoperative physiotherapy record. Perry et al.¹⁴ have reported some loss of extension in all 11 patients in their series, which is similar to the findings in the present study.

The rating system for these fractures has consistently highlighted the importance of the range of elbow motion achieved^{4,8,13}. The rating system used in this study for the final evaluation, takes into account factors like pain and the activity level as well as the range of motion at the elbow. Overall, 83.33 per cent of patients had satisfactory results (6 excellent and four good). This can be attributed to early open reduction, stable internal fixation, early mobilization of the elbow, and compares favourably with those reported in literatures^{5,7,8}. One important reason described in the literature for the inability to obtain good results following operative intervention is a failure of fixation due to osteopenia^{6,7}. The age group in the present study was comparatively younger, with a good bone stock, and this may have been the reason for no fixation failures and the higher percentage of acceptable results.

The present study, therefore, reaffirms that open reduction and stable internal fixation followed by early mobilization is the treatment of choice for these complex fractures. Careful pre-operative planning and early operative intervention make reconstruction of the elbow in these fractures relatively easier.

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Original Article



Reverse Flow Radial Recurrent Artery Island Flap for Covering Posterior Elbow Soft Tissue Defects

Md. Abdul Gani Ahsan¹, Kazi Md. Salim², Ishtiaque-Ul-Fattah³, Syed Musharof Hussain⁴

ABSTRACT:

Soft tissue defect over back of the elbow are unusual; caused by road traffic accident, electric burn, surgical wound fails to heal. This type of wound cannot be managed by 2ndary intension or skin graft only; immediate and proper manage is essential to avoid a disaster. There is versatile option for coverage of exposed elbow with some complication in donor site. Here four cases were presented with aim to evaluate the result of Radial recurrent artery (RRA) fasciocutaneous island flap for coverage exposed back of the elbow to save the limb, functional and cosmetic point of view. These cases have been performed in Sylhet Women's Medical College Hospital and other private hospital in Sylhet. All the 04 cases satisfactory result was found. So, RRA fasciocutaneous island flap is a good option to cover the exposed elbow joint with minimum donor site morbidity.

Key wards: Radial recurrent artery, fasciocutaneous island flap.

INTRODUCTION:

In 1986, Maruyama¹ first reported the use of the RRA fasciocutaneous flap for coverage of antecubital defects. The anatomy of the elbow allows cover of skin defects with a great variety of flaps. The use of ipsilateral upper limb as a donor site has many advantages. Both donor and recipient sites are located within the same operative field permitting the entire surgical procedure to be performed with the patient under single regional block anaesthesia; both flap and recipient sites being prepared synchronously in a bloodless field. The donor site morbidity will be minimum and restricted to single extremity.² Orthopaedic surgeons occasionally performing flap surgery for coverage around the elbow reconstruction need to be familiar with flaps that are dependable and easily harvested.

MATERIALS AND METHODS:

This prospective study was conducted in the Department of Orthopaedic Surgery in Sylhet Women's Medical College Hospital and other private hospital in Sylhet, science June 2009 to June 2012. We have performed 04 cases of RRA fasciocutaneous island flaps for coverage

soft tissue defect over back of elbow. All the 04 patients had initially been treated on at another hospital for exposed olecranon and or proximal ulna. Three patients bone were exposed due to trauma or electric burn and another patient for infective olecranon bursitis. Previous attempts to close the wound with debridement, primary skin closure, antibiotics and splinting of the elbow in 90° of flexion had failed. All the necessary information regarding this was given to all the patients and attendants, a written consent was obtained from the patients/parent's guardians. During that study period all the details of patients including pre and post operative photographs were recorded individually. Repeated debridement and daily dressing was done, until the wound was clear. We did the flap coverage after 1 to 3 weeks.

Anatomy of the flap: This flap is supplied by 2 or 3 major septocutaneous branches of the posterior radial collateral artery (PRCA); the terminal branch of the profunda brachi, which anastomoses with terminal branches of the radial recurrent artery (RRA) in the subcutaneous tissue of the lateral aspect of the elbow. The PRCA originated from the

1. Assistant Professor, Department of Orthopaedic Surgery, Sylhet Womens Medical College (SWMC)
2. Professor & Head, Department of Orthopaedic Surgery, Sylhet Womens Medical College (SWMC)
3. Associate Professor, Department of Orthopaedic Surgery, Sylhet MAG Osmani Medical College, Sylhet
4. Assistant Professor, Department of Orthopaedic Surgery, JRR Medical College, Sylhet

Correspondence: Dr. Md. Abdul Gani Ahsan, Assistant Professor, Department of Orthopaedic Surgery, Sylhet Womens Medical College (SWMC)

radial groove of the humerus, running in the lateral intermuscular septum between the triceps posteriorly and the brachialis and brachioradialis muscles anteriorly, becoming more superficial as it neared the lateral humeral epicondyle. Dissecting to its origin (PRCA); an average pedicle length of 7 cm could be obtained. The venous return of this flap is through two systems; the superficial veins, draining to the cephalic vein and the deep system of venae comitantes, which is placed adjacent to the arterial pedicle.^{2,3}

Surgical technique: The insertion of the deltoid and the lateral humeral epicondyle are outlined. A line joining these two landmarks is the central axis of the flap. The base of the flap is at the elbow and the proximal limit at the mid-upper arm. The width of the flap depends on the size of the elbow defects and the entire flap is on the posterolateral aspect of the upper arm (fig 2). The flap is outlined by an incision around the previous marking area. The deep fascia tag with dermis proximally and a distal incision will allow identification and mobilization of the distal pedicle. Anteriorly, the flap is dissected from the brachioradialis to expose the intermuscular septum. The posterior radial collateral artery is ligated at its origin. The septum is released from the humerus. A vascular-fascioareolar pedicle is dissected and mobilized towards the elbow (fig 2). It contains the anastomoses between the PRCA and the RRA, which supply the flap. We opened the skin bridge for flap transposition in all cases (fig 2). The flap can be rotated anteriorly or posteriorly to cover the elbow area and sutured in position. The wound is drained for 36 to 48 hours. In small lesions (<4.5 cm wide), the donor site closed primarily (fig 3), but over larger defects covered with split-skin grafts. In 03 cases we closed donor site primarily (fig 3); remaining 01 case we grafted the donor area. The elbow immobilized post operatively by anterior plaster slab for 3 weeks and then removed all stitches / staples & splint. Post operatively we monitored the flap survival clinically. During follow up period details with photographs were recorded in individual. Among 04 patients 02 patients were available for follow up for 6 months or more (fig 6). Among remaining 02 cases were followed up for 3 month or less.

RESULTS:

Among 04 patients 03 were males 01 female. The ages ranged from 28 to 46 years. Causes were trauma due to road traffic accident², high voltage electrical burn¹, and infective olecranon bursitis¹. In all these patients negligence was a sole factor of these entire occurrences. All of the patients had injury on right elbow except 01 patient was involved left side. Most of the patients in our



Fig.-1. Exposed olecranon, 6 months later of initial injury.

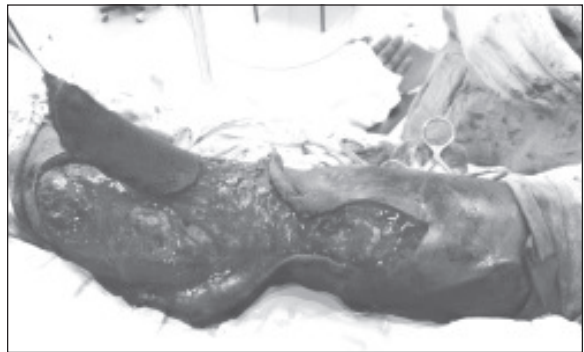


Fig.-2. Wound debridement and elevation of RRA flap (Rt).



Fig.-3. Flap cover with multiple drains, direct closure of donor site.



Fig.-4. Satisfactory healing of the donor & flap cover, 3 weeks later.



Fig.-5. Three month later, donor & recipient's area.



Fig.-6. Nine month late, donor & recipient's area.

Table
Patient data

No	Sex	Age(yrs)	Risk factors for patients wound healing	Number of previous operations	Operation after injury	Flap size (cm ²)
1	M	33	Smoking	3	24 weeks	4.5x7
2	M	56	Smoking	3	8 weeks	4.5x5
3	M	28	-	2	12 weeks	3.5x4
4	M	45	Smoking, DM	4	7 weeks	4x4

series were operated between 1st months to 6th month of occurrence. Flap size varied in width 3.5-5 cm and in length 4-7 cm in our study. We raised smallest flap of 3.5cmx4cm size and flaps of largest dimensions in our study was 4.5cmx7cm. The flaps survived in all patients. No marginal loss of the flap was noted. Mild oedema developed in 01 patient and subsided over a time of two weeks. None of our cases showed any evidence of venous congestion. Regarding the donor site morbidity only one case had sensory deficit back of distal arm.

DISCUSSION:

Skin and soft tissue defects of the elbow are often irregular with exposed nerves, tendons, bones and joints are usually unsuited to skin grafting. The coverage of posterior elbow defects is usually difficult and time consuming. A variety of flap have been employed for their reconstruction; such as local transposition flaps⁴ or pedicle flaps⁵ and distant⁶ or free flap.⁷

The ulnar artery forearm flap⁸, radial Chinese flap⁹ are one-stage local flap for coverage posterior elbow defects. This involves complete division of a major artery of the hand associated with donor site morbidity including skin graft failure, reduced hand and or wrist strength with

stiffness. Cold induced symptoms in the hand also developed.^{10, 11}

When local muscle flaps with or without overlying skin include the brachioradialis muscle^{12, 13} or myocutaneous¹⁴ flaps, extensor carpi radialis longus myocutaneous flaps¹⁵ consider the functional loss of donor muscle and an unsightly donor contour defect. A skin grafting is need over donor site which directly over the course of the superficial radial nerve which causes painful and unsightly scar in a brachioradialis myocutaneous flap.¹⁴

The radial recurrent artery (RRA)^{16, 17} or ulnar recurrent artery fasciocutaneous flaps¹⁸ are another options for elbow coverage. Both of these versions are reliable axial-pattern flaps. It is characterized by the expendable vascular pedicle distally based flaps for resurfacing of moderate-size defects of the elbow. These do not sacrifice the major artery or local muscles; the dissection is straightforward, with easy tissue planes and a constant anatomy. The donor site can usually be closed primarily and directly. It can be transferred easily. The flap may be harvested in lateral or prone position. Disadvantages of the flap include directly primary closure of donor site may tight and anaesthesia of back of distal arm owing to transaction of the cutaneous nerve of the arm.

In extensive defects or patients in whom the vascular supply precludes the use of a local flap; distant pedicle flaps offer an ideal alternative. But distant flaps from the trunk are usually multi-staged cumbersome procedure and require prolonged periods of hospitalization & immobilization of the patient in very awkward positions. There is 20% of cases may failure.¹⁹

Free flaps avoid some of the limitations of local or distant pedicle flaps. Although they are single stage technique but requires prolonged operating time, micro surgical training, specialized equipments and intensive post operative care. It may not be suitable in elderly patient, so free flap rarely applied for elbow defects.²⁰

Local adipofascial turnover flaps^{21,22,23} may be another reliable tools for coverage difficult wounds of the elbow, however, the length-to-width ratio and flap-to-base area ratio limit the dimension of the flaps.

CONCLUSION

The radial recurrent fasciocutaneous flap relatively simple one stage surgical modality. It is easy to elevate and transpose with less donor site morbidity than other available procedures for posterior elbow reconstruction.

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Results of Open Reduction and Internal Fixation of Displaced Fracture Acetabulum by Reconstruction Plate and Screws

Mohammad Serajus Saleheen¹, Md. Iqbal Qavi², Qamrul Alam Saleh², Md. Abdus Sabur³,
Md. Aminul Haque Pathan⁴, Md. Abdul Maleque⁵

ABSTRACT

The present prospective study was conducted to evaluate the results of open reduction and internal fixation of displaced acetabular fractures by reconstruction plate and screws. A total of 25 patients aged more than 18 years presenting within 3 weeks of injury were included in the study. The mean age of the patients was 34 years and the youngest and the oldest one were 20 and 60 years respectively. Majority of the patients were male and businessman, service holders, students or housewives by occupation. Eight patients (32%) presented with posterior wall fractures, 2(8%) presented with posterior column fractures, 3 (12%) presented with anterior column fractures, 6(24%) presented with posterior wall and posterior column fractures and rest 6(24%) presented with both column fractures. The mean interval between injury and operation was 9.4 days and minimum and maximum interval was 5 and 17 days respectively. Mean hospital stay was 22.6 days. Majority (76%) of the injury was caused by automobile accident. Evaluation of the outcome at 6 months showed that 40.0% of the patients had excellent outcome, 32.0% had good outcome and 8.0% had fair outcome and 20.0% patients had poor outcome. The mean Matta score was 14.5. Seven complications were seen during the follow up period. Complications included wound infection in three(12%) patients, heterotrophic ossification in three (12%) patients and neuropraxia of sciatic nerve in one (4%) patient. No reoperation was required in any patient. The result of the study demonstrates that open reduction and internal fixation of displaced acetabular fractures by reconstruction plate and screws provides sufficient stabilization to allow early mobilization and thereby good functional outcome.

Keywords: Open reduction and internal fixation, Displaced fracture acetabulum, Reconstruction plate and screws

INTRODUCTION:

Displaced fractures of the acetabulum are best treated with anatomical reduction and rigid internal fixation. Residual displacement of more than one or two millimeters may lead to progressive post-traumatic osteoarthritis and a poor functional result¹. Fracture of acetabulum usually occurs as a result of high velocity injury and often affect the young and economically productive portion of the population². High-energy

trauma is the primary cause of acetabular fractures in younger individuals such as vehicular accidents or falls from height, fractures secondary to moderate or minimal trauma are increasingly of concern in those over 35 years because of osteoporotic changes³. Fractures of acetabulum are most commonly classified according to the system described by Judet and Colleagues⁴. The system is based on the orientation of the fractures and the structures involved. In this

1. Clinical Assistant, Department of Orthopaedic Surgery, NITOR, Dhaka
2. Professor, Department of Orthopaedic Surgery, NITOR, Dhaka
3. Assistant Professor, Department of Orthopaedic Surgery, NITOR, Dhaka
4. Registrar, Department of Orthopaedic Surgery, NITOR, Dhaka
5. Medical Officer, NITOR, Dhaka

Correspondence: Dr. Mohammad Serajus Saleheen, Clinical Assistant, Department of Orthopaedic Surgery, NITOR, Dhaka

system, 10 patterns of acetabular fractures are defined. The 10 patterns are divided into 5 elementary and 5 associated patterns. Elementary patterns include fractures with a single fracture orientation, whereas associated patterns usually involve combinations of the elementary fractures. Elementary patterns include anterior wall, posterior wall, ant. Column, post. Column and transverse fracture. Associated patterns include both column fractures, post. Column fracture with post. Wall fracture. Transverse fracture with post. Wall fracture, T-shaped fractures and ant. Column fracture with post. Hemitransverse fracture⁴. Of all fractures of acetabulum both-column fractures are the most common variety. But isolated anterior and posterior column fractures are less common^{4,5,6}. The subject of acetabular fractures is one that will interest most trauma surgeons. They pose a challenge both in their diagnosis and their management. Operative treatment of displaced acetabular fractures should now be the standard of care. Open reduction and internal fixation is not an easy undertaking. The anatomy of the acetabulum is complex and exposure for fracture reduction is difficult. In addition there are numerous types of acetabular fractures which demand different surgical approaches and techniques. Specific training and expertise are thus required⁷. The possible complication of the open reduction and internal fixation are substantial, however, exposure is often difficult. With good operative technique and post operative follow up these problems could be overcome. Open reduction and internal fixation of Acetabular fractures has been suggested to provide the best stability of fixation and the best clinical outcome.

Objectives:

To evaluate the results of open reduction and internal fixation of fracture acetabulum by reconstruction plate and screw.

Methodology

This study was conducted at the National Institute of Traumatology and Orthopaedic Rehabilitation (NITOR), Sher-e-Bangla Nagar, Dhaka. The study was carried out during the period from July 2010 to December 2012. Patients of diagnosed case of fracture acetabulum of both sexes admitted in NITOR during the above mentioned period were the study population. Patients above 18 years of age and presenting within 3 weeks of injury were included in

the study. Patients with open fracture, spinal injury, head injury and with co morbidities like heart disease, diabetes mellitus were excluded from the study. Plain radiographs of the three standard views are obtained upon admission: Antero-posterior, obturator and iliac views of Judet. Computed tomograms were also performed on all these patients. All patients were put on straight leg traction prior to surgery. The Kocher-Lange beck approach was used for fixation of most of most of the fractures and anterior column fractures were fixed by ilioinguinal approach. Follow-up data was collected and patients were recalled for assessment of their functional outcome. Functional outcome was assessed with a hip scoring system devised by Matta⁸.

RESULTS:

The patients, after proper resuscitation and investigation, were treated by open reduction and internal fixation by reconstruction plate and screws and followed up from 1 month to 30 months. After an average of 6th month follow up the following findings were compiled.

Table I

Age distribution of the study patients (n=25)

Age (in year)	Number of patients	Percentage
20-30	14	56.0
31-40	6	24.0
>40	5	20.0
Mean	34	

In this study the highest number of patients 14(56.0%) were observed in 3rd decade and lowest number 5(20.0%) patients was observed in 5th decade. The mean age was 34 years.

Among the study population male was found 23(92.0%) and female was 2(8.0%). In this series out of 25 patients 10(40.0%) were service holder, 3(12.0%) student, 2(8.0%) housewife, 10(40.7%) businessman. Among the study population, 76.0% of the fractures are caused by automobile injury and rest of the 24.0% of the fractures are caused by fall from height.

Regarding the associated injury it was observed that 4(16.0%) patient present with hip dislocation, 4(16.0%) with pelvic fracture, 2(8.0%) with fracture shaft of femur, 1(4.0%) with fracture tibia fibula.

Table II
Type of fracture of the study patients (n=25) and approach of surgery

Type of fracture (according to Letournal and Judet Classification)	Number of patients	Percentage	Approaches of surgery
Posterior wall fracture	8	32.0	Kocher Langenbeck Approach
Posterior column fracture	2	8.0	Kocher Langenbeck Approach
Anterior column fracture	3	12.0	Iliioinguinal Approach
Posterior column and posterior wall fracture	6	24.0	Kocher Langenbeck Approach
Both column fracture	6	24.0	Kocher Langenbeck Approach

Among 25 patients, 8(32.0%) were presented with posterior wall fractures, 2(8.0%) were posterior column fractures, 3(12%) were anterior column fracture, 6(24.0%) were posterior column and posterior wall fracture, 6(24.0%) were both column fracture. 22(88.0%) patients were operated by Kocher–Langenbeck approach and 3(12.0%) patients were operated by Iliioinguinal approach.

Regarding the time interval between injury & operation it was observed that 16(64.0%) patients were operated within 10 days of injury and the rest of the patients 9(36.0%) was operated between 11-20 days of injury.

The mean duration of hospital stay was 22.6 days and most of the patients stay at hospital 11 to 30 days.

According to score grading it was found that excellent 10(40.0%), good 8(32.0%) and fair 2(8.0%), poor 5(20.0%).

Among the study population 12% patients had heterotrophic ossification, 12% patients had wound infection and 4% patients had neuropraxia of sciatic nerve.



Fig-1(A): Preoperative Xray of Fracture Acetabulum (Posterior wall and posterior column fracture)

Table III
Distribution of the study patients according to Functional outcome score (Matta scoring system) (n=25)

Matta score	Number of patients	Percentage
18	10	40.0
15-17	8	32.0
13-14	2	8.0
<13	5	20.0
Mean	14.5	

The mean Matta score was 14.5.

Table IV
Distribution of the study patients according to score grading (n=25)

Score grading	Number of patients	Percentage
Excellent	10	40.0
Good	8	32.0
Fair	2	8.0
Poor	5	20.0



Fig-1(B): Post operative Xray of Fracture Acetabulum

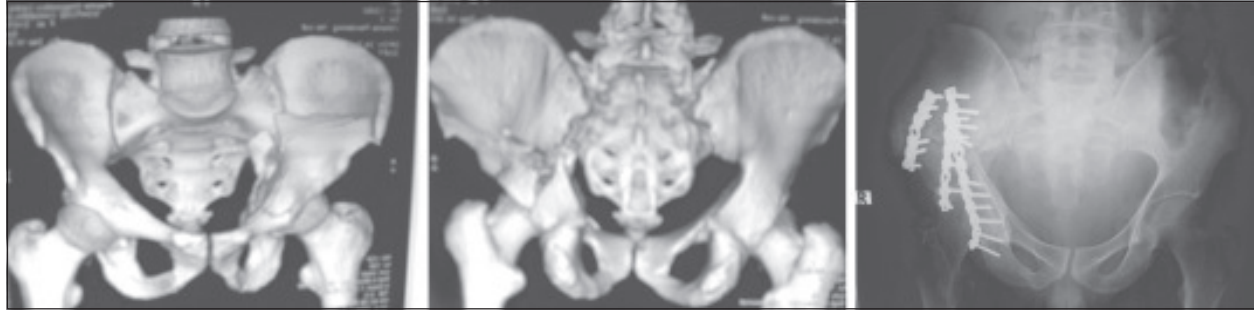


Fig-2(A): 3D reconstruction CT scan of both column fracture of acetabulum

Fig-2(B): Four months after surgery, fracture is united radiologically

DISCUSSION:

Since Letournel and Judet first suggested in 1961 that operative reduction and fixation of displaced fractures will likely lead to a better outcome^{5,9}, there have been a number of papers that support this claim. This prospective study was carried out with an aim to evaluate functional outcomes of open reduction and internal fixation of displaced acetabular fractures by reconstruction plate and screws. The present study findings were discussed and compared with previously published relevant studies.

In this current study it was observed In this study the highest number of patients 14(56.0%) were observed in 3rd decade and lowest number 5(20.0%) patients was observed in 5th decade. The mean age was 34 years. Among the study population male was found 23(92.0%) and female was 2(8.0%). Tan et al⁷ found that the mean age of patient was 34.9 years. In another series, Kreder et al¹⁰ observed the mean age of the patients was 41.6 years(18 to 75), and 100 (78%) were men which is closely resembled with the current study. Among the study population, 76.0% of the fractures are caused by automobile injury and rest of the 24.0% of the fractures are caused by fall from height. Judet et al.¹¹ found that 77% of the fractures are due to motor vehicle accident. The finding regarding the cause of fractures are consistent with the present series. In this series, most of the acetabular fracture(32.0%) are posterior wall fractures. Letournel and Judet¹² also observed that Approximately 35% of all acetabular fractures

have involvement of the posterior wall which is the most common pattern.

In this study it was observed that the mean duration of hospital stay was 22.6 days and most of the patients stay at hospital 11 to 30 days. Tan et al⁷ was observed in his study that mean hospital stay was 24.9 days which is similar with this study.

According to functional outcome score grading system devised by Matta, it was found that excellent 10(40.0%), good 8(32.0%) and fair 2(8.0), poor 5(20.0%). According to functional assessment almost similar findings obtained by Matta¹³, where the investigator found 40.0% excellent, 36.0% good, 8.0% fair and 16.0% poor. In another study, Tan et al⁷ also found that 13.3% excellent, 66.7% good, 13.3% fair, 6.7% poor functional outcome which is almost similar to current series.

In this study most of the cases had minimum six month follow up, most of the cases are radiologically united. Only seven patients had post operative complication that are heterotrophic ossification, wound infection, neuropraxia of sciatic nerve. All patients took indomethacin post operatively to prevent heterotrophic ossification.

CONCLUSION:

This series of 25 cases of displaced acetabular fracture fixation reports our experience at the National Institute of Traumatology and Orthopaedic Rehabilitation (NITOR), Sher-e-Bangla Nagar, Dhaka. The outcome results are similar to those that have been published in previous larger studies and confirm the place of operative treatment in the management of displaced acetabular fractures. The accuracy of the reduction is an important predictor of functional outcome. The number of cases in this paper is insufficient to produce any statistically significant outcome predictors but accuracy of reduction is an important factor. A good to excellent result was attained in 80% of the patients which confirms that open reduction and internal fixation is the treatment of choice for displaced acetabular fractures.

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Original Article

Removal of a Bent Intramedullary Femoral nail- Challenges of Management

Shyamal Chandra Debnath¹, Zahidur Rahman², Suman Kumar Roy³, Anil Kumar Basak⁴

ABSTRACT

Intramedullary nailing is the current standard of treatment for femoral shaft fractures and has low complication rates. Bent femoral intramedullary nails resulting from secondary trauma are rare and technically challenging. This article describes a case of 38 year old male who presents with 55 degree bent of a “K” nail. Literature reviews outline the options of removal of an intramedullary nail through the fracture site, cutting at the angle of the nail and removal as separate pieces. This article describes straightening of the bent nail by manipulation under anaesthesia and proximal retrieval, exchange nailing by interlocking intramedullary nail. Forceful extraction of the bent nail results in ipsilateral fracture neck femur and subsequent management of neck femur fracture by two cannulated hip screws keeping the nail in situ.

Key Words: Bent, Intramedullary nail, removal

INTRODUCTION

Closed diaphyseal femoral fractures are mostly treated by interlocking intramedullary nail but Kuntscher nail fixation is still practiced in many hospitals of our country due to good healing rate as well as low incidence of complications. Complications of intramedullary nail fixation includes malunion, non-union, mal-rotation, infection and hip or knee pain depending on the site of insertion^{1,2}. Refracture of femoral shaft due to secondary trauma around a stable IM nail with subsequent nail bending has been reported in the literature^{3,4}. Review of literature regarding extraction of bent intramedullary femoral nail indicated that majority of the deformities were in coronal plane⁵. This report typically involves weakening of the bent nail at the apex and then using the perineal post to manually straighten the nail followed by extraction⁴.

In a recent article a technique describes for removal of a bent nail by using a Midas Rex MR7 high speed burr and the F-tool to facilitate the removal of the bent femoral nail⁶. Authors followed straightening the “K” nail

manually in the anesthetic limb then removal in a single piece by conventional retriever. Exchange nailing by intramedullary interlocking nail. Forceful retrieval of the nail results in ipsilateral femoral neck fracture which was detected 2 weeks postoperatively. At 8 weeks proximal screws were removed and 2 cannulated hip screws inserted for fixation of femoral neck with the nail in position. At 4 months both fractures united and patient resumed his job at 8 months.

PATIENT AND TECHNIQUE

A 38 years old male presented to us with pain and deformity of his right thigh following a sudden fall 7 days back. Medical history reveals that the patient had a right sided closed femoral shaft fracture following Road Traffic Accident and, treated with a “K” nail in a different hospital about 10 months back.

His right thigh was painful and swollen but neurology was intact. X-ray shows re-fracture at the initial site and a bent “K” nail was in situ.

1. Assistant Professor, Department of Orthopaedic Surgery, NITOR, Dhaka
2. Junior Consultant, Department of Orthopaedic Surgery, Armed Forces MCH, Dhaka.
3. Orthopaedic Surgeon, Registrar- Apollo Hospitals Dhaka
4. Assistant Professor, Department of Orthopaedic Surgery, NITOR, Dhaka

Correspondence: Dr. Shyamal Chandra Debnath, Assistant Professor, NITOR, Dhaka, Bangladesh, E-mail: dr.shyamaldebnath@gmail.com



Fig.-1: Pre operative AP view showing bent "k" nail with refracture at mid shaft of femur.

The nail was bent 55 degree in the coronal plane with apex lateral. We admitted the patient at NITOR for removal of the bent nail and subsequent management of the fracture. After completion of routine investigations we presented the problem in our morning discussion panel , opinion was deferring - some surgeons advised going through the fracture site and cutting the nail then retrieval of both parts, others advised manual straightening of the bent nail and removal in a single piece then fixation with a interlocking intramedullary nail. We have prepared the patient in lateral decubitus position spinal anaesthesia given. Before drapping we manually straightened the limb in desired direction to straighten the bent nail. It took vigorous force and C-arm picture showed the nail was straighten but minor kinking occurred at the site of bent. Then nail was removed using nail extractor through the proximal portal. Extensive force was necessary to remove the bent nail. Then the fracture site opened and freshened, a small butterfly fragment formed during removal. A 12mm X 38 cm size interlocking nail inserted and bone graft applied. Immediate post operative period was eventless and check x ray of hip and thigh was unremarkable.

At two weeks x ray showed a minimally displaced fracture of the neck of femur on same side. This fracture was a complication of forceful removal of the bent nail but was

unnoticed per-operatively and at immediate postoperative period. We decided to fix the fractured neck immediately but patient was not prepared for second operation. At 8 weeks we operated the patient for the second time.

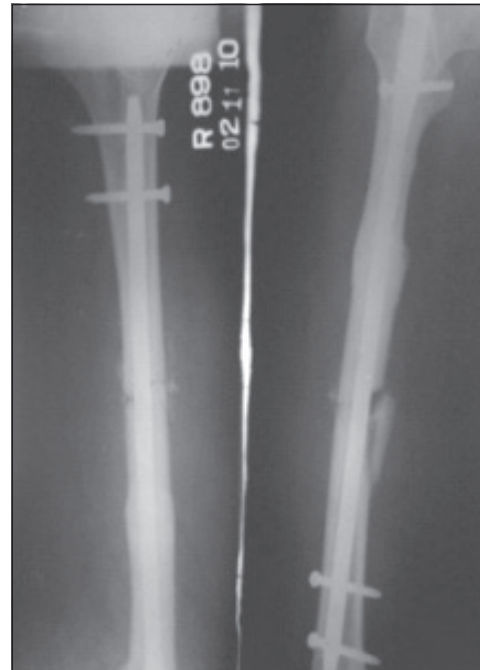


Fig.-2: Post operative x-ray following removal of bent "k" nail and reinsertion of interlocking IM nail and bone graft.



Fig.-3: No evidence of neck fracture found at immediate post of x-ray.

The fracture neck was reduced under C-arm cover and proximal locking screw was removed. Lateral view of the proximal femur showed sufficient bone mass on the posterior surface of the interlocking nail.

We inserted two 6.5 mm X 70 mm cannulated lag screws with washer for fixation of the neck keeping the nail in position (Fig 4,5).



Fig.-4: Visible fracture at neck of Femur at 2 weeks post operative x-ray.



Fig.-6: Follow up AP view at One year shows union at femoral Neck and shaft.

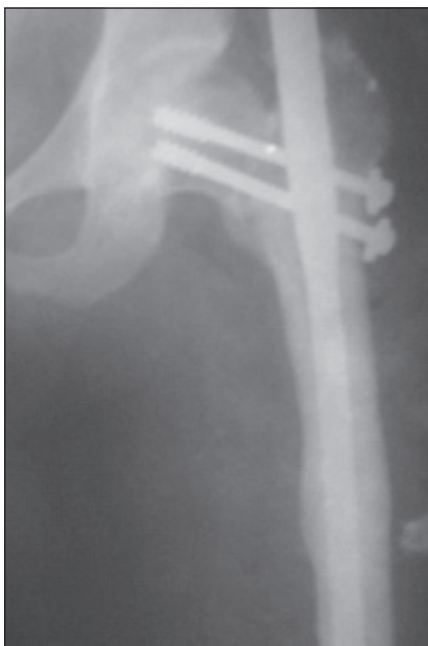


Fig.-5: Post operative x-ray following Neck femur fixation by 2 cannulated hip screws.



Fig.-7: Lateral view shows hip screws through posterior aspect of the nail.



Fig.-8: Clinical picture at one year follow up.

At 12 weeks the patient was allowed partial weight bearing and both the fractures were in progress of healing after one year of the second surgery patient could walk independently and continue activities of daily living (Fig 6,7,8). Radiology shows consolidated union of the fracture neck of femur as well as shaft fracture.

DISCUSSION

Intramedullary nailing is the gold standard of diaphyseal fracture shaft of femur^{1,2}. Though literature review shows high rate of union³ but in our situation non union and other complication (infection, malunion, joint stiffness) is not uncommon. Intramedullary nail failure results from repetitive stress on ununited bone⁸. Acute bending of the nail following a second trauma after surgery is rare^{6,7} so in literature review only case reporting in available and any large series describing technical detail is lacking. In this paper the patient had a healed fracture with K² nail operated elsewhere 10 months back. He started activities of daily living and second trauma caused re-fracture at previous site with the nail was bent 55° coronal plane⁵. The reports of a removal of a bent intramedullary nail involves manual straightening and using a perineal post but perineal post may not provide enough counter force to straighten a bent intramedullary nail⁴. Most authors described weakening of the nail by a drill or cutting the nail by high speed burr. Both this techniques involves massive contamination of soft tissue by metal debris, necrosis by mechanical heat and subsequent infection. To avoid this problem we have straightened the nail manually keeping

soft tissue trauma to a minimum. For extraction of nail forceful manipulation caused fracture neck femur which remain unnoticed during operation. After freshening of the fracture site and inserting an intramedullary interlocking nail and bone grafting post operative x ray showed no abnormality in proximal femur. At two weeks following surgery ipsi-lateral fracture neck was detected. This fracture added a new challenge to heal the fracture neck of femur. We have evaluated the lateral view x ray of proximal femur and looked for any option to fix the neck by cancellous hip screws keeping the nail insitu. At 8 weeks under c arm control we reduced the fracture neck femur and fixed it by 2 hip screws posterior to the nail. The fixation was good and patient was allowed to bear weight after 12 weeks. At one year follow up he could walk independently without pain but limping due to 1 cm shortening of the limb. X ray shows consolidated union of both the shaft and neck fracture.

CONCLUSION

Bent femoral nail with re-fracture of diaphysis is a challenging problem to the surgeon. As it is a rare condition techniques of removal are lacking. Weakening the nail and correction of the angulations are common trend for removal of a bent nail. We present this case to describe the outcome of forceful retrieval of a bent nail which may add another complication, like fracture neck of femur. Although it was managed by proximal hip screws but morbidity to the patient should be considered. Authors' advice to use hi tech instruments to avoid sufferings to both the patient and surgeon.

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Original Article

Management of Fracture Shaft of Tibia by MIPO Technique - Early Experience

Ziaul Haq¹, MHM Alamgir², Kamruzzaman³, MG Sarwar⁴, Kazi Shamim Uzzaman⁵, AKM Zahir Uddin⁴

Abstract

Management of fracture of shaft of tibia by MIPO technique using locked plate in an excellent method. This technique can be used where modern operating facility is available. It may be the first choice of fixation where patients are victims of polytrauma, where surgeon want to avoid intra medullary reaming. MIPO technique is a better option when bridging plate technique is required in long segment comminuted fractures and also in fractures of metaphyseal region. Disadvantage of these techniques is this requires operating room facility with fluoroscopy and other modern facilities. Moreover executing this technique requires technical expertise and experience.

Key words: Fracture Shaft of tibia, MIPO Technique, fluoroscopy, early experience

INTRODUCTION

As orthopaedic surgery is a very dynamic subject, there is continuous evaluation of the technique. So there is new development of concept every day. With the development of concept, we can introduce new technical technology.

Though we are practicing orthopaedic surgery in developing country, but trying to catch-up the new development of the subject. Due to the aspects of new technology and implants in practice, may be a little bit slower.

Now a days we are trying to practice the new technology and using newer and better implants in our day to day orthopaedic practice.

In this study we are evaluating our two new techniques. One is the use of MIPO (minimally invasive plate osteosynthesis) technique and other is locking plate.

In our study we operated on fracture shaft of tibia (diaphysis & metaphyseal region). These techniques requires support of c-arm (Fluoroscopic) guidance during operation and a good power drill for accurate placement of screws.

Some of the patient we operated the victim of poly trauma (chest & head injury). So we tried to avoid intramedullary reaming and some of the fractures were in metaphyseal region, where interlocking nail does not work properly. In many previous studies, it was recommended that, interlocking nail is better technique, than traditional DCP in fracture tibia. But

we found that this new locking plates when used by MIPO technique is very useful and a good method.

METHODOLOGY:

This is a retrograde evaluation of our work with this new technique and implants. We carried out this study for 5 years (2007-2012). We worked in a private hospital, where fluoroscopy and modern facilities are available.

In this study we included adult patients, age between (18-60yrs), male and female both included. We included patients with closed fracture of tibia as well as open fracture Gustillo type I. We included fracture of shaft of the tibia (both diaphyseal & metaphyseal fractures), those were operated within 10 days of injuries.

Many of our patients were victim of poly trauma (head/chest injury). The delay was due to management of other injuries, as we managed the patients with long leg back slabs. All of our patients were operated by closed reduction using Fluoroscopy (by external distraction, manipulation on fracture table) and internal fixation by locking plates using MIPO technique.

We used LCDCP locking plates and distal tibial locking plates. In 5 years period we included 30 patients in our study, out of that 20 cases we used LCDCP locking plate and within 10cm we used distal tibial locking plates. We used locking plates

1. Assoc. Prof (Ortho Surgery), Shaheed Suhrawardy Medical College, Dhaka
2. Asst. Professor (Ortho Surgery), Shaheed Suhrawardy Medical College, Dhaka
3. Assoc. Prof (Ortho Surgeon), Bangladesh Medical College and Hospital, Dhanmondi, Dhaka
4. Asst. Prof (Ortho Surgeon), NITOR, Dhaka
5. Asst. Prof. (Ortho Surgeon), Shaheed Suhrawardy Medical College, Dhaka

Correspondence: Dr. Ziaul Haq. E-mail: zia637@gmail.com

as bridging plates, in ploy trauma cases & in open fractures, some cases were diaphyseal fracture, some were upper and lower metaphyseal fractures. Though most of the patients are victim of high energy road traffic accidents, as we operated in so many different conditions, we could not put them in a specific scoring system. So we are evaluating the cases as our initial experience of MIPO technique with locking plates.

RESULT:

Table-I
Age distribution

18-30yrs	31 – 45yrs	46 – 60yrs
15	9	6

Table-II
Sex distribution

Male	Female
24	6

Table-III
Type of Injury

Solitary Injury	Head Injury	Chest Injury	Other limb
8	14	6	7

2 patients had both chest and head injury, 3 patients had head injury with other limb fractures.

Most of the patients in our study are victim of high energy road traffic accident. Many of them are motor cycle riders. So, naturally young male patients are more. It is also natural that young male persons go out more for day to day work. Many of the patients had head injury. This study was carried out in a renown private hospital where head injury & poly trauma patients were managed carefully & promptly.

Table-IV
Classification of fracture

Closed	Open (Type-I)
24	6

Victim of high energy accidents are frequently come with open fractures, we did not include severe type fractures for locked plate fixation. Only we included some cases of Gustillo type-I fracture.

Table-V
Type of Implant used

Locked LCDCP	Locked distal tibial plate
20	10

When fracture was situated only in diaphyseal region, we use locked LCDCP, but when fracture was in low metaphyseal region, we used locked tibial plate. When any fracture extend to proximal or distal articular region, we did not include in our study.

Table-VI
Time of union/ healing

Up to 3 months	3-4 months	>6months	Non Union
15	13	2	0

Patients with head injury have known for early union of fractures. Locked plating by MIPO also gives shorter healing time.

Table-VII
Complications

Neurovascular	0	Superficial Infection	3
Deep infection	0	Rotation/ angulation	4
Shortening	0	Non Union	0
Implant failure	0	Joint stiffness	2

As the technique is minimally invasive, so there were less handling of soft tissue, blood supply of skin & periosteum was minimally handled. Superficial infection of skin was

Case -1



Fig-1

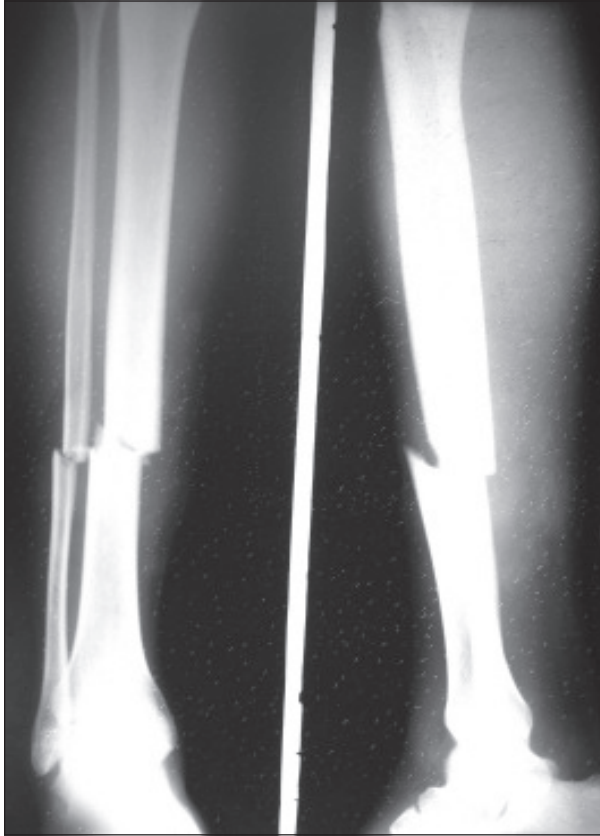


Fig.-2

Case - 2



Fig.-4

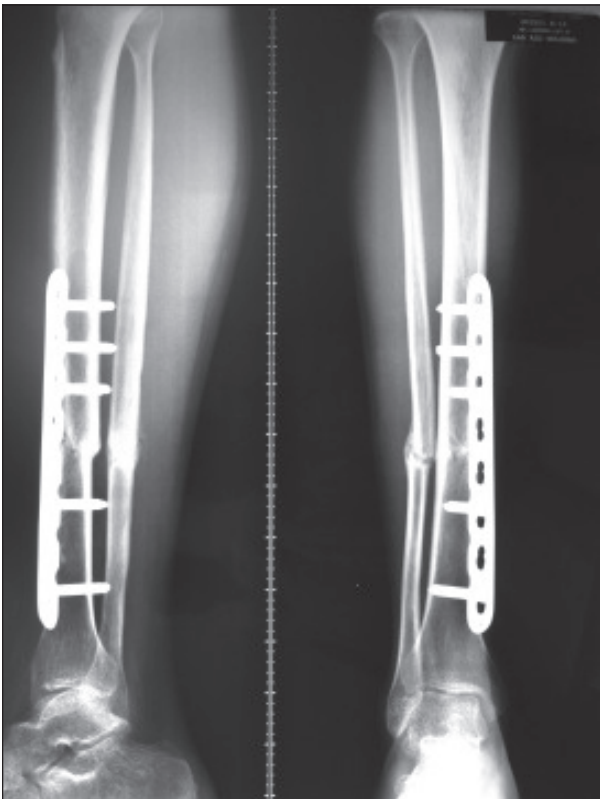


Fig.-3



Fig.-5

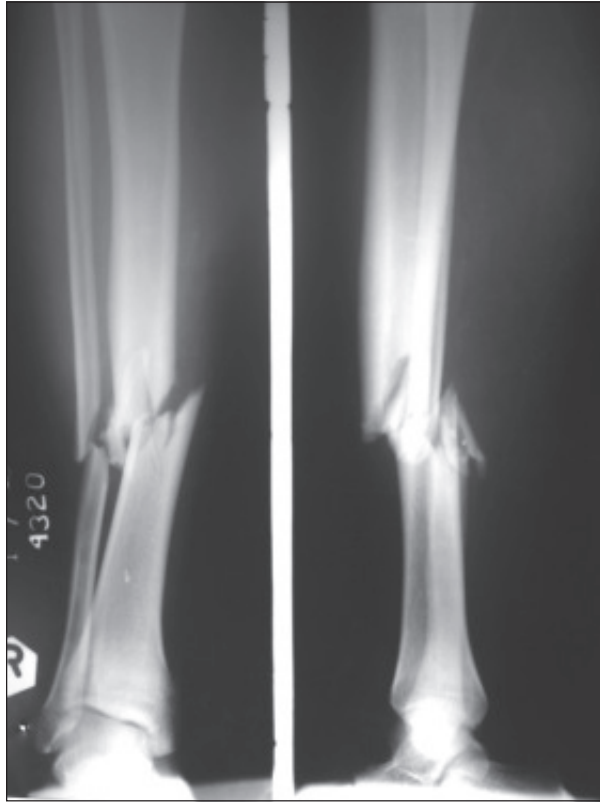


Fig.-6

Case - 3



Fig.-8



Fig.-7



Fig.-9

Case - 4

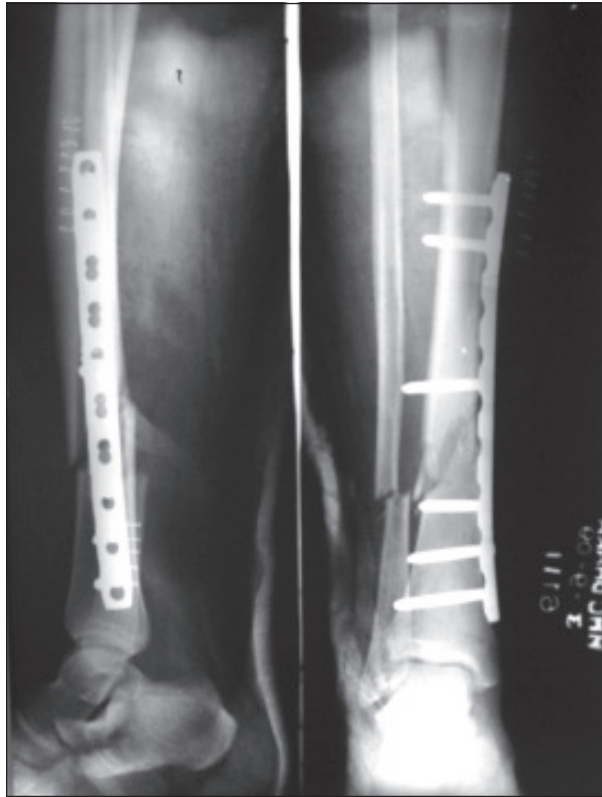


Fig.-10



Fig.-11

associated with skin injury during fracture, (blister formation, open fracture etc.) Joint stiffness of ankle associated with cases of distal metaphyseal fractures with experience incidence of complication can be reduced.

DISCUSSION:

This is a retrograde study, based on the initial experience of using MIPO technique with locked plate. Different types of fracture tibia, which are non-articular were included in this study. As the study was carried out in private hospital specialized for management of poly trauma cases with head injury, many of our cases had head injury. As part of the damage control principle, and also to prevent ARDS, we avoid intramedullary fixation in poly trauma cases. With the use of MIPO technique using locked plates, cause minimum injury during procedure and it is also a form of definite surgery.

Full contact plate (DCP) fixation rigidly applied to the bone may result in some bone resorption beneath the plate due to localize avascularity from the compression of underlying periosteum.

Because of this problem, plates were developed that has less contact with the bone. Biologic plating techniques were developed whereby the plate spans the zone of injury with fixation proximally and distally. To facilitate this indirect reduction technique use of fluoroscopy, bone distractors or external fixators for reduction, sharp bone holding forceps have been developed.

Locked plate fixation provide a rigid construct and the locked screws must fail together pulling out of the bone at the same time, for implant failure. Various studies result demonstrate that MIPO have undeniable advantages over classical technique: fast healing, reduced complication rate, reduced primary and secondary bone graft requirement, shortening of operative time. Good result of MIPO due to preservation of blood supply and increased resilience to mechanical stress. Fixation with long locked plate away from fracture site allows micro motion (relative instability) which is useful for fast healing.

In our study most of the fracture healed within 4-6 months of the time. Due to application of the MIPO technique along with locked plate, operation time was very short. There was very less tissue handling & minimal disturbance of blood supply to injured tissue.

There was no case of non-union, no case required bone grafting. Only 3 cases had superficial skin infection as in these cases skin conditions were compromised due to initial trauma. They eventually healed without any

complication.

As we started the technique of indirect reduction, 4 cases had minor degree of angulation with experience with the technique & these can be corrected. As screws and plate construct is very stable, so there was no incident of implant failure, and locked plates allows micro motion at fracture site, which result secondary union of bone with callus formation, which is an important factor for early union, in comminuted and long segmental fractures. Bridging plate technique with this method gives great benefit to the patient. Fracture in metaphyseal region, and in osteoporotic bone is treated very successfully by this technique.

In case of interlocking nails, there in some interference to the extensor mechanism of knee joint. Here knee joint was totally spared. With this technique both periosteal and endosteal blood supply were undisturbed.

For treatment of shaft of the tibia, closed interlocking nailing proved superior to the conventional DCP. But with introduction of the newer technique (MIPO) may be more appropriate in case of damage control surgery and may can be better in same cases of definite surgery. Preservation of blood supply to the bone, rigid bone – screw construct and presence of micro motion at fracture site may be key points to be considered. Avoidance of intramedullary fixation is sometime a valuable point.

CONCLUSION

Management of fracture of shaft of tibia by MIPO technique using locked plate in an excellent method, we recommend the technique where modern operating facility is available. This can be first choice of fixation where patients are victims of polytrauma, where we want to avoid intra medullary reaming. When bridging plate technique is required in long segment comminuted fractures and also in fractures of metaphyseal region, where controlled angulation is difficult with conventional plating and intramedullary fixation. Disadvantage of these techniques is this requires operating room facility with fluoroscopy

and other modern facilities. Executing this technique requires technical expertise and experience.

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Original Article

Interlocking Fixation of Displaced Fracture of Tibial Diaphysis by Externally Placed Special Designed Jig Without Image Intensifier

MHM Alamgir¹, Z Haq², M. Erdhadul Haq¹, A Kader³, Kazi Shamim Uzzaman¹

ABSTRACT

Intramedullary nailing is the standard treatment for the closed and some open unstable tibial diaphyseal fractures. Locking procedure is done under fluoroscopic guide which is expensive and substantial radiation hazards to surgeons as well as patients. Moreover these are not readily available in developing country like Bangladesh. But every fracture anywhere in the world should have equal chance of getting care. To overcome this shortcoming we use especially designed external jig to achieve interlocking screws. This procedure is cheap and suitable for low incoming region of world likes Bangladesh. Here we don't need extensive item like image intensifier for the interlocking procedure. In our series there are 58 male and 08 female patients with altogether 60. Average age 35 yrs with arranges from 18 to 60yrs, average follow up period was 5months and 2 weeks ranging from 3 to 14 months. The average union time was 04 months. The duration of operation time was one and a half hour in average. Complications following the procedure were a few and mild like loosening of distal screws, external rotation of foot (mild) superficial infection one, deep infection one, shortening of 2 centimeter in one case. A few patients complaint of anterior knee pain. All fractures were united only 2 patients developed delayed union, one of two needed dynamisation and partial weight bearing the another one needed exchange nailing with autogenous bone graft, no case developed chronic osteomyelitis. So we can conclude this method is viable and acceptable for achieving interlocking nailing without image intensifier.

Keywords: Interlocking fixation, Tibial diaphysial fracture, Special Designed Jig, without image intensifier

INTRODUCTION

Eighty percent of the severe fractures occur in developing country¹. Here many long bone fractures are being treated conservatively because of illiteracy, poverty, lack of intra-operative image intensifier and consistent power supply. Being treated in this way many patients developed life long disability¹. Locked Intramedullary nailing is the standard operation for fixation of long bone s in the developed country^{2,3,4}. Intramedullary nails act as load shearing internal splints and locked intramedullary nails offer greater rotational stability while counter acting axial and bending forces⁵. And preventing fracture disease⁶.

But the insertion of locking screws is very difficult because of during insertion of nails inside the long bone it undergone bending and twisting⁷. For insertion of screws image intensifier is mandatory which is costly and radiation hazards to surgeons and patients. Peoples are trying to achieve the locking screws without image intensifier^{3,4,8,9,10,11}.

Modifications of standard interlocking technique involve the use of external jig and guide wire to aid the screw placement⁴ or the use of regular screws into appropriately modified Kunsher nails¹². As image intensifier is not used fracture is reduced through a smaller incision than

1. Assistant Professor, Department of Orthosurgery, Shaheed Suhrawardy Medical College, Dhaka

2. Associate Professor, Department of Orthosurgery, Shaheed Suhrawardy Medical College, Dhaka

3. Junior Consultant, Ovoinagar Upazila Health Complex, Jessor

Correspondence: Dr. MHM Alamgir, Assistant Professor, Shaheed Suhrawardy Medical College Dhaka Bangladesh; Email d.malamgir@yahoo.com

that of used in fixation with plate and screws^{9,12}. Due to all these difficulties and radiation hazards external jig aided placement becoming popular day-by-day in poor – resource country like Bangladesh¹³. In our study, we use external jig and guide wire to achieve locking screws. This study was conducted to see the effectiveness of fixation by interlocking nail without fluoroscope. The study period was 2006 to 2010 and there were 58 male and 08 female patients with altogether 60.

PATIENTS AND METHODS

This is a perspective study carried out at Tangail General Hospital Tangail. Inclusion criteria were closed and open (type i and ii) displaced tibial diaphyseal fractures and it includes acute, malunited, non-united fractures. Only sixty patients met these criteria and were included in this study. All the patients were discussed about the methods of fixation earlier. Open fractures were meticulously debride and irrigated with normal saline Prophylactic antibiotic (Inj. Cefriaxone 1 gm IV) given in all cases. In open cases reaming was not done. Spinal anesthesia was given in all cases.

Surgical technique: Patient was in supine position after being anesthetized. The limb was washed with soap-water. A thigh tourniquet was applied before the limb being draped free. Leg remains hanging from the edge of operating table. A sand bag was placed under the knee. A midline incision was made from the lower pole of patellae to tibial tubercle. Through retracting the cut margins entry point is identified just behind and proximal to tubercle. An owl is introduced into the medullary cavity perforating the cortex flexing the knee up to 110 degree. During introduction into medullary canal awl remains parallel to the long axis of the tibia otherwise it will perforate the posterior cortex. One of the two equal size guide wires is passed through the entry point into the medullary canal. The end of the wire will be seen through fracture end. Fracture site was opened through a small incision over the antero-medial surface of the leg. Fracture ends are cleaned and currated then reduced by traction and externally rotating the distal leg. The guide wire is then advanced into the distal fragment. Then cannulated reamer is passed over the guide wire starting from 8 mm in diameter. In our method we use tibial nail with canal inside it through which guide wire can be passed easily. The nail has about 10 degree angle in its proximal end to accommodate the shape of the proximal tibia. Moreover the nail has locking holes on either side so that locking screw can be inserted from the medial side of the leg. Reaming is done to accommodate larger size nails except in open cases to avoid damaging the endosteal

blood supply. Proper size nail is selected and assembled with introducer. Jig is also assembled with introducer. Jig and nail are well-aligned by alignment pin. All bolts and screws are made tight by wrenc. Then nail is passed over the guide wire into the medullary canal. Gentle hammering done to seat the nail in the canal. A 4mm drill bit is passed through the drill sleeve and is drill through medial surface of tibia by making nick. After completing near cortex drill the guide is passed beyond last locking hole. now drill bit is advanced slowly if bit is in the locking hole it will catch the wire. In this situation wire can not be pulled back then drill is withdrawn a little. Now wire can be pulled back easily and far cortex is drilled. The drill bit is removed then a 4.9 mm locking screw is inserted as it advanced it will hold guide wire in the nail, then guide wire can not pulled back but if screw is withdrawn the wire can be pulled back easily confirmed the placement of it in correct position. All screws are inserted in the same way a total 4 screws, two for each end. here one thing is very important that first screw is inserted in most distal one. After completion of insertion of distal screws, limb is straighten and slapped on the sole to impact the fracture. Wound is cleaned, sutured and dressed. Finally a long leg back slab is applied after removing the tourniquet. X-ray done in the next day routinely to confirmed correct position of nails as well as locking screws. Subsequently x-ray is taken at 10 weeks, 16 weeks, 18 weeks and then in every monthly. The successful placement of locking screws in this method should not only improve the Quality of fracture care, it also reduce the chances of radiation exposure 4 rads per minute when image intensifier is on^{8,14,15,16,17,18}.

RESULTS

A total of 60 cases, 52 male and 08 female were evaluated at 6 weeks, 12 weeks, 06 month and 09 month or till united. The follow up period was five month in average with a range of 3 month to 14 month. Average age was 34 years with range of 15 to 60 years. Average time prior to surgery was 5 days for acute fractures. Duration of operating time was from one to one and half hour. Autogenous bone graft given during fixing the malunited and nonunited fractures.

Table I
Showing sex distribution

Male	Female	Total
52	08	60

Table II
Showing subgroups of total fractures

Nonunion	Malunited	Acute Fracture	Total
6	3	51	60

The 58 cases (96.66 percent) united before six months. Two fractures turned into delayed union one of which united after dynamization and partial weight bearing .Another one required reoperation by exchange nailing and bone graft was united in 14 months. Closed procedures done in 5 cases .These cases were simple transverse fracture and patients were lean thin.

Table III
Mode of injury

Fall	Road Traffic	Accident Sports Injury	Physical Assault	Total
10(16.66%)	43(66.66%)	5(8.33%)	2(3.33%)	100%

Table IV
Showing type of method used

Closed method	ORIF	Total
5(8.33%)	55(91.66%)	60(100%)

Table-V
Showing the pattern of fracture

Oblique	Transverse	Spiral	Comminuted	Total
40(66.66%)	7(11.66%)	10(16.66%)	3(5%)	100%

The postoperative x-ray confirmed the correct position of nail and screws Average union time was 4 months. The complications were a few and mild like loosening of distal screws due to osteoporotic bone, 2 cases of delayed union ,one case of superficial and another one case developed deep infection. No patient developed chronic osteomyelites. All the cases united without deformity except one who had loosening of screws leading to more than 10 degree of valgus and 2 centimeter shortening.

Table VI
Showing radiological finding at 3 month follow up

No callous	5(8%)
Visible callous one side	7(11.66%)
Visible callous both sides	35(58.33%)
Union	13(21.66%)

Table VII
Showing radiological finding at 6 month follow up

Fracture united	58(96.66%)
Delayed union	2(3.33%)

DISCUSSION

The most common causes of morbidity and mortality in the most productive period of life worldwide are road traffic accident causing fractures^{19,20,21}. The tibial shaft fractures are common since they account for 9 percent of all fractures.²² The sex distribution is also keeping with other reports²¹, and further emphasizes the greater vulnerability of males to trauma. The availability of an appropriate method of modality could be of utmost concern to any practicing orthopedic surgeon in the resource-poor country like Bangladesh^{20,23}. The use of interlocking nails for fracture of long bones has increased and indeed has become the gold standard for the care of unstable long bone fracture.⁴ However its main drawbacks are cost and need for intraoperative image intensifier support^{24,2,11,3}. There are new nails that can be locked with the aid of external jig^{25,15,8,11,18,4}. In this study, 100 percent fractures were fixed with interlocking nails without image intensifier and post operative X-ray confirmed the correct position of nails and screws. This is an agreement with others works^{3,17}. All closed fractures were reamed to accommodate larger nails where as open cases were fixed with un-reamed nails. Un-reamed locked nails with fitting can produce satisfactory clinical results for acute fractures. It has an advantages of technical simplicity and an acceptable risk of implant failures^{26,27,28,29,30,31,32}. In our series union of fracture is 100 percent, delayed union 3.33percent, infection 3.33 percent, loosening of screws of distal screws 1.6 percent. The commonest cause of fracture is road traffic accidents, Oblique fracture of the middle third is the commonest site .Fracture united in an average of 4 months. In our series 58 cases united in 4 months. Two cases of delayed union also united after appropriate measures taken. The results are comparable with others series:

Authors	N=Number of cases	Union	Nonunion
Alho A. et al. ³³	98	15wks	2%(n=2)
Court-Brown et al. ²	50	15.4 unreamed 16.5wks reamed	10%(n=5)
Court-Brown. ²⁷	125	16.5wks	2%(n=2)
Ike metal. ⁴	40	3 months	5%(n=2)
Anglen et al. ³³	45	34.5wks reamed 22.6wks unreamed	13%(n=6)
Giri et al. ⁹	55	16 weeks	2%(n=2)
In this series	60	16 weeks	2%(n=2)

CONCLUSION

With all these discussion we can say that interlocking intramedullary nailing can be achieved without image intensifier once the surgeon developed considerable expertise with the use of external side jig.

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Original Article

Management of Complex (Schatzker-Type V And VI) Tibial Plateau Fractures by Ilizarov Method

Md. Mofakhhkarul Bari², Md. Shahidul Islam², Gazi Md. Enamul Kabir³, Nazmul Huda Shetu⁴, Masum Billah⁵

ABSTRACT:

We studied 46 tibial plateau fractures (Schatzker Type V and VI), managed by Ilizarov fixator in National Institute of Traumatology & Orthopaedic Rehabilitation (NITOR), Pink unit-II (Ilizarov, Deformity Correction and Reconstruction Unit), Dhaka, Bangladesh. All fractures were the result of high energy trauma. Duration of study was 6 and a half years. Using The Knee Society Clinical Rating System, 32 knees were rated as excellent, 13 as good and 1 as fair. Pin sites inflammation and pin loosening were the commonest complications in our study. This study emphasizes the clinical success and low morbidity associated with the use of Ilizarov external fixator.

Key ward: Tibial plateau fracture, Soft tissue injury, External fixator, Functional outcome.

INTRODUCTION:

In 1979, Schatzker et al. introduced a classification for tibial plateau fractures that distinguished low-energy split depression fractures from high energy bicondylar (Schatzker type V and VI) fractures. Complex tibial plateau fractures (Schatzker type V and VI) are one of the most challenging problems in orthopaedic surgery. The Ilizarov technique solves many of these problems encountered in the management of such fractures and provides a method for closed reduction and fixation that does not necessitate excessive soft tissue stripping.^{3,12}

These fractures involve both medial and lateral condyles with various amount of articular surface comminution are often associated with severe soft tissue injury that can frequently result in compartment syndrome and are frequently open fractures. Operative management of these injuries is invariably complicated by the condition of the soft tissue envelop of the proximal tibia.

The risk of wound complication following open reduction and internal fixation is notably high owing to extensive

soft tissue dissection. Alternatively application of Ilizarov technique minimizes soft tissue dissection and provides adequate fracture stabilization to allow early movement of joint and correction of any malalignment. With this technique soft tissue complication particularly surgical site infections are expected to be significantly reduced. The purpose of this study is to evaluate the management of these complex injuries with the Ilizarov technique, functional outcome and complications associated with this treatment method^{2,6}.

The treatment goal for bicondylar tibial plateau fracture with Ilizarov method is to obtain a stable, aligned, painless and mobile knee and to minimize the risk of post-traumatic osteoarthritis. Ring fixator like Ilizarov system, with tensioned fine wires, utilizes beam loading to create uniform support for the joint and stable fracture immobilization to achieve fracture union.^{3,4,5}

MATERIALS & METHODS:

This retrospective study was conducted at Pink Unit –II (Ilizarov, Deformity Correction & Reconstruction Unit),

1. Associate Professor, Department of Orthopaedic Surgery, NITOR, Dhaka, Bangladesh.
2. Professor of Anaesthesiology, Shishu Hospital, Dhaka
3. Junior Consultant, Noakhali Sadar Hospital, Noakhali
4. Medical Officer, Monshigonj Sadar Hospital, Dhaka
5. Assistant Registrar, NITOR, Dhaka

Correspondence to : Dr. Md. Mofakhhkarul Bari, Department of Orthopaedic Surgery, NITOR, Dhaka, E-mail: shayan_bari@hotmail.com

NITOR, Dhaka, Bangladesh. Number of total patient was 46. The duration of study was 6 and half years from January, 2006 to, July, 2012. All fractures occurred after high energy trauma including RTI and falls from height of >2.5 meter. There were 44 male and 2 female with an average age of 40 years (range 21 to 62 years). 34 were closed fractures and 12 were open fractures. Soft tissue injury for the closed fractures was classified according to Tscherny and Gotzen, and open fracture was classified according to Gustilo and Anderson. Inclusion criteria were patients of skeletal maturity with complex tibial plateau fractures that were treated with Ilizarov external fixator. Patients were excluded if they had any of the following: (1) a condition that would impede the rehabilitation process of the patient – for example, acetabulum fractures that would require prolonged immobilization; (2) concomitant injuries that could alter the functional outcome of the patient- for example, ipsilateral femoral shaft fractures; (3) previous major trauma, surgery or deformity of the affected knee. The preoperative diagnostic approach was to determine the severity and the extension of the osseous damage. Plain radiograph were supplemented in all cases by biplane tomograms. Computed tomography scan was used in 30 fractures and magnetic resonance imaging was used in 4 fractures.

SURGICAL TECHNIQUE:

The objective was to accurately reduce the condyles in relation to one another and to reduce and stabilize the tibial shaft beneath the reduced condyles. Anatomical reduction of the joint surface was a secondary goal that was often accomplished percutaneously or through limited approach. Condylar reduction was assisted by longitudinal traction on the fracture table with application of the varus or valgus forces. Large pointed reduction forceps applied percutaneously help to obtain accurate condylar reduction and compression (Ligamentotaxis).

After reduction of the condyles, counter-opposed olive wires through the fragments were used to achieve interfragmentary compression. Three to four wires at least 1.5 cm. from the joint line, with an overall divergence of an angle at least 60 degree, were introduced for stabilization of the condylar and metaphyseal fragments. Frequently we used an olive wire through the fibular head obliquely into the lateral tibial condyle, taking advantages of the buttress effect that fibular head offers to the lateral column of the tibia. A 5/8 ring was attached to allow greater knee

flexion and wire tensioning was performed under C-ARM guide to directly view the adequacy of the reduction and avoid over-compression.

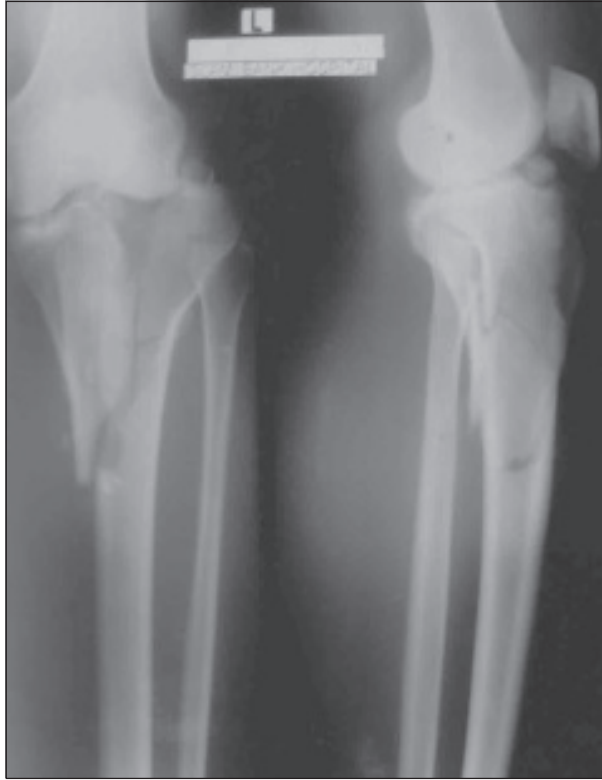
Middle construct was made with a full ring two to three cm. distal to diaphyseal fracture site and distal ring was placed at a lower level and secured to a transfixation reference wire positioned parallel to the ankle joint to ensure mechanical axis of the tibia. Now second and third ring were joined by four connecting rods, then metaphysio-diaphyseal alignment was corrected under C-ARM control. Finally 1st and 2nd ring were joined by four connecting rods.

POST-OPERATIVE CARE:

All patients were instructed on fixator care and taught to do daily pin sites cleansing with rectified spirit and started on passive range of motion exercise on the 2nd post-operative day and active motion by 1 week. Ankle equinus deformity was prevented by meticulous wire placement technique, active joint mobilization post-operatively and splinting of the foot in a neutral position. Early range of movement exercise for the knee and mobilization with crutches was encouraged in all cases. Partial to full weight-bearing was increased as tolerated. Patients with marked articular comminution were kept partial-weight bearing for 6 weeks.

OBSERVATION AND RESULTS:

The mean patient's age at the time of injury was 40 years (range 22-62 years). Average duration of hospitalization was 10 days (6 to 14 days). The average follow-up was 14 months (range- 12 to 18 months). All fractures united in an average time of 14 weeks (ranges 10 to 20 weeks). Fixators were removed after union of fractures. The radiographic reduction of fractures was rated as excellent in 38 and good in 8 according to Rasmussen's criteria. Using The Knee Society Clinical Rating system, 34 were rated as excellent, 11 as good and 1 as fair. The average total range of knee flexion was 120 degree (range 0 to 140 degree). 34 patients had a normal walking pattern and were able to climb stairs normally. Five patients had clinically demonstrable grade 2+ medial-lateral instability. Only two were symptomatic but had no functional handicap. 8 had mild or occasional pain. In 4 patients, walking was limited, and needed walking aids. Pin-tract infection was mild and common but controlled by dressing and antibiotics



Fi.-1. Complex (Schatzker-Type VI) tibial plateau fractures of a 24 years old boy.

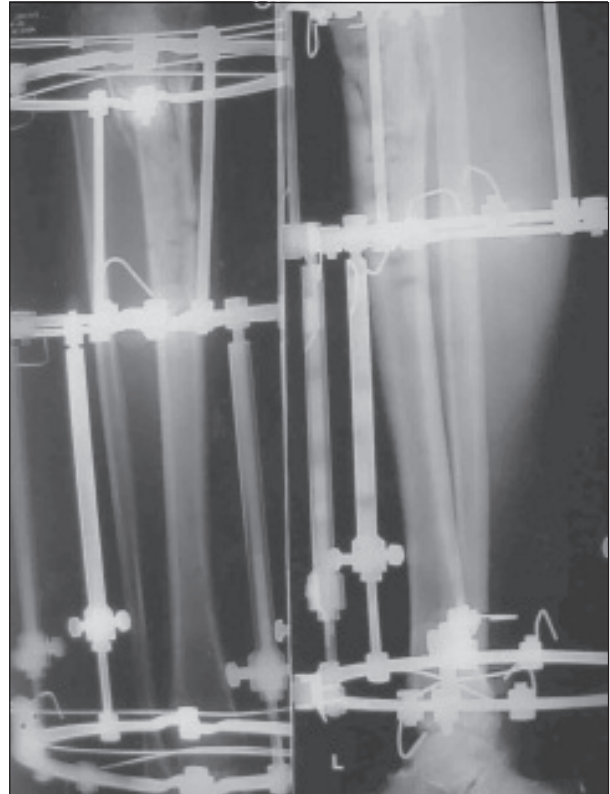


Fig.-3. 16 weeks after application of Ilizarov external fixator.

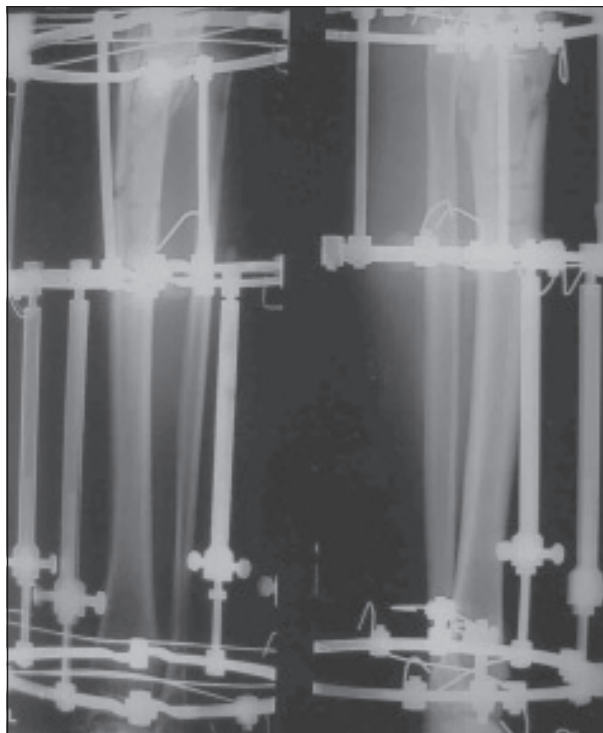


Fig: 2. 2 weeks after application of Ilizarov external fixator.



Fig: 4. After removal of Ilizarov external fixator (at 20 weeks)

FOLLOW-UP:

After discharge, patients attended the Ilizarov clinic in NITOR held on every Sunday. During follow-up, the patients were assessed in term of range of motion, fracture union clinically and radiologically, any loss of reduction radiologically, any hardware related complications like wire breakage, surgical sites infection, complications related to the surgery like nerve injury from inadvertent pin placement. Serial standing radiograph of the knee and leg in antero-posterior and lateral plane were performed at 6th week, 12th week, 18th week, 24th week and 28th week post-operatively. The Ilizarov fixator was removed once radiographic evidence of union was established. Functional outcome was determined using The Knee Society Clinical Rating Score.

DISCUSSION:

The goals of operative treatment of these fractures include anatomic reduction for restoration of articular congruity and alignment, and stable fixation to allow early motion. However the classic dual plate osteosynthesis has been associated with potentially devastating complications such as fixator failure, malunion, nonunion, joint stiffness, secondary post-traumatic osteoarthritis, infection, and most importantly severe soft tissue complications ranging from 23 to 87.5%^{2,9,12}.

The management of intraarticular fractures in the tibial plateau is inherently complex. The restoration of articular congruity is mandatory, and careful treatment of soft tissue is as important as bone. Over the past few decades, a number of evolving treatment modalities ranging from traction to cast immobilization to open reduction and internal fixation have been used with mixed results. No treatment modality has been produced consistently good results, nor has any allowed both stable fixation and preservation of remaining soft tissues. In an attempt to achieve both stable fixation and preserving the remaining soft tissue many surgeons have chosen to use indirect reduction and external fixation. Ilizarov external fixation has been introduced and shown to be effective in the treatment of these difficult fractures^{3,8,12}.

The Ilizarov fixator offers several advantages that include minimizing further injuries to soft tissue envelop, feasible surgery even in the presence of badly injured soft tissue, adequate stability to allow early post-operative mobilization, and minimizing risk of joint stiffness. The disadvantages include the need for constant pin site care, pin sites infection and risk of septic arthritis from incidental intracapsular pin placement and potential risk of common peroneal nerve injury from poor pin placement^{3,9}.

Using Rasmussen criteria for radiographic assessment, excellent to good reduction was achieved in all our cases, which is superior to all similar series. The mean range of movement reported by Guadinez et al. was 85 degree and by Morandi and Pearse was 113 degree (9). All patients reported by Zecher et al. achieved at least 90 degree. The average knee range of movement in our study was greater than comparable studies, despite the presence of 2 cases of knee stiffness. When applying The Knee Society Rating System, the average knee score in our study was 80.2 and average functional score was 83.8, and the average knee rating was 82.5. Mikulak et al. reported a mean score of 78.5, a mean functional score of 81.9, and an average knee rating of 80.2 in their 24 patients (8). Kumar and Whittle reported a mean score of 83 and a mean functional score of 69 (79%) in 45 patients⁶.

Several published studies have shown decreased complication with treating bicondylar tibial plateau fractures with the fine-wire external fixator. Kataria et al. reported on a series of 38 patients treated with small wire external fixator and had no incidences of non-union or septic arthritis. In series by Dendrinis 24 patients were treated with Ilizarov circular external fixator, and there was no incidence of non-union, osteomyelitis or septic arthritis. Chin et al. reported similar results of 18 patients, none of whom developed wound dehiscence, infection, osteomyelitis or septic arthritis (1). The current series is comparable to these studies in that no cases of wound dehiscence, infection, osteomyelitis or septic arthritis were encountered.

Pin tract infection was the main drawback when using an external fixator to treat fractures. In meta-analysis of 10 studies with a total of 381 patients, Hutson et al. encountered 38 cases superficial pin tract infection (10%), 5 septic arthritis (1%), and 13 deep infection (4%).

Limitations of this study include the small number of cases and the retrospective nature of the review. Also, the exclusion of patients with certain concomitant injuries could lead to a selection bias, possibly omitting patients with more severe injuries.

CONCLUSION:

Complex tibial plateau fractures fixation by Ilizarov technique has become increasingly popular over the past decade. The degree of soft tissue injury associated with these fractures is an important determinant for both the choice of treatment modality and prediction of treatment outcome. Ilizarov method is a safe and effective option for the treatment of difficult Schatzker type V & VI tibial plateau fractures. This method minimizes soft tissue

complication and favours bony union with an acceptable return of function. Complications are mainly related to pin tract sepsis. We feel that the technique merits a place in the armamentarium for managing.

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Efficacy of Ilizarov External Fixation Technique for the Treatment of Perthes' Disease

Md. Abdul Maleque¹, Md. Sajjad Husain², Md. Mofakhkharul Bari³, S.M. Amir Hossain⁴,
Md Serajus Saleheen⁵

ABSTRACT:

Arthrodiastasis with the Ilizarov fixator for treatment of Perthes' disease is known to induce angiogenesis around the hip joint, seems to achieve true ambulatory non-weight bearing containment and has the hypothetical advantage of addressing both mechanical and biologic aspects of this pathologic mechanism. This study was undertaken in the National Institute of Traumatology and Orthopaedic Rehabilitation (NITOR), Dhaka, Bangladesh from January 2009 to December 2010 to observe the functional outcome of the patients of Perthes' disease treated by Ilizarov external fixator. Total twelve cases of Perthes' diseases treated by Ilizarov External fixator technique were studied. The mean age was 9.75 years, ranging from 7 to 12 years and 10(83.3%) were males and 2(16.7%) were females with the male female ratio of 5:1. Among the 12 cases, all(100%) had preoperative pain, but post operatively 10(83.3%) cases were painfree and 2 (16.7%) cases had transient post operative pain. Among them, 9 (75%) were catterall stage 3 and 3 (25%) were catterall stage 4, 9(75%) were lateral pillar group-C and 3(25%) were lateral pillar group-B. Among them, 4 (33.3%) patients had post operative pin track infection and rest of the patients had no complication. Among the cases 4(33.3%) cases had good outcome, 6(50%) cases had fair outcome and 2(16.7%) cases had poor outcome, 10(83.3%) had satisfactory and only 2 (16.7%) had unsatisfactory outcome. Ilizarov external fixator technique is an effective method for the treatment of Legg-Calve-Perthes' disease.

Key words: Ilizarov external fixation technique, treatment of Perthes' disease.

INTRODUCTION:

Legg-Calve-Perthes' disease is an uncommon condition (1/5000) that affects one, or sometimes both, hips of a child between the ages of 3-15 years. Arthur Legg, Jacques Calve, and Georg Perthes' independently identified the disease in the early part of the 20th century shortly after x-ray diagnosis tools became available. The disease is commonly known as Perthes' or simply the abbreviation LCPD.¹ The disease typically affects boys more commonly than girls, in a 4:1 ratio. The affected children come to medical attention because of limping. Pain is typically located in the groin area and is often present only during

physical activity; in 25% of patients, the pain radiates into the thigh and knee. There may also be knee pain without groin or thigh pain, and, in such cases, the diagnosis is often delayed. It follows, therefore, that any child presenting with knee pain should have the hip carefully examined as well. In 10% to 15% of children with Perthes' disease, both hips are affected. The mobility of the hip is limited mainly in internal rotation and abduction. Clinical risk factors for a poor outcome include a later age of onset, overweight, severe limitation of the range of motion, and female sex.² The cause of Legg-Calvé-Perthes' disease is unknown, previously, some authors thought that an

1. Medical Officer, National Institute of Traumatology & Orthopaedic Rehabilitation (NITOR), Dhaka.
2. Professor, Department of Orthopaedic Surgery, National Institute of Traumatology and Orthopaedic Rehabilitation, Dhaka.
3. Associate Professor, Department of Orthopaedic Surgery, NITOR, Dhaka.
4. Assistant Professor, Department of Orthopaedic Surgery, NITOR, Dhaka.
5. Clinical Assistant, Department of Orthopaedic Surgery, NITOR, Dhaka.

Correspondence: Dr. Md. Abdul Maleque, Medical Officer, National Institute of Traumatology & Orthopaedic Rehabilitation (NITOR), Dhaka.

inherited thrombophilia promoted thrombotic venous occlusion in the femoral vein causing bone death in the femoral head and ultimately leading to Legg-Calvé-Perthes' disease.³

In 1971, Catterall proposed a fourfold classification of the disease, based on the extent of involvement of the femoral head. The Catterall classification has only limited reliability and prognostic value. The most recent classification was proposed by Herring in 1992. It is based on the height of the lateral pillar of the epiphysis of the femoral head, as seen on an AP x-ray view in the early fragmentation phase. This "lateral pillar" classification, when determined in the fragmentation phase, is of greater prognostic value and has a greater interobserver reliability than the Catterall classification.² The prognosis for Perthes' worsens with advancing chronological age and those who are aged more than 10 years have an almost universally poor outcome even with aggressive treatment. The goal of all forms of treatment is to prevent deformity of the femoral head and incongruence of the affected hip.² Professor G.A. Ilizarov started practicing his Ilizarov external technique, extremely versatile circular fixator in Kurgan, Siberia, in early 1950s.⁴ Typical of ring fixators are Ilizarov, Volkov ace-Fischer. They are built with longitudinal rods ring elements. Generally they allow for gradual and multiplaner adjustment. The Ilizarov fixator was significantly less stiff than some of the unilateral fixators in lateral bending. Off centering the bone was associated with a higher axial stiffness and a lower torsional stiffness than the centered configuration.¹

Increasing the ring radius reduce the axial stiffness and the bending stiffness and increased the torsional stiffness. The basic of the Ilizarov technique is that osteogenesis can occur at a specially controlled osteotomy site given the appropriate degree of retained vascularity, fixation and quantified distraction. The Ilizarov method has revolutionized thinking about fracture healing and osteogenesis. It has greatly broadened the scope and indications for limb lengthening and has incorporated limb lengthening as a tool in both fracture and nonunion management. Close adherence to Ilizarov principles makes it possible to successfully treat most of the orthopaedic conditions that previously were fought with high morbidity rates of poor result. As experience broadens, application of Ilizarov method will continue to grow.⁵

METHODOLOGY:

A prospective study of treatment of Perthes' diseases done at NITOR from Jan 2009 to December

2010. Among 12 patients, 10 male and 2 female were with an average age of 9.7 yrs (range 7-12 yrs). All of them treated with arthrodiastasis by Ilizarov external fixator technique.

Following general anesthesia the patient is placed supine position on the operating table with a pillow or sand bag beneath the ipsilateral buttock. The affected hip, perianal area, thigh & leg are scrubbed and painted & draped accordingly. Through a 2 to 3 cm incision over the iliac crest and two schanz pins are placed in a convergent manner. Entry points of the pins are approximately 3 cm apart. All the pins are fixed to the pelvic arch. Ilizarov frame is constructed (two ilizarov rings, one at the level of sub trochanteric region & another at the level of mid shaft of the femur with a hinge between pelvic arch & proximal ring) and applied to the affected side with two K-wires introduced into the epiphyses through the neck (to improve circulation) with the help of image intensifier (C-arm). Proper dressing done of pin introduction sites. Patient is allowed to walk after pain subsided (usually after 3-5 days).

Results are evaluated both clinically and radiographically subsequently (after several weeks).

RESULTS:

Total 12 cases of Perthes diseases treated by Ilizarov External fixator technique were studied. All of the patients were followed up monthly. The mean age was 9.75 years, ranging from 7 to 12 years. Among the 12 cases, 8 patients (66.7%) were within the age group 8 to 11 years, 2 (16.6%) were within 4 to 7 years & 2 (16.7%) were older than 11 years. Among them, 10 (83.3%) were males and 2 (16.7%) were females with the male female ratio of 5:1. Among the 12 cases, all (100%) had preoperative pain, but post operatively 10 (83.3%) cases were painfree and 2 (16.7%) cases had transient post operative pain. Among the cases, 9 (75%) were catterall stage 3 and 3 (25%) were catterall stage 4. (all are preoperative assessment). Among them, 9 (75%) were lateral pillar group-C, 3 (25%) were lateral pillar group-B. It was seen that 4 (33.3%) patients had post operative pin track infection. Rest of the patients had no complication. Among 12 patients, 4 (33.3%) cases had good outcome, 6 (50%) cases had fair outcome and 2 (16.7%) cases had poor outcome. In this study good & fair results were treated as satisfactory and poor results were treated as unsatisfactory. Among the 12 cases 10 (83.3%) had satisfactory and 2 (16.7%) had unsatisfactory outcome.

Table I

Distribution of the patient by age and sex (n=12)

Age in years	Number of patients	Percentage
4-7	2	16.7
8-11	8	66.7
>11	2	16.6
Total	12	100.0

Sex	Number of patients	Percentage
Male	10	83.3
Female	2	16.7
Total	12	100.0

Table II

Distribution of patients by pain. (n=12).

	Frequency	Percentage
Pre operative pain		
Present	12	100
Absent	0	0
Total	12	100.0

Postoperative pain

Present	2	16.7
Absent	10	83.3
Total	12	100.0

Table III

Distribution of patients by Catterall stage and Lateral pillar group.(n=12)

	Frequency	Percentage
Catterall stage		
Stage 3	9	75
Stage 4	3	25
Lateral pillar group.		
A	0	00
B	3	25
C	9	75

Table IV

Distribution of patients by complications and functional results (n=12)

Complications	Frequency	Percentage
Present	4	33.3
Absent	8	66.7

Functional results	No. of patients	Percentage
Good	4	33.3
Fair	6	50
Poor	2	16.7

Table V

Distribution of patients by final outcome (n=12).

Outcome	Frequency	Percentage
Satisfactory	10	83.3
Unsatisfactory	2	16.7
Total	12	100.0



Fig-1 : Pre operative X-ray of Perthes' disease of left hip

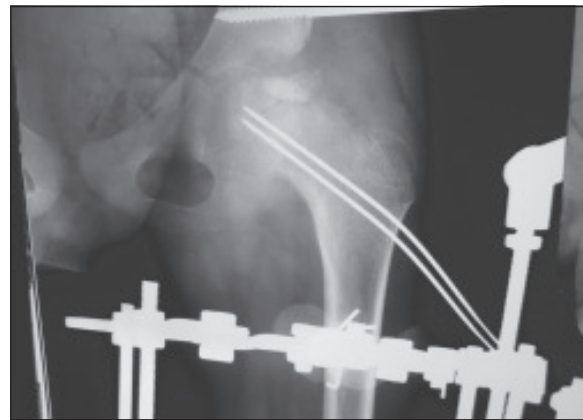


Fig-2 : Post operative X-ray of Perthes' disease of left hip



Fig-3 : Epiphyseal height is increased after removal of illizarov

DISCUSSION:

This experimental study was carried out at National Institute of Traumatology and Orthopaedic Rehabilitation (NITOR), Dhaka, Bangladesh from January 2009 to December 2010. Sample size was twelve, all of the cases of Legg-Calve-Perthes' disease were treated by Ilizarov external fixator technique. Mean age of the patients in this study was 9.75 years, ranging from 7 to 12 years. In a multicenter clinical survey on 711 patients with 766 affected hips, in Japan, the average annual incidence of LCPD was 0.9 per 100,000; the average age at diagnosis was 7 years 1 month.⁶ In another study in 2008 on 43 cases, the mean age was 10.8 years.⁷ Kocaglu in 1998 carried a study on 11 patients of Legg-Calve-Perthes disease treated by Ilizarov external fixator, where the mean age was 6.9 years, ranging from 7.5 to 10 years.⁸

Male female ratio in our study was 5:1 (among 12 cases 10 males and 2 females). In a multi center clinical survey in Japan on 711 patients of LCPD, where male female ratio was 6.3: 1.⁶ In another study on 11 cases in 1999, this ratio was 8:3.⁹ In our study among 12 cases, 9(75%) were Lateral pillar group-C, 3(25%) were Lateral pillar group-B. In a study on 11 cases 7(63.6%) were Lateral pillar group-C, 4(36.3%) were Lateral pillar group-B.⁸ In a study on 42 cases of LCPD, 23 cases (having 9 lateral pillar B & 14 lateral pillar -C) were treated with an articulated distraction technique and 19 cases (having 11 lateral pillar-B & 8 lateral pillar-C) were treated conservatively as a control group.¹⁰ So there was a variation of Lateral pillar group involving the cases studied. Regarding one important complication, pin track infection among 12 cases, 4 (33.3%) patients had post operative pin track infection and rest of the patients had no complication in our study. In the study by Kocaglu on 11 cases, 8 (72.7%) had pin track infection post operatively.⁹

A study on 15 cases of perthes' disease above 7 years of age, all are treated with arthrodiastasis methods for an average period of 4 months & compared with conventionally treated, consecutive, historical control group. It was found that 1 of 15 cases loss of more than 50% lateral epiphyseal column, other complications like pin site infections were most of the patients.¹¹ So post operative pin track infection rate was much less in our study in comparison to the other study. Regarding final outcome of results among 12 patients, 4(33.3%) cases had good outcome, 6(50%) cases had fair outcome & 2(16.7%) cases had poor outcome in our study. In a multicenter clinical survey on 711 patients in Japan, opined that operative treatment had a better outcome than

conservative treatment, with an odds ratio of 1.872.⁶ In another study on 42 patients of late onset perthes' disease in the treatment of arthrodiastasis, clinically, the results were good in 21 patients (92%), fair in 1 (4%), and poor in 1 (4%). In patients treated conservatively, clinically, 71% had good results, 17% had fair, and 12% had poor.¹⁰ It was found that twice as many patients with a poor result in the conservative group.⁷

A study on 14 cases on late onset perthes disease, all of them underwent 2 stage procedures, Arthrodiastasis & femoral varus osteotomy subsequently and found better functional outcome than single procedure regarding improvement in pain & containment.¹² In retrospective review on prospectively collected data on 44 cases of perthes disease with catterall stage 2,3,4 with onset age of more than 7 years. It was found that outcome were poorer with increasing age.¹³ A radiological evaluation study on 42 hips suffering from perthes disease. It was found that there was a trend towards a better femoral head coverage following surgical containment of Herring type II & III hips and it was concluded that surgical containment may offer a better prognosis for patients with severely affected hips.¹⁴ The results in our study corresponds to that of the other study. So as a surgical means of treatment, Ilizarov external fixator technique is an effective method for the treatment of late onset perthes' disease.

CONCLUSION:

Our study denoted only 16.7% poor outcome during the follow up period of 2 to 15 months. To asses the actual functional outcome, longer period of follow up is important. Proper diagnosis, pre-operative preparation and counseling, meticulous surgery and appropriate application of Ilizarov external fixator, optimum post operative care and rehabilitation are essential for the satisfactory outcome.

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Original Article



Evaluation of The Result of Delayed Percutaneous Internal Fixation of Intracapsular Fracture of the Neck Femur in Young Adult

Md. Saidul Islam¹, Kamal Mahmood Khan², Md. Wahidur Rahman³, Md. Tofayel Hossain⁴,
Md. Saiful Islam⁵

ABSTRACT:

Femoral neck fractures in the young adults are uncommon and often the result of high energy trauma. They are associated with higher incidences of femoral head osteonecrosis and non-union. Multiple factors can play a significant role in preventing these devastating complications and contribute to a good outcome. An anatomic reduction and stable internal fixation are imperative, other treatment variables such as time to surgery and the fixation method remain variable. In our study a total of 26 patient, aged between 18 to 50 years were included. Aim of the study was to evaluate the result of closed reduction and delayed internal fixation of intracapsular fracture of neck of the femur in young adult less than 50 year of age with percutaneous multiple cannulated hip screw. Among 26 patient 6 were either of Garden type 1 or 2 and rest of the patient were of type 3 and 4. Average age was 34 years. The average timing of surgery was 6 days. The results in all 6 patient in Garden type 1 and 2 were very good. In the rest of the 20 patient of garden type 3 and 4 had variable result, 4 were AVN and 2 were non-union. Average time of union was 20 weeks in rest of the cases.

Keywords: Intracapsular Neck Fracture, Young Adult, anatomic reduction, stable fixation

INTRODUCTION

An intracapsular fracture of the neck of the femur in the young adult is an uncommon injury and difficult injury to manage^{7,10}. It is usually due to high- energy trauma. Fracture pattern is more vertically oriented and thus is biomechanically more unstable^{2,3,4}. This factor have important implications in terms of obtaining and maintaining stable fixation to allow healing to occur. Non-union and avascular necrosis (AVN) of the femoral head are very common in fracture of the neck of the femur^{6,8,9,12} in displaced type (Garden type -3 and 4) of fracture. Most studies indicate that early fixation with proper reduction is necessary for good result.^{10,11,12} The aim of this study

was to evaluate the result of closed reduction and delayed internal fixation of intracapsular fracture neck of the femur in young adults <50 years of age with percutaneous multiple cannulated hip screw.

MATERIAL AND METHOD

This was a prospective study which was carried out at National Institute of Traumatology and orthopaedic Rehabilitation (NITOR), Dhaka and different hospital in Dhaka, Bangladesh during the period from January 2005 to August 2008. Our study comprising 26 patients having an intracapsular fracture neck of the femur. Patient having extracapsular fracture, Poly trauma, patient with co-morbid

1. Junior Consultant, Department of Orthopaedic Surgery, Shaheed Shohrawardy Medical College Hospital. Shere Bangla Nagar, Dhaka
2. Assistant Professor, Department of Orthopaedic Surgery, NITOR, Dhaka
3. Assistant Professor, Department of Orthopaedic Surgery, NITOR, Dhaka
4. Junior Consultant (Ortho-surgery), Savar Upazila Health Complex, Dhaka
5. Medical Officer, NITOR, Dhaka

Correspondence to: Dr. Md. Saidul Islam, Junior Consultant, Department of Orthopaedic Surgery, Shaheed Shohrawardy Medical College Hospital. Sher-e-Bangla Nagar, Dhaka-1207.

medical ailment were excluded from study. Age range of the patient was 18 to 50 years, mean age 34 year. 21 patient were male and 5 patient were female. 6 patient were Garden type 1 and 2. 20 patient were Garden type 3 and 4. The average timing of surgery was 6 days (Range-2 to 10 days).

All patient were given spinal anesthesia. On fracture table reduction of the fracture was achieved by standard method under image intensifier. Fracture were stabilized by 6.5 mm cannulated hip screw. All three screws were placed percutaneously, parallel to each other using an angle guide. The first screw was placed along the calcar, the 2nd along the posterior cortex and the third in the superior part of the neck.

The patient were allowed active assisted mobilization of hip as soon as pain subsided and non-weight bearing crutch walking for 1st 6 weeks. Patient was followed in OPD at 3 weeks, 6 weeks and 3 monthly for 1 year and 6 monthly onward. Patient was allowed touch weight bearing at 6 weeks, partial weight bearing at 12 weeks and full weight bearing when there was clinical and radiological union.

RESULT:

All the patient of Garden type 1 and 2 united without complication. Among 20 patient of Garden type 3 and 4, 6 patient had complications, 4 patient (15.38%) had AVN and 2 patient (7.69%) had non-union. 20 patient had union. The average time of union was 20 weeks (Range 12 to 36 weeks).



Fig-1: Percutaneous pinning.



Fig-2: X-ray of union of fracture



Fig-3: Pre-operative x-ray

DISCUSSION:

In our study the rate of union in Garden type 1 and 2 was nice irrespective of age and time of surgery. Rate of AVN was 15.38% and non-union 7.6%, if we consider all the patient. Then if we consider only Garden type 3 and 4 then

the rate was 20% and 10 % respectively. In various study^{1,9,11} non-union had ranged from 4% to 59% and AVN from 10% to 86%. The reason for such a large variation might be difference in selection of patient in respect of age, timing of surgery, type of fracture, mode of reduction and fixation and quality of bone.

In a study by Swiontkowski et al¹² had 20% AVN. Zetterberg et al⁴ suggested that timing of surgery after injury was an important factor in influencing the outcome. In our study all the patient was operated within 2 to 10 days because of delay of arriving at hospital and lack of emergency operation facility. Delayed internal fixation of intracapsular fracture neck femur by Upadhyay et al¹³ also had AVN 19% and non-union 16.7%.

The cause of significant amount of complication in our study might be due to posterior comminution in all Garden type 3 and 4, early loss of reduction in 2 cases, difficulty in reduction during surgery in 8 cases and timing of surgery.

CONCLUSION:

Initial damage to femoral head blood supply by displaced fracture is out of control of surgeon. But other factors which contribute to high rate of complications can be prevented by early surgery, anatomic reduction and percutaneous internal fixation with multiple cannulated hip screw as it is simple, less invasive and provide reasonable amount of stability.

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Evaluation of The Surgical Outcome of Lumbar Burst Fractures Using A Single Posterior Approach

KM Rafiqul Islam¹, Md. Ahsan Majid², Md. Moshir Rahman², Sharmin Chowdhury³, Md. Shah Alam⁴, Kh. Abdul Awal Rizvi⁵

ABSTRACT

This was a prospective study carried out at NITOR from July 2009 to June 2011 to evaluate the results of surgical outcome of lumbar burst fractures through single posterior approach. A total of 15 patients aged over 15 years were included in the study. Among the 15 cases, 12 cases (80%) were male and 3 cases (20%) were female. The age range of patient was from 17-55 years. Most commonly affected people were labours 5 (33.33%). Fall from height was the commonest cause of injury 8 (53.33%). Most common level of injury was L1 10 (66.67%). Pedicle screw and rod used in all cases for short segment reconstruction above and below the involved level. According to Frankel grade preoperatively most common grade was C 10 and next common was B 5. Post operatively most was D 9 and next was E 4 & C-2. Fewer complications were observed among the patients preoperatively and post operatively. According to Denis et al, pain scale most commonly 8 (53.34%) cases complain no pain & work scale most commonly 2 (13.33%) cases were completely well and can perform normal work up to latest follow-up. Mean hospital stay was (36.16±8.84) days (24 -45) days. Satisfactory results (excellent & good) were in 12 (80%), fair 2 (13.33%) and unsatisfactory (poor) results in 1 (6.67%) cases. The results of the study demonstrates that Surgical outcome of Lumbar burst fracture using a single posterior approach is an effective procedure.

Key words: Lumbar burst fractures, single posterior approach, pedicle screws & rods

INTRODUCTION

Background of the study:

Fracture and dislocations of the spine are serious injuries that most commonly occur in young people. Nearly 43% of patients with spinal cord injuries sustain multiple injuries. (Leventhal, 2003).

Spinal column injuries represent approximately 3% of all trauma cases and 10% of spine injuries are accompanied by injury to the spinal cord. 75% of all spinal injuries occur within the thoracolumbar segment. Epidemiological studies show that these injuries affect mainly younger age group

of patients. Surgical treatment is now offered not only to patients with spinal injuries accompanied with spinal cord lesion, but also to injuries where instability and subsequent deformity is expected. (Lukas et al. 2006).

The thoracolumbar junction is the most common area of injury to the axial skeleton. Forces along the long stiff kyphotic thoracic spine switch abruptly into the mobile lordotic lumbar spine at the thoracolumbar junction. Biomechanically, this transition zone is susceptible to injury and is the most commonly injured portion of the spine. Primary goals in thoracolumbar trauma patients are

1. Research Assistant, Department of Orthopaedic Surgery, BSMMU, Dhaka
2. Medical Officer, Department of Orthopaedic Surgery, BSMMU, Dhaka
3. Resident, Medicine Unit IV, DMCH, Dhaka
4. Associate Professor, Department of Orthopaedic Surgery, NITOR, Dhaka
5. Director & Professor of Orthopaedic Surgery, NITOR, Dhaka

Correspondence to: Dr. K. M. Rafiqul Islam, Research Assistant, Department of Orthopaedic Surgery, BSMMU, Dhaka

prompt recognition and treatment of associated injuries and expeditious stabilization of the spine and protection of the neural elements. (Patel et al. 2002).

A burst fracture is a type of traumatic spinal injury in which a vertebra breaks from a high energy axial load with pieces of the vertebra shattering into surrounding tissues and sometimes the spinal canal.

Burst fractures are most often caused by car accident or by falls. Burst fractures are categorized by the “severity of the deformity, the severity of (spinal) canal compromise, the degree of loss of vertebral body height, and the degree of neurologic deficit.”

Main goal of a surgical treatment of an unstable fracture is reduction of fracture, correction of deformity, stabilization of fracture, decompression of neural canal and early rehabilitation of the patient.

Surgical intervention for lumbar burst fractures is indicated for patients with neurological deficits and/or evidence of severe spinal instability. Traditionally, nonsurgical management with immobilization and external bracing has been recommended for patients with burst fractures located between T 11 and L 4 without accompanying neurological deficit or significant instability. (Acosta et al.2005).

Short segment pedicle screw fixation through single posterior approach is a common and relatively simple method for treating lumbar burst fractures, and potentially allows for spinal stabilization while preserving as many motion segments as possible. Nevertheless, instrument failure rates and progressive sagittal deformity have been reported in as many as 50% of patients treated with short segment pedicle screw alone. (Acosta et al.2005).

Surgical decompression of the spinal canal is presently accepted worldwide as the method of treatment for lumbar burst fractures with neurological deficit in the belief that neurological recovery may be produced or enhanced. (Boerger et al.2000).

The advantages of surgical treatment for lumbar burst fracture include better correction of kyphotic deformity, greater initial stability, and an opportunity to perform direct decompression. The question as to how this fracture should be approached and stabilized (anteriorly, posteriorly or combined anteroposteriorly) is controversial. (Dai et al 2007).

The posterior procedure is well established. The advantages include safe exploration of the surgical site without violating the pulmonary, visceral and vascular structures. It also has the advantages of alignment

correction. Pedicle screw – rod systems provide rigid segmental fixation along all three columns of the spine and allow a combination of forces (distraction, compression or rotation) to be selectively applied to the spinal segment. Thus, pedicle screw fixation improves the ability to correct a spinal deformity. The great advantage of the posterior approach is that it gives a clear view of the neural structures. Using the posterior approach, all processes, such as decompression, correction of alignment with instrumentation, and posterior stabilization are performed safely under direct view. Furthermore, dural tear occur frequently in lumbar burst fracture with posterior element fractures (McAfee et al 1989).

It is possible to suture the dural tear when using the posterior approach. Therefore, posterior short-segment fixation without the anterior support is most common and most simple treatment of burst fracture (Picket et al 1989).

It is critically important to determine if a vertebral fracture is stable or not. Of an unstable fracture’ is overlooked, it may cause serious neurologic deficit, progressive spinal deformity, persistent back pain, bed rest of long duration and usage of boring orthosis. On the other hand, if a stable fracture is misdiagnosed, it may lead to unnecessary surgical intervention.

MATERIALS AND METHODS

Types of study: Quasi experimental study.

Place of study: National Institute of Traumatology and Orthopaedic Rehabilitation (NITOR), Dhaka, Bangladesh.

Period of Study: July 2009 to June 2011

Study population: A total number of fifteen patients with Lumbar Burst fracture were selected from NITOR, Dhaka, Bangladesh.

Sampling Method: Purposive sampling technique.

A total of 15 consecutive patients who underwent decompression and stabilization through single posterior approach of lumbar burst fractures with incomplete neurological deficit by pedicle screw and rods were included in the study. Purposive sampling was followed as per inclusion and exclusion criteria.

Inclusion Criteria:

- Unstable lumbar burst fractures
- Lumbar burst fractures with incomplete neurological deficit.
- Injury within 6 weeks.
- Age (15—60 years).

Exclusion criteria:

- Complete neurological lesion.
- Patients with co-morbid diseases like diabetes, Hypertension.
- Associated with other injury-cervical spine & lower limb fracture.

Variables:

The following outcome variables were studied:

- Pain scale
- Work scale
- Hospital stay
- Functional outcome
- Complications

RESULTS

During this study, total number of 15 patients of lumbar burst fracture with incomplete neurological deficit were selected. All patients were operated in the form of decompression, fusion, & stabilization by pedicle screw & rods through single posterior approach.

Table-I

Distribution of patients according to age (N=15)

Age group (Years)	Frequency	Percentage
11-20	2	13.33
21-30	7	46.66
31-40	5	33.34
41-50	0	00
51-60	1	6.67
Total	15	100

Age distribution:

In this study the age ranged from 17 to 55 years. Maximum patients were found in 21 to 30 years age group 07 (46.66%).

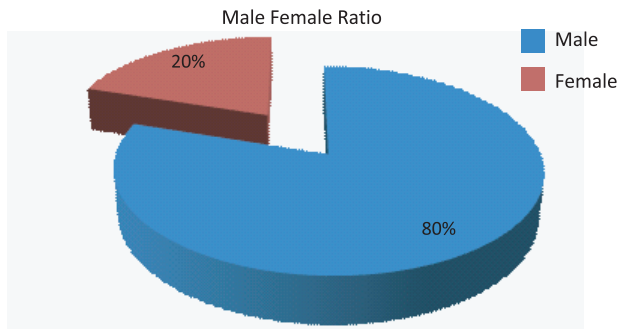


Fig.-1: Sex distribution of the patients

Mean age: (29.5±9.86) Years,

Sex Distribution:

Vast majority (80%) of the patients were male and the rest (20%) female giving a male to female ratio of roughly 4:1

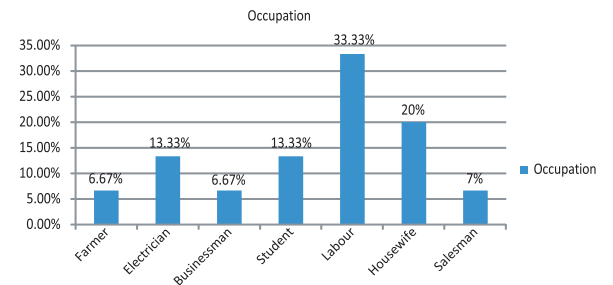


Fig.-2: Distribution of patients according to occupation

Occupation:

Occupation of the subjects demonstrates that Labour 05 (33.33%), & Housewife 03 (20%) comprised the main bulk. Other occupants were, Electrician 02 (13.33%), Students 02 (13.33%), Farmer 01 (6.67%), Businessman 01 (06.67%) and Salesman 01 (06.67%).

Causes of Injury

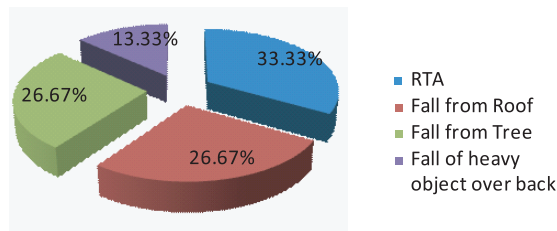


Fig.-3: Causes of Injury

Cause of injury:

In this study, Road Traffic Accident 05 (33.33%), followed by Fall from roof of building 04 (26.67%) and Fall from tree 04 (26.67%) then Fall of heavy object over back 02 (13.33%).

Table-II

Distribution of patients according to level of injury (N=15)

Level of spine	Frequency	Percentage
L1	10	66.65
L2	01	6.67
L3	01	6.67
L1,L2	01	6.67
L2,L3	01	6.67
L3,L4	01	6.67
Total	15	100

Level of injury:

In this study, 10 cases (66.65%) had fracture L1, 01 cases (6.67%) had L2 fracture, 01 case (6.67%) fracture L3, 01 case (6.67%) had fracture L1,L2, 01 case (6.67%) had fracture L2,L3, and 01 case (6.67%) had fracture L3,L4.

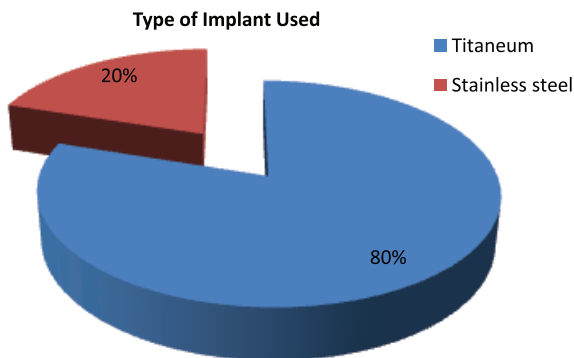


Fig.-4: Type of Implant used

Implant used:

Most of the cases used titanium pedicle screw & rod 12 (80%) and stainless steel used only 03 (20%) cases.

Table-III

Distribution of patients according to hospital stays (Days) (N=15)

Hospital stay (Days)	Frequency	%
21-30	4	26.67
31-40	9	60
41-50	2	13.33
Total	15	100

Hospital stay:

In this study, most of the patients 9 (60%) stayed in the hospital (31-40) days. Then 4 (26.67%) cases stayed (21-30) days, 2(13.33%) stayed (41-50) days.

Mean hospital stay: (36.16±8.84) days.

Table-IV

Distribution of patients according to pre-operative & post operative Frankle grade. (N=15)

Frankle's Grade	Pre-operative patients	Post-operative patient
A	0	0
B	5	0
C	10	2
D	0	9
E	0	4
Total	15	15

Frankle grade:

Most of the patients 10 (66.67%) had pre-operative Frankle grade "C" & post-operative Frankle grade "D" 9 (60%) and 4 (26.67%) patients become completely normal that is Frankle grade "E".

Table-V

Distribution of patients according to shift of Frankle grade (N=15)

Shift of Franke grade	Frequency	%
1	7	46.67
2	8	53.33
Total	15	100

Shift of Frankle grade:

In this study, shift of Frankle grade 2 was the highest 8(53.33%), and 1 in 7 (46.67%) patients.

Table-VI

Distribution of patients according to complications (N=15)

Complications	Frequency	%
No complications	9	60
Misplacement of Screw	1	6.67
UTI	2	13.32
Sacral Sore	1	6.67
Screw Breakage	1	6.67
Superficial wound Infection	1	6.67
Total	15	100

COMPLICATIONS:

In this study majority of the patients had no complications. Misplacement of 1 pedicle screw in 1 case, UTI developed in 2 cases, pre-operative sacral sore developed in 1 case, screw breakage occurred in 1 case and superficial wound infection developed in 1 case.

Table-VII

Distribution of patients according to pre and post operative Bowel & Bladder Control (N=15)

Bowel & Bladder	Pre-operative		Post operative	
	Frequency	%	Frequency	%
Controlled	9	60	13	86.67
Not controlled	6	40	2	13.33
Total	15	100	15	100

Bowel & Bladder control:

In this study bowel & bladder controlled post operatively in 13 (86.67%) cases & not controlled in 2 (13.33%) cases.

Table-VIII

Distribution of patients according to pain scale (N=15)

Grade	Frequency	%
1	8	53.34
2	5	33.33
3	2	13.33
4	0	0
5	0	0
Total	15	100

Pain scale:

In this study- according to Denis et al. pain scale most of the patients were grade-1, 8 (53.34%) then grade-2, 5 (33.33%) then grade-3, 2 (13.33%) and there was no patient in grade 4 & 5.

Table-IX

Distribution of patients according to work scale (N=15)

Grade	Frequency	%
1	2	13.33
2	6	40
3	4	26.67
4	3	20
5	0	0
Total	15	100

Work scale:

In this study, according to Denis et al. work scale 2 (13.33%) patients become completely normal that is grade-1 and most of the patients were grade-2, 6 (40%) cases followed by grade-3, 4 (26.67%) then grade-4, 3 (20%) cases and no patient in grade-5.

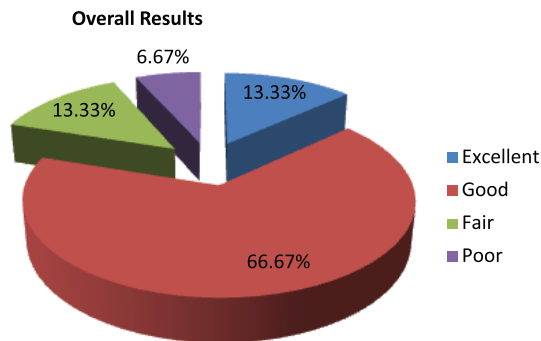


Fig.-5: Overall Results

OVERALL RESULTS:

In this study, overall results were classified as excellent, good, fair & poor. 2 (13.33%) cases in excellent group, 10 (66.67%) cases were in good, 2 (13.33%) cases were in fair & 1 (6.67%) case was poor. (Appendix-II).

Follow up

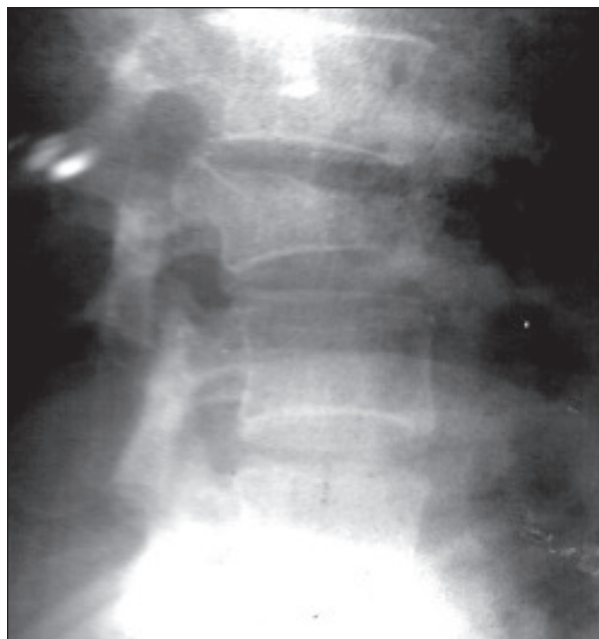


Fig.-6: Pre operative X-ray of lumbosacral Spine



Fig.-7: Pre-operative MRI (Vertical section)

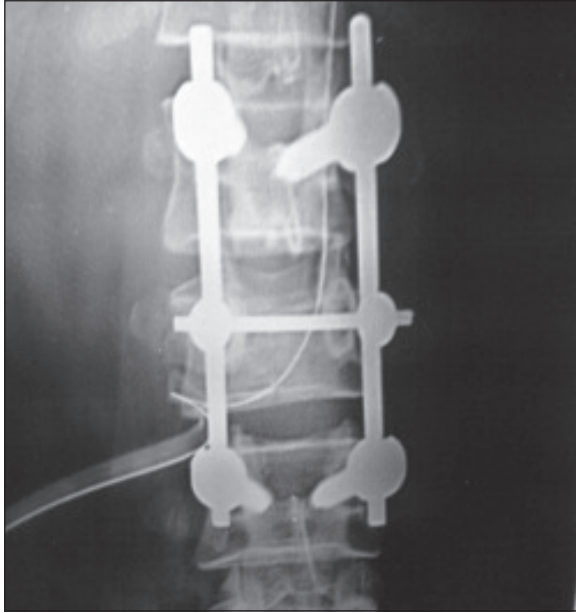


Fig.-8: Immediate post operative x-ray (A/P)

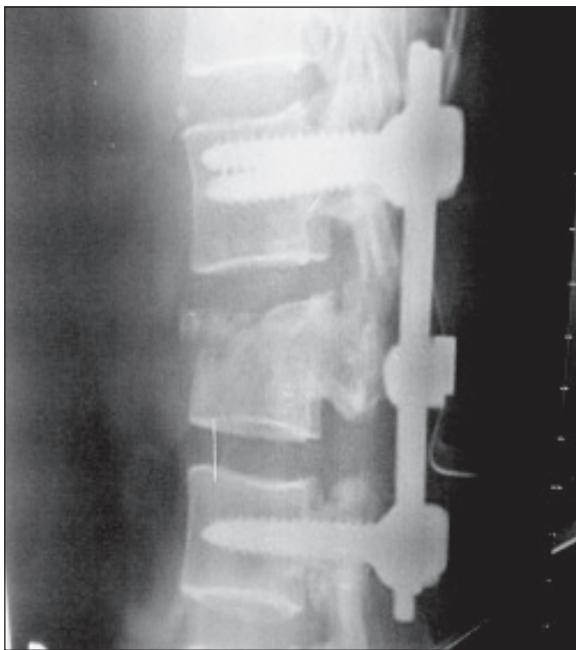


Fig.-9: Immediate post operative x-ray (Lateral view)

DISCUSSION

The purposes of treating vertebral fractures are to achieve early neurological restoration, overcome damaged spinal segments anatomically and accomplish firm, and stable fixation for early rehabilitation. Decompression, correction of kyphosis, fusion & stabilization of lumbar burst fractures through single posterior approach is performed as a basic treatment in many hospitals.

A prospective study was carried out from July 2009 to June 2011 at NITOR. A total 15 patients satisfying the inclusion and exclusion criteria were selected for this study.

In this study, the age range of patients was from 17 to 55 years, with mean age of (29.5±9.86) years. Majority of the patients in this series were in the age group of 21-30 (46.66%), while the next common age group 31-40 (33.34%).

Yue et al. 2002 selected mean age 41.3 years (range 21-76 years). Aebi et al. 1987 stated mean age was 33.8 years (range 18-61 years). McNamara et al. 1992 found mean age 28.6 years (range 16-50 years). Rahman (2006) stated mean age was 29.29, Islam (2008) stated mean age was 34.21 years. High incidence of young adult in the present series is due to working group people.

Male population in the study constituted 80% of cases, while the female made up the remaining 20%. McNamara et al. 1992 observed a male predominance (Male 22 & Female 2). According to the series of Rahman, (2006) Male 82.35% and Female 17.64% & Islam (2008) male 95.65% & female 4.35%. Yue et al. 2002 stated 25 men and 7 women.

In all of the series male representation was the majority. Male being the major working force of a society and are thus more consistently exposed to the external environment, which probably accounts for this discrepancy.

In this study, most involved occupational group was labour (33.33%), then housewife (20%), electrician (13.33%), student (13.33%) others farmer, businessman, salesman (all are 6.67% in each group). Most of the occurrence occurred in village area & labours were engaged in their daily activities such as climbing a tree. Rahman (2006) found that farmer (47.37%) was the most common occupational group.

In this series, fall from height was the commonest cause of injury. It comprises fall from tree (26.26%) and fall from roof of building (26.26%). RTA (33.33%) was another cause of injury. Rahman. (2006) found that fall from height was the most common cause of injury (70.58%). Aebi et al. 1987 showed that the common cause of injury is RTA (33.33%). Yue et al. 2002 also found that common cause of injury was high energy trauma such as motor vehicle accidents.

Study in our country showed that most common cause of injury due to fall from height especially fall from tree. But study in western countries showed that common cause of injury is RTA. Difference between these two studies due to socio-economic status of the patient.

But Moon et al (2003) study done in Korea showed that most common cause of injury was fall from height (66.66%).

In this study, most involved level of spine was L1 (66.65%), next common involved group was L2 (6.67%). Rahman (2006) also showed that most involved level of spine was L1 (33%). Aebi et al (1986) showed most common level was L1 (43.3%) & Celebi et al. (2007) also found most common involved level was L1 (37.5%). So in all series L1 was the most common involved spine level.

In this study, we used pedicle screw and rod for all the patients. Titanium pedicle screw and rod for 12 (80%) patients and stainless steel for 3 (20%) patients.

In this series, associated injury only for one patient was Colles' fracture. Moon et al (2003) found associated fractures in calcaneus 12, tibia 6 & pelvis 3.

According to Frankel classification in this study preoperatively 5 were Frankel B, 10 were Frankel C. Postoperatively 9 were Frankel D, 4 were Frankel E and 2 were Frankel C.

No patient with an incomplete lesion was neurologically worse at the time of follow up. Most of the patients 10 (66.67%) had pre-operative Frankel grade "C" & post-operative Frankel grade "D" 9 (60%) and 4 (26.67%) patients become completely normal that is Frankel grade "E".

Sasso & Cotter (1993) showed that in pedicle screw group all five Frankel E remain E, 10 of 12 incompletes improved, and 5 of 6 complete deficits remained complete.

Aebi et al (1986) found that 12 of the 14 patients with partial neurologic deficit (Frankel grades C and D) improved at least one Frankel grade.

Hardeker et al (1990) showed that improvement in one or more grades was noted in 34 (85%) of the 40 patients presenting with incomplete neurologic deficit.

In this study, shift of Frankel grade 2 were the highest 8 (53.33%), and 1 in 7 (46.67%) patients.

In this study majority of the patients had no complications. Misplacement of 1 pedicle screw in 1 case UTI developed in 2 cases, pre-operative sacral sore developed in 1 case, screw breakage occurred in 1 case at follow up and superficial wound infection developed in 1 case.

Yue et al (2002) found that a single deep wound infection & no cases of hardware failure. Alanay et al (2001) showed that one deep vein thrombosis, no superficial infection and two screw breakages. Shin et al (2007) stated that one screw pullout resulted in kyphotic angulations and one screw was misplaced.

In this study, at latest follow up bowel & bladder control postoperatively in 13 (86.67%) cases & not controlled in 2 (13.33%) cases.

In this study- according to Denis et al. pain scale most of the patients were grade-1, 8 (53.34%) then grade-2, 5 (33.33%) then grade-3, 2 (13.33%) and there was no patient in grade 4 & 5. Shin et al (2007) showed the similar type of results grade I patients 11 (57.9%), grade 2 was 7 (36.8%), grade 3 was 1 (5.3%) and no patient was grade 4 & 5.

In the series of Aebi et al (1986) showed that out of 30 patients 22 patients were in group 1, six patients were in group 6, two patients fell into group 3, no patient was in group 4.

In this study, according to Denis et al. work scale 2 (13.33%) patients become completely normal that is grade-1 and most of the patients were grade-2, 6 (40%) cases followed by grade-3, 4 (26.67%) then grade-4, 3 (20%) cases and no patient in grade-5.

In the Shin et al (2007) series showed that 10 (52.6%) patients were in grade-I, 4 (20.5%) were in grade 2, 2 (10.5%) were in grade 3, 1 (5.3%) was grade 4 and 5 (10.5%) were in grade 5.

In this study, most of the patients 9 (60%) stayed in the hospital (31-40) days. Then 4 (26.67%) cases stayed (21-30) days, 2 (13.33%) stayed (41-50) days. In Celebi et al (2007) showed that mean length hospital stay was 7.4 (5 14) days and in Aebi et al (1986) series mean hospitalization time was 17 (7 35) days.

In this study, overall results were classified as excellent, good, fair & poor. 2 (13.33%) cases in excellent group, 10 (66.67%) cases were in good, 2 (13.33%) cases were in fair & 1 (6.67%) case was poor.

In Celebi et al (2007) reported that 16 (33.3%) patients had excellent results, 23 (47.9%) had good, 7 (14.58%) had fair & 2 (4.16%) patients had poor results.

In their series preoperative Frankel E was 28 patients. But in our series no patient of Frankel E before operation.

CONCLUSION

In the surgical treatment of lumbar burst fractures, decompression, correction, and intertransverse fusion by a single posterior approach is a safe surgical treatment for the neural structures. Other advantages of this operative procedure are complete spinal canal decompression and kyphosis corrections are achieved, while providing anterior support and posterior stabilization.

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Functional Outcome of Posterior-Short Segment Pedicle Instrumentation for Unstable Thoracolumbar Fractures with Incomplete Spinal Cord Injury

Syed Shahidul Islam¹ Rezaul Karim², Md. Shah Alam³

ABSTRACT

This is a retrospective study to evaluate the functional outcome after short segment pedicle screw fixation in unstable fractures of the thoracolumbar spine with incomplete neurological deficits. We reviewed the functional outcome in 40 patients (32 males and 8 females) of unstable thoracolumbar fractures with incomplete neurological deficits who underwent short segment pedicle screws & rod fixation and fusion from January 2009 to December 2012 at National Institute of Traumatology and Orthopaedic Rehabilitation (NITOR), Dhaka, Bangladesh. Mean age was 32.13 years (range 14-66 years). Involvement of T11, T12, L1, L2 & L3 was noted, respectively in 2, 12, 15, 10 and 1 patients. According to the ASIA impairment scale 7 patients had B, 24 patients had C and 9 patients had D scale. The mean follow-up was 12.5 months (Range 11-36 months). A fall from height usually a tree was the most common cause of injury. Modified functional result were excellent in 13 patients (32.5%) good in 18 patients (45%), fair in 6 patients (15%) & poor in 3 patients (7.5%). Neurological recovery of one or more ASIA Impairment Scale was seen in all patients. There were misplaced screws in one patient, screw cut out in 2 patients & screw breakage in 4 patients. There were superficial infection in 2 patients & deep infection in 2 patients. Short segment pedicle screw fixation for unstable thoracolumbar fracture with incomplete neurological deficit gives satisfactory results. It also gives significant reduction of recumbency associated complications; there were significant other complications also.

Keywords: Spine, Fracture, Unstable, incomplete neurological deficits, short segment instrumentation.

INTRODUCTION:

Thoracolumbar fractures involves thoracic and lumbar vertebrae. There is a mechanical difference which predispose to failure at thoracolumbar junction. Biomechanical and clinical studies have shown that when more than 50% of the vertebral body height^{10,13} or angulation of the thoraco-lumbar junction more than 20 degree⁹, acute spinal instability results. Injury to the cord & cauda equina is associated with 10-38% (Sabec LA et

al-1991). Surgery is indicated if there is PLC disruption and failure of at least two of the Denis three column³. There were many reports that conservative management may lead to degrading nervous function, radiculopathy and pain, worsening spinal stenosis, increasing pressure on the vertebral body, increasing Kyphosis⁴. Surgical treatment by posterior short segment pedicle instrumentation allows reduction, correction and prevention of subsequent deformity, and improvement in

1. Assistant Professor, Spine & Ortho Unit, National Institute of Traumatology & Orthopaedic Rehabilitation, Dhaka, Bangladesh.
2. Registrar, National Institute of Traumatology & Orthopaedic Rehabilitation (NITOR), Dhaka, Bangladesh.
3. Associate Professor, National Institute of Traumatology & Orthopaedic Rehabilitation (NITOR), Dhaka, Bangladesh.

Correspondence: Dr. Syed Shahidul Islam, Assistant Professor, Spine & Ortho unit, National Institute of Traumatology & Orthopaedic Rehabilitation, Dhaka, Bangladesh.

nervous function. It allows early mobilization of the patient and decrease in complication of prolong bed rest^{1,3}. Pedicle screw fixation allows immediate stable fixation as the screw traverse all the columns. Short segment pedicle instrumentation has become popular method since Dick et al⁴ introduced the “fixator interne device”. Development of transpedicular screw fixation has brought short segment instrumentation into general clinical practice⁸. The aim of this study was to evaluate the functional outcome after short segment pedicle screw instrumentation in unstable fractures of the thoracolumbar spine with incomplete neurological deficits.

MATERIAL AND METHODS

We retrospectively evaluate the functional outcome in 40 patients with unstable thoracolumbar spine fracture operated in a single centre at National Institute of Traumatology and Orthopaedic Rehabilitation (NITOR), Dhaka, Bangladesh, from January 2009 to December 2012. There were total 40 patients (Male-32, female 8) with male and female ratio 4:1. Mean age was 32.13, range 14-66 years. There were two patients with T11, twelve patients with T12 fractures, fifteen patients with L1 fractures, ten patients with L2 fractures & one patient with L3 fracture. Neurological status were assessed according to the ASIA impairment scale for spinal cord injury. 7 patients had B, 24 patients had C and 9 patients had D scale. Indication for operation was incomplete neurological deficit with unstable thoracolumbar spine fractures. Operations were done between 5-15 days (average 6 days) after injury. There were associated injury in 50% of the patients. Patients were followed clinically and radio graphically. Patients were evaluated functionally using Denis pain scale (DPS) & work scale (DWS). Then their functional status was classified as excellent, good, average, poor or very poor using the Modified Denis pain and work scale (MFR). ASIA impairment scale system was used for assessment of neurological deficit on admission and subsequently in the follow-up. The mean follow-up was 12.5 months (Range 11-36 months).

RESULT

A fall from height usually a tree was the most common cause of injury followed by RTA (Fig.-1). The average preoperative kyphotic angle was 21.12 which improved to 10.84 in the immediate post operative period. The average pre-operating vertebral height was 43.6% which improved to 70% in the immediate post operative period. The loss of body height averaged 4.8% at the final follow-up and the loss of kyphotic correction averaged 4.5%

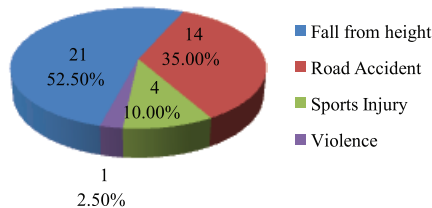


Fig-1: Cause of injury

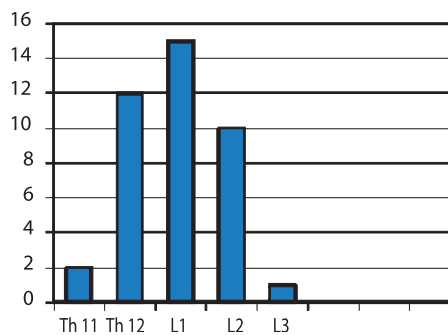


Fig-2: Distribution of fracture

Table-I

Functional assessment with modified Denis

Excellent	13 patients (32.5%)
Good	18 patients (45%)
Fair	06 patients (15%)
Poor	03 patients (7.5%)

Table-II

Neurological recovery

ASIA Scale	Preoperative	Latest Follow-up				
		A	B	C	D	E
A	0	-	-	-	-	-
B	7	-	-	2	5	-
C	24	-	-	-	13	11
D	9	-	-	-	-	9
E	0	-	-	-	-	0

At the final follow up examination 16 Patients (40%) had no complains of pain (P₁), 17 (42.5%) of the patients had rare complains of pain but felt the need for treatment (P₂), 6 (15%) patients had pain that did not interfere with their daily activities or work but required treatment (P₃) & 1 patient (2.5%) had moderate-severe pain, frequently required treatment (P₄). 17 (42.5%) patients had returned to their former job(W₁) and 18 (45%) patients had returned to their former job but 26 yrs, female, L₂ fracture 3 years after operation X-ray before operation Pre-Operative kyphosis 21°

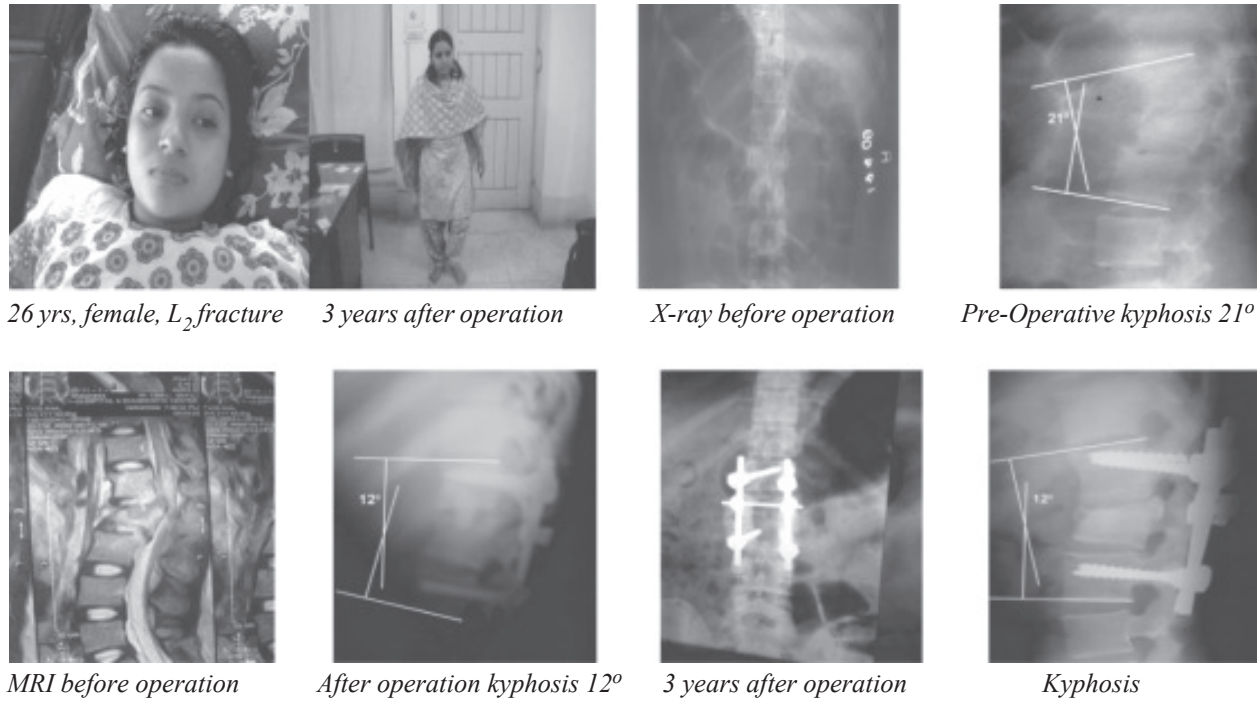


Fig.-3: Case no- 1, L₂ fracture with incomplete spinal injury

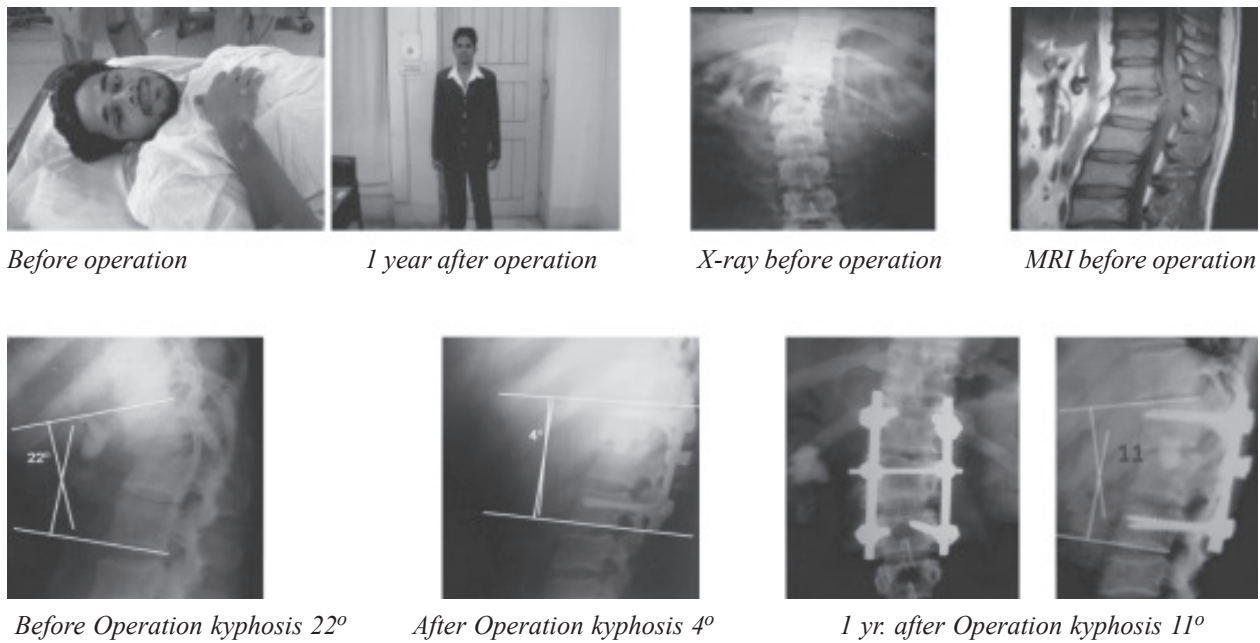


Fig.-4: Case no-2, 25 yrs, male, L₁ fracture with incomplete spinal injury

were not able to do physically difficult jobs (W_2). 3 patients (10%) had been forced to transfer to physically earlier jobs (W_3). 2 patients (5%) were unable to work for a full day because of pain. In the evaluation of the modified functional result 13 (32.5%) patients had excellent result, 18 (45%) had good, 6 (15%) had and 3 (7.5%) patients had poor results.

Neurological recovery of one or more Asia Impairment Scale was seen in all patients. Two grades of improvement were observed in 16 (40%) patients. One grade of improvement was found in 24 (60%) patients. No patient had late neurological deficit. There were patients with implant related problems. Screw loosening was noticed in

two patients, screw breakage in four patients. Screw breakage necessitated removal in two patients. Misplaced screw & screw loosening was left untouched because the patients denied further surgery. Superficial wound infection developed in three patients but healed with antibiotic use with local wound care. 2 patients developed deep wound infection required surgical debridement and antibiotic use with local wound care.

DISCUSSION

After Denis³ report of late neurological decline in a mean of 17% of patient followed with conservative treatment after thoracolumbar burst fractures, these fractures began to be treated surgically intensively. The advantages of surgical treatment are the early stabilization of the spine and for the reason a decrease in possibility of neurological decline. It allows indirect and direct decompression of the canal, early mobilization of the patients and shortens the hospital stay^{1,2,5,6}. In developed countries thoracolumbar fractures mainly occur in association with motor vehicle accident and falls^{1,6}, while in the developing countries they are primarily the result of a fall from height². The improvements observed in the radiological parameters (vertebral body height, kyphotic deformity) measured in the immediate post-operative period and at the final follow-up are, with a few exceptions, comparable with those reported elsewhere^{1,2}. After an initial substantial correction, there was a gradual partial loss of correction, leaving an overall loss of kyphosis of 4.42° at the final follow-up. The loss of initial correction after pedicle screw fixation has been reported by many authors. Although a good correction of kyphosis and restoration of vertebral body height is achieved by surgery, most is lost during the long-term follow-up period. This loss of correction and the failure of the implant are more common in spine fractures repaired with pedicle screws¹ than in those in which anterior grafting and instrumentation are used⁵, reportedly due to the failure of posterior instrumentation to support the anterior column.

The earliest we were able to stabilize a spine was 6 days after the initial trauma – primarily because of the non-availability of facilities for emergency stabilization of the spine in our hospital. The pattern of neurological recovery in our patients, however, is not discouraging despite this delay. Of the 40 patients with incomplete neurological deficit (i.e. ASIA Impairment Scale B, C, D), two grades of improvement were observed in 40% (16/40) of the patients and one grade of improvement was observed in 60% of patients (24/40). It has been reported in some research studies that spinal canal decompression that is obtained

with ligamentotaxis is insufficient in most cases.¹⁹ Surgical decompression were done in all patients. As with all surgical implants, failure of the instrumentation with subsequent loss of reduction is of utmost concern. We had a significant number of implant failures in the form of loose, cutout and broken screws. Almost all of the implant failures in our study occurred at the thoracolumbar junction. Krag⁹ has suggested segmental pedicle fixation two levels above the kyphosis to avoid such implant failures. We believe that this technique should be used at the thoracolumbar junction where compression forces act more anteriorly.

Whereas early (within hours of the initial trauma) or immediate (within 48 h) stabilization and indirect or direct decompression is a distant dream in our surgical set-up even delayed stabilization of the unstable spine has benefits. However, the number of complications remains worrisome; this is particularly true with respect to hardware failure.

CONCLUSION

Short segment pedicle screw fixation for unstable thoracolumbar fracture with incomplete neurological deficit gives satisfactory results. This is true provided that adequate restoration of neural canal is achieved. It also gives significant reduction of recumbency associated complications; there were significant other complications.

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Original Article

Results of Posterior Interbody Fusion and Transpedicular Screws Fixation for the Treatment of Spondylolisthesis

MS Alam¹, MR Karim², SS Islam³, UK Roy⁴, SH Sabuj⁵, M Alam⁶, MT Hossain⁷, Khalid Mosharof Hossain Khan⁸

ABSTRACT

The posterior lumbar interbody fusion (PLIF) procedure allows restoration of the weight-bearing capacity to a more physiological ventral position and maintenance of disc space height. However, the procedure can be technically difficult and may cause complications. It has always been performed bilaterally, central fusion has not been commonly used. Twenty-eight patients who met the interbody fusion criteria from March 2008 to July 2012 were included in the study. Surgery was performed from the posterior with chips of bone graft for interbody fusion supplemented with transpedicular screws and rod. The follow-up period from 8 to 30 months with a mean of 14.4 months. It was a prospective study irrespective of age & sex. Overall, 92.86% of the patients were satisfied after surgery. Radiography study showed the rate of bony fusion being 82.14%. Fibrous union was noted in two patients. One patient experienced tear of the dura without clinical sequel. One patient had misdisplacement of screws in disc space. Overall, the complications were negligible and none of the patients sustained a motor deficit and permanent complication. The PLIF procedure using central bone graft combined with bilateral pedicle screws fixation obtained satisfactory outcome within a short-term or long-term follow-up period. Since the implant-related complications have seldom been observed, it may be used as an alternative option for recurrent lumbar disc herniation or low grade spondylolisthesis with apparent degenerative disc disease.

Key words: Posterior lumbar interbody fusion, bilateral pedicle screws

INTRODUCTION

Interbody fusion is the most reliable fusion technique currently available for the lumbar spine. These constructs are biomechanically stronger, provide axial support with less graft subsidence or collapse comparing to those with posterolateral arthrodesis, and produce a better biologic fusion in lordotic alignment^{1,2}. A successful interbody

construct reduces the postoperative segmental mobility and permits better graft incorporation³. The bilateral posterior lumbar interbody fusion (PLIF) procedure was first introduced by Cloward for lumbar interbody fusion and neural decompression⁴. Since then, many variations of the procedure have been implemented, including morsalized autogenous onlay graft, disc replacement, bone

1. Assoc. Prof. Spine & Ortho Unit, National Institute of Traumatology and Orthopedic Rehabilitation (NITOR), Dhaka, Bangladesh
2. Registrar, Spine & Ortho Unit, NITOR, Dhaka
3. Asst. Prof. Spine & Ortho Unit, NITOR, Dhaka
4. Asst. Registrar, Spine & Ortho Unit NITOR, Dhaka
5. Medical Officer, Spine & Ortho Unit, NITOR, Dhaka.
6. HMO, Spine & Ortho Unit NITOR, Dhaka
7. Junior Consultant (c.c), Savar Health Complex, Dhaka
8. Junior Consultant, Orthopaedic Surgery, Lauhojong Health Complex, Munsigonj, Dhaka

Correspondence: Dr. MS Alam, Assoc. Prof. Spine & Ortho Unit, National Institute of Traumatology and Orthopedic Rehabilitation (NITOR), Dhaka, Bangladesh, Dhaka

dowels, and unilateral procedure (but not central procedure)⁵⁻⁸. The PLIF procedure can be technically difficult, and complications may include graft migration, implant subsidence, epidural hemorrhage, inadvertent laceration of the dura, and bone graft donor-site morbidity, which was performed bilaterally before^(5,9). Theoretically, the procedure that was performed using chips of bone graft appears to reduce the risk of neural compression in comparison with bilateral cage implantation. However, the clinical outcome and fusion rate of single central interbody strut graft with pedicle screws has not been studied. The purpose of this study was to demonstrate the feasibility and clinical option of posterior lumbar interbody fusion supplemented with pedicle screws in patients with recurrent sequestered lumbar disc herniation or in patients with low-grade degenerative spondylolisthesis.

METHODS

The study included 28 patients in whom PLIF with chips of bone graft for interbody fusion supplemented with transpedicular screws & rod were performed at NITOR and private Hospital in Dhaka from March 2008 to July 2012. Among the 28 patients, six had recurrent herniated lumbar discs and 22 had different-grade of spondylolisthesis with degenerative discs (no disc space higher than 9 mm and all MR imaging showed apparent end-plate changes). The PLIF indications were strictly limited to those patients with severe discogenic disease. The standard hospital chart, outpatient notes, and preoperative and postoperative imaging studies were reviewed. The patients were in the prone position during surgery. The operating table was not flexed, helping to increase lumbar lordosis. For cases with stenotic canals, decompressive laminectomy and foraminotomy were performed. Then, annulus was cut with a 15 size knife bilaterally. Radical discectomy was achieved to the boundary of the anterior limiting membrane as to avoid anterior vascular injury. Partial decortication of the

cartilaginous end-plate was also accomplished using sharp straight curettage. Posterior elements (lamina and spinal process) were used as the autogenous bone graft. Chips of bone was taken from removed lamina and spinous process. All patients received bilateral transpedicular screws fixation. The wound then was closed after meticulous haemostasis. Each patient returned to a regular hospital ward postoperatively and became mobilized after being fitted with a thoraco-lumbar or lumbar orthosis (rigid molded lumbo-sacral corset, or Taylor’s brace). All patients underwent preoperative anteroposterior, lateral flexion-extension radiographs and MR imaging. Postoperative radiographic evaluations (antero-posterior and lateral radiographs) were conducted after the patients became mobile and all patients underwent radiographic evaluation at 1, 3, 9, and 12 months after the operation. From a radiology perspective, a successful fusion was defined as the absence of lucency around the graft, evidence of bridging bone between the endplate and the graft, and the absence of movement on dynamic imaging studies. The results were assessed according to the economic and function rating scale system developed by Prolo et al¹⁰. The economic grade of the patient indicated his or her capacity for gainful employment or alternative comparable pursuits (housework, retirement activities). For the functional grade, the patients ranked his or her pain responses and the effects of the pain on the activities of living. Each grading scale consisted of five reproducible criteria that were assessed before and after treatment (Table 1). The sum of the responses from these two scales ranged between a perfect result of 10 to an incapacitated state of 2. According to this scale, the results of treatment were divided into categories including: excellent (10,9), good (8,7), fair (6,5), and poor (4-2)¹⁰.

RESULTS

This small series consisted of 28 patients who were followed for more than 8 months after PLIF (Table 2). The ages of the patients ranged from 30 to 80 years with an

Table-I
Anatomic-Economic-Functional (AEF) Rating System by Prolo et al¹⁰.

Economic status	Functional status
E1 Complete invalid	F1 Total Incapacity(or worse than before operation)
E2 No gainful occupation (including ability to do housework or continue retirement activity)	F2 Mild to moderate level low back pain and/or sciatica (or pain same as before operation but able to performed daily work of living)
E3 Able to work but not at previous occupation	F3 Low level of pain and able to perform all activities except sports
E4 Working at previous occupation on part time or limited status	F4 No pain, but patient has had one or more recurrences of low back pain or sciatica
E5 Able to work at previous occupation with no restrictions of any kind	F5 Complete recovery, no recurrent episodes of low back and able to perform all previous activities including sports

average of 56.6 years. There were 06 men and 22 women. A total of 28 levels were surgically treated. Twenty-eight patients underwent one-level fusions (Level L4-L5: 20 patients, Level L5-S1: 8 patients). The levels fused were mostly at L4-5. Radiography for fusion mass was interpreted by an independent radiologist. Radiography study showed that the bony fusion rate was 82.14% (Fig. 1). Fibrous union was noted in two patients during follow-up. The preoperative and postoperative economic and functional status of the 28 patients is shown in Table 3. Most patients (24) had no gainful occupation and experienced mechanical axial low-back pain and/or sciatica. It was also noted that none of the patients achieved an economic/functional score greater than 5. The results demonstrated that 92.86% of the patients had an excellent^{9,10} or good^{7,8} outcomes (Table 4). Among the six patients of recurrent herniated lumbar disc, five patients had excellent or good outcomes and one patient had fair outcomes. Among the 22 patients of low-grade spondylolisthesis, nearly all of the patients had excellent or good outcomes. No patient sustained permanent motor deficit. One patient (recurrent herniated disc, had previous operation for 2 times) experienced a dural tear with no associated clinical sequelae. Transient and nondisabling neurological deficits related to the bone graft occurred in two patients: Overall, there were no permanent neurological complications in our study.

Table-II

Description of Patient Population with respect to

Gender, Age, Levels of fusion	No
Gender	
Mal	06
Female	22
Age (years)	
30-39	4
40-49	14
50-59	6
60-69	3
>70	1
Level of Fusion	
L4-L5	20
L5-S1	08

Table-III

Preoperative and Postoperative Economic and Functional scores for 22 patients

Preoperative			Postoperative		
Status	Score	No.	Status	Score	No.
E1F1	2	11	E5F5	10	16
E2F1	3	4	E5F4	9	2
E2F2	4	12	E4F4	8	4
E3F2	5	1	E5F3	8	1
			E3F5	8	1
			E4F3	7	1
			E3F4	7	1
			E3F3	6	2

DISCUSSION

In theory, interbody fusion provides several advantages when compared with other fusion techniques⁴⁻¹⁵. It immobilizes the painful degenerated spinal segments, decompresses the nerve roots, and restores disc height and root canal dimensions, as well as load bearing ability of the anterior structures. Overall, acceptable results were achieved. According to previous reports, PLIF with bilateral cage and autologous bone can be used as a standalone procedure, and even with posterolateral fusion in some situations, may achieve very similar results. The fusion rates ranged from 88 to 94 %, and clinical success rates ranged from 82 to 92%⁽⁵⁻¹¹⁾. However, problems such as graft collapse, slippage, dura and nerve root manipulations have also been observed in 4 to 10 % of the cases in which PLIF was performed^{5,7,16}. With technical improvement, however, the risks has decreased. . Because of the sufficient disc space exposure required for inserting the bone graft, difficulties are often experienced in preserving the facet joints.

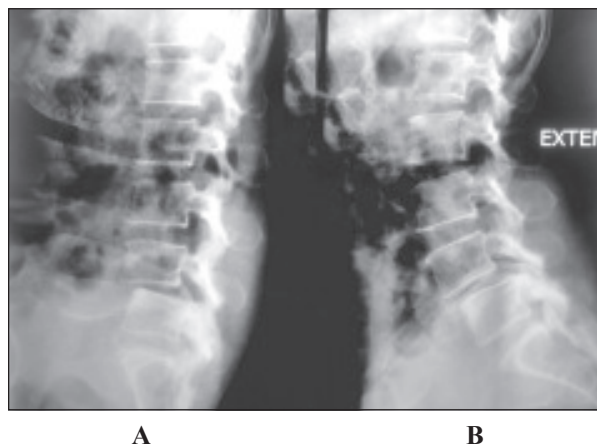


Fig.-1: Preoperative plain X-ray of L/S Spine (A) Flexion view, (B) Extension view

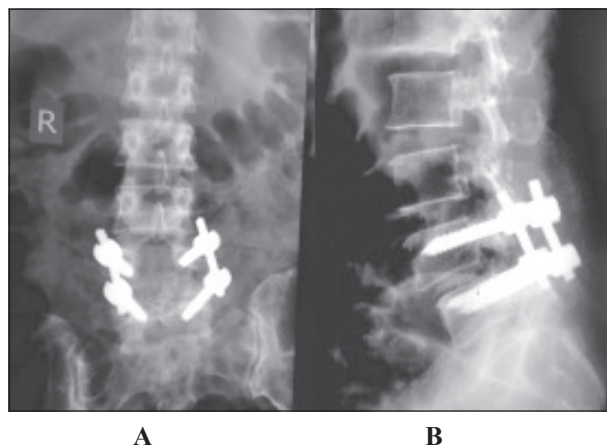


Fig.-2: Postoperative plain X-ray of L/S Spine (A) Anteroposterior view (B) Lateral view showing chips of bone graft

Kettler et al reported that although the shear force resulted in translation motion across the disc space that may be resisted by threaded cages, reduced stability during cyclic loading was observed in various cage designs¹⁷. It makes the case for supplemental instrumentation of the motion segment to reconstruct the posterior tension band and preserve the best possible stability in extension and rotation⁽¹⁸⁻²⁰⁾. The patients in our study who underwent surgery using the chips of bone graft for interbody fusion with placement of pedicular screw had acceptable clinical outcomes (92.86%). Among the six patients with recurrent herniated lumbar disc, five patients had excellent or good outcomes and one patient had fair outcomes. Among the twenty two patients with low grade spondylolisthesis, nearly all patients had excellent or good outcomes. This suggested that the procedure had more favourable outcome in the patients with low-grade spondylolisthesis than those with recurrent herniated discs. The results also suggested that there was an equivalent or even better outcome than for the patients who received bilateral cages supplemented with transpedicular screws. The use of posterior fusion and posterolateral fusion have been the predominant surgical modalities in the treatment of degenerative spinal conditions. According to the report by Zdeblick, the fusion rate in patients with posterolateral fusion was about 80%²². In comparison with the posterolateral fusion and interbody fusion techniques have apparent mechanical and surgical advantages, such as restricted motion by placing the graft bone in the center of segmental movement, giving the method the greatest theoretically possible restriction of motion. In addition, it requires a small volume of bone to obtain the fusion. However, further studies with a larger population

are necessary to clarify the indications for the use of interbody chips bone graft in lumbar surgery. In our study, the PLIF indications were strictly limited to those patients with severe discogenic diseases such as recurrent herniated disc disease and low-grade spondylolisthesis with apparent degenerative disc disease.

To obtain a solid interbody spinal fusion, over 30% cross-sectional bone area was required⁽²²⁻²⁴⁾. Ray reported that of the 236 patients who underwent PLIF, solid fusion occurred in 47% of cases within 6 months and in 65% of cases within 2 years after operation¹¹. In the series by Kuslich et al, 85% of the 356 patients with PLIF reported experiencing less pain at 2 years post-operatively, and 91% had improved functionally¹⁶. In our clinical review, interbody fusion using chips of bone bone graft and with postero-lateral arthrodesis achieved similar excellent results. Radiography studies showed the bony fusion rate as 82.14%. Complications associated with PLIF can be serious. They are often related to excessive retraction of the nerve roots or the dural sac. According to various reports, these serious complications occurred in 4 to 10% of the patients who underwent the procedures with or without supplemental pedicle screw placement^(16,25,26). In our study, only one patient had the complication of laceration of the dura with no associated permanent clinical sequelae. There were few negligible complications directly associated with the procedure using chips of bone bone graft supplemented with pedicular screw fixation, and no patient experienced any permanent complications.

CONCLUSION

In conclusion, the outcomes of PLIF with chips of bone graft for interbodyfusion supplemented with pedicular screws were encouraging. The fusion rate of 82.14% and the overall satisfaction rate of 92.86% demonstrated that this is an acceptable procedure. There were very few negligible transient complications directly related to the procedure. The procedure was relatively safe. It may be used as an alternative option for recurrent herniated discs and low-grade spondylolisthesis with kyphotic spine or apparent degenerative disc disease. Larger studies may be needed to further clarify the indications for the use of interbody chips bone graft in more advanced lumbar surgery.

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Original Article

Ruptured Tendo Achilles Repair by Baker's Inverted "U" Lengthening Technique - A Good Option for Reconstruction of Degenerated Tendon

Shyamal Chandra Debnath¹, Suman Kumar Roy², Ripon Kumar Das³, RR Kairy⁴

ABSTRACT:

Baker's inverted 'u' technique was used for Tendo Achilles Lengthening for correction of equinus foot in cerebral palsied child. Authors have used this technique for reconstruction of degenerated rupture of Achilles tendon. Eleven patients with 12 tendons were repaired in between January 2010 to December 2012. The study group comprised of eight men and three women. At the last follow up all patients were evaluated with regard to post operative complications, activities of daily living and satisfaction of treatment. No incidence of re-rupture but one had deep infection. All tendons healed within 12-16 weeks time and patient resumed pre-injury activities. Chronic Achilles tendon rupture requires resection of some amount of degenerated tissue and the resulting gap can be covered by Bakers "tongue in groove" lengthening technique. It requires less time, avoids extensive soft tissue surgery and offers easier skin closure over the heel.

Key words: Achilles tendon, Degenerated rupture, Baker's technique

INTRODUCTION:

Tendo Achilles is the thickest and strongest tendon in the body (Maffuli N, 1999). Rupture of tendo Achilles is increasing in last few decades (Ari Pajala, 2009). Acute rupture of the tendon occurs mostly in men in third or fourth decade of life (Bradly et al,1990). Spontaneous rupture of Tendo Achilles results from degenerative changes of the tendon, following local or systemic steroids, Rheumatoid disorder, Diabetes mellitus and other collagen disease (Gunduz Tezeren, 2006)

The treatment of Achilles tendon rupture remains a controversial issue (Ari Pajala, 2009). The modalities of treatment include conservative and operative. Debates going on for operative treatment and nonoperative treatment since Ambroise Pare' 1575. Surgical management seems to be a preferred option (Bhandari et al, 2002). Till date, about 41 surgical techniques evolved but question

is unsolved about the best method. Surgical repair of ruptured Tendon may be simple end to end suture or augmentation with gastro-soleus turn down flap (Bosworth 1956, Lindholm, 1959) or with peroneus brevis transfer (Teuffer, 1974). Percutaneous repair (Ma and Griffith, 1977) involves increased risk of sural nerve injury though cosmetically attractive.

As the degenerated ends of ruptured tendon need some amount of resection and resulting gap is difficult to close. Abraham and Pankovich in 1975 devised "V-Y" plasty of gastro-soleus aponeurosis. This remains the mainstay of treatment in conditions where tendon gap is present. Baker's inverted "U" technique for lengthening of gastro-soleus was initially practiced for children. Till date no published paper using Baker's technique for adult reconstruction of Achilles tendon is available. Authors have used this procedure for adult reconstruction and

1. Assistant Professor of Orthopaedics , NITOR, Dhaka, Bangladesh
2. Registrar-Orthopaedics, Apollo Hospitals Dhaka, Bangladesh
3. Asst. Registrar of Orthopaedics, NITOR, Dhaka, Bangladesh
4. Professor of Orthopaedics, NITOR, Dhaka, Bangladesh

Correspondence: Dr. Shyamal Chandra Debnath, Assistant Professor of Orthopaedics, NITOR, Dhaka. E-mail: dr.shyamaldebnath@gmail.com

variable gap was covered by inverted “U” lengthening technique. There are many complications such as wound gap, muscle atrophy, tendon re-rupture and infection (Mortensen et al, 1999). Baker’s technique is simple, less time consuming and offers optimal tendon length which allows tension free end to end suture. The purpose of this prospective study is to establish that Baker’s inverted “U” technique can be used in adult reconstruction of ruptured Achilles tendon with minimal complications.

Patient & Methods:

This prospective randomized study was carried out in between January 2010 to December 2012 at NITOR and different hospitals of Dhaka. Patients with spontaneous ruptures following minor trauma were included. Twelve tendons of 11 patients between ages in between 35 to 60 were included in this study.

Diagnosis was mainly clinical, history of forceful planter flexion, palpable gap (Figure-1) at the heel, lack of push off and positive Thompson test. No MRI or ultra sound study done for confirmation of rupture.



Fig.-1

All operations were performed under spinal anesthesia. Tourniquet used at thigh and patient was placed in prone position. A curvilinear incision given over the tendon starting from mid leg to heel. The subcutaneous tissue and deep fascia carefully dissected in a single layer. Sural nerve and accompanying vessels saved. The Ruptured Achilles tendon ends found degenerated and chalky white necrotic tissues (Figure-5) and friable tendon bundles (Figure-4) resected up to healthy margin at both ends. This results a tissue gap ranging from 1 cm to 5 cm. In two cases distal stump was avulsed from calcaneum and calcified bodies found at the tip of rupture.

The limb was positioned at 30° Knee flexion and 20° ankle planter flexion. Then the tissue gap was measured. At least double the length of the gap was taken to make the inverted “U” flap of gastroc-soleus aponeurosis.



Fig.-2



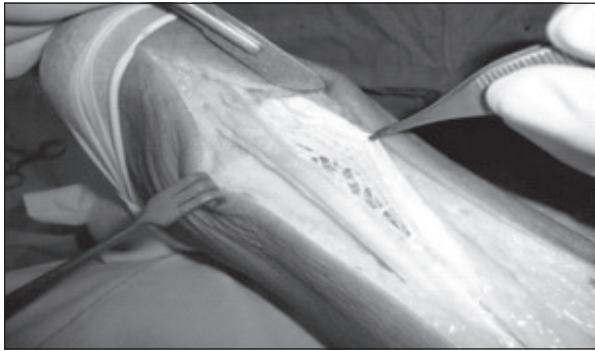
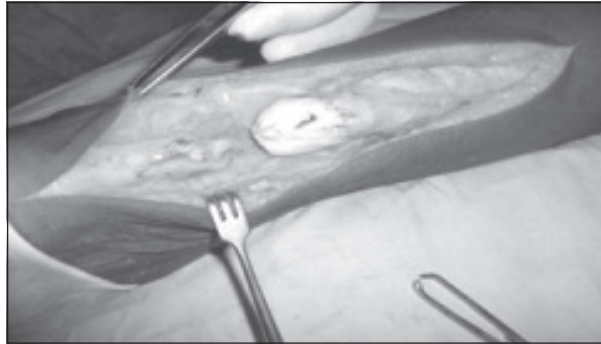
Fig.-3

Modified Kessler's suture raised at both ends of the tendon with number 1/0 prolene and proximal stump pulled down to appose the gap at the upper part of the gastroc-soleus aponeurosis and central slip descends in “tongue in groove fashion”(Figure-2 and 3). Sometimes median raphe of soleus has to cut to ease the migration of the tendon. Care taken to avoid any injury to the mesentery of the proximal stump. When tension free apposition achieved then kessler's sutures tied together. Number 3/0 prolene were used as rolled on suture over the core suture to strengthen the repair. Proximally the tongue of central slip sutured with the side slips with 3/0 prolene.

Deep fascia with subcutaneous tissue sutured by 2/0 vicryl and skin closed by 2/0 prolene. No drain used and the leg after sterile dressing splinted with above knee cast for two weeks. At two weeks plaster removed, skin sutures removed and below knee cast applied with foot in 20° equinus. At six weeks plaster changed and foot kept in plantigrade position. At eight weeks plaster removed and non weight bearing ankle movement allowed at 12 weeks. Full weight bearing movement allowed with heel raised shoe for another 4 weeks.

RESULT:

Eleven patients were included in this study, eight male and three female and one female had both tendon rupture at different occasions. Age ranges from 35 to 60 years average of 38, left side affected in 7 and right side in 5. All patients in the study group had close tear presented within 7 days to 3 months after trauma. Causes include sudden running or forceful dorsiflexion of the foot and minor household trauma. One patient was unaware of the incidence and had only lack of push off of the affected limb. Among 11 patients three were diabetic, 3 had chronic tendinosis with history of local steroid injection.

**Fig.-4****Fig.-5**

One patient was suffering from chronic arsenicosis and had bilateral rupture. Baker's inverted "U" technique applied in all cases. After debridement resulting gap was 1cm to 5 cm. End to end repair was possible in 9 patients as distal stump had enough length to suture. In two patients of avulsion injury there was no distal stump. Pull out suture done through calcaneum to heel by a rubber button. None had any intraoperative complications and average hospital stay was 3 days. At the end of follow up, no residual pain at rest or activity reported. About 10⁰

Lack of dorsiflexion recorded in two patients, calf muscles atrophy at mid leg was 2 to 3 cm in two patients and weak

push off power in one patient. One patient had deep infection after two weeks and took longer time to heal (16 weeks). All other tendon healed by 12 weeks. Tendon re-rupture didn't occur but minor wound gap occurred in one patient. All wounds heal spontaneously. According to final assessment 8 patients had excellent result, 2 had good and one had fair result.

DISCUSSION

Both augmented and non augmented techniques are equally practiced according to surgeon's preference. End to end suturing is not possible in degenerated tendon which becomes friable and avascular. After freshening upto healthy margin the stumps create a considerable gap. In case of delayed presentation contracture of triceps surae add to this problem. V-Y lengthening of gastroc-soleus apponeurosis (Abraham and Pankovich, 1975) can solve this problem where small gap is present. Baker's inverted "U" technique allows lengthening of the apponeurosis in "tongue in groove" fashion for coverage of wide gap between the ruptured ends.

Authors have evaluated 12 cases of degenerated tendon rupture. All patients were non-athlete and following household trauma tendon rupture occurred. Using Baker's technique upto 5 cm tissue gap covered without bow-stringing of the tendon. All modalities of treatment results decrease in gastroc-soleus power and 2 to 3 cm calf muscles atrophy (Bbandari et al. 2002). Early mobilization and functional rehabilitation can overcome this morbidity (Cetti et al, 1994). But if reconstruction is not augmented increased chance of re-rupture and elongation of tendon can occur (Kangas et al, 2003). The rate of skin failure is significant due to excessive tension at suture site (Nistor, 1981). In this study no rerupture occurred but one infection was due to inadequate debridement of dead tissue.

Augmented reconstruction ensures greater strength (Gerdes et. al 1992) but it poses difficulty in wound closure. Baker's technique can avoid this morbidity by end to end suture of equally sized tendon ends. Care should be given for vascular mesentery and soleus muscles bridge at the transferred segment. The weakness of this study includes small series and shorter duration of follow up. Authors don't advise to follow the technique where more than 5 cm tendon gap to be covered.

CONCLUSION

Baker's inverted "U" lengthening technique for reconstruction of ruptured Achilles tendon is less time consuming, technically simple and offers variable lengths of tendon gap coverage. It has minimal morbidity compared

to other techniques. This technique can be used in acute trauma and conditions where segmental loss of tendon present. More works and prolonged period of assessment requires to judge the superiority evaluate the merits of this technique.

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Original Article

Evaluation of The Result of Early Repair of Open Tendo Achilles Injury

Md. Rezaul Karim¹, Md. Jahangir Alam¹, Md. Saiful Islam², Uttam Kumar Roy²,
Syed Golam Samdani², Sayeed Hossain², S.M. Amanullah³, Mahfuzur Rahman⁴,
M. Shahiduzzaman⁵

ABSTRACT

Open Tendo-Achilles injury by toilet pan or by any means is common in our country. The injury of the Achilles tendon is a disabling condition, which is difficult to treat if delayed because a gap or defect developed between the two ends of the injured tendon is due to contracture of the calf muscles, so end to end repair become difficult. Therefore even in immediate repair of fresh injury will need reconstruction. So early repair of Tendo-Achilles injury after meticulous surgical toileting give best result. Assessments of result in primary repair of open Tendo-Achilles injury and evaluate the outcomes. To calculate the percentage of results of early repair of open Tendo-Achilles injury. Assess the rate of infections, skin necrosis, and failure of healing in primary repair. Thirty patients who had acute open Tendo-Achilles injury was studied. Variable level of open acute Tendo-Achilles injury were treated at DMCH, Dhaka in the period from July 2006 to June 2008. After thorough surgical toileting cut tendon was repaired end to end by modified Kessler method. Plaster cast was given for immobilization & broad spectrum antibiotic given for two to three weeks. Final outcome measured according to Juhana Leppilahti modified scoring scale. Thirty patients with Tendo-Achilles injury were studied. Fifteen cases result were excellent, eleven cases good, two case fair and two cases poor. In early repair of open Tendo-Achilles injury need short period of post operative inactivity. It will help to return a Tendo-Achilles injured patient to his normal work early as well as reduce burden of hospital cost and his family. Early repair of open Tendo-Achilles injury within 12 hours is effective procedure for patients as for surgeon.

Keywords: Open tendo achilles injury, Early repair, meticulous surgical toileting

INTRODUCTION

Achilles, the warrior and hero of Homer's Iliad, lends his name to the Achilles tendon, the thickest and strongest tendon in the human body. Thetis, Achilles's mother, made him invulnerable to physical harm by immersing him in the river Styx after learning of a prophecy that Achilles would die in battle. However, the heel by which he was held remained untouched by the water and thus Achilles had a

vulnerable point. Achilles led the Greek military forces, which captured and destroyed Troy after killing the Trojan prince Hector. However, hector's brother Paris killed Achilles by firing a poisoned arrow into his heel. (Maffulli N 1999).

Ruptures of the Achilles tendon have been described since antiquity and have in the past been associated with near

1. Assistant Professor, Department of Orthopaedic Surgery, NITOR, Dhaka
2. Junior Consultant, Department of Orthopaedic Surgery, Nandail, Upazilla Health Complex, Mymensingh
3. Medical Officer, DMCH, Dhaka
4. Assistant Professor, Department of Orthopaedic Surgery, Comilla Private Medical College
5. Prof. & Head. Department of Orthopaedic Surgery, DMCH, Dhaka

Correspondence: Dr. Md. Rezaul Karim, Assistant Professor, Department of Orthopaedic Surgery, NITOR, Dhaka

certain death. This belief is mirrored in Greek mythology. Achilles died after suffering an injury of the calcaneal tendon through an arrow released by goddess Apollo. (Franke 1995).

THE ACHILLES TENDON:

The tendinous portions of the gastrocnemius and soleus muscles merge to form the Achilles tendon. The gastrocnemius tendon begins as a broad aponeurosis of the distal margin of the muscle bellies, whereas the soleus tendon begins as a band proximally on the posterior surface of the soleus muscle. The length of the gastrocnemius component ranges from eleven to twenty-six centimeters and that of the soleus component, from three to eleven centimeters.

In Bangladesh most of the cases, come to hospital with open type of Tendo Achilles injury, occur in all age group of people and both sexes. In contrast to western countries, most people in our country uses flat pan in the latrine, which are at a same level of the toilet floor. Many people use a common latrine, so that surroundings of the latrine remain wet and slippery. Moreover bathroom and latrine are placed in same small room, so it remains always wet and slippery. Maximum people are barefooted or using sandal, which cause them to slip and fall on the toilet pan. Some cases of open tendon injuries occur due to road traffic accident, cut by broken glass and assault. About a week after rupture, the space between the tendon ends fills with scar tissue. If left untreated, the tendon will not heal, leaving the patient unable to push off in the affected side. Running, jumping and activities such as ascending or descending stairs are severely compromised. If there is gap or functional impairment foot or disabling, for this case reconstruction is indicated. (Azar 2003)

SURGICAL PROCEDURE

After regional anesthesia (Spinal/epidural/local) patient position was prone. Then proper surgical toileting of the wound was done with sterile water, soap and hexiscrub. After cleaning of the wound than tourniquet applied in the thigh and wound was painted with antiseptic solution especially with povidon-iodine and proper drapping was done. Carry the incision sharply through the skin, subcutaneous tissue, and tendon sheath. Extend the

wound upward and downward from the previous lacerated or cut margin. Aseptic surgical toileting was done with diluted povidone-iodine. Finally wound was wash with 4-5 liter normal saline and a swab was taken for culture and sensitivity test.

Then tendon was repair as end to end with No-1 nonabsorbable suture like proline by modified Kessler method, paratenon was sutured by 2/0 absorbable vicryl. Skin was loosely apposed by 3/0 or 4/0 porline interruptedly and sterile dressing was given. A short leg anterior plaster slab was applied with the ankle in gravity equinus position.

After admission tetanus prophylaxis was given to all patient. Preoperatively injection cefuroxime- 1.5 gm was given to every patient and second and third dose of injection cefuroxime 750 mg was given 8 hours interval. When patients were discharged oral ciprofloxacin given for 2 weeks. Oral metronidazol were administered for a week starting on day one. After getting culture and sensitivity report antibiotics were changed accordingly if needed.

PLASTER IMMOBILIZATION:

All patients were immobilized by short leg casts for the period of 6 to 8 weeks. Short leg anterior slab were given in all cases (100%) for 2 weeks post operatively with ankle in gravity equinus. Short leg anterior slab were removed during the time of stitch removal at 14th post operative day and below knee cast were given with few degree correction of ankle equinus. Window was made in those with mild infection or poor skin condition. Below knee cast were changed after 4 weeks and another below knee cast were given with further correction of equinus for another 2 weeks.

MATERIAL & METHODS:

Thirty patients who had acute open Tendo-Achilles injury was studied. Variable level of open acute Tendo-Achilles injury were treated at DMCH, Dhaka in the period from July 2006 to June 2008. After thorough surgical toileting cut tendon was repaired end to end by modified Kessler method. Plaster cast was given for immobilization & broad spectrum antibiotic given for two to three weeks.

Juhana Leppilahti modified scoring scale

Clinical Factor	Scores (points)
Pain	
None	15
Mild, no limited recreational activities	10
Moderate, limited recreational, but not daily activities	5
Sever, limited recreational and daily activities	0
Stiffness	
None	15
Mild, no limited recreational activities	10
Moderate, limited recreational, but not daily activities	5
Sever, limited recreational and daily activities	0
Calf muscle weakness (subjective)	
None	15
Mild, no limited recreational activities	10
Moderate, limited recreational, but not daily activities	5
Sever, limited recreational and daily activities	0
Footwear restrictions	
None	10
Mild, most shoes tolerated	5
Moderate, unable to tolerate fashionable shoes, modified shoes tolerated	0
Active range of motion difference between ankles	
Normal (d° 5 ⁰)	15
Mildly limited (6° -10 ⁰)	10
Moderately limited (11 ⁰ -15 ⁰)	5
Severely limited (e° 16 ⁰)	0
Subjective result	
Very satisfied	15
Satisfied with minor reservations	10
Satisfied with major reservations	5
Dissatisfied	0
Power of planter flexion	
BMRC-5	15
BMRC-4	12
BMRC-3	9
BMRC-2	6
BMRC-1	3
Overall results	
Excellent	90-100
Good	75-85
Fair	60-70
Poor	<55

OBSERVATION AND RESULTS

This prospective study on the Evaluation of the result of Early repair of open Tendo Achilles injury was carried out to evaluate the result of primary repair of open Tendo Achilles injury and to find out the common causes of injury, age & sex incidence, organism found in wound swab and to propose a protocol for treating the such cases in a safer and cost effective way.

This study was done at orthopaedics department of DMCH, cases were operated at Casualty OT. Patients were hospitalized for 24 hours. Then patients were followed up at ortho OPD and ortho indoor routinely.

Among 30 patients 25 were male and 05 were female. Mean age was 30½ years. 77% injury was due to sharp edge of broken toilet pan following accidental fall in the pan. It is very much alarming. Right side were more affected about 60% and left side 40%. In this series median level of cut was 2.8 cm where interquartile range was 2.42-3.28 cm. In 76 % cases E. coli, 7% Klebshiela, 7% Pseudomonus, 3% no growth and 7% others organisms found in culture. In 67% cases I had not to change my prescribed antibiotics at first time, Because of 67% organism were sensitive to ciprofloxacin others changed accordingly. Median delay of repair was 5 hours 42 minutes, where interquartile range was 4 hours 48 minutes to 6 hours 42 minutes. All the patients were advised for regular follow up at Orthopaedics out door or in Orthopaedics ward. 1st visit was 3-5 days after operation for looking sign of inflammation and 2nd visit at 14th POD for stitches removal, then regular visits at four weeks interval upto total return of normal daily activity. Median follow- up period 7 months.

In 15 (50%) cases shown no complications and in another 15 (50%) cases shown different types of complications In 15 (50%) cases shown no complications and in another 15 (50%) cases shown different types of complications. Among minor complications 5 (19%) was superficial skin infection, 15 (51%) was pain, 4 (15%) was swelling and 4 (15%) was ugly scar. Among major complications 1 (50%) was failure of tendon healing due to deep wound infection and 1 (50%) was skin necrosis requiring flap coverage.

Final Outcome:

Final out come measured according to Juhana Leppilahti modified scoring scale.

Table-I
Distribution of final out come.

Grade	No of cases	Percentage
Excellent	15	50%
Good	11	36.67%
Fair	2	6.67%
Poor	2	6.66%
Total	30	100%

$$\begin{aligned} \text{Satisfactory} &= \text{Excellent} + \text{Good} \\ &= 50\% + 36.67\% \\ &= 86.67\% \end{aligned}$$

$$\begin{aligned} \text{Unsatisfactory} &= \text{Fair} + \text{Poor} \\ &= 6.67 + 6.66\% \\ &= 13.33\% \end{aligned}$$

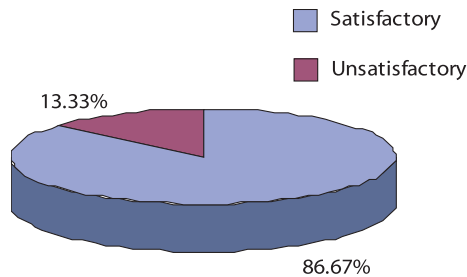


Fig.-1: Showing final out come.

I divided 30 cases into two groups. Patients whose open cut Tendo Achilles repaired before 6 hours and whose Tendo - Achilles repaired within 6-12 hours.

Table-II
Functional out come scoring.

Groups	Cases		Clinical score Mean \pm SD	Z-value	P-value
	Number	Percentage			
Group - I	13		90.77 \pm 4.4	3.57	< 0.01
Group - II	17		75.94 \pm 60.33		

In group-I clinical out come score was 90.77 \pm 4.4. In group –II clinical out come score was 75.94 \pm 60.33. By comparing between these two groups, group-I score significantly (P<0.01) higher than group-II score. It indicates that open Tendo Achilles injuries repaired before six hours achieved maximum functional out come.

DISCUSSION

Most the literature was published in journal on calcaneal tendon rupture which were mostly deals with spontaneous closed rupture (M Kakiuchi 1995, Roger A 1991). Limited papres were published on diagnosis and early treatment of few cases of open lacerations of Tendo Achilles (Inglis 1976, Mahmoud 1992). In our country open Tendo Achilles injury is common. In this series of 30 patients, 23 cases (76.66%) were caused by sharp edge of the broken toilet pan, 6 cases were (20%) caused by sharp cut (by knife or glass), 1 case caused (3.33%) by machinery injury. All these patients included in this study treated within 12 hours of injury. Age distribution in this series was ranging form 18 years to 60 years. So most of patients were young adult (18-30 year), Male were common victim in our study. Mean age was 30.5 \pm 10.23. All patients were immobilized by plasters casts for a period of 6 to 8 weeks. Short leg anterior slab were given in all cases for 2 weeks post operatively in ankle gravity equinus. All anterior slabs were removed during the time of stitch removal at 14th

post operative day and below knee cast were given with few degree corrections of ankle equinus. Below knee cast were changed after 4 weeks and another below knee cast were given with correction of equinus for another 2 weeks. After removal of cast all patients were advised for ankle movement exercise and partial weight bearing with crutches. All the tendons were repaired by modified Kessler's method. Paratenons were repaired as much as possible. 13 patients were (43.33%) treated before 6 hour of injury. The rate of infection were less in these patient, those received treatment before 6 hour of injury. The functional result of treatment assessed in terms of the patients ability in stand or rise on tip toes (Moller 2001). In this series we took it as a parameter of assessment and assessed after 16 weeks of treatment. 27 patients were able to stand on tip toes (90%), 2(6.67%) patients could not stand on tip toes of affected foot unsupported and 1 patient failed to stand on affected foot unsupported (3.33%) due to failure of tendon healing. Failure of tendon healing rate in this series is 3.33%; which is less in comparison to other study (6.66%-Monirul's 2002, 4%-Moller 2001). Failure of healing occurs after 4 weeks due to severe infection. Changes the motion of the ankle, indicates, tendon shortening or lengthening (Monirul's 2002, Moller 2001). Ankle motion were normal in 15 (50%) cases and change of motion were up to 5 degree in 11 (36.66%) patients in this series, which is very much acceptable in comparison to above studies. Common complications were skin infection (29%), pain persists for months (26%), and swelling persists for months (21%). Other complications (ugly scar, skin necrosis requiring flap coverage etc) in 21% cases. In this series I used 7 parameters to asses the final outcome of the patient functionally. These were stand on affected tip toes unsupported, range of ankle motion of affected side, power of plantar flexion of injured leg, calf muscle wasting, presence or absence of pain, footwear restriction and subjective results. These parameters were also used in various study described in various literature already mentioned. The final result was as follows: Excellent 50%, Good 36.67%, Fair 6.67%, Poor 6.66%. So the result of this study is acceptable in 26 (86.67%) cases, which is comparable with the result described in other (Monirul's 2001- 86.66%, Nada 1985-90%) study.

CONCLUSION

The injury of the Achilles tendon is a disabling condition, which is difficult to treat because a gap or defect developed between the two ends of the injured tendon if repair is delayed. The gap between two ends of the injured tendon

is due to contracture of the calf muscles, so end to end repair become difficult. Therefore even in immediate repair of fresh injury will need reconstruction. In delayed repair patient needs longer period of post operative inactivity (Minimum 16 weeks), but in early repair need short period of post operative inactivity. So it will help to return a Tendo Achilles injured patient to his normal work early as well as reduce burden of hospital cost and his family.

Repair of open Tendo Achilles is not difficult but early diagnosis, proper surgical toileting, meticulous repair, adequate post operative immobilization and physiotherapy is the important part of management. So from the encouraging result of this study, treatment protocol use here can followed, which is easy for surgeon as well as convenient and cheap for the patient.

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Original Article



Reconstruction of Neglected Tendo-Achillis Injury by Peroneus Brevis Tendon

Moniam Hossen¹, Md. Jahangir Alam¹, Hasan Masud¹, Forid Uddin Ahmed², Qamrul Alam Saleh³

ABSTRACT:

A prospective observational study was done from July 2010 to December 2012 on 16 neglected tendo-achillis injured patient at NITOR and different private hospital in Dhaka. In all patients reconstruction were done by Peroneus brevis tendon. Age range was 25-65 years. Male – Female ratio was 4:1. Mode of injury was due to fall at toilet pan 5 cases (31.25%), degenerative rupture 9 cases (56.25%) and in 2 (12.5%) cases rupture were due to application of local steroid injection for tendinitis, average follow up was 12 months. Outcome was evaluated by persistence of pain, improving gait and by assessing the strength of calf comparing with normal side.

Keywords: Neglected Tendo-Achillis injury, Reconstruction, Peroneus brevis tendon

MATERIAL & METHOD:

Total 16 patients were diagnosed clinically by unable to walk on tip toes and Simonds test positive. 9 cases (56.25%) were degenerative rupture and neglected cases following acute traumatic injury is decreasing now-a-days due to getting improved care even at upozilla and district level of the country.

Neglected rupture of the tendo-achillis pose a difficult problem, wide separation of the ruptured tendinous ends which cannot be repaired by end to end anastomosis.

Several surgical procedures have been described with the objective of bridging the gap by grafting and thus restoring continuity of the tendon. Time interval from injury or rupture to operation were 10 weeks to 20 weeks. Average hospital stay was 2 weeks.

Under spinal anesthesia patient was laid prone after touriquate application affected limb was washed, painted and draped. A longitudinal incision was given at base on 5th metatarsal, insertion of peroneus brevis was identified and released subperiosteally from its insertion.



Fig.-1



Fig.-2

A longitudinal midline incision was made to expose injured tendo-achillis and posterior surface of calcaneum. By this incision peroneus brevis tendon is identified, pull out through this incision from the insertion site. A hole is made in the postero-superior spike of calcaneum by a 6mm

1. Assist. Prof. Dept. of Orthopaedic Surgery, NITOR, Dhaka
2. Registrar, Department of Orthopaedic Surgery, NITOR, Dhaka
3. Professor, Department of Orthopaedic Surgery, NITOR, Dhaka

Correspondence: Dr. Moniam Hossen, Assistant Professor, NITOR, Dhaka, E-mail: dr.monaim@yahoo.com

drill bit. Now peroneus bervis tendon was passed through the hole of calcaneum from leteral to medical side of calcaneum and crossed over the gap of tendo-achillis and then sutured it both from lateral and medial side of tendo-achillis with ankle 20° planter flexion. Haemostasis secured, wound was closed by keeping a drain in situ. Long leg anterior slab with knee 30° flexion and ankle 20° planter flexion. Drain was removed on 2nd postoperative day and patient was discharged to attend outpatient department after 02 weeks to remove stitch. After stitch removal, plaster was kept for another 04 weeks. After total 6 weeks patient is allowed to move the ankle without any weight bearing. 12 weeks after opn full weight bearing is allowed. 70%-80% strength to normal was gained by 12-16 weeks.

RESULTS:

The causes of tendo-achillis injury is shown were table-I.

Table-I

Causes of injury	Number of patients	Percentage
Spontaneous rupture (Degenerative)	9	56.25%
Fall at toilet pan	5	31.25%
Local steroid induced rupture	2	12.50%

All 16 patients were advised to attend in outpatients department at regular interval for follow up. 12 (75%) were excellent 03 (18.75%) were good. 01 (6.25%) was bad result due to wound infection which healed after using antibiotic following culture-sensitivity report. All patients except one walked with full weight bearing with normal or near normal strength and gait pattern.

The results were graded according to following criteria:

1. Excellent
 - a) No post operative pain or infection
 - b) Strength of tendo-achillis by Thompson test and by measuring the distance between heal and floor



Fig.-3

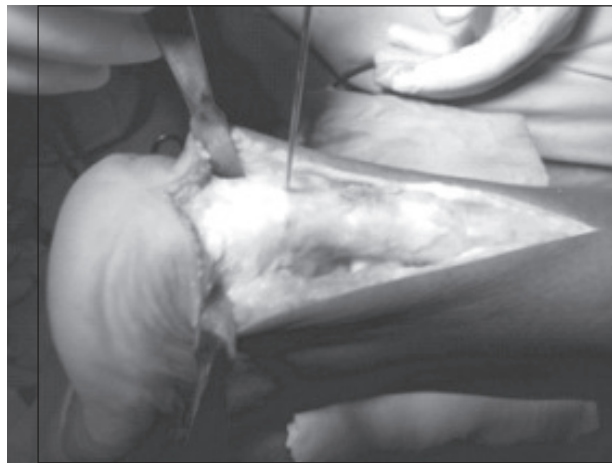


Fig.-4



Fig.-5



Fig.-6



Fig.-7

- when patient on tip toes. 60%-80% strength gained within 3 months.
- c) Normal or near normal walking patterns
2. Good
 - a) No post operative infection / mild pain
 - b) Strength of tendo-achillis gained 40%-60% within 3 months
 - c) Near normal walking gait
 3. Poor
 - a) Mild post operative infection or marginal skin necrosis
 - b) Post operative pain
 - c) Limping gait

Table-II

Results	No of	Percentage
Excellent	12	75%
Good	5	18.75%
Poor	1	6.25%

DISCUSSION

Tendo-achillis injury is a common injury in our country. Most common causes are due to fall at the toilet pan on slippery floor. It also occurs in our country by political mishap. Due to increasing life expectancy, degenerative ruptures also increases day by day. Another cause of injury is due to local steroid injection in tendinitis patient.

There are many procedures for reconstruction of neglected tendo-achillis injury. Skin closure after reconstruction is a major problem at the back of heel and chances of skin necrosis is much more common which invites further complex procedure.

In this study, in all 16 cases of neglected tendo-achillis injury, reconstructions were done by peroneus brevis



Fig.-8

tendon which ensures strength of the tendon. Peroneus brevis tendon was used for reconstruction in this study. Tendon length is adequate, can be transferred at same incision over the injured tendo-achillis. In this series, excellent result was 75%, good result was 18.25%, and poor result was 6.25%.

This procedure is relatively easier, post operative complication is less.

CONCLUSION:

Management neglected tendo-achillis injury is difficult problem. Reconstruction can be done by many procedures. Reconstruction by peroneus brevis tendon is an easy procedure with excellent out come.

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Original Article

Treatment of Paediatric Femoral Shaft Fracture by Titanium Elastic Nails

ABM Golam Faruque¹, AHM Tanvir Hasan Siddiquee², Md Mahabbatullah³, AKM Zahiruddin¹, Asit Baran Dam¹, Shudhangshu Kumar Singha⁴, Riad Majid⁴, Mohsin Reza⁵

ABSTRACT :

Although the incidence of paediatric femoral shaft fractures is about 1.6%, it's treatment is controversial, especially in children of age 6-12 years. This prospective observational study was performed at NITOR, Dhaka, Bangladesh from January 2012 to December 2012, on 7 children ($n=7$). Both male and female children with simple transverse and short oblique fractures were included. Among the 7 cases, 6 were closed femoral shaft fracture and 1 was Gustilo Anderson type 1 open fracture. The mean age of the patients was 8.57 years, ranging from 5-13 years. 6 were male and 1 was female, with a male female ratio of 6:1. In 4 cases right side was affected and in 3, left side was affected. 5 cases were treated by closed reduction and the rest 2 cases were treated by open reduction, The average union of fracture was 9.7 (6-15) weeks. Results were evaluated using Flynn et al scoring criteria, with 4 excellent, 2 good and 1 poor outcome during the 5-11 months follow up period. Titanium elastic nailing has considerably decreased the period of immobilization, ensured early return to normal life and provides psychological advantages. It provides better outcome in simple transverse short oblique mid diaphyseal femoral fractures.

Key words : Paediatric femoral shaft fracture, Titanium elastic nail

INTRODUCTION:

Trauma is the leading cause of morbidity and mortality in children. In paediatric fractures, femoral fractures have significant impact on the patients, families and their regional trauma resources¹. They account for about 1.6% of all fractures in paediatric population², with male female ratio being 2.6:1. These fractures have bimodal age distribution with peak at 2 and 17 years. Blacks are more affected than the whites³.

Mechanism of trauma is age dependent. In children younger than 6 years fall from height is the commonest cause; in children 6 to 9 years, motor vehicle-pedestrian accidents, and motor vehicle accidents for the teenagers. Also, birth injury, child abuse, sports injury, etc. may cause femoral fractures. Rarely, it may also be pathological⁴.

Femoral fractures are classified as -

1. Transverse, spiral or oblique,
2. Simple or comminuted.
3. Open or close.
4. Fractures of proximal, middle or distal third⁵.

Treatment of the femoral shaft fractures in children is controversial, specially, in children of age 6-12 years⁶. The traditional method of treatment has been an initial period of traction followed by a spica cast until solid union occurs⁷.

Various methods of treatment can be used successfully depending upon the age of the patient and the type of fracture, but there is no consensus on one method as the best option⁸.

1. Asst. Professor, Department of Orthopaedic Surgery, NITOR, Dhaka
2. Medical Officer, NITOR, Dhaka
3. Junior Consultant, Department of Orthopaedic Surgery, NITOR, Dhaka
4. Asstt Registrar, Department of Orthopaedic Surgery, NITOR, Dhaka
5. Resident, Department of Orthopaedic Surgery, NITOR, Dhaka

Correspondence : Dr. ABM Golam Faruque, Asst. Professor, Department of Orthopaedic Surgery, NITOR, Dhaka

Ideal treatment of femoral shaft fractures in children is one that controls alignment and length, is comfortable for the child, convenient for the family, and causes the least negative psychological impact possible⁹. Determination of the ideal treatment depends on the age of the child, location and type of the fracture, family environment, knowledge and ability of the surgeon, and to a less extent, financial consideration¹⁰.

In case of spica casting, the problems are patient mobility, toilet hygiene, time off work for parents, schooling, and off course, prolonged recumbency, which may cause negative psychological impact for the patient.

In this study, we treated our cases by intra-medullary titanium elastic nails.

Materials and Methods:

This prospective observational study was performed at NITOR, Dhaka, Bangladesh from January 2012 to December 2012, on 7 children ($n=7$). Both male and female children of 5 to 13 years of age, with simple transverse and short oblique fractures were included. Also, closed as well as open Gustilo Anderson type 1 fractures were included. Children of less than 5 years and more than 13 years with unstable fractures (long oblique/spiral), comminuted fractures and open Gustilo Anderson type 2 and 3 fractures were excluded.

To determine the size of the titanium nails, femoral diaphyseal internal diameter was measured on both antero-posterior and lateral x-rays were divided by 2 and 0.5mm was subtracted from that calculation for the eventual nail diameter as determined by Kasser and Beaty,¹¹

Nail size = (Internal diameter/2) - 0.5mm

So, 4 cases were treated by 3 mm diameter elastic nails and 3 cases by 2.5 mm nails.

Operative Technique:

Under general anaesthesia, the patient was placed supine on the fracture table and the image intensifier was used to localise the placement of skin incisions 2.5 cm above the distal femoral physis. After skin and soft tissue dissection, distal lateral femoral metaphysis was exposed and opened using an awl at a point 2.5 cm proximal to the distal femoral physis. The drill was then inclined at 10° angle with the distal metaphyseal cortex. Then the titanium elastic nail of appropriate size was then inserted through the drilled hole with bent tip and the apex of convexity to lie at the level of the fracture. When the nail reached the fracture site, the fracture was reduced by manipulation and traction under

image intensifier control. After reduction the nail was pushed into the proximal fragment. Then the medial nail was inserted in a similar retrograde manner. Both the nails were then driven into the proximal end of femoral neck and the lateral one just distal to the trochanteric apophysis. Distally the nail was cut so that 1 cm of nail remains outside the cortex. The extra osseous portion of the nail was bent slightly away from the bone for easy removal after fracture union. Skin wounds were then closed.

ASSESSMENT:

Initially, the patients were followed up at monthly intervals for the first 6 months and then at 3 monthly intervals till the completion of 1 year after operation. At each visit patients were clinically and radiologically evaluated. After union. The nail was removed in 3 cases; after 7 months after 9 months and 10 months respectively after operation.

The final results were evaluated using the criteria of Flynn et al.¹²

RESULTS:

Fall from the height was the most common mode of trauma in 5 cases. Rest of 2 were due to road traffic accident, 2 cases were with associated injuries which were treated conservatively. 6 were closed femoral shaft fracture and 1 was Gustilo Anderson type 1 open fracture. The mean age of the patients was 8.57 years, ranging from 5-13 years. 6 were male and 1 was female, with a male female ratio of 6:1. In 4 cases right side was affected and in 3, left side was affected. All cases were treated by initial surface traction followed by titanium elastic nailing. 5 cases were treated by closed reduction and the rest 2 cases were treated by open reduction, as closed reduction was impossible.

The median duration of surgery was 69 (50 - 80) minutes, and the mean hospital stay was 8.86 (5 -16) days. The average union of fracture was 9.7 (6-15) weeks. Partial weight bearing with crutches was started when external callus was visible on X-ray; at 4 - 8 weeks with an average of 4.6 weeks after operation. Full weight bearing was started at 8 -12 weeks with an average of 8.5 weeks.

Nails were removed in 3 cases after bony union. All cases were available for follow up, although some of them came irregularly. One had shortening of 2 cm, 2 had angulations more than 10°. Although in initial post operative xrays 4 had mild lateral bowing, none had either re-fracture or varus or valgus malformation during the subsequent follow up. None had physeal injury or nail migration. 1 had post operative pain and infection for prolonged period but the fracture was united.



Fig.-1 : *Closed fracture right femoral shaft in a 10 year old boy.*



Fig.-2 : *Immediate post operative x ray of the same patient*



Fig.-3 : *X ray, 3 months after surgery*

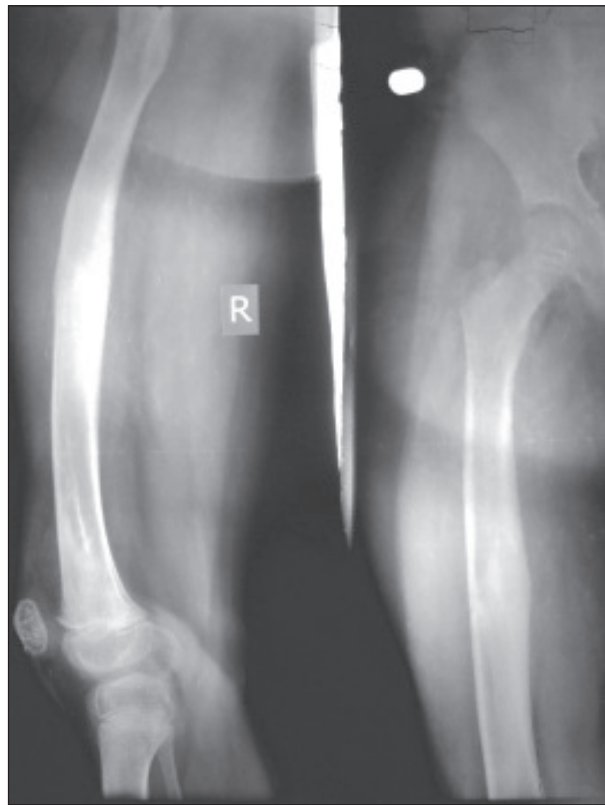


Fig.-4 : *X ray at 9 months after surgery; nail removed*



Fig.-5 : 10 months after surgery



Fig.-6 : The same patient, squatting easily

Results were evaluated using Flynn et al Scoring criteria ⁵:

	Excellent	Good	Poor
Limb length discrepancy (cm)	<1	<2	>2
Angulations (degrees)	<5	5 - 10	>10
Pain	Absent	Absent	Absent
Complications	Absent	Mild	Extended period of resolvable morbidity

Results

	Number of Cases (n=7)	
Excellent	4	(57.14%)
Good	2	(28.57%)
Poor	1	(14.29%)

DISCUSSION:

Paediatric femoral shaft fractures have traditionally been treated non operatively with either early spica cast or a period of traction followed by application of hip spica cast until the time of fracture union. But the problems are malunion, joint stiffness and delay in functional recovery, especially in older children.¹³

During the past few decades, plate fixation, rigid intra medullary nailing, Ender nailing, Titanium nailing, etc. have been advocated, but controversy regarding the ideal implant to treat paediatric femoral fractures still exists.¹⁴ The ideal device for the treatment of most femoral fractures in children would be a simple, load sharing internal splint

that allows mobilization and maintenance of alignment and limb length until bridging callus forms. Titanium elastic nail offers these features.¹⁵

In this study, 7 cases were included. All of which were treated by insertion of 2 titanium elastic nails. All the fractures were united within 3 months of fixation (average 9.7 weeks) with 1 malunion. Oh et al observed that all 31 fractures in his series healed within 12 weeks (mean 10.5 weeks).¹⁶ Singh observed that all 35 fractures in his series united within 4 months of fixation with no non union or delayed union.⁵ Houshian et al reported median union time of 7 (5 - 9) weeks.¹⁷

In this study, full weight bearing was started at 8-12 weeks, with an average of 8.5 weeks, which is comparable with the study by Flynn et al. who observed walking without assistive devices at an average of 8.5 weeks.¹² Mazda et al observed walking without assistive devices at an average of 9.5 weeks.¹⁸ Houshian et al reported partial weight bearing as early as 3 weeks, and full weight bearing after 6-8 weeks.¹⁷

In this study, 1 had angulation >10° at the fracture sites, with leg length discrepancy 2cm, for which longer time of follow up is needed, as there is the scope of remodelling. Singh observed significant shortening in 2 out of 35 cases.⁵ Adhering to biomechanical principles of elastic stable intramedullary nailing is recommended to avoid limb length discrepancy.

Ligier et al observed 13 out of 123 cases of skin ulceration or local inflammatory reaction due to irritation by nail ends, for which nails were removed after bony union.¹⁹

In this series, 2 cases needed open reduction as closed reduction was failed due to soft tissue interposition. Singh also performed open reduction in 2 out of 35 cases.⁵ So, proper initial traction is recommended, if surgery is likely to be delayed.

Theoretically nail removal is possible at 3 months after surgery, even as early as at 6 weeks.²⁰ However, there are always chances of re-fracture with early removals. Singh recommended removal of nail after 1 year of the fracture fixation.⁵ In this series, in 3 out of 7 cases, nails have been removed so far at 7 months, 9 months and 10 months respectively after fracture fixation.

CONCLUSION:

Titanium elastic nailing has considerably decreased the period of immobilization, ensured early return to normal life and provides psychological advantages. In this series, the follow up period is only 5-11 months. Longer follow-up time is recommended for school going children to avoid prolonged period of immobilization with spica casting and hence being away from school. Titanium elastic nailing provides better outcome in simple transverse short oblique mid diaphyseal femoral fractures.

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Original Article

Risk Factors for Infertility in Patients Attending to GOPD of Shaheed Suhrawardi Medical College Hospital, Dhaka

Jinnat Ara Islam¹, Nilofar Yasmin², Kaberi Guho², Zara Rahman³

Abstract:

Infertility is the central issue in the lives of individual who suffers from it. It is a multifactorial condition. It constitutes a worldwide public health problem that has gained much concern during past two decades. There are many risk factors associated with infertility for both male and female. These risk factors for female included PCOS, tubal block, endometriosis, PID, Obesity. Male risk factors included smoking drugs, disease like D.M. T.B. orchitis. To find out the proportion of various risk factors for infertility among the male and female attending to GOPD in SHSMCH. This is a cross sectional study. 34 infertile couples were enrolled in this study. Pretested questionnaire was used to collect data about the socio-demographic life style, medical, surgical history, detailed gynecological and obstetric history. Frequency and cross tabulation analysis were used to see the frequency of risk factor and assess the magnitude of association at 5% level of significance. Majority of the respondents were in 26 to 30 years age group. The frequency of risk factors for infertility were PCO (42.8%) PID (23.5%), Obesity (26.5%), smoker (29.4%). The significant association for male infertility by cross tabulation was smoking on sperm count. The result of the present study are comparable with other local and international studies which revealed that PCOS, obesity, and age at marriage are risk factors for primary infertility to which strategic management should be directed.

Key words: Risk factor, Infertility, GOPD, SHSMCH.

INTRODUCTION:

Infertility is global reproductive health issue and its social and psychological consequences simply can't be ignored. Efficient treatment for infertility is time consuming, expensive and often unsuccessful.¹

Primary infertility is the term used to describe a couple that have never been able to achieve a pregnancy after one year of regular unprotected sex in spite of cohabitation.^{2,3}

Who estimates that there are 60-80 millions infertility couples worldwide.^{4,5}

The influence of infertility in any community varies between 5% and 15%.⁶

Although there has been a global increase in infertility results, the causes of infertility are difficult to determine because there are numerous factors that bias studies. Both partners in relationship contribute to potential fertility and both may be sub fertile. The female factors contribute most (40-55%) in the etiologies of infertility followed by male factors (30-40%), both partners (10%). The chance of pregnancy in healthy couples who are both under the age of 30 and having sex regularly is only 25-30% per month. A women's peak fertility occurs in her early 20s. As a women in ages beyond 35 the like hood of getting pregnant drops of less than 10% per month.²

The risk factors for female can be classified into modifiable and non modifiable. Modifiable risk factors like infections,

1. Assistant Professor, Department of Obst. & Gynae, Shaheed Suhrawardy Medical College Hospital, Dhaka

2. Junior Consultant, Department of Obst. & Gynae, Shaheed Suhrawardy Medical College Hospital, Dhaka

3. Bioelectrical Engineering Hofstra University, 1000 Fulton Avenue Hempstead, New York 11549

Correspondence: Dr. Jinnat Ara Islam, Assistant Professor, Department of Obst. & Gynae, Shaheed Suhrawardy Medical College Hospital, Dhaka

mainly STT as Chlamydia, gonorrhoea, T.B. some unhygienic health care practice may contribute to post partum and post abortion infections. Among the non modifiable risk factors are some genetic abnormalities, anatomical, malformation, hormonal and immunological disturbances and they account for about 5% of infertile couple.⁷ There are many risk factors for smoking, alcohol, drugs, disease like orchitis, T. B. surgical cause.

The objective of this study is to determine the proportion of risk factors for male, female and also determine the socio-demographic character including education, income and occupation.

Research question:

What are the common risk factors for infertility of both male and female patients attending to Shaheed Suhrawardi Medical College Hospital, Dhaka.

Objectives of the study

General Objectives

To find out the proportion of various risk factors for infertility among the male and female coming to GOPD in SHSMCH.

Specific Objectives

1. To determine the proportion of infertility cases among the gynecology out patients attending to SHSMCH.
2. To find out the proportion of infertile women suffering from PCOS endometriosis PID and others.
3. To determine the proportion of risk factors for male partner.
4. To determine the socio-demographic characteristics of infertile couple.

Key variable

Dependant variable: - infertility

Independent variable: selected risk factors listed below

Female factors: Age, Obesity, PCOS & PID

Male Factors: Smoking

Methodology:

Study population: Infertile couple attending to GOPD in SHSMCH.

Sample size: 34 infertile couples were selected as duration of study period was short.

$$n = \frac{z^2 \times p \times q}{d^2}$$

Sampling technique: purposive.

Place of study: This study will be conducted at outpatient department of SHSMCH.

Duration of study: 5 weeks.

Methods of data collection:

This is cross sectional study. Data was collected by interviews of infertile couples who attended the gynae outdoor of SHSMCH. History from female and male partner was taken separately. Data was also be collected from previous record sheets. The risk factors regarding sub fertility was evaluated by taking proper history from male and female partners, performing thorough clinical examination of female partners and doing some primary — investigations including hemoglobin percentage, urine R/ E M/E, and estimation of blood sugar, ultra sonogram of pelvic organs, VDRL and for male partner semen analysis. Some special investigation was done for confirmation of female risk factors. For PCOS hormone assay (FSH, LH, prolactin) was done. All information's were recorded in data sheet. BMI was calculated by measuring height and weight. All primary sub fertile couples were selected for this study.

Secondary sub fertility, history of previous treatment for infertility was excluded.

Medical conditions included: diabetes mellitus (DM), hypertension (HTN), pelvi-abdominal surgery also excluded.

RESULT:

The study was conducted in Shaheed Suhrawardi Medical College Hospital from 15-4-12 to 28-4-12. It included 34 infertile couples.

Socio-demographic characteristic of respondents

Table- 1.1

Infertility according to age distribution

Age group (years)	Frequency	Percent %
20-25	10	29.4
26-30	16	47
31-35	7	20.6
36-40	1	2.9

16 out of 34 female partners (47%) were in 26-30 years age group.

Table 1.2*Distribution of male partner according to occupation*

Occupation	Frequency	Percent %
Service holder	13	38.2
Businessman	13	38.2
Driver	3	8.8
Day labourarTeacher	23	5.98.8

Both service holder and businessman was 38.2%.

Table 1.3*Distribution of socio-economic status according to income pattern*

Income	Frequency	Percent %
4000-6000/-	1	2.9
6100-8000/-	10	29.4
8100-10000/-	17	50
>10000/-	6	17.6

Majority 17 out of 34 (50%) respondents had monthly income within 8100-10000/-

Table 1.4*Educational Status*

Educational Status	Frequency	Percent %
Illiterate	1	2.9
Primary	3	8.8
SSC	6	17.6
HSC	11	34.4
Degree	13	38.2

38.2% of female respondents were graduate.

Table – 2*Frequency of risk factors for female respondents.*

Risk factors	Frequency	Percent %
PCOS	14	42.8
PID	8	23.5
Obesity	8	23.5

Very high percentage 14 out of 34 (42.8%) was PCOS.

Table – 3*Association of smoking with sperm count by cross tabulation*

Sperm count	Smoker		Total
	Yes	No	
5-10 million	4	0	4
11-15 million	3	1	4
16-20 million	0	2	2
21-40 million	2	7	9
40-80 million	1	13	14
	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	17.687	4	.001
Likelihood Ratio	19.247	4	.001
	14.766	1	.000

Linear by Linear Association

Pearson Chi-Square was significant

Table – 4*Frequency of menstrual pattern*

Menstrual pattern	Frequency	Percent %
Regular	20	58.8
Irregular	2	5.9
Oligomenorrhea	12	35.3

35.3% respondents had oligomenorrhea

Table - 5*Association of menstrual pattern with PCOS*

Feature of PCO	Menstrual Pattern			Total
	Regular	Irregular	Olligo	
Absent count	20	0	0	20
% within feature of PCO	100%	0%	0%	100%
Present count	0	2	12	14
% within feature of PCO	0%	14.3%	85.7%	100%
Total	20	2	12	34
	58.8%	5.9%	35.3%	100%
	Value	df	Asymp. Sig. (2-sided)	
Pearson Chi-Square	34.00	2	.0001	
Likelihood Ratio	46.07	2	.0001	
Linear by Linear Association	31.12	1	.0001	

Pearson Chi-Square was significant

Table – 6
Frequency of Sperm count

Sperm count	Frequency	Percent %
5-10 million	4	11.8
11-15 million	4	11.8
16-20 million	2	6.9
21-40 million	10	29.4
40-80 million	14	41.2

11.8% of male partner was severely oligospermic

Table – 7
Duration of infertility

Infertility duration	Frequency	Percent %
1-2 years	11	31.4
3-5 years	11	32.4
6-10 years	8	23.5
>10 years	4	11.8

32.4% of respondents had 3-5 years of duration infertility

From table – 1.1 47% female respondents were in 26-30 years age group.

Table -1.2 38.2% of male partners were service holder.

Table 1.3 50% respondents had monthly income within 8100-10000/-

Table 1.4 32.4% of respondents were graduate.

Table – 2 PCOS was reported 42.8%, PID 23.5%, obesity 23.5%.

Table – 3 Pearson Chi-Square was significant in association of smoking with sperm count

Table – 4 35.3% had oligomenorrhea

Table – 5 Pearson Chi-Square was significant in association of menstrual pattern with PCOS.

Table – 6 32.4% respondents had duration of infertility within 3-5 years.

DISCUSSION:

In this study majority of the respondents were in 26 to 30 years age group.

Obesity according to BMI is significantly associated with infertility in this study which is compatible with recent study by Homan and his colleagues.

Polycystic ovarian syndrome was a significant single risk factor associated with primary infertility with an agreement

with voluminous literature indicating similar significant association from different areas in western countries as well as developing countries including Egypt.^{5,12,13}

Menstrual irregularities in the form of any deviation from normality like oligomenorrhea irregular menstruation also significant risk factors for infertility which are the similar findings in Allxandria study 2006.⁵

Pelvic inflammatory disease (irrespective to the causative agents) or its sequel as tubal fibrosis and obstruction were extensively studied and proved in developed as well as developing countries.¹⁵

Smoking is a risk factor for male infertility which has an effect on sperm count.

In this study obesity was measured by calculating height, weight and BMI. The strategic management of primary infertility in such population should be directed to very high significant modifiable risk factors with minimal intervention mainly menstrual irregularity PID and PCOS.

Strength and limitations:

Limitation of the study include short duration for data collection small sample size, no use of multivariate analysis to control confounders other hand strength of study include identical application of pre-designed questionnaire.

CONCLUSION:

From this study it is concluded that the most significant modifiable risk factors for female infertility are PID, menstrual irregularity, PCOS and smoking habit of male partner. Early diagnosis and proper management of modifiable gynecological causes of infertility as menstrual irregularity, sexually transmitted infection and PCOS by regular check up. Also, it is preferable to conceive before the age of 25 years. Larger studies are strongly recommended to elaborate more associations and clarify the interaction between risk factors.

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Case Report

Treatment of Aggressive Bone Tumors of Hand – By Enblock Excision and Reconstruction by Iliac Crest Tricortical Graft - A Series of Four Cases

Shyamal Chandra Debnath¹, Suman Kumar Roy², RR Kairy³

ABSTRACT:

Locally aggressive bone tumors of hand are rare. These aggressive and destructive tumors constitute only 2%-5% of all benign tumors of body. Among them enchondromas are the commonest, followed by giant cell tumor and aneurysmal bone cyst. Small round cell tumor is very rare in hand bones and potentially malignant. At clinical presentation, the whole bones are usually involved due to rapid expansion of the tumor. Treatment requires enblock excision or amputation to avoid recurrence. But reconstruction of excised bone to restore function and cosmesis of the hand is a concern. In this paper authors presenting four cases of aggressive bone tumor management by enblock excision and reconstruction by iliac crest structural graft. At an average two year follow up all grafts were incorporated without any recurrence of the tumor. Hand function was good and cosmetically accepted to the patient.

Key words: Aggressive tumor, hand bones, iliac crest, tricortical graft.

INTRODUCTION:

Aggressive tumors of hand bones are rare. Although enchondromas are described as most common and destructive primary bone tumors of hand skeleton¹, giant cell tumor accounts for 30% of all bone tumors in Asians,² 20% in Chinese population³. Giant cell tumors of hand bones are rare⁴ and accounts for about 2%-5% of all Giant cell tumors of body⁵. Primary bone tumors of hand are most aggressive and following curettage and bone grafting 50% to 90% incidence of recurrence reported⁴. Small round cell tumors of the hand bones are very rare and has a potential of distant metastasis⁶. Treatment options are enblock excision, ray excision or amputation to avoid recurrence for long time⁷. Following enblock excision, structural integrity, functions of hand as well as cosmesis is a problem. Literature review shows various options of reconstruction of hand bones following excision. Vascularized transfer of toe joints to retain joint function⁸, fibular bone graft to maintain length and stability⁹ with

some amount of compromise in joint function has been mentioned. Use of siliastic spacer¹⁰ can maintain the length and satisfactory function. Nonvascularized tricortical iliac crest bone graft for reconstruction with good results described by many authors^{11,12}. In this study authors present 4 cases of aggressive bone tumors of hand bones. This study was carried out between January 2008 to April 2013 with an average follow up of 24 months. One patient with tumor of proximal phalanx of thumb and another with thumb metacarpal and 2 patient with 3rd metacarpal bone. In all cases enblock excision of whole bone or near total excision of involved bone done followed by reconstruction by iliac crest tricortical graft. At the end of follow up no recurrence occurred grafts were nicely remodeled to the shape of the bones and retain good hand function.

PATIENTS AND METHODS:

In this series 4 patients with aggressive bone tumors of hand were included. Patients were between 13 years to 63

1. Assistant Professor, Department of Orthopaedic Surgery, NITOR, Dhaka, Bangladesh

2. Registrar, Apollo Hospitals Dhaka, Bangladesh.

3. Professor, Department of Orthopaedic Surgery, NITOR, Dhaka, Bangladesh

Correspondence: Dr. Shyamal Chandra Debnath, Assistant Professor, NITOR, Dhaka, Bangladesh, E-mail: dr.shyamaldebnath@gmail.com

Case	Age(Y) /Sex	Site of tumor	Size of the tumor(cm)	Duration of symptom (Months)	Treatment	Follow up	Remarks
I	13/F	Proximal phalanx of Lt. Thumb	3X2X2	1	Enblock excision with iliac crest graft	4 years	No recurrence
II	25/F	Third Metacarpal (Rt.)	5X4X4	8	Tumor excised middle 3/4 th with prx. And distal end preserved	2 and half years	No recurrence
III	18/F	Third Metacarpal (Rt.)	5X4X3	4	Whole tumor excised, only distal articular end preserved	3 years	No recurrence
IV	63/M	First Metacarpal (Lt.)	6X5X4	5	Whole tumor excised with both articular ends	3 months	No recurrence (still to evaluate)

years of age with an average 30 years. Of them 3 were female and one was male. Study period was between January 2008 to April 2013. All patients present with a short history of pain and swelling of the affected bone (one proximal phalanx of thumb, two with third metacarpal and one with first metacarpal). After clinical evaluation all tumors were radiologically assessed (Tumor extension pathological fracture, soft tissue extension). As per Campanacci staging¹³ three patients had stage 2 and one had stage 3 lesion. Histopathology done in all patients prior to reconstruction. Histology revealed two GCT, one enchondroma and one small round cell tumor. For patient with small round cell tumor chest x-ray and bone scan done to rule out distant metastasis. For the purpose of description patients were designated as case-I to case – IV and depicted in the following table.

SURGICAL TECHNIQUE:

Under GA and tourniquet control affected limb and ipsilateral iliac crest was prepared aseptically. Through a curvilinear dorsal approach soft tissue envelope elevated saving the flexor and extensor tendons and neurovascular bundles. Enblock excision done including a tumor free margin as much as possible. We didn't preserve articular margins to compromise wide marginal resection. For case-I whole proximal phalanx was excised and for case-II both

ends and case-III distal end were preserved and near total excision done. For case IV whole bone including articular ends excised. There was soft tissue extension in case IV and pathological fracture in case III. Involved bone length measured before excision. Ipsilateral tricortical iliac crest graft harvested carefully and tailored to the size of the affected bone. One 1.2 mm "k" wire used for stabilization of the graft fixing with proximal and distal bones of same row. Soft tissue envelope repaired in single layer and skin sutured by 3/0 prolene. Hand splinted in a plaster slab and kept elevated for 7 days. Active movement of finger started as soon as pain subsides. At 2 weeks following operation skin sutures removed and plaster slab reapplied for another 2 weeks, "K" wire removed at 4 months when radiological union was visible.

CASE ILLUSTRATIONS:

Case-I:

Case –I was operated one month following symptoms. At first occasion only curettage done and biopsy revealed small round cell tumor. Whole phalanx was involved; the thumb was swollen and inflamed. At this stage tumor scored Enneking¹⁴ stage- IIA. After 3 weeks of 1st operation second operation done by enblock excision and iliac crest tricortical graft applied for reconstruction. Three

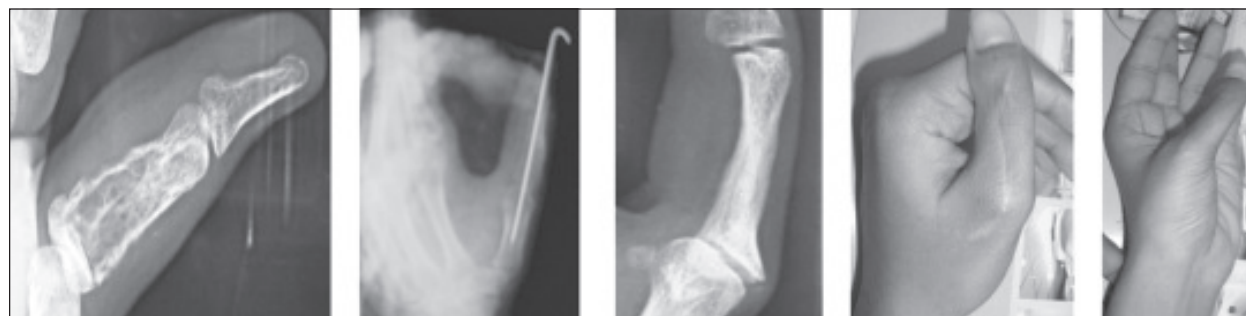


Fig. 1-5: Shows illustrations of case-I

months following second operation graft regressed in size then remodeling took place within 6 months. At 4 year follow up no local recurrence occurred and graft remodeled to the shape of phalanx. Thumb movements were full and pinch grip restored. The MP and PIP joints movements preserved.

Case-II:

Enchondroma of third metacarpal with the H/O curettage and bone grafting one year back followed by recurrence. Radiological stage -2 and whole bone involved except articular ends. Tumor excised and interpositional iliac crest graft was used and fixed with a “k” wire. At 4 months graft incorporated and hand function was good.

Case-III

GCT of third metacarpal with the H/O curettage two years back and recurrence occurred. At presentation huge swelling of bone with pathological fracture and septated appearance. Whole bone excised except distal end. At 5 months graft incorporated.

Case-IV:

GCT of first metacarpal with expansile lesion and extraosseous extension with radiological stage-3 appearance. FNAC revealed GCT. Excision and iliac crest graft applied.



Fig.-6-8: Shows illustrations of case-II

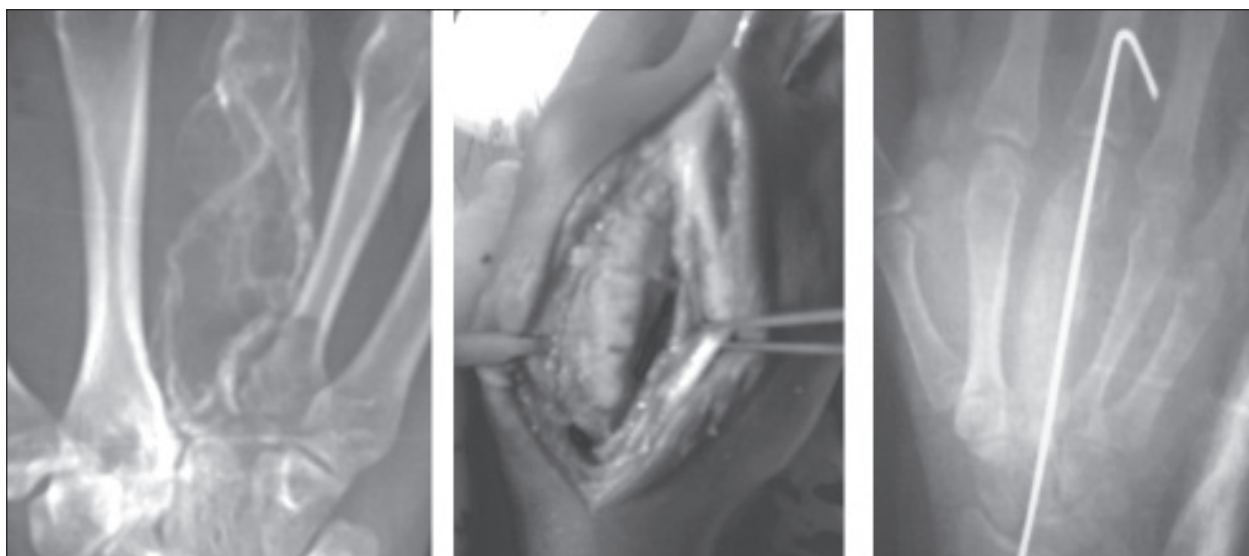


Fig.-9-11: Shows illustrations of case-III

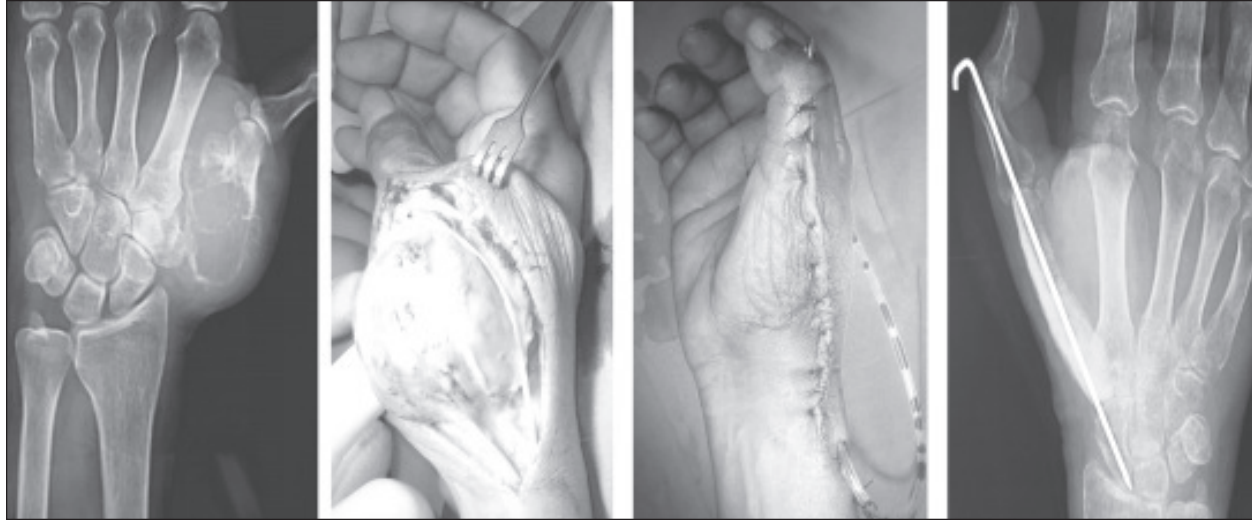


Fig.-12-15: Shows illustrations of case-IV

RESULTS

Case-I was a malignant tumor and following excision follow up done for 4 years, there was no local recurrence and distant metastasis. Hand function was good and pinch grip was possible. Case II and III had good graft incorporation within 4 months. After removal of “k” wires middle finger had 20 degree flexion lag at MP joints, hand function improved. Case IV was operated only 3 months back and still in follow up.

DISCUSSION

Aggressive tumors of hand skeleton are rare tumors of body. Though enchondromas are most frequent¹ but literatures are not available to support of the study. GCT constitutes 2% to 5% of all GCT of body⁴. These aggressive bone tumors usually present with pain and swelling of involved bones and sometimes gross disfigurement and pathologic fracture. Aggressive tumors with Campanacci¹³ stage-2 and stage-3 and Enneking¹⁴ stage-III requires wide marginal excision to avoid recurrence¹⁵. Hand function and stability is a problem. Primary GCT of hand bones are more aggressive and usually recur within one year of first surgery¹⁵. Repeated surgery increases the incidence of malignancy¹⁶. Ray excision or distal amputation of the affected bone advised by many authors¹⁷ but cosmetically not acceptable to the patient. Autogenous iliac crest strut graft is a good option. Lee et al⁹ reconstructed the excised bone by fibular graft but takes longer period of incorporation (average 8 months). Silastic spacers¹⁰ have the chances of silastic synovitis or implant breakage. Composite bone and joint microvascular transfer¹⁸ from toe causes donor site morbidity and requires high skill in microsurgery.

In this study all grafts incorporated within 4 months and remodeled within 8 months of surgery. At an average 2 year follow up no recurrence occurred. Lee et.al⁹ in their study harvested fibroosseous cartilage of iliac crest at distal end of the graft to resurface proximal metacarpophalangeal hemi joint. But we neither resurface the graft ends nor denuded articular cartilage to achieve arthrodesis. To retain joint motion Athansian et al⁵ used silicon prosthesis. Some authors¹⁸ criticized iliac crest as a weaker structural graft and chances of resolution is high. But if the soft tissue collar is good, graft can be revitalized and remodeled to the shape of the excised bone. Figure 1-5 describe good remodeling of iliac crest graft to the shape of the proximal phalanx of thumb.

CONCLUSION

Considering the aggressive nature of primary tumors of hand bones and the tendency to develop local recurrence, en-block resection seems to be the treatment of choice. No recurrence reported in any cases of this series. Articular surface reconstruction and preservation of hand function is a concern to many authors who advised vascularized toe transplantation or osteochondral graft. Arthrodesis is an easy option at the cost of hand function. This paper highlights the iliac crest as a good structural graft and has a potential to adopt the joint congruity and permits some amount of joint motion.

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