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The Journal of Bangladesh Orthopaedic Society (JBOS)

THE JOURNAL OF BANGLADESH ORTHOPAEDIC SOCIETY

VOLUME 32 **NUMBER 2** **JULY 2017**

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ORIGINAL ARTICLES

Original Article

Use of TENS in Unicameral Bone Cyst of Humerus at Pediatric Age Group

Quazi Shahidul Alam[1], Md. Golam Mostofa[2], Md. Golam Sarwar[2], Mobarak Hossain[3], Md. Khorshed Alam[3], Md. Ashfaqur Rahman[4], Mohammad Ruhul Amin Mollah[4], Sarwar Ibne Salam[5], Ghiyas Uddin Ariph[5]

ABSTRACT

Cystic lesion in different long bone at pediatric age group is difficult to manage in medical science. Management needs surgery, casting, braces, occupational therapy and drugs. Use of Titanium Elastic Nail System (TENS) helps the patient to a great extent and is one of the newer accepted methods of surgery. We had operated ten patients in the year, 2017 at DMCH. All had simple bone cyst in humerus. We applied TENS followed by U casting for four weeks after the surgery. Results were evaluated by DASH Score. All the patients were found clinically improved. With postoperative follow up, there was improvement in radiological finding too. There is practice of using TENS in unicameral bone cyst in pediatric age group throughout the world with published journal. We have started this practice in Bangladesh too, as first time. Results are yet to be decided as at least 2 year follow up is required to find out how they do in our local community. So far it is looking satisfactory. Looking forward to see the final outcome in future.

Key Word : TENS, Unicameral bone cyst, cystic lesion in bone at pediatric age group.

INTRODUCTION

Bone cysts commonly occur in the humerus (55-65%) and femur (25-30%)[1,2]. Among of all bone lesions in pediatric age group simple bone cyst form 3%.(3-5) the unicameral bone cyst (UBC) also known as simple bone cyst (SBC) found in skeletally immature patients, is a benign fluid-filled lesion, located mostly in metaphyses of long bones. Often the presenting feature is pathological fracture[2]. The aetiology and pathogenesis is uncertain. The possible treatment spectrum includes observation, aspiration and injection of corticosteroids, curettage and bone grafting, percutaneous injections of bone marrow and medullary decompression by flexible nails[4-8]. All these options show variable results in the outcome. Recent studies suggest that the obstruction of the venous return and the increase in the resulting intracystic pressure can be the aetiology and main factors influencing its size increase[3,9,10]. Opening of the medullary canal and making a connection between the canal and the cyst, would allow permanent decompression that favour the healing of the lesion[2,6,11,12]. There is strong evidence of high rate of healing using this technique. Here we present the intramedullary cannulation and stabilization by TENS for the treatment of simple bone cysts.

MATERIALS & METHODS:

From January 2017 to December 2017, total 12 children (07 male and 05 female) treated for a unicameral bone cyst at Department of orthopedic surgery, DMCH. Age range was six to 16 years. The diagnosis was based on typical radiographic imaging, cyst features and computed tomography. Seven cysts were located in the proximal humerus, three in the distal humerus. All the patients were treated with TENS. Following inclusion criteria was used: patients of both sexes with diagnosis of UBC of the humerus bones treated surgically with intramedullary nailing. Exclusion criteria: patients with incomplete clinical histories or radiographies.

RESULT:

All patients were reviewed clinically and radiographically at four weeks, three and six months after surgery. The mean hospital stay was 24 hours. At four weeks postoperatively, all patients were pain free. Radiographic signs of cyst healing were present at three months in all patients.

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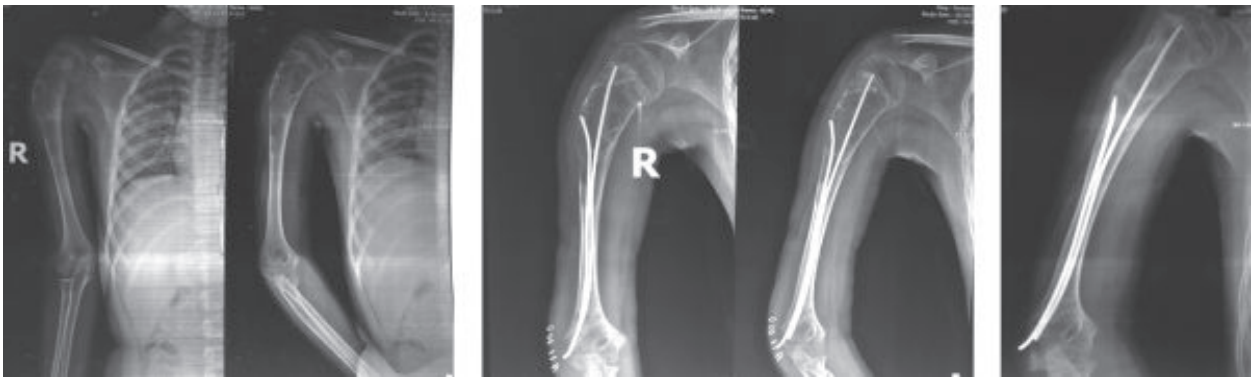
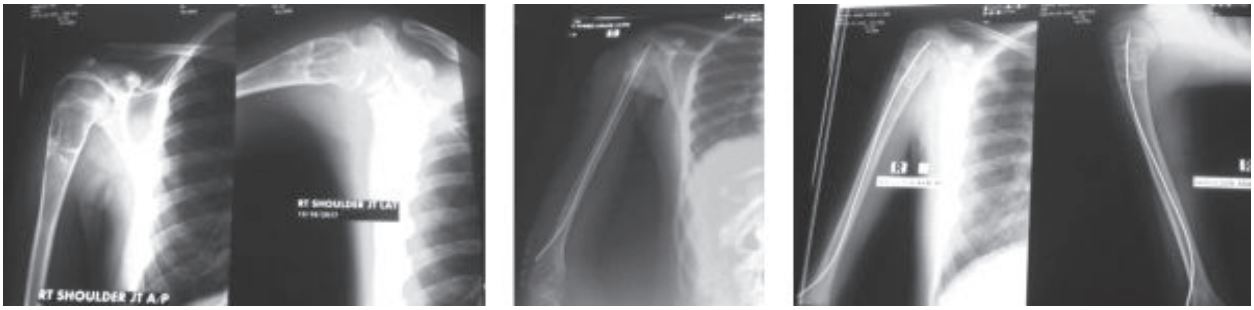
Case 1



Preoperative *Postoperative* *Follow Up*

Case 2



Preoperative *Postoperative* *Follow Up*

Results were evaluated by DASH score. (13, 14). All the patients were found clinically improved. Outcome measured with DASH score showed a very low level of disability which means good outcome.

DISCUSSION :

A unicameral bone cyst is a unilocular cavity in bone, lined by a fibrous membrane and filled with fluid. The lesion almost always arises in the metaphysis of a long bone adjacent to an epiphyseal plate. Although unicameral bone cysts may occur anywhere in the skeleton, two-thirds of cases occur either in the proximal humerus or proximal femur[1,11]. Various treatment options have been reported including crushing of the cyst wall and grafting, total resection with bone grafting, curettage combined with bone grafting[15], allografting with freeze-dried crushed cortical bone, homologous cancellous bone chips, high-porosity hydroxyapatite components or plaster-of-Paris pellets[16] and cryosurgery, injection of methylprednisolone, injection of fibrin sealant, bone marrow or bone substitutes, decompression with drilling or screws, and intramedullary nailing. Initial treatment of simple bone cysts consisted of curettage and bone grafting, and the success has ranged from 55% to 65%. The remaining 35% to 45% of patients had recurrence and required additional open surgery[3]. The treatment of simple bone cysts was drastically changed by the strategy of percutaneous injection of methylprednisolone acetate[17]. However, long-term studies of percutaneous injection of methylprednisolone acetate have been less satisfactory. Advantages of methylprednisolone injection include short operating time, less bleeding, and minimum hospital stay and rehabilitation. However, the healing rate with methylprednisolone injection is variable and usually incomplete, even after multiple injections. Injection of fibrin sealant into the cavities of simple bone cysts is a further possible treatment with excellent concrescence[18]. A few authors have advocated percutaneous multiple drilling with Kirschner wires, or prolonged decompression of the cyst using cannulated screws left in place without corticosteroid injection[19]. The mechanism of action of percutaneous drilling and decompression is based on the concept that the lesions are caused by fluid unable to escape from the bone because of venous obstruction. Drilling leads to decompression and decrease of the internal pressure within the cyst. Biological methods of treatment such as autogenous or allogeneic bone grafting and injection of bone marrow or bone substitutes have

also been reported[20]. Although almost all the previously described methods including injection of steroids, bone marrow or bone substitutes, and decompression may produce ossification of the cyst, they do not provide early mechanical stability to the weakened bone[2]. We used TENS for simple bone cysts. The time to healing was short and patients returned to full daily activities without restrictions. Elastic intramedullary nailing has the twofold benefits of continuous cyst decompression, and early stability to the involved bone segment, which permits early mobilization and return to the normal activities of the young patients.

CONCLUSION:

Now a day's use of TENS in SBC of Humerus is a gold standard of practice throughout the world with published journals. We have started this practice in Bangladesh too and this time at DMCH in a large scale. Results are yet to be decided as at least 2 year follow up is required to find out how they do in our local community

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Original Article

Tibial Remnant Preserving Anterior Cruciate Ligament Reconstruction

G.M. Jahangir Hossain[1], Md. Hasan Masud[2], Pervez Ahsan[3], Md. Abdul Hye[4], Mohammad Mahfuzur Rahman[5]

ABSTRACT

Remnant preserving anatomic ACL reconstruction is a new technique in the treatment options of ACL injury. Anatomic graft placement with secure fixation, revascularization, tendon healing, bone tunnel healing and proprioception recovery are still the main factors influencing the functional effects of ACL reconstruction with remnant preserving. A total of 54 ACL injuries in 52 patients underwent anatomic ACL reconstruction with tibial remnant preserving between June 2015 and September 2016 were included in this study. Among them 26 cases were sports injuries, 10 cases of training injury and 16 cases of traffic accident injury. All the patients were males with a mean age of 24 years (17 to 44 years). The main clinical manifestations was joint instability and symptoms were more serious at running, going downstairs or upstairs and uneven surfaces. Physical examination showed different degrees of atrophy of quadriceps , anterior drawer test was positive in 47 cases, Lachman test was positive in 50 cases and weakly positive in 4 cases. Patients were followed up for a mean period of 22 months (12 to 36 months), and stability of knee joint was significantly increased. Lysholm knee joint function score was significantly increased from preoperative (64.7 ± 6.2) to postoperative (92.8 ± 0.6). Lachman test was negative in 8 cases, weakly positive in 4 cases and positive in two case. All subjects in this study re-obtain the ability of daily work and life or gradually resume movement level before sports injury. Arthroscopic reconstruction of ACL with the tibial remnant preserving technique may enhance the revascularization, bone tendon healing, cellular proliferation and early joint proprioception.

Keywords: Remnant preserving, ACL, Reconstruction

INTRODUCTION

Arthroscopic anterior cruciate ligament reconstruction with creating femoral tunnel through accessory anteromedial portal has been the anatomic treatment strategy for ACL injury[1]. However, anatomic graft placement with secure fixation, revascularization, tendon healing, bone tunnel healing and proprioception recovery are still the main factors influencing the curative effects of ACL reconstruction[2]. Several techniques of ACL reconstruction have been introduced to improve the functional outcome and restore normal kinematics of the knee. Meanwhile, a tibial remnant-preserving technique was developed to preserve the proprioception and to enhance the revascularization of the reconstructed ACL[3]. There are three reasons to preserve these remnants: biomechanical, vascular and proprioceptive advantages for the patient. Good quality fibers work as graft protection during the healing process. Periligamentous and endoligamentous vessels presenting to the native ACL tissue may enhance the vascularization of the ACL augmentation. Mechanoreceptors still remaining in the residual ACL fibers may have proprioceptive function[3]. The definition of remnant ACL is controversial, based on anatomy, clinical examination, instrumental laxity assessment or MRI findings. Continuous remnant ACL fibers bridging the femur and tibia, from native femoral ACL footprint to native tibial ACL footprint seem to be a good definition[4]. Four varieties of remnant which avulsed or teared from femoral site were included in this study. Type I remnant bridge between tibia and intercondylar notch of femur(Fig.1a &1b). Bridging between posterior cruciate ligament and tibia is called Type 2 remnant (Fig. 2a & 2b). Bridging between anatomic insertions of lateral femoral condyle and tibia constitute the Type 3 remnant and shown figure 3a and 3b. When there is no bridging of ACL remnants between femur and tibia is called type 4 remnat shown in fig. no. 4.

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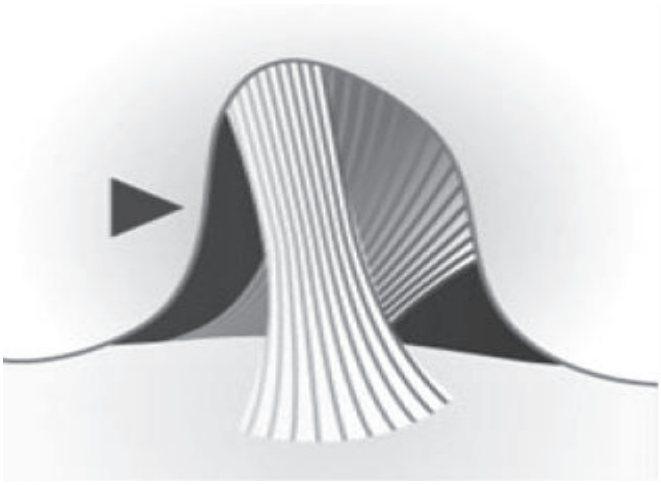

Fig.-1a: *type 1 remnant*

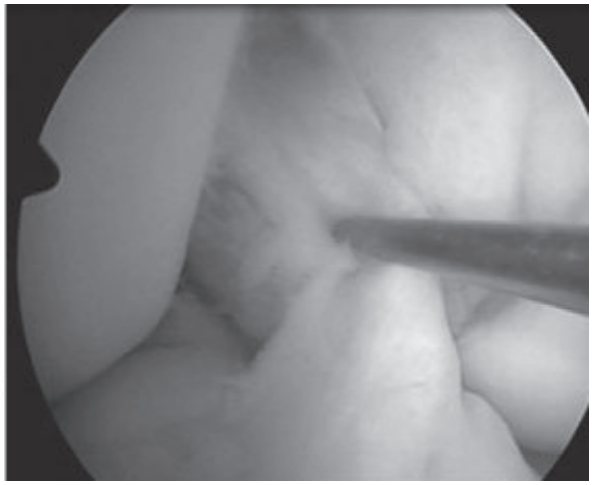

Fig.-1b: *type 1 remnant*

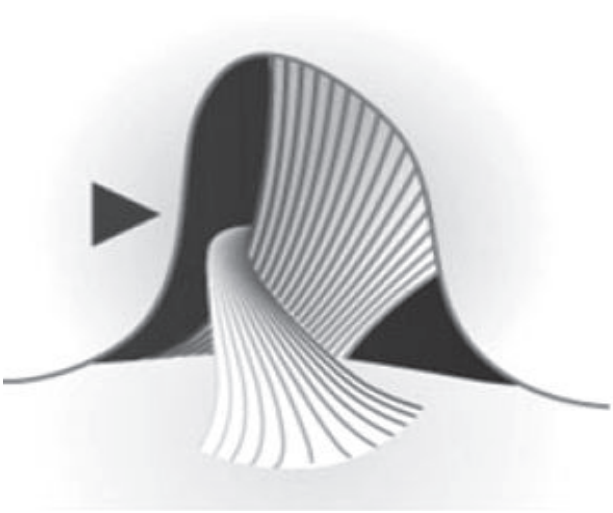

Fig.-2a: *type 2 remnant.*

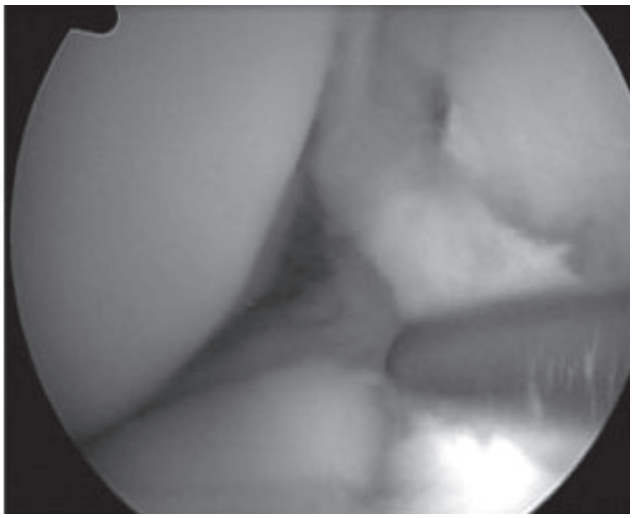

Fig. 2b: *type 2 remnant.*

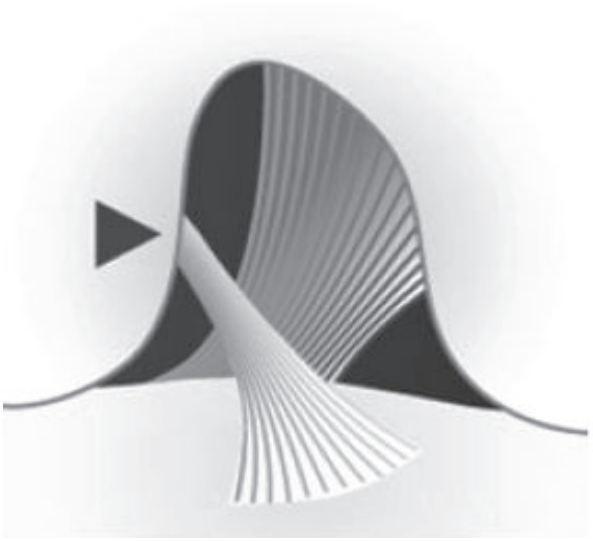

Fig.-3a: *type 3 remnant.*

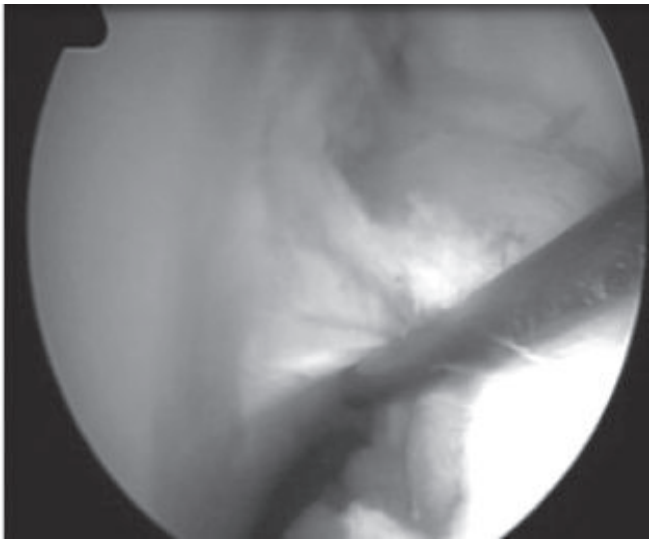

Fig.-3b: *type 3 remnant*

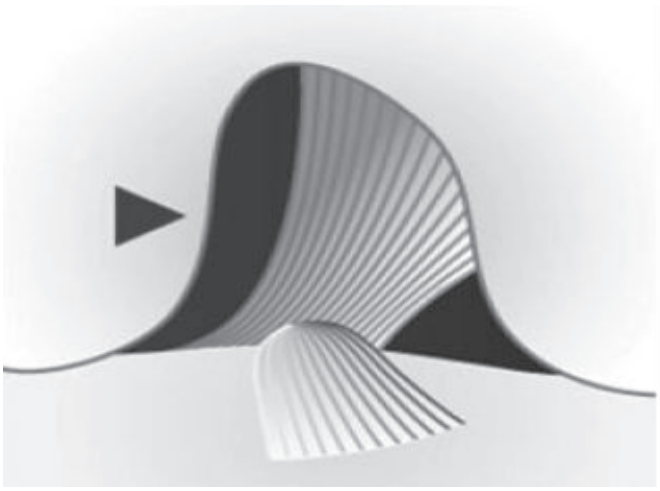

Fig.-4a: *type 4 remnant.*

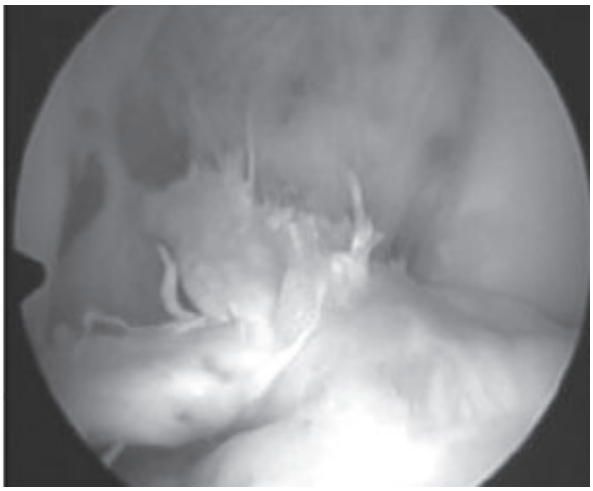

Fig.-4b: *type 4 remnant.*

In this study, arthroscopic reconstruction of anterior cruciate ligament with remnants obtained satisfactory curative effects.

PATIENTS AND METHODS

Patients

A total of 54 ACL injuries in 52 patients underwent anatomic ACL reconstruction with tibial remnant preserving between June 2015 and September 2016 were included in this study. Among them 26 cases were sports injuries, 10 cases of training injury and 16 cases of traffic accident injury. Sports injury refers to general physical exercise-induced injury of both professiona and amateur while training injury refers to the damage caused by military training activities. The injured people are mainly BGB soldiers. All the patients were males with a mean age of 24 years (17 to 44 years). The main clinical manifestations included knee joint instability, pain and swelling, and these symptoms were more serious at running, going downstairs or upstairs and uneven surfaces. Physical examination showed different degrees of atrophy of quadriceps femoris, anterior drawer test was positive in 47 cases, Lachman test was positive in 50 cases and weakly positive in 4 cases. All patients were diagnosed using knee MRI to exclude combined posterior cruciate and other ligament injuries.

OPERATIVE PROCEDURE

41 cases of complete disruption and 11cases of partial rupture were confirmed by arthroscopy. The duration from injury to operation time is three week - 2 years, with an average time of 8 months. ACL remnants in complete disruption were not removed at tibial site. The knee joint was flexed at 100^0 - 110°, and then an appropriate femoral tunnel locator was placed through the accessory anteromedial portal. Then, each guide pin was inserted from clock 10-11 in right knee or clock 1-2 in the left knee or seeing the resident ridge or debrided femoral remnant. A drill bit equal with the diameter of tendon transplant was selected to establish a 3 cm long femoral tunnel with the guide of guide pin. The location of the tibial tunnel was medial and posterior to the native tibial ACL attachment point, that is, 2 mm anterior from the medial tibial spine or 7.5 mm anterior to PCL in the extension a line starting at the free edge of the anterior horn of the lateral meniscus. The tibial tunnel inclination was 55°, and a guide pin was drilled and it entered joint through tibial remnant (Fig. 5). A drill bit with a diameter corresponding to the tendon transplant was selected to drill the tibial tunnel over the guide of guide pin. A shuttle suture passed from femoral tunnel to tibial tunnel. The tendon graft passed from tibial tunnel through the tibial stump to the femoral tunnel with shuttle suture. The reconstructed ACL ligament was covered with tibial remnants in a sleeve-like fashion.

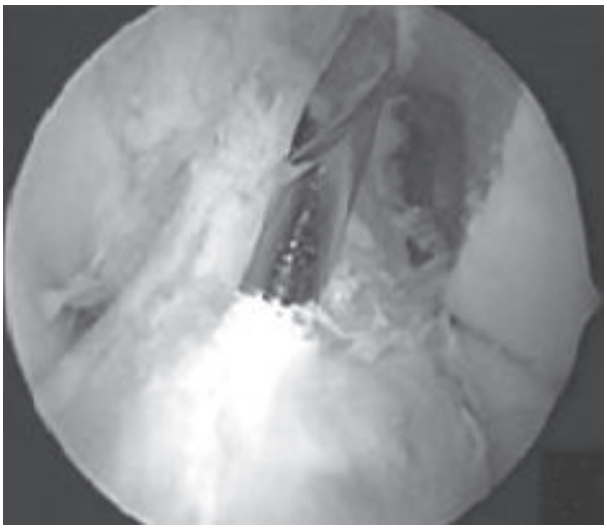

Fig.-5: *Guide wire through tibial remnant*

In single bundle branch ACL injuries, the stump of the disrupted bundle was retained. The ACL was reconstructed with an autologous single bundle branch of quadrupled hamstring tendons. After fixation graft at femoral site with bioscrew 15 times of knee joint flexion and extension at the traction of ligament at tibial site was done, then the ligament was fixed with bioscrew at tibial tunnel.The tension and stability of reconstructed ligament was checked. If there was impact and friction at knee extension intercondylar notchplasty was performed. In the early stages after operation, the injured lower limb was protected with orthosis, and functional exercises were performed according to rehabilitation program.

RESULTS

All patients were followed up for a mean period of 22 months (12 to 36 months), and stability of knee joint was significantly increased. Lysholm knee joint function score was significantly increased from preoperative (64.7 ± 6.2) to postoperative (92.8 ± 0.6). Lachman test was negative in 48 cases, weakly positive in 4 cases and positive in two case. All subjects in this study re-obtain the ability of daily work and life or gradually resume movement level before sports injury. Quadriceps femoris was obviously atrophic in early stage after operation. After rehabilitation training for a period of 6 to 12 months, knee joint function gradually restored to normal level. One year later, there was no significant difference in the proprioceptive sensation of knee joint between two sides, and the stability of knee joint was significantly increased, and Marshall score (5) special for knee ligament injury was 47.8.

DISCUSSION

Anterior cruciate ligament injury may be complete or partial disruption. After complete disruption of the ACL, the preventive function on tibia anterior translocation is lost. The ACL must be reconstructed to re-obtain the stability of knee joint. More often ACL disrupt or avulse from femoral site. During operation, ACL remnants were not removed at tibial attachment sites. The tendon graft was reconstructed through the tibial stump, and the reconstructed ligament was covered with ligament remnants in a sleeve-like fashion.

Fiber and synovium at the tibial attachment site is the main blood supply source of the ACL, while the remaining blood supply is derived from the infrapatellar fat pad and the synovial blood vessels. Therefore, if ligament remnants are removed in ACL reconstruction, the reconstructed ACL is completely stipped of blood supply, which is not conducive to the ingrowth of nerve fibers and revascularization of transplanted tendons. Otherwise, ACL reconstruction with remnants can ensure that the reconstructed ACL is sufficiently covered with ligament and synovial tissues, which is conducive for revascularization the graft[6]. Tsuda's studies[3] reveal that there are many kinds of mechanoreceptors such as Ruffini corpuscles, Pacinian corpuscles and Golgi bodies in ACL fibers, and these mechanoreceptors are closely related with the proprioceptive sense of knee joint. Mechanoreceptor excitement can improve the stability of the knee by activating neuromuscular reflexes. The retained bundle branches and stump fibers are conducive to the ingrowth of mechanoreceptors in transplanted tendons and the restoration of proprioceptive sense of knee joint. Besides, excessive removal of ligament remnants in ACL reconstruction may result in excessive synovial fluid leakage in the bone tunnels, affecting the healing of bone and ligament. The retained ligament remnants and synovial membrane can seal the bone tunnels[7, 8]. Ento-ectad interface screw is not conducive to the prevention of synovial fluid in bone tunnels. Indirect fixation away from articular surface such as the use of button door-shaped screws leads to "bungee jumping effect" due to the vertical motion between transplanted tendons and bone tunnels and "windshield wiper effect" due to horizontal motion. The aperture fixation system is near the anatomical insertion of ACL, which is conducive to the prevention from vertical and anteroposterior displacement, and expansion of bone tunnels[9,10]. Besides, aperture fixation system can promote the healing of bone and tendons due to the close contact of tendons and bone tunnels, and effectively prevent joint fluid into bone tunnels[10,11,12].

CONCLUSION

Arthroscopic reconstruction of ACL with the tibial remnant preserving technique may enhance the revascularization and cellular proliferation of the graft, to preserve proprioceptive function, and to be able to acquire anatomic placement of tendon graft.

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Original Article

Early Measurement of compartment pressure using simple device

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Abstract

Direct compartment-pressure measurement is the diagnostic criterion standard and should be the first priority if the diagnosis is in question. A number of handheld devices are available. The Stryker pressure tonometer is widely used but not available in all centre of our country. As commercial device is unavailable, it is possible to assemble a device to measure intracompartment pressure. The device measures the pressure that is necessary to inject a small quantity of fluid. This technique often over estimates low pressures but is generally reliable. Our objective is to early diagnosis of compartment pressure so that we can save limb because clinically sometime we can miss the diagnosis. Our device is very easy to assemble and cheap and very helpful.

Key ward: compartment syndrome, whitesides instrument, fasciotomy, limb salvage

INTRODUCTION:

Elevated tissue pressure within a closed fascial space

Reduces tissue perfusion- ischaemia

Results in cell death-necrosis.True Orthopaedic Emergency

Limb compartment syndrome

Acute

Chronic

1881, volkman published an article in which he attemted to describe the condition of irreversible contractures of the flexor muscles of the hand to ischaemic processes occuring in the injured forearm when applicationof restrictive dressing aetiology

Reduced compartment size

tight dressing, bandage /cast

closure of fascial defect

Increased compartment content

bleeding-fracture, vascular injury,bleeding disorder

Capillary permeability

Ischaemia,trauma,burns,snake bite, drug injection

Fracture

The most common cause

Incidence of accompanying compartment syndrome of 9.1%

This incidence is directly proportional to the degree of injury to soft tissue and bone

Acute compartment syndrome may be more prevalent after a low energy(lack of compartment disruption)

Tibialdiaphysial#

Distal radius#

Forearm#

McQueen et al;JBJS Br 2000

Normal tissue pressue

0-4 mm Hg

8-10 with exertion

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Absolute pressure theory

30 mm Hg-mubarak

45 mmHg-matsen

Pressure gradient theory

<30 mm Hg of diastolic presssure- whitesides, mcqueen et al

Tissue servival

Muscle

3-4 hours-reversible changes

6 hours-variable damage

8 hours-irreversible changes

Nerve

2 hours-looses nerve conduction

4 hours-neuropraxia

8 hours-irreversible changes

Effect of delayed diagnosis

Permanent sensory and motor deficit

Contractures

Infections

amputations

How do we diagnose presence of compartment syndrome in a traumatized limb?

Diagnosis

History

Clinical exam: the p's

Compatment pressure

Laboratory test

Cpk

Urine myoglobin

P'S

Pain Out Of Proportion-earliesr symptoms but inconsistant, minimal in deep post compartment

Palpably Tense Compartment-early finding,only objective findings

Pain With Passive Stretch

Paresthesia/Hyposthesia-peripheral nerve tissue is more sensitive than muscle to ischaemia

Difficult to interpret

Paralysis-very late finding. Irreversible nerve and muscle damage present

Difficult to evaluate because of pain

Pulselessness/Pallor –rarely present, indicate direct damage to vessels rather than compartment syndrome

Pain And The Aggravation Of Pain By Passive Stretching Of The Muscles Ini The Compartment In Question Are The Most Sensitive(And Generally The Only) Clinical Findings Before Te Onset Of Ischaemic Dysfunction In The Nerves And Muscles

————Whitesides AAOS 1996

Most reliable signs are pain on passive stretching and pain on palpation of the involved compartment

Other feature like pallor, pulselessness, paralysis,paraesthesiaetc appear very late and we should not wait for these things.

——willis&Rorabeck OCNA 1990

Value of these clinical parameters i diagnosis of compartment syndrome?

Ulmer T:

The clinical diagnosis of compartment syndrome of the lower leg:are clinical findings predictive of the disorder?

J Orthop Trauma 2002

Ulmer T showed:

With presence of 1 clinical finding:

With pain————25%

With paresthesia——26%

With pain in passive stretching(PPS) —25%

With paresis——19%

With presence of 2 clinical findings(Pain, pps)—68%

With presence of 3 clinical findings(pain, pps. paresis)-93%

With presence of 4 clinical findings——98%

To achieve a probability of over 90%of ACS being present 3 clinical findings must be present

The third clinical, finding is paresis., thus to achieve an accurate clinical diagnosis of ACS the condition condition must be allowed to progress until late which is clearly unacceptable.

Compartment syndrome can be a life or limb-threatening emergency. Early diagnosis is important for the prevention

of disability. Approximately 40% of all compartment syndromes occur after fractures of the tibial shaft.1

The classical clinical features of five Ps (pain, pallor, paralysis, paraesthesia, pulselessness) cannot be always relied upon for early diagnosis of a developing acute compartment syndrome.2,3

These features are not apparent in most of the patients unless some permanent damage has occurred. Also, the clinical features are subjective in nature.

Intracompartmental pressure measurement is a reliable objective method for early and accurate diagnosis of compartment syndrome.4–10

Anterior compartment is the most commonly involved compartment of the leg in acute compartment syndrome. Sheridan *et al.*,11Gershuni*et al.*12 and McQueen *et al.*,13 reported consistent involvement of the anterior compartment in tibial fractures complicated by acute compartment syndrome.

They recommend routine monitoring of anterior compartment and other compartments need to be investigated only if there is clinical suspicion of involvement. Appropriate treatment in the form of decompression of the compartments has to be initiated at the earliest to prevent any permanent disability.

We studied 46 consecutive patients with closed fractures of leg between2ND DECEMBER TO 28 DECEMBER2018 . Only those patients presenting within six hours of injury were included in the study. Patients with compound fractures and who presented after six hours of injury were excluded from the study.

Informed consent was taken from each individual. There were 38 male and 8 female patients with the majority in the age group of 21-40 years (65.33%), the mean age being 30.44 years. Only 20% patients had isolated fracture of tibia, the remaining 80% had an associated fracture of the ipsilateral fibula. Right-sided involvement was seen in 39 patients (61.33%). Middle third was fractured in 31 patients (58.67%) and comminution was present in 21 patients (42%).

All the patients were evaluated for the presence of any associated life-threatening emergency and as such resuscitation was carried out for these patients (n = 9). A careful physical examination was carried out to look for the clinical features of compartment syndrome including pain out of proportion with firmness of the compartment, pain on passive stretching of the involved muscles as well as paralysis, paraesthesia and pulselessness. Proper radiographs of the involved extremities were taken. Anterior compartment pressures of the injured extremities were measured using the Whitesides' infusion technique.

Whitesides' technique employs the following materials - i) One mercury manometer, ii) Two plastic intravenous extension tubes, iii) Two 18-gauge needles, iv) One 20-cc syringe, v) one three-way stopcock, vi) One bottle of bacteriostatic normal saline [Figure 1]. The extremity to be measured is cleaned and sterility prepped. Sterile saline is drawn into the 20 ml syringe, which is attached to the three-way stopcock. A single intravenous extension tube is attached to the stopcock and a second 18-

gauge needle is attached to its other end. The third unused portion of the stopcock is closed off temporarily. The 18-gauge needle at the end of the extension tube attached to the stopcock is then inserted into the bottle of the saline. Saline is then aspirated without the bubbles into approximately half the length of the extension tube. The three-way stopcock is turned to close off this tube so that the saline is not lost during transfer of the needle. The second extension tube is then connected to the three- way stopcock at its remaining open part and its other end is connected to the manometer. The saline- containing needle is then inserted into the muscle of the extremity to be tested. The stopcock is then turned so that the syringe is opened to both extension tubes, forming a T-connection with a free column of air extending from behind the column of saline into the syringe as well as into the manometer. Pressure is increased in the system gradually by slowly depressing the plunger of the syringe while watching the column of saline. As the plunger is depressed, the saline meniscus will be altered from a convex configuration to a flat configuration, when the air pressure in the system equals the interstitial pressure in the patient's examined tissue. The manometer reading at this time is the tissue pressure in mm Hg. Precautions were taken not to depress the syringe plunger too rapidly or placing the needle into the tendon, as these may give a false high reading. A new needle was used for each measurement in order to assure accuracy.

METHODOLOGY:

We studied 46 consecutive patients with closed fractures of leg between2ND December To 28 December 2018 . Only those patients presenting within six hours of injury were included in the study. Patients with compound fractures and who presented after six hours of injury were excluded from the study.

Pressure measurements were taken at the level of fracture and at 5 cm and 10 cm away from the fracture site

proximally and distally. Differential pressures were calculated by subtracting the absolute tissue pressure from the patients' diastolic blood pressure.

RESULT:

Patients with high absolute tissue pressure (>50 mm Hg) were subjected to repeat measurements after one or two hours. The diagnosis of impending compartment syndrome was made when the differential pressure was less than 30 mm Hg.

Road traffic accident was the commonest mode of injury and accounted for 62.67% of the cases in our series. Other modes of injury included domestic falls (16%), fall from height (13.33%), sports injury (6.67%) and assault (1.33%).

The compartment pressure was found to be highest at the level of the fracture. A pressure gradient was established as we moved away from the fracture site.

The mean anterior compartment pressures at the level of fracture and at 5 cm and 10 cm away from the fracture site were found to be 31.47 mm Hg, 17.07 mm Hg and 3.41 mm Hg respectively. The mean difference in pressure at 5 cm from the highest level recorded was 14.4 mm Hg and at 10 cm was 28.05 mm Hg. Table 2 shows pressure distribution at different levels of fracture with mean tissue pressure (mm Hg) in Figure 2. Comparison of the pressures of the anterior compartment measured at different levels of the fracture shows *p*-values of < 0.001, which is statistically significant. Statistical analysis was done using Fisher's exact test.

On comparing the mean anterior compartment pressure in different modes of injury, it was found to be more in patients sustaining injuries following road traffic accidents.

Based on the results of the absolute anterior compartment pressures (ACP), differential pressures (DFP) and the presence or absence of clinical features, the patients were divided into four groups.

Group I: patients with ACP < 30 mm Hg and DFP > 30 mm Hg. There were 33 patients in this group. **Group II:** patients with ACP > 30 mm Hg and DFP > 30 mm Hg with no clinical signs of raised pressure. There were 21 patients in this group.

The patients in Group I and Group II were diagnosed as having no compartment syndrome. The fractures in these groups were treated with immobilization in plaster cast or internal fixation as appropriate.

Group III: patients with ACP > 30 mm Hg and DFP > 30 mm Hg with clinical signs of raised pressure. There were 19 patients in this Group. All these patients were kept under observation and treated with splitting of the casts and paddings. The limb was elevated to the level of the heart and hyperbaric oxygen inhalation administered. Repeat pressure measurements were performed at every one or two-hourly intervals until the pressure fell down to the safe range.

Group IV: patients with ACP > 30 mm Hg and DFP < 30 mm Hg. These patients were diagnosed as having acute compartment syndrome and were treated with four-compartment decompression using the double incision fasciotomy technique. In our series only two out of 75 patients developed acute compartment syndrome (incidence 2.67%). Fasciotomies were performed in both the patients within eight hours of injury and the fractures were stabilized with tibial interlocking nails.

Acute compartment syndrome is an acute surgical emergency.5 Early diagnosis and treatment are of the utmost importance in order to avoid long-term disability.11 The clinical features cannot always be relied upon for diagnosis. Compartment pressure measurement is the most reliable and objective method for early diagnosis

11 A number of devices are available to measure intracompartmental interstitial pressure like Wick catheter, Simple needle manometry, Slit catheter, Side-porter needle, Fibreoptic transducer. Most of these devices are either expensive or not easily available in developing countries. Wick catheter and slit catheter has the danger of being left behind in the compartment.

Whitesides' apparatus is one of the devices used for measurement of tissue pressure. The apparatus is simple and effective and can be assembled with the materials easily available in any hospital ward or emergency room. Moreover, it is inexpensive, safe, reproducible and most importantly ideal for use in peripheral hospitals in a developing nation like ours.

s.4–It is evident from our study that young patients, especially men and those sustaining road traffic accidents are at increased risk of developing compartment syndrome.

The critical level of absolute tissue pressure above which decompression should be performed has always been variably reported as 30 mm Hg,17–19 40 mm Hg,20 50 mm Hg.4 Whitesides*et al.*, introduced the concept of relative or differential pressure, stating that ischemia begins when pressure rises to within 10 to 30 mm Hg of the diastolic blood pressure

.6 According to McQueen *et al.*, absolute compartment pressure is an unreliable indication of the need for fasciotomy.21 There is now a growing body of evidence to support this view. Setting an absolute pressure ignores the role of the blood pressure in maintaining an adequate blood flow within the compartment. Tissue viability is dependent on adequate perfusion and the blood flow within the microcirculation is dependent on both tissue and venous pressures.22

We have also taken the differential pressure of less than 30 mm Hg as the criterion for diagnosis of acute compartment syndrome.6,23 In a study using this differential pressure for surgical intervention it was demonstrated that many unnecessary fasciotomies were avoided,

while patients who had developed an increase in compartmental pressure sufficient to cause obvious tissue compromise as seen at the time of fasciotomy were identified correctly.20 Had we used the absolute pressure of more than 30 mm Hg as the threshold for decompression, as recommended

by many authors, then 40 out of 75 patients (53.33%) would have had an unnecessary fasciotomy.16–18 The highest pressure recorded in a patient who did not require fasciotomy was 54 mm Hg, but this was in the presence of a differential pressure of 38 mm Hg. None of the patients in our series had any stigmata of compartment syndrome during a minimum follow-up of six months. This proves that not a single case of compartment syndrome remained undiagnosed on taking the differential pressure of less than 30 mm Hg as the criterion for diagnosing acute compartment syndrome.

Heckmann*et al.*, reported a relationship between compartmental tissue pressures and the distance from the site of the fracture.23 Pressure was measured at the fracture site and in 5-cm increments distal and proximal

In their series, 89% of the compartments had the highest pressure measurement at the fracture site; 5% at 5 cm distal and 2% at 5 cm proximal. The mean difference in pressure 5 cm from the highest level recorded was 10 mm Hg. In the present series also, we have found that the peak pressure in a compartment always lies within 5 cm of the fracture site. A pressure gradient is established as we move away from the fracture site, which is statistically significant ($P < 0.001$). Pressure measurements, therefore, should be carried out as close to the fracture site as possible. Our findings are consistent with those of Heckman *et al.*23

CONCLUSION:

From our study, we conclude that intracompartmental pressure monitoring is a reliable and objective method for early and accurate diagnosis of compartment syndrome. Early diagnosis can minimize the soft tissue damage and therefore improve the long-term results.

We therefore believe that all patients with closed fractures of leg should have routine anterior compartmental monitoring. Whitesides' technique, though not much widely favored, is a safe, inexpensive, easily assembled and reliable method for measurement of intracompartmental pressure in a peripheral setup in developing countries.

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Conflict of Interest: None.

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Original Article

Evaluation of The Results of Idiopathic Clubfoot Management by Ponseti Method in Older Children From 1 To 5 Years of Age

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ABSTRACT

Congenital Talipes Equino Varus (CTEV) is one of the commonest congenital lower limb deformity in children. The Ponseti method has become the gold standard for the treatment of idiopathic clubfoot in early presenting cases but success for late presenting cases is not yet clear. Evaluate the results of Idiopathic clubfoot management by Ponseti method in older children from 1 to 5 years of age. This prospective interventional study was conducted in the Department of Orthopaedics, Dhaka Medical College and Hospital, Dhaka, from March 2015 to November 2016. A total of 26 patients (40 feet) were enrolled in this study as per inclusion and exclusion criteria. Diagnosis of the congenital talipes equinovarus deformity was made by history and clinical examination. Treatment was given according to Ponseti technique which includes weekly serial casting followed by percutaneous tendoachilles tenotomy. After that Steenbeek Foot Abduction Brace was used, regular follow-up was done for nine months and correction of deformity was assessed by Pirani scoring system. Among 26 patients 18(69.23%) were male and 8(30.77%) were female. Patients age were from 12 – 60 months. Bilateral involvement of foot were in 14(53.8%) cases. 24(92.3%) patients had no family history of clubfoot. Percutaneous tenotomy were needed in 30(75%) feet. Average 7 casts (range, 3—15) were required. More or less all the patient used foot abduction brace. Out of 26 patients (40 feet), 35 (87.5%) had satisfactory (good+fair), 5 (12.5%) had unsatisfactory (poor) outcome. This study permits to conclude that results of idiopathic clubfoot management by Ponseti method in older children from one to five years of age is effective.

Key Words: Congenital talipes equinovarus (CTEV), Ponseti method, Pirani score.

INTRODUCTION

Congenital talipes equinovarus (CTEV) also called clubfoot was first depicted in ancient Egyptian tomb paintings, and treatment was described in India as early as 1000 B.C. The first written description of clubfoot was given to us by Hippocrates (circa 400 B.C.), who believed the causative factor to be mechanical pressure.[6] clubfoot is one of the most common birth defects occurs in one in 1000 live births involving the musculoskeletal system. Idiopathic clubfoot is an isolated deformity of the foot and leg that is identifiable in utero and consists of four components: Ankle equinus, hindfoot varus, forefoot adductus, and cavus.[5] Males are more commonly affected than females with a ratio of 2:1 and up to 50% of cases

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are bilateral. It can be associated with other conditions such as spina bifida, arthrogryposis or other syndromes in approximately 20% of the cases.[4] The true etiology of clubfoot remains unknown but proposed many theories are present. Nonoperative correction is commonly accepted today as the standard initial treatment for idiopathic clubfoot.[9] Patients treated with extensive surgeries for clubfoot often developed painful feet with residual deformities over time. Ignacio Ponseti developed and refined his treatment method for clubfoot in the late 1940s. The Ponseti method is a specific method of serial manipulation, casting, and tenotomy of the Achilles tendon to achieve correction of the clubfoot.[6] Regardless of the degree of initial correction, the deformity may relapse up until the age of 7 years and there is a 10-56% relapse rate quoted in the literature.[8] Therefore, with use of foot abduction orthoses, there is an opportunity to minimise relapse.

MATERIALS AND METHODS

This prospective interventional (Quasi experimental) study was conducted in the department of Orthopaedics, Dhaka Medical College and Hospital, Dhaka, from March 2015 to November 2016 for duration of twenty one months. In our study 26 patients (40 feet) were collected with a pre-tested structured questionnaire. Our selection criteria was between 1 to 5 years of age children in both sexes and previously untreated without any associated neurological abnormality. Then pre casting Pirani scoring was done in every patient. According to their scoring Ponseti casting was done until the correction of cavus, adductus and varus (Ponseti casting no 4). For equinus deformity tenotomy was done percutaneously when Mid foot score <1 and Hind foot score >1. Final casting (Ponseti casting no 5) was done after tenotomy (in tenotomy cases) and retain it for 3 weeks. Then starting to use foot abduction brace at night time. Patients were followed up for at least nine months and final scoring was done in nine months follow-up. Data were collected with a pre-tested structured questionnaire containing history, clinical examinations, management, follow up findings and complications. Data were collected compiled and tabulated according to key variables and functional assessment scoring. The quantitative data were presented as mean and standard deviation (SD). Comparison between initial Pirani score and after treatment Pirani score were done by using paired 't'- test. For all analyses level of significance was set at 0.05 and p-value <0.05 was considered significant.

RESULTS AND OBSERVATIONS

A total of 26 patients (40 feet) were treated and followed up for this study. Among 26 patients 18(69.23%) were male and 8(30.77%) were female. The age limit in the study group was from 12 to 60 months. Bilateral involvement of foot was in 14(53.8%) cases followed by right and left foot involvement which was in 10(38.5%) cases and in 02(7.7%) cases respectively. 24(92.3%) patients had no family history of clubfoot. Percutaneous tenotomy was needed in 30(75%) cases, among them complication occur in 2(5%) cases. Average 7 casts (range, 3-15) were required. The mean total Pirani score were 4.35 ± 1.33 and 0.77 ± 0.83 initial and after treatment respectively ($p < 0.001$).

Table I

Comparison of feet by Initial and after follow-up Pirani Score(n=40)

Parameters	Initial score	After last follow-up score	P value
Mid foot score (MFS)	1.83±0.96	0.22±0.40	< 0.001
Hind foot score (HFS)	2.53±0.61	0.55±0.50	< 0.001
Total score	4.35 ±1.33	0.77±0.83	< 0.001
Range	1-6	0 -2.5	

The range of total Pirani score were 1 — 6 and 0 – 2.5 initial and after treatment respectively. The rating of final outcome after 9 months follow-up period among 40 feet, 13 (32.5%) were good, 22 (55%) were fair and 5 (12.5%) were poor. Here Singh, et al. (2011) grading system was used (Good, Pirani score <0.5; Fair, Pirani score 0.5 – 2 and Poor, Pirani score >2).[12] Confidence interval (CI) at 95% confidence level was 77% – 98%.

Fig-1: *Pre and post treatment photograph of a 15 months old boy*

DISCUSSION

The treatment of congenital clubfoot has evolved over the past few decades. Recently, with the perception that extensive soft tissue releases are often complicated by stiffness and residual or recurrent deformities at long term follow-up, there has been considerable interest in the minimally invasive Ponseti method. This method has dramatically reduced the number of extensive soft tissue releases performed in selected centers in both economically developed and underdeveloped regions. The upper age limit for Ponseti method in published series were 2 years. We therefore asked whethere the Ponseti method could achieve initial correction of untreated idiopathic clubfoot in patients presenting between 1 to 5 years of age. The results of our study suggest initial correction of the deformity can be achieved without the need for an extensive soft tissue release in 87.5% of cases.

Ponseti treatment is well accepted today in early age group (upto 2 years) but in late presenting cases is not yet clear. Our study was done in older children from 12 – 60 months of age. Among 26 cases, the highest numbers were in the age group 12 - 24 months which were 18 (69.23%). Rest of 8 (30.77%) cases were from 25—60 months. With increasing age the number of cases were decrease which may be due to availability of its treatment and more concern and worry of the parents about their child deformity since after birth. Spiegel, et al. (2009) done study in Nepalese inbetween 1 to 6 years of age, where number of cases also decrease with increased age.[13] In Romania, Derzsi, et al. (2013) done study with 31 patients aged between 1.5 and 12 years.[3] In Brazil, Lourenco and Morcuende (2007) treated 12 boys and 5 girls with mean age at presentation was 3.9 years (1.2 to 9 years).[10]

In Ponseti method of treatment protocol the main treatment procedure is casting of clubfoot. Agarwal and Gupta (2014) shows number of corrective casts required till tenotomy, increases with age. There was an average increase of one cast for every increase in age of 20 months.[1] In our study number of casts also increases with age but have slight variation. From 1—2 years mean cast required was 7.3 ± 3.21 with a range 3—15, from 2—3 years it was 6.6 ± 1.4 with a range 4—9, from 3—4 years was 9.25 ± 2.75 with a range 6—12 and from 4—5 years was 9 casts respectively. After completion of casting for the equinus deformity tenotomy was done. Tenotomy was done after assessing the equinus clinically and evaluating the Pirani score. When MFS <1 and HFS >1 then tenotomy was done percutaneously with regional anaesthesia. We had done total 30 (75%) tenotomy. Complication was present in 2 (5%) cases. Among 2 cases blister was found in 1 (50%) case and redness of skin in 1 (50%) case. Goriainov, Judd and Uglow (2010) found that of the 80 feet, 28 (35%) were successfully treated with serial casting alone, 51 (64%) required a primary achilles tenotomy.[8] Ford Powell, et al. (2013) also found 76% undergoing tenotomy. Two percent of patients experienced complication.[7] Changulani, et al. (2006) reported tenotomy required in 85 (85%) of feet.[2] In our study more or less all patient use foot abduction brace. Among them 2 patients (4 feet) were non compliance with use of brace initially but after counselling they become compliance with bracing, 3 patients (5 feet) were brace intolerance due to discomfort from skin irritation or inconvenience for first 3—4 weeks. Then after time passing they also cope with brace.

After completion of treatment a final scoring was done in last follow-up (9 months after use of FAB). Comparison of all scores were done with initial score and level of significance also tested. Agarwal and Gupta (2014) found no linear relationship between initial Pirani scores and number of corrective casts.[1] Spiegel, et al. (2009) showed number of casts required was similar between the age groups. The Pirani score for the entire group improved after casting.[13] In our study all the values were reduced significantly after treatment and more correction of feet deformity is possible in younger children than the older children.

Grading of foot was done according to Singh, et al. (2011)[12] and found 13 (32.5%) good, 22 (55%) fair and 5 (12.5%) poor. Level of satisfaction was little bit higher in younger than older group. Good results are more in younger and fair results are more in older group, which represents more correction of deformity is possible in younger group than the older group. Spiegel, et al. (2009) found 94% success in 260 feet from 1—6 years of age.[13] Ponseti and Smoley (2009) found 71% of the feet good, 28% a slight residual deformity persisted and in 1% foot a poor results.[11] In this study, total nine months follow-up was done for all patient. First follow-up was done 2 weeks after use of foot abduction brace, second after 3 months from use of foot abduction brace, third after 6 months from use of foot abduction brace and last after 9 months from use of foot abduction brace. Final outcome was seen after this last follow-up. Regarding final outcome, out of 26 patients (40 feet), 35 (87.5%) had satisfactory (good+fair), 5 (12.5%) had unsatisfactory (poor) outcome. We found an acceptable satisfactory outcome because of less follow-up period. Among several study we found as

long the follow-up period more the recurrence and unsatisfaction. Changulani, et al. (2006) with 100 feet, 96(96%) was responsive and relapse in 31(32%) of responsive feet with a mean period of follw-up of 18 months.[2] Half, Walker and Crawford (2007) with mean follow-up period 35 months showed out of 51 babies (73 feet), 21 (41%) recurred.[9]

In conclusion we can say that treatment of clubfoot by Ponseti technique is effective in older children from one to five years of age. It avoids the complication of surgery in the older children.

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Original Article

Femoral Varus Derotation osteotomy for Legg-Calve-Perthes' Disease: Clinical and Radiographic Observations in 22 Hips

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Abstract

Legg-Calve-Perthes disease is a condition of unknown aetiology affecting the developing hip. Various theories as the underlying cause have been explored, but much remains unexplained. The clinical course of the condition is highly variable. The principles of treatment of Legg-Calve-Perthes' disease are containment and preservation of hip range of motion. The purpose of this study is to evaluate the clinical and radiographic results of femoral varus derotation osteotomy performed in a group of patients with the diagnosis of Legg-Calve-Perthes disease. The present study evaluated the clinical and radiographic outcomes in 22 patients who underwent femoral varus derotation osteotomy as the surgical treatment of LCP disease, between January 2013 and December 2016 in BSMMU hospital. The patients included 19 males and 3 females with a mean age of 8.3 ± 2.6 (range 6-12) years at the time of surgery, with a minimum follow up of 12 months (12-40 months). We used an open-wedge subtrochanteric varus osteotomy with derotation. The osteotomy was held in 20 to 25º of varus and 10 to 1 derotation with a pre-band small DCP and screw. The operations on all the 2 2(n=22) hip were successful without major complication. The mean Merle-Aubigne hip score was 10.6 (range 8-12) before the operation and increased significantly (p<0.05) to 15.4 (range 12-18) during the follow-up. 36% (n=8) of the operations achieved good, 55% (n=12) fair, and 9% (n=2) poor. Our objective was to discuss persistent issues raised by LCPD. No effective preventive strategies are available. Convincing evidence exists now that non-operative treatment is ineffective. Surgical treatments have been shown to provide good outcomes. Femoral varus derotation osteotomy provides permanent femoral head coverage and less restriction of mobility. The results of containment be femoral osteotomy were superior to those treated by conservative methods for patients with severe perthes' disease.

Keywords: Legg-Calve-Perthes' (LCP), Containment, Femoral varus derotation osteotomy.

INTRODUCTION:

Perthes' disease is a self-limiting disease in children; the interruption of the blood supply to the femoral epiphysis is temporary and complete revascularization of the epiphysis is the norm if the child is younger than 12 years at the onset of the No treatment is needed to facilitate the process of revascularization. As the blood supply to the epiphysis is reestablished, the necrotic bone is completely replaced by healthy new bone by a process of "creeping Following the vascular insult part or all of the femoral epiphysis becomes necrotic; this triggers a synovitis, articular cartilage and hypertrophy of the ligamentum These soft tissue changes compounded by muscle spasm cause the femoral head to extrude beyond the acetabular margin. Weight-bearing stresses and forces of muscular contraction are transmitted across the acetabular margin

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onto the extruded part of the femoral head. While normal healthy bone can quite effectively withstand these physiologic stresses, bone of the avascular epiphysis is not capable of withstanding them. So the femoral head may become deformed while revascularization proceeds over a period of 2 to 4 years.

The disease was first divided by Waldenstrom14 into two stages, based on plain radiographic appearance: an initial evolutionary stage and a later stage of healing. Subsequently investigators divided the disease into 4 stages: the stage of avascular necrosis, the stage of fragmentation, the stage of reconstitution or regeneration, and the healed stage. More recently the first 3 stages were further divided into early and late thus enabling clinicians to define the timing of events leading to femoral head deformation more clearly. It was noted that in untreated children femoral head extrusion increased modestly through the initial stages of the disease, but abruptly increased as they reached the late stage of fragmentation, often exceeding This finding clearly suggests that the predilection for deformation increases once the disease evolves to this stage.

The epiphysis is most vulnerable to deformation during the late stage of fragmentation and in the early part of the stage of reconstitution. In the late stage of fragmentation the necrotic bone is being actively resorbed and the dead trabeculae are thus weakened and prone to collapse. On the other hand, in the early stage of reconstitution viable trabeculae of the woven bone that is newly laid down on the periphery of the epiphysis are also prone to collapse, because the bony trabeculae are initially laid down haphazardly and not in the direction that enables them to resist stress.

Current treatments for Legg-calve-perthes' disease are largely based on the principles of obtaining and maintaining good hip range of motion, and obtaining and maintaining containment of the femoral head in the acetabulu It is believed that, if these principles are followed, a soft femoral head will be molded into a spherical shape by the acetabular socket. Containment can be achieved by two different methods. The first involves positioning the femur either in abduction and internal rotation, which can be done by casting, bracing, or surgery on the femur. Alternatively, containment can be achieved by an osteotomy of the pelvis that reorients the acetabulum such that it covers the anterolateral part of the femoral epiphysis or by creating a bony shelf over the extruded part of the epiphysis. The aim of this paper is to evaluate the results of management of perthes disease by varus derotation osteotomy with special reference to Catteral group lll and lV or Herring B, B/C, C.

MATERIAL AND METHODS:

After having approval from the local ethical research committee, the present study retrospectively evaluated the clinical data of the patients who underwent femoral varus derotation osteotomy as the surgical treatment of LCP disease. Between January 2013 and December 2016, 45 patients were surgically treated for LCPdisease in BSMMU hospital. The patients who were older than 12 years or younger than 6 years at the time of surgery, had a history of previous surgical intervention for the same hip joint, and the ones who had combined acetabular and femoral osteotomy at the same session or consequent acetabular osteotomy after the initial femoral varus derotation osteotomy were excluded. The study group consisted of 26 patients. 4 patients who were either lost to follow-up or not attend the final clinical follow-up visit despite being contacted by phone were also excluded. Therefore, the present study evaluated the clinical and radiographic outcomes in 22patients.

The patients included 19 males and 3 females with a mean age of 8.3 ± 2.6 (range 6-12) years at the time of surgery, with a minimum follow up of 12months (12-40 months). 14 of the cases were left hip and 8 were right hip. Preoperatively, 8 hips were in the initial stage and 14 hips in the fragmentation stage based on Waldenstrom's criteria. Extent of the femoral head involvement was classified preoperatively for each of the hips according to lateral pillar classification 6 hips were lateral pillar B, 10 hips were B/C, and 6 hips were C.

We used an open-wedge subtrochanteric varus osteotomy with derotation. The osteotomy was held in 20 to 2 of varus and 10 to 1derotation with a pre-band small DCP and screw. The most proximal screw was placed to cross the trochanteric growth plate. Postoperative immobilization is provided in all cases by Petrie casts for 6 weeks then it is discarded and patient is allowed to resume gradual weight bearing as tolerated. The patients were evaluated by clinical examination every one month for the first 3 months, radiological assessment every 3 months till one year, and then every 6 months after one year. The plate is removed one year later after complete healing of osteotomy site.

RESULTS:

The operations on all the 22(n=22) hip were successful without major complication. The mean Merle-Aubigne hip score was 10.6 (range 8-12) before the operation and increased significantly ($p<0.05$) to 15.4 (range 12-18) during the follow-up (table-). 36% (n=8) of the operations achieved good, 55%(n=12) fair, and 9%(n=2) poor (Table-)

Pain, moderate to severe limitation of ROM, and limp were observed in all patients before surgery. Postoperative ROM for abduction ($p<0.001$) and internal rotation ($p<0.001$) increased compared with preoperative values (Table-II).

The radiographic results at final follow-up revealed near full coverage of the femoral head; however, the femoral head remained larger than normal. Figures 3 and 4 show pre- and postoperation radiographs of patients with lateral pillar Group B and Group C respectively.

Complications related to surgery were encountered in 3 hips, 2 superficial wound infections diagnosed within the first postoperative weeks, were treated successfully with administration of antibiotic therapy and primary wound care. One hip with excessive varus required a subsequent valgus osteotomy.

Table-I

Preoperative clinical and radiographic data.

Patient No.	Sex	Side	Age at beginning	Age at surgery	Preoperative mobilities	Radiological stage (Waldenstrom)	Herring (Lateral pillar)
1	M	R	6y 10m	7y 9m	Abd-20/Ir-15	Fragmentation	B
2	F	L	9	9y 4m	Abd-25/Ir-20	Fragmentation	B
3	M	L	12	12y 3m	Abd-1o/Ir-10	Initial	B/C
4	M	L	6	7	Abd-40/Ir-20	Fragmentation	B
5	M	R	6y 11m	7y 8m	Abd-35/Ir-20	Fragmentation	C
6	M	R	10	10y 5m	Abd-40/Ir-25	Initial	C
7	M	L	8	9	Abd-10/Ir-15	Fragmentation	B
8	M	L	12	12y 4m	Abd-15/Ir-15	Initial	B
9	F	L	10y 8m	11y 5m	Abd-10/Ir-15	Fragmentation	B
10	M	L	9y 5m	10	Abd-20/Ir-15	Initial	B/C
11	M	R	9	9y 6m	Abd-25/Ir-20	Initial	B/C
12	M	R	8	9	Abd-30/Ir-20	Fragmentation	C
13	M	R	7	8	Abd-40/Ir-25	Fragmentation	B
14	M	L	7y 6m	8	Abd-35/Ir-25	Initial	B
15	M	L	8	9	Abd-15/Ir-15	Fragmentation	B
16	M	R	8	9y 3m	Abd-20/Ir-15	Fragmentation	B
17	M	L	11	11y 7m	Abd-10/Ir-20	Initial	B
18	M	L	10y 4m	11	Abd-15/Ir-20	Initial	C
19	F	R	10	10y 8m	Abd-30/Ir-25	Fragmentation	C
20	M	R	8	9	Abd-25/Ir-20	Fragmentation	B/C
21	M	R	6	7	Abd-40/Ir-30	Fragmentation	B
22	M	L	6	7y 3m	Abd-25/Ir-20	Fragmentation	B

Table-II

Clinical and radiographic findings of the patients at the final follow-up.

Patient no	Sex	Pain during motion	Leg length discrepancy	ROM(0)	MAP score(points)	Stulberg
1	M	N/A	N/A	Abd-30/Ir-25	16	1
2	F	N/A	N/A	Abd-35/Ir-25	13	2
3	M	N/A	1 cm	Abd-25/Ir-20	11	2
4	M	N/A	N/A	Abd-45/Ir-30	9	4
5	M	N/A	N/A	Abd-40/Ir-25	11	3
6	M	Yes	N/A	Abd-45/Ir-30	18	1
7	M	N/A	1 cm	Abd-20/Ir-15	10	3
8	M	N/A	N/A	Abd-30/Ir-20	17	2
9	F	N/A	2 cm	Abd-40/Ir-30	6	5
10	M	N/A	1 cm	Abd-25/Ir-20	11	3
11	M	N/A	N/A	Abd-30/Ir-25	11	2
12	M	Yes	N/A	Abd-45/Ir-30	16	1
13	M	Yes	N/A	Abd20/Ir-15	9	4
14	M	N/A	N/A	Abd-45/Ir-30	18	1
15	M	N/A	3 cm	Abd-35/Ir-30	10	2
16	M	N/A	N/A	Abd-30/Ir-25	17	2
17	M	N/A	N/A	Abd-30/Ir-15	11	3
18	M	N/A	N/A	Abd-25/Ir-20	10	3
19	F	Yes	3 cm	Abd-20/Ir-15	6	5
20	M	N/A	N/A	Abd-35/Ir-20	10	2
21	M	N/A	N/A	Abd-45/Ir-30	15	1
22	M	N/A	N/A	Abd-30/Ir-15	9	3

Table-III

Merle-aubigne and poster (MAP) hip score measured preoperatively and postoperatively.

Time	MAP hip scoring	
Preoperative	Range8-12	Average10.6
12 months after operation	12-18	15.4

Table IV

The result of treatment by MAP hip score (n=22)

	MAP hip score	
Excellent improvement	>12	8 (36%)
Good improvement	7-11	12 (55%)
Fair improvement	3-6	2 (9%)
Failure	<2	None

Fig.-1: *Preoperative*

Fig.-2: *Peroperative*

Fig:-3:*Postoperative*

Fig.-1: *Preoperative*

Fig.-02: *Peroperative*

Fig.-3: *After one years*

DISCUSSION:

The challenge for orthopedists in relation to LCPD lies in treating this condition. There has been much discussion about whether there is or is not any definitive possibility of altering what Catterall called the natural history of the disease. There has also been much discussion regarding the treatment that should be applied. Because of the lack of convincing evidence regarding the effectiveness of therapies, these concepts have been applied over the course of the years, based on each author's experience of diagnosing, classifying and managing LCPD.

Legg-Calve-perthes' (LCP) disease is a self-limiting idiopathic disorder which may result in a wide variety of hip deformity[1,4]. The interruption in the blood supply of the femoral head has been attributed to its progression leading to changes in the femoral head, metaphysis, growth plate, and acetabulum[5]. Today, with ongoing debate regarding the exact aetiology, pathogenesis, as well as the treatment over decades since its first description; the optimal treatment for LCP disease has still been controversial[6,7]. The primary objective of treating LCP disease is to prevent secondary degenerative arthritis of the hip joint occurring due to residual problems such as restricted hip motion, leg length discrepancy, incongruity of the hip, aspherical femoral head, coxa magna, and poor coverage of the femoral head[8]. During the recent decades, the concept named as "containment" of the extruded part of the femoral head has gained wide acceptance[9]. Containment methods as the current treatment approach mainly focus on holding the femoral head in the acetabulum to prevent lateral migration of the femoral head during the active stages of the disease while necrotic bone is resorbed and living bone is restored[3,10]. Surgical interventions include proximal femoral varus osteotomy, salter innominate osteotomy, acetabular shelf procedure or combination of femoral and pelvic procedures. Femoral varusderotationosteotomy has been one of the most widely known surgical techniques since first described by Axer[12]. Shah mentioned that it was easy to perform, as effective as a pelvic osteotomy, and did not increase intra-articular pressure[8].

The main purpose of the present study was to analyses the clinical and radiographic results of femoral varus derotation osteotomy performed in a group of patients with the diagnosis of LCP disease between 6 -12 years of age.

Age at onset of LCPdisease has been reported as a significant determinant for the prognosis of the disease especially in the aspect of obtaining a spherical femoral head at maturity[6,19]. Saran et al[1] reported that patients at 6 years of age and older were more likely to have better femoral head sphericity from surgical treatment than Nonoperative treatment. Wiig et al[21] conducted a study to determine the prognostic factors and evaluate the outcome of different treatments of LCPdisease and they concluded that in children over 6 years of age at diagnosis, proximal femoral varus osteotomy yielded a significantly better outcome than orthosis or physiotherapy. According to the results of the current study, patients younger than 10 years of age during surgery had significantly better MAP scores as well as better radiologic outcome evaluated as Stulberg's classification.

Waldendenstrom[22] described the 4 radiographic stages of the LCP disease in 1922. Herring et al[15] developed a prognostic classification based on the height of the lateral epiphyseal pillar in 1992. Based on the radiographic stage and lateral pillar classification, many authors suggested radiographic status at which surgery was undertaken directly affected femoral head sphericity at maturity as better results following containment surgery could be obtained in patients with lateral pillar group A or B involvement as well as the ones operated at the initial or early fragmentation stage[3,13]. Joseph et al[9] emphasized that for children in the stage of regeneration it was too late to prevent femoral head deformation by performing containment surgery. Hoikkaet all[24] noted that the results of containment were poor if done in the healing phase of the disease. In our study group, hips with lateral pillar group B or C involvement preoperatively had significantly better outcome in the aspects of both MAP scores in clinical evaluation and Stulberg classification indicating the sphericity of the femoral head as well as congruency

of the hip joint in radiographic evaluation. We did not perform femoral varus derotation osteotomy in the stage of re-ossification because we agree that it is too late to prevent deformity by surgical means after regeneration stage began.

We note some limitations of the present study. First, it was a retrospective evaluation of a prospectively followed patient group. Second, our cohort included limited number of patients. Third, the follow-up was 4 years which was not enough to evaluate the course of the disease following femoral varus derotation osteotomy as well as the progression to degenerative arthritis.

CONCLUSION:

Our objective was to discuss persistent issues raised by LCPD. No effective preventive strategies are available. Convincing evidence exists now that non-operative treatment is ineffective. Surgical treatments have been shown to provide good outcomes. Femoral varus derotation osteotomy provides permanent femoral head coverage and less restriction of mobility. The results of containment be femoral osteotomy were superior to those treated by conservative methods for patients with severe perthes' disease.

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Original Article

Management of Distal Femural Fracture by Distal Femoral Locking Compression Plate for Open Reduction and Internal Fixation Technique

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INTRODUCTION

Femur is the longest and strongest bone of the body which is suspected to break by major trauma. Fracture of distal femur occurs 4-7% of all femur fracture which is almost always due to high energy trauma like motor vehicle accidents, motor cycle accidents, fall from height. Frequently it is associated with injuries of multiple organ system. (Martinet O et al, 2000).

This fractures are often unstable and comminuted tend to occur in elderly or multiple injured patient. The goal of treatment of distal femoral fracture are restoration of alignment ,length and rotation, anatomical reduction of articular fracture, preservation of blood supply to aid union, prevention of infection, rehabilitation of the extremity and maximizing overall function of the limb. Distal femoral fractures, especially comminuted fractures are difficult to treat. Previously the trend in treatment of these fractures leaned towards closed conservative management with traction, casting, or a combination of both. (Andertion R. ,1967)

The problems associated with conservative management are the limitation of reduction and difficulty of maintaining reduction. As orthopaedic surgery has evolved, trends in treatment of supra-condylar and inter-condylar femoral fractures now more commonly involve operative management. (Schatzker,1979).

Internal fixation devices that have been used to treat these fractures include the 95°angled blade plate, dynamic condylar screw plate, condylar buttress plate and retrograde supra-condylar inter-locking nail. However, as the complexity of fractures needing treatment has changed from simple extra-articular supra-condylar types to inter-condylar and metaphyseal comminuted types, these implants may not be ideal. locked plating techniques have been advocated. (Schutz M ,). Locking compression plate has a smaller application device and allows both locking and compression screw fixation of the femur shaft. (FRIGG, R., 2003).

Both compression and splinting for fracture stabilization can be given through the same implant (Wagner M. , 2003 & Cantu RV,2006)

The introduction of plates with the option of locked screws has provided means to increase the rigidity of fixation in osteoporotic bone or in periarticular fractures with a small distal segment where traditional screw purchase is compromised. LCP is technically easier to apply than others. (Heather A.May,2009).

The stability of fracture fixation with an ordinary plate is based on the friction induced by compression between the plate and the cortex but that with the locking plates depends on the angular stability produced by matching screws and the plate.(Egol KA,2004)

For the comminuted fracture LCP fixation relies on the principle of bridge plating. So anatomical reduction of intermediate fragment is neither sought nor necessary. Accurate positioning and fixation are require to produce satisfactory results.There are two technique of use LCP – open & MIPPO technique. (PARREN S.M, 2005) .

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Open technique is practiced in less facilities area. (Yeap, E.J., 2007). Fixation of this fractures by traditional plates result in varus angulation because of movement at screw plate interface and to prevent this needs double plating. Traditional plates need direct reduction & act as a compression devise. LCP has both compression & bridging technique so either technique can be done by using one plate depending on fracture site. Only one LCP give proper stability to medial & lateral component simultaneously without needs of double plating.

LCP may be technically easier to apply than the traditional plate. Screws are locked to the plate. So stability is maintain at angular –stable screw plate interface & it is difficult for one screw to pull out or fail unless all adjacent screws fail. There are two technique of use LCP – open & MIPPO technique. As our resources are limited, here we used open technique. So this study may help to find out most effective and easiest Orthopedic Surgical technique.

Aim and Objectives

1. General objectives:

To assess the success rate of locking compression plating in distal femoral comminuted fracture.

1. Specific objectives:

a. To ascertain the rate and time taken for union

b. To determine range of movement ,any deformity or shortening

b. To assess the functional outcome of treatment including motion of knee joint.

3. Anatomy of distal femur:

The term 'distal femur' traditionally comprises the lower third of the femur (Fig 1.a & 1.b). This zone is the literature varies greatly between the distal 7.6 cm and the distal 15 cm of the femur.

The supracondylar area of distal femur is the transition zone between the distal diaphysis and the femoral articular condyles. At the diaphyseal-metaphyseal junction, the metaphysis flares, especially the medial side, to provide platform for the broad condylar weight-bearing surface of the knee joint. Anteriorly between this condyles is the smooth articular depression for patella and posteriorly the intercondylar notch

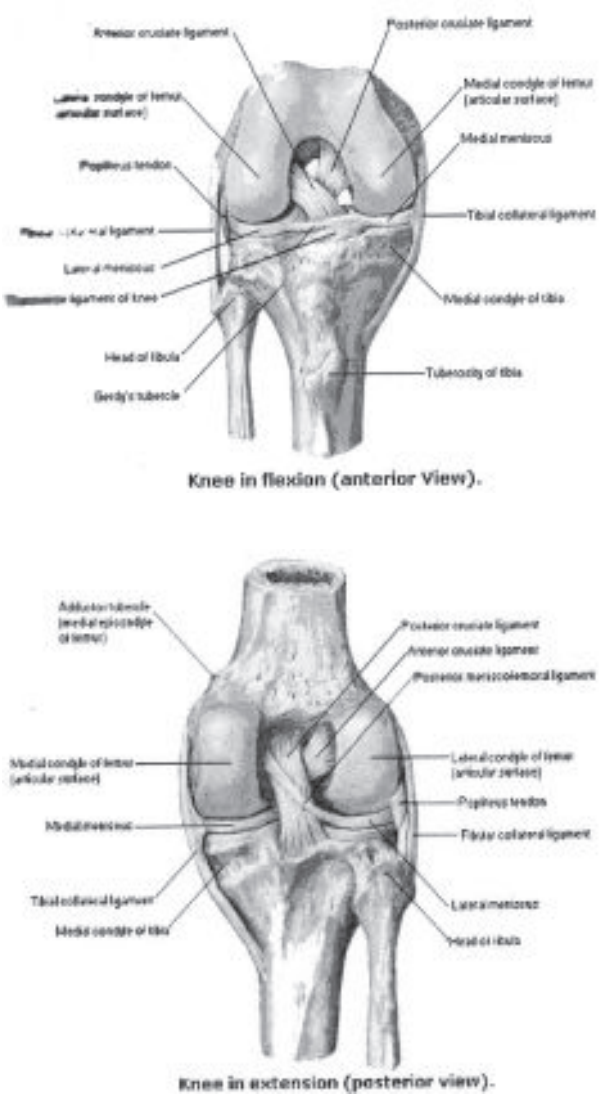

Fig.-4: ***Knee interior (After Neter, 1998)***

BIOMECHANICS OF DISTAL FEMUR & KNEE:

Biomechanics is very important because both the injury and the surgery affect the function of the knee joint. Impaired knee function is common after suparacondylar fracture because of the associated injury to the quadriceps muscle and other surrounding soft tissue regardless of whether or not an arthrotomy is performed. (Delong and Bennett 1966).

Anatomically the knee is classified as a freely mobile joint of the hinge type. However, several kinematics studies have confirmed that motion in the knee is not that of a simple hinge but is an extremely complex series of movements about variable axis and in three separate planes during the course of a normal gait cycle. Flexion and

extension do not occur about a fixed transverse axis of rotation but rather about a constantly changing center of rotation, that is, polycentric rotation describes a J-shaped curve about the femoral condyles (Gunston 1971). Flexion and extension, of the knee occurs by both rolling and gliding motion between femoral and tibial condyles. Not only flexion and extension occurs in the sagittal plane but also adduction and abduction occurs in coronal plane and internal and external rotation occurs in the transverse plane. Motion in all three planes has been measured to be approximately 70 degree of flexion

Materials and Methods

Study design : This prospective interventional study was under taken to evaluate the result of open reduction & internal fixation of distal femoral comminuted fracture by LCP.

Study period : 01/ 01/2015 to 31/ 12 /2015 (12 months).

Place of study : Dept. of Orthopaedics and Traumatology, 250 Bedded General Hospital, Tangail.

Study population : All patients with clinical and radiological evidence of distal femoral comminuted fracture were admitted in this hospital for operation.

Preoperative preparation

In all cases a detailed history and clinical examination were done. Investigations like complete blood count, random blood sugar , serum creatinine, x-ray chest posterior-anterior view& ECG were done routinely. X-ray of the affected thigh including hip and knee joints (A/P and lateral view) were performed to defined the pattern of fracture and to defined ideal implant position, size and screw placement. Informed consent was taken & preanaesthetic check-up was done in time.

Surgical Technique

Selected cases were treated by Distal Femoral Locking Compression plate under spinal anesthesia. Painting and drapping was done and torniqette was applied. Incision was given on the lateral side of the distal thigh.Bone was exposed and plate was attached to bone then fixed by locking screws.

Postoperative management

During postoperative period limb was supported by long leg back slab for 2 weeks. . Isometric quadriceps exercise was stared 24 hours after operations. Stitches were removed on the 12^{th} to 14^{th} postoperative day. The patients were allowed to ambulate as long as pain is tolerable using crutches without weight bearing on operated limb. Adequate antibiotics were given for 2 – 3 weeks in all cases.

Advice on discharge

The following advices were given on discharge

1) Regular Quadriceps exercise.
2) Active movement of hip and knee joints after removal of back slab.
3) Crutch ambulation without weight bearing on operated limb.
4) Follow up at outpatient department every 6 weeks interval.

Follow up schedules and activities

1) All patients were advised to attend at follow up sessions at at 6^{th}, 12^{th}, 18^{th}, and 24^{th} week up to a minimum of 9 months.
2) Each patient were evaluated both clinically and radiologically.
3) If there was radiological evidence of healing (callus), the patient was allowed to toe-touch walking and thereafter gradual weight bearing.
4) Full weight bearing was allowed after radiological evidence of consolidation

Observations and Results

The present study was carried out between January 2015 and December 2015 in 250 Bedded General Hospital,Tangail.Total 20 patients of fracture of distal femur were selected. The purpose of the study was to evaluate the outcome of treatment of distal fracture of femur by Locking Compression Plate. Follow- up period from 1 month to 12 months. All the relevant findings obtained from data analysis are presented in tables & figures .

AGE DISTRIBUTION:

Table I

Age distribution of the participants (n = 20)

Age (yrs)	Frequency	Percentage
≤ 30	04	20.0
31 – 40	06	30.0
> 40	10	50.0

Mean age = (40 ± 12.1) years; range = (20 – 70) years.

Out of 20 patients, half (50 %) was > 40 years, 20% 30 or < 30 years and 30 % 30 - 40 years old. The mean age of the patients was 40 ± 12.1 years and the lowest and highest ages were 20 and 70 years respectively

Affected limb:

Table II
Distribution of the limb affected (n = 20)

Side	Frequency	Percentage
Right	17	85.0
Left	03	15.0

Out of 20 patients, 17 (85%) presented with right distal femoral fracture and only 3 (15%) with left distal femoral fracture.

5.3 Duration of hospital stay:

Table III
Duration of hospital stay (n = 20)

Duration (wks)	Frequency	Percentage
2 – 3 weeks	14	70.0
>3–4 weeks	06	30.0

Out of 20 patients, two-third (14) of the patients stayed in the hospital for 2–3 weeks and the rest > 3–4 weeks .

5.4 Evaluation of outcome:
5.4.1 Range of knee motion:

Table IV
Outcome of patients based on range of knee motion (n = 20)

Range of knee motion (degree)	Frequency	Percentage
$> 130^0$	08	40
110^0– 130^0	09	45
90^0– 110^0	02	10
$<90^0$	01	5

Objective evaluation of outcome revealed that 8(40%) patients exhibited wide range of knee motion ($> 130^0$), 9(45%) patients slightly restricted knee motion ($110–130^0$), 2(10%) moderately restricted knee motion ($90–110^0$) and 1(05%) extremely restricted knee motion ($<90^0$)
Status of union:

Table V
Distribution of patients by status of union (n = 20)

Status of union	Frequency	Percentage
United	16	80.0
Delayed union	04	20.0

Radiological evaluation of fracture site showed that 80% united and 20% had delayed union .

DISCUSSION

Current fracture patterns involve complex comminuted types due to the prevalence of high speed vehicles. Improved health care results in a longer lifespan and subsequently presents us with more osteoporotic fractures which were previously treated using conservative methods. The LCP is a single beam construct where the strength of its fixation is equal to the sum of all screw-bone interfaces its unique biomechanical function is based on splinting rather than compression resulting in flexible stabilization, voidance of stress shielding and induction of callus formation (Yeap EJ et al 207).

In this study, the age of the patients were between 20-70 years, mean age being 40 years. Almost similar findings were reported by Ricci et al, 2001where the average age of the patients was 39 years.

Total numbers of cases were 20. In the study of Mark Millar et al, 2004 total number of case was 20 and in the study of Weight and Collinge, 2004 total number of case were 22.

Among 20 patients 16(80%) were male and 4 (20%) were female. Male-female ratio was 4.1. In the study of Ricci et al, 2001 male-female ratio was 8:3 and in the study of Yeap EJ et al 2007, the male-female ration was 4:1.

85% patients were affected on the right side and 15% patients were on the affected on the left side.

Analysing the mechanism of injury, it was found that most (95%) of patients sustained injury due to high energy trauma. Among 95% patients, 70% patients sustained injury form motor vehicle accident, 15% from motor cycle accidents, 10% due to fall from height and only 5% of distal femoral shaft fractures occurred due to bullet injury. EJ yeap et al, 2007, reported in there study that all of distal femoral fractures were due to high energy trauma-motor vehicle accidents and fall.

In this study 50% patients were operated within 2 weeks of injury & 70% of the patients stayed in the hospital for less than 3 weeks. In the study of Jahangir 2002, 60%

operated within 14 days & it was 83.33% patients study in the hospital for 3 weeks.

In this study there were two malalignment one is Varus 5^0 & another valgus 7 degrees. In the study of Ostrum et al, 1995 varus & valgus were 5 degrees & 12 degrees respectively. In the study of Janzingalas, 1998 varus & valgus were 5 degrees & 10 degrees respectively.

In the study of Jahangir 2002 there were 2 patients with posterior angulation of 5^0 and 6^0 respectively and 1 patient with 6^0 Valgus and 1 patient with 7^0 Varus deformity.

In this study two patient developed shortening. One was 1cm & another was 1.5cm. In the study of Krettek et al,2001 shortening were > 1cm in 2 patient & in the study of Janzing et al,1998 1cm shortening were in 4 patients.

In this study there was no infection. In the study of Jahangir 2002 Superfecial infection rate was 6.6%. Ostrum et al, 2004 & Janzing et al,1998 did not found any infection in their studies. All other patient had closed fractures and antibiotic coverage started one hour before operation and continued 2 weeks postoperatively. All patients were in close supervision in the postoperative period.

There were 2-3 cm quadriceps atrophy in 3 (15%) patients at 12 weeks follow up. Proper physiotherapy is at utmost importance in combating the pre and post operative quadriceps atrophy.

Regarding range of knee motion, eight (40%) patients had knee motion > 130 degrees. nine (45%) patients had 110-130 degree and three (15%) patients had < 90 degrees of motion. In the study of Ostrum et al, 2000 average range of knee motion was 120 degrees. In the study of Weight & Collinge, 2004 average range of knee motion was 114 degrees.

Successful fracture union was defined as complete bridging callus in three cortices, together with pain less full weight bearing. In this study there was 100% union rate but 2 (10%) delayed union. Ricci et al 2004 found non-union & Ostrum et al, 1995 found 3% non-union in their study.

All fractures united within average 16 weeks and were able to bear weight within 12 weeks of fixation. Period of fracture healing was average 18 weeks in the study of EJ yeap et al, 2007, 18.27 weeks in the study of Ostrum et al, 2000 and 14.8 weeks in the study of Mark miller et al, 2004.

In this study two patients complained moderate type of pain in the knee joint, almost similar to the findings of Yeap EJ et al, 2007 who found moderate knee pain in one patients of their study.

In the final follow-up, according to Schatzker and Lambert,1979 the satisfactory result (excellent and good) was 85% of which 45% excellent and 40% good results. This findings was all most similar to the findings of Mark Millar et al 2004, which was 87.5%, in the study of Rade marker et al, 2004 & Bolhofne et al 1996 Satisfactory result were 84%. In the study of Bolhofne et al 1996 excellent were 45% & good were 44%.

So fixation of distal femoral comminuted fracture by LCP is an effective method of treatment.

CONCLUSION

In this study outcome of distal femoral comminuted fracture treated by Locking Compression Plate demonstrated excellent to good result in majority of the cases. Sixty percent of the cases returned to routine preinjury activities without limitations and one-quarter with mild limitations. Distal femoral Locking Compression Plate provide stable fixation in distal femoral fractures,

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Original Article

Management of Fractures of the Distal Femur by Distal Femoral Locking Plate by MIPO Technique

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ABSTRACT

Distal femoral fracture is one of the common skeletal injury accounting about 06% of all femoral fractures.. It is more common in young adults (high energy) which is often open and intra articular.1/3 of them present with poly trauma. In elderly it is due to low energy and associated with osteoporosis or periprosthetic fracture. Few injuries present more difficult problems during surgery due to severe soft tissue damage, comminution and intra articular extension. Fractures of the distal femur can be challenging to manage and are on the increase in the elderly osteoporotic population. Management with casting or bracing can unacceptably limit a patient's ability to bear weight, but operative fixation has been associated with a high rate of re-operation. In this study, we describe the outcomes of fixation using modern implants within a strategy of early return to function. This prospective study was done on 15 patients (M-12, F-03) with distal femoral fracture from January 2013 to December 2017. Rasmussen's scoring system was used to evaluate the functional outcome at the end of 6 months. All fractures in our series united. Average union time were about 16 weeks (range of 12 to 24 weeks). Of 15 patients only two developed restricted ROM of about 70º. Average time for full weight bear were 16 weeks (range of 12 to 24 weeks). There were two superficial wound infection which were controlled by appropriate antibiotic & dressing. According to Rasmussen's scoring system the final result were excellent in 10 (66.66%), good in 4 (26.66%), fair in 2 (13.33%), poor in 0. The MIPO technique combined with distal femoral locking plates resulted in favorable outcomes in our small series. The technique appears to be useful and safe.

Key words : Fracture, distal femur, distal femoral locking plate, MIPO.

Introduction

Fractures of the distal femur are severe injuries that present many clinical challenges to the orthopaedic surgeon. Nonunion, delayed union, implant failure, and the need for secondary procedures can reflect complications of healing. The fracture must be accurately reduced and fixed with enough stability to allow early joint motion and patient rehabilitation. In current practice, most distal femur fractures are internally fixed using multi hole locking plates.[1] Although their treatment evolved during the last years, distal femoral fractures still remain challenging for orthopedic surgeons, due to their high complication rate. The incidence of these fractures is around 37 per 100,000, representing 4-6 % of all femoral fractures [1-2]. Regarding the epidemiology which is differentiated by age, traumatic energy and fracture aspect. Distal femoral fractures in young patients appear after high energy trauma, usually produced by a frontal collision mechanism, frequently associated with poly trauma, whilst elderly sustain fragility fractures on osteoporotic bone, due to low energy trauma,

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mainly falls [3]. In both these categories, fixation is usually difficult in distal femoral fractures due to either involvement of the articular surface and comminution (in the young age group), or poor bone stock (in the older age group) thus surgery has to be properly indicated and performed.

Distal femur fractures have traditionally been treated with open reduction and internal fixation through a standard lateral approach. New, "minimally invasive" internal fixation techniques, however, have been developed in an effort to devascularize the bone less than the traditional method. This article reviews the literature on distal femur fractures treated with locking plates to determine the reported rate of healing difficulties.

Classification of Distal Femur Fractures [AO/ASIF] [4]

- **A – Extra-articular [Supracondylar Fractures]**
  - A1 – Simple
  - A2 – Metaphyseal, wedge
  - A3 – Metaphyseal, complex
- **B – Partial articular**
  - B1 – Lateral condyle (sagittal fracture line)
  - B2 – Medial condyle (sagittal fracture line)
  - B3 – Frontal (coronal fracture line) {Hoffa's fracture}
- **C – Complete articular**
  - C1 – Articular and metaphyseal segments, simple fractures
  - C2 – Articular simple, but metaphyseal multifragmentary fractures
  - C3 – Articular and metaphyseal segments, multifragmentary fractures

The lateral minimally invasive approach for plate osteosynthesis (MIPO) consists of a short lateral approach overriding the lateral condyle to the distal femur as well as a short lateral approach to the mid shaft or proximal femur depending on plate length, and small stab incisions for direct reduction and percutaneous screw placement. A medial approach to the distal femur may be used to expose a medial distal femoral or Hoffa-type fractures.

The surgical approach for type A fractures may be as minimal invasive and respect as much of the fracture biology as possible. This usually can be achieved by minimal invasive plate osteosynthesis (MIPO). This

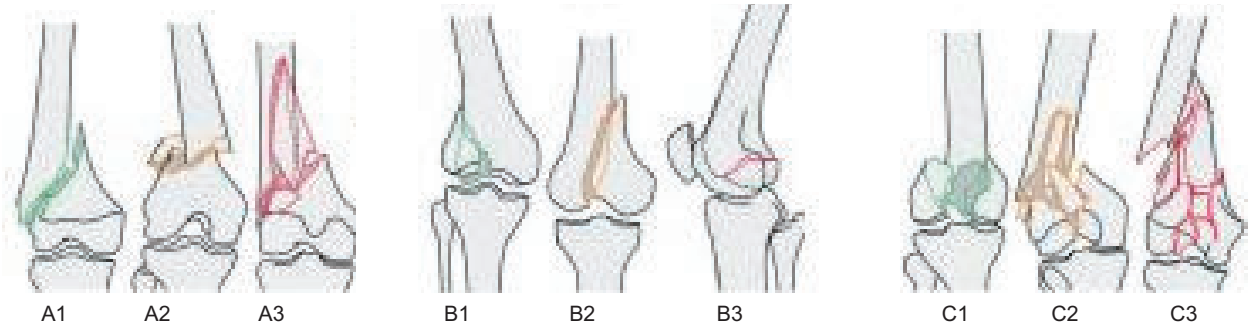


Fig.-1: *Muller AO classification for distal femoral fractures (region 33) from* www. afoundation.org

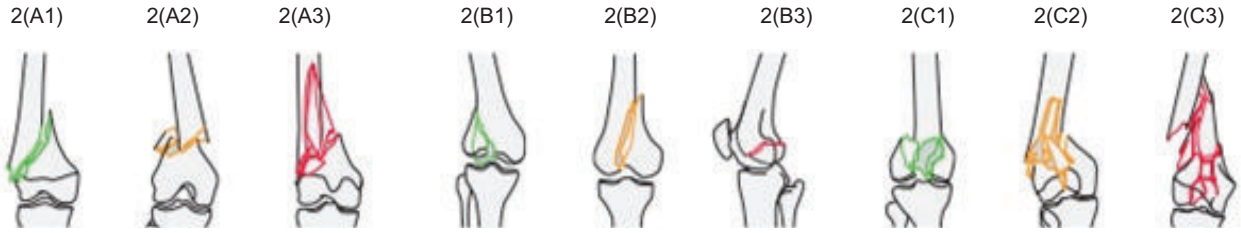


Fig. 2 (A) Extraarticular fracture
A1 simplex
A2 metaphyseal wedge and/or fragmented wedge
A3 metaphyseal complex

Fig. 2(B) Partial articular fracture
B1 lateral condyle, sagittal
B2 Medial condyle, sagittal
B3 Coronal

Fig. 2 (C) Complex articular fracture
C1 Articulr simplex, metaphyseal simple
C2 Artic, simple, metaphyseal multifragmentary
C3 Articular multidiagmentary

approach allow bridging the fracture zone with the implant. This stands in contrast to open reduction and internal fixation of intermediate fragments where blood supply and, consequently, the healing process may be impaired. Restoration of axial alignment, length and rotation of the fractured femur is minimizing changes to the load-bearing axis of the lower limb as well as decreasing impact on the entire musculoskeletal system by gait alterations.

Advantages of MIPO

- The implant can be used in a minimally invasive manner
- The advantage of closed reduction and internal fixation is a greater preservation of the fracture biology in the metaphyseal / diaphyseal area
- This leads to higher union rates, less infection and fewer wound complications[5]

Distal femoral locking compression plate

The LCP Distal Femur Plates are part of the Large Fragment LCP System. With a design and footprint based on the Distal Femur LISS Plates, the LCP Distal Femur Plates feature Combi holes along the shaft and threaded locking holes in the plate head. The Condylar LCP is a modification of the former condylar buttress plate. Locking-head screws in the plate, producing angular stability. The locking head screws distally have prevented varus collapse, even in cases of osteoporosis.[6]

FEATURES & BENEFITS

- Round threaded locking holes in plate head accept 5.0 mm locking screws and 4.5 mm cortex screws
- LCP Combi holes in the plate shaft accept 4.5 mm cortex screws in the dynamic compression unit (DCU) portion, 5.0 mm locking screws in the threaded portion, or a combination of both
- The preshaped, low-profile plate minimizes potential issues with soft tissues and reduces need for plate contouring
- A tapered, rounded plate tip facilitates a minimally invasive surgical technique
- Plates available in stainless steel and titanium, with 5, 7, 9, 11, and 13 holes for left and right femurs.[7]

MATERIALS AND METHOD :

This prospective study was conducted in department of orthopaedics of a tertiary care teaching hospital of Dhaka from January 2013 to December 2017 with a minimum follow up period of one year.

- Study Period: From January 2013 to December 2017
- Study Type: Prospective
- Total number of patients: 15 (M-12, F-03)
- Technique: MIPO
- Implants: Distal femoral anatomical locking plate
- Place of Study: Dhaka Medical College Hospital and other private clinics of Dhaka.

Inclusion Criteria

- AO type 33A & 33C fractures
- Close fractures
- Adult patient

Exclusion Criteria

- Open fractures
- Pathological fractures
- Inability to reduce the fractures by indirect means

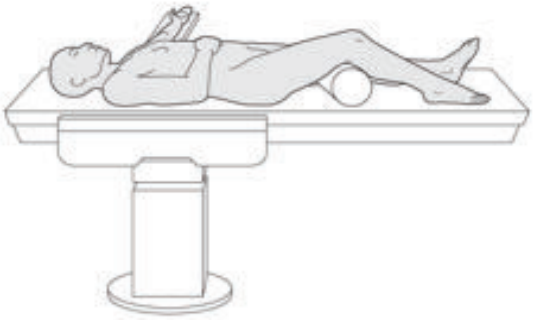
PROTOCOL FOLLOWED

All our patients received initial management as per ATLS protocol. Permission from ethical committee was taken prior to commencement of study and preoperative counselling and informed consent of all the patients included in the study regarding the treatment, operation and study was obtained. A total of 15 patients with distal femoral fractures were included in study. The fractures were classified as per AOOTA system. All patients were evaluated clinically and proper history of the incident was elicited. The fractured limb was splinted in a Bohler Braun frame with the application of skin traction. Patients with open wounds received immediate wound lavage and were put on intravenous antibiotics, which continued post operatively according to requirement. Radiological

evaluation was done to assess the type of fracture, included antero-posterior and lateral X-Ray of the femur along with a pelvic X-ray to rule out proximal fractures. CT scan was done as per requirement. Preoperative investigations were done consist of complete blood count (CBC), renal function test, fasting or random blood sugar, viral markers. A blood group cross match of patient was sent to the blood bank prior to surgery. A chest X-ray and ECG were done for anaesthesia team. After getting all preoperative evaluation and fitness for surgery patients were operated with distal femoral locking compression plate (DFLCP). Surgeries were planned under spinal anaesthesia in most of cases on radiolucent operative table. Tourniquet applied where fracture site permitted, after templating limb was stabilized using various leg stabilizers and sand bags

Surgical procedure

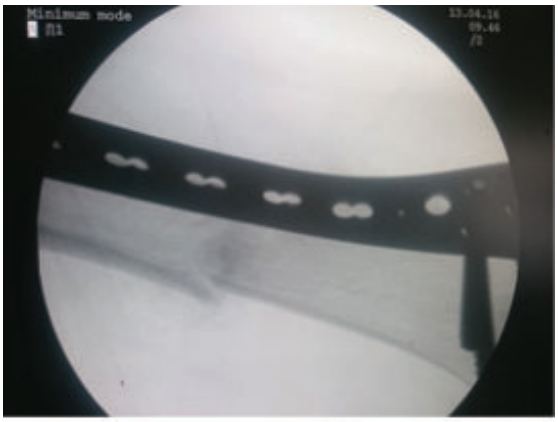
- All patients underwent a spinal anaesthetia and received a perioperative antibiotics (usually a 3rd-generation cephalosporin+ Clindamycin)
- Position the patient supine on a radiolucent table with the knee in 30° flexion

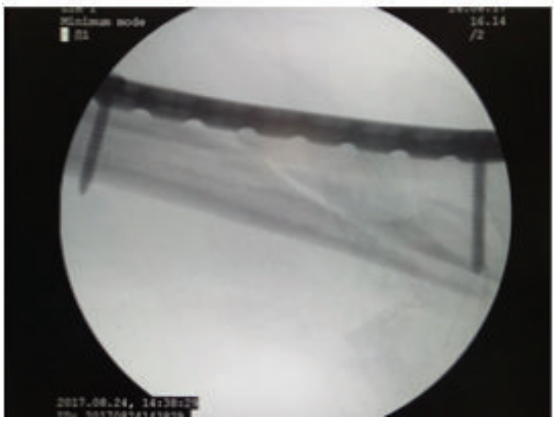


Cushion under the knee relaxes gastrocnemius and restores femoral bow

- The lateral MIPO approach combines a short version of lateral approach to the distal femur and a minimally invasive approach to the mid shaft or, proximal femoral region
- A small incision is placed 2 cm posterior to the patella which is laterally extending distally as required only in case of intra-articular extension.
- The operative incision deepened until submuscular plane was reached.
- Locking plate of appropriate length was selected and passed through the submuscular plane along the lateral border of shaft of femur.
- Proximally another small incision was placed to centre the plate on the lateral cortex.
- Reduction was achieved either by manual traction or with the help of condylar LCP using indirect reduction technique

- A plate length with 4 to 5 screws were chosen in each of the distal and proximal femur
- Plate was provisionally fixed with k wires in the femoral condyles as well as in the diaphysis
- Final positioning of the plate & reduction is confirmed by using image intensifier





- Then fixation with cancellous (distal) and cortical (proximal) locking screws were carried out
- After satisfactory fixation, stability was assessed under image intensifier
- Wound closed with drain left in situ and compressive dressing applied

Aftercare

- Gentle ROM exercises, quadriceps exercises, ankle and toe pump exercises were initiated from the 2nd postoperative day onwards.
- Patients were allowed to have non weight bearing walking for the first 6 weeks following which progressive weight bearing was allowed depending on the radiological evidence of progress of healing

Follow up

- Supervised rehabilitation with clinical and radiological follow-up were done after 2, 6 and 12 weeks & then 6 weeks interval till 6 months
- Full weight bearing usually after 3 months, considering radiological union

RESULTS

Mean age of these was 42.86 years (range, 18–67 years) Fracture patterns and outcomes of our population.

Patient	Age	Sex	Fracture	Outcome
1	67	M	33 A.1	Healed
2	29	M	33 C.3	Healed
3	27	F	33 A.1	Healed
4	22	M	33 A.2	Healed
5	18	M	33 C.1	Healed
6	46	M	33 C.3	Healed
7	39	M	33 A.3	Healed
8	55	F	33 A.3	Healed
9	60	M	33 C.2	Healed
10	51	M	33 C.1	Healed
11	33	M	33 A.3	Healed
12	28	M	33 A.2	Healed
13	66	M	33 A.1	Healed
14	47	M	33 C.3	Healed
15	55	F	33 A.3	Healed

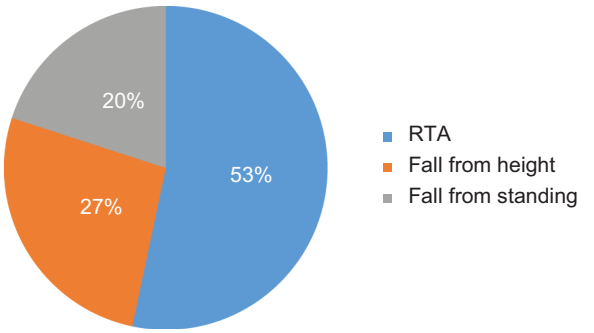
Sex distribution

Most of the patients were male (12) where as only 3 were female.

Mode of injury

Eight of these injuries were caused by road traffic accident and four from fall from height.

- Road traffic accidents – 8 cases;
- Accidental fall from height - 4 cases;
- Accidental fall from standing - 3 cases, or, resuming, 12 fractures produced by a high energy trauma, and 3 cases by low energy trauma.



Mechanism of trauma n=15

The 3 low energy fractures appeared in patients over 60 yrs, thus having osteoporosis as main cause, while from the rest of 12 patients, only 2 having over 60 yrs and the rest less than 60 yrs; in all the cases, the type of the force was the same, bending the distal femur, thus overwhelming the resistance of the bone.

TYPES OF FRACTURE

According to AO classification, there were nine (60%) type A (simple) fracture patterns, and six (44%) type C (complex) fracture patterns.

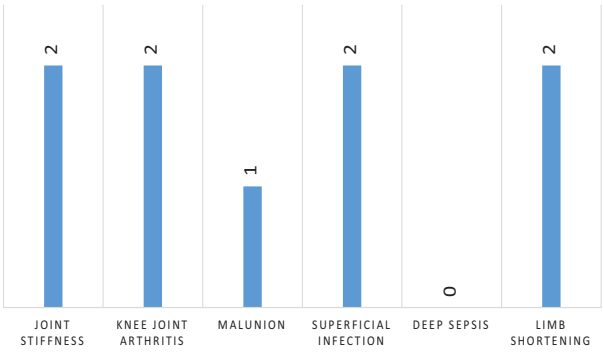
Type of fracture (AO)	Number of patients
A1	3
A2	2
A3	4
C1	2
C2	1
C3	3
Total	15

The average duration of hospitalization was 13 days (range 6-32 days). The variation in duration of hospital stay could be due to different reasons such as associated injuries, compound injuries which require debridement and external fixators need to follow the strict post-operative physiotherapy which could have affected the course of treatment and rehabilitation and some patients who preferred to stay in hospital till suture are removed due to social reasons.

The average operative time was 90 minutes (range, 60–180 minutes), and average C-arm time was 112 seconds (range, 72–180 seconds). There was no varus or valgus mal-alignment greater than 10 degrees.

All fractures were followed-up at least until fracture union. Average follow-up was 10.8 months (range, 5–18 months).

Average union time were about 16 weeks (range of 12 to 24 weeks). Average time for full weight bear were 16 weeks (range of 12 to 24 weeks).



Post operative complications

There were two superficial wound infection which were controlled by appropriate antibiotic & dressing. Of 15 patients only two developed restricted ROM of about 70º.

The local complications were represented by:

- Joint stiffness - 2 cases
- Knee arthritis - 2 cases
- Malunion - 1 case
- Superficial wound infection - 2 cases
- Deep septic complications – none.
- Limb shortening – 2 (>1cm)

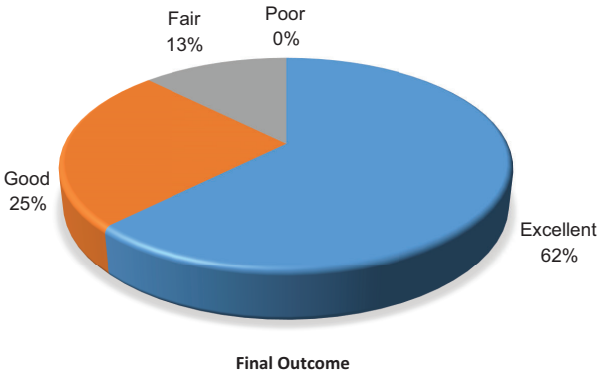
Rasmussen's scoring system[8] was used to asses the functional outcome at the end of 6 months.

Rasmussen's Scoring System

Rating	Pain	Walkingcapacity	ROM	ClinicalSigns	Stability
Excellent	No	Normal	Normal	NO	Normal
Good	Minimal	Walking outdoor for at least 1h	75% of normal	+	Minimal
Fair	Occasional ache	Walking outdoor for 15 min	>50% of normal	Swelling, ++	Instability in flexion
Poor	Pain at rest	Walking indoor only	50% of normal or less	+++	Instability in flexion as well as in extension

According to Rasmussen's scoring system the final result were

- Excellent in 10 (66.66%)
- Good in 4 (26.66%)
- Fair in 2 (13.33%)
- Poor in 0



DISCUSSION

Distal femoral fractures affect primarily the function of the knee, even in cases when the fracture is extra-articular, because failure to restore the functional angles of the distal femur directly impairs the joint motion and stability. That is why the main objectives for the surgical treatment of these fractures are similar to any other articular fracture-restore articular surface, the bone contact, the metaphyso-diaphyseal angle, the rotation of distal femur and the stability of the knee. Due to these tasks, when treating such a fracture, the orthopedic surgeons must establish first what is damaged and then how it can be fixed[9]. Proper chose of implant must take into consideration not only the indications of the implants, but especially their limits. The outcome of these fractures depends primarily on the characteristics of the fracture (the more comminuted the fracture is, the more severe complications are to be expected), type C being the most difficult to treat. Bone quality influences the outcome since osteoporotic fractures have a poor prognosis and request for special implants with angular stability. Previous knee joint pathology usually enhances the chance of post-traumatic osteoarthritis, especially if reduction and fixation fail to restore functional anatomy.[10-11]

The treatment of distal femur fractures has evolved over the last 50 years to locking plates through an interesting series of fixation techniques and devices. Neer et al and Stewart et al both recommended closed treatment in the 1960s reporting only 52% to 54% acceptable results after operative intervention compared with 67% to 90% acceptable results in their nonoperative group.[12,13] Closed techniques often with traction followed by a cast brace were commonly used through the 1980s; however, better surgical implants and AO techniques of internal fixation combined with dissatisfaction in non operative methods because of deformity, nonunion, and joint stiffness led to internal fixation becoming the treatment of choice in the 1970s. Wenzel et al and Schatzker et al reported 73.5% to 75% good or excellent results after internal fixation compared with only 32% after non operative treatment.[14,15] The blade plate and the supracondylar plate and lag screw often combined with acute bone grafting became the preferred techniques with nonunion rates reported from 0% to 4.2% and acceptable results of 74% to 80%.[16-18]

Locking plates solve many of these problems. Locking plate constructs with multiple fixed-angle screws provide better stability in the osteoporotic distal femur. Locking plates facilitate bridge plating of comminuted metaphyseal segments, whereas multiple distal screws are used to fix the reduced multi fragmentary articular segments. Locking plates and associated insertion guides were easily adapted for minimally invasive insertion techniques that facilitated closed indirect reduction of metaphyseal fragments and maintained the soft tissue attachments to bone-preserving blood supply.[14,15] In comminuted fractures, functional alignment is emphasized over anatomic reduction of the metaphysis and union occurs by secondary bone healing through callus formation

Biologic plating techniques preserved fragment vascularity and bone grafting was not routinely required.[11-14] These less invasive techniques have been widely used to insert locking plates for distal femur fractures. Biological plating is the concept that is particularly useful in comminuted articular or metaphyseal fractures that cannot be nailed. This technique described by Mast et al. [19] uses "indirect reduction", which minimises direct exposure and muscle stripping, reducing the fracture by distraction using either a distractor, tension device, or lamina spreader. In 1997, Wenda [21] and Krettek [22] introduced a percutaneous plating technique called "minimally invasive plate osteosynthesis (MIPO)". MIPO has gained popularity and has continued to evolve in the last decade. Farouk et al. [20] studied the vascular supply to the femur in the cadaver and compared the effects of two surgical plating techniques, the conventional lateral plate osteosynthesis and MIPO, on femoral vascularity. The results showed that MIPO maintained the integrity of the perforators and

nutrient arteries and was associated with superior periosteal and medullary perfusion.

The combination of excellent stability by locking plates and minimally invasive biologically plate insertion technique lead to improved healing rates over previous devices. Unfortunately, clinical experience and some reports in the literature indicate that fracture healing may not be better than that achieved with previous methods of fixation.[17-18]Difficulties with fracture healing in the distal femur may present clinically as an established nonunion, delayed union, a need for secondary procedures, implant failure, and late loss of alignment.[33]

The mean age in our study was 42.86 years with better results obtained in both young as well as old patients. Rajaiah *et al*.[26] reported a mean age of 44 years with better result in younger age patients than older age. Virk *et al* [27] reported a mean age of 36.64 years with positive results obtained in both old as well as young patients. Charles N Cornell *Et al* [29] carried out a study on use of DF-LCP in peri prosthetic fractures with average age of patient ranging 69.4 years to 76.7 years was able to obtain 77.6%union rate with very few malunion, thus making it the implant of choice for distal femoral fractures across all age groups. Scope of DF-LCP is limited not only to isolated distal femur fractures but also in the use of peri-prosthetic distal femur fractures in patients of Total Hip Replacement (THR) and Total Knee Replacement.(TKR). [30]

In present study, out of 15 patient 12 were males. Similar male preponderance was reported by other studies [15,16]. This male preponderance in present study could be attributed due to the fact that males are mainly exposed to high energy trauma in Indian scenario.

In our study, most of the injuries were caused by road traffic accidents affecting mostly males. We had 9(53%) RTA injuries and 4(27%) fracture due to fall. Similar pattern was also observed in other studies [15-17]

Since the fracture is usually reduced by closed reduction through the soft tissue window away from the fracture site, malalignment is a more common complication compared to conventional open reduction. To prevent malalignment, Krettek et al. [22] recommended various techniques to assess the correct limb length, axial alignment, and rotation. Rotational deformity was one of the complications in MIPO. Krettek et al. [32] reported the rotational deformity of 14 distal and proximal femoral fractures treated with MIPO—two had malrotation more than ten degrees and four had malrotation of nine degrees. In eight complex distal femoral fractures treated with transarticular MIPO [31], two had malrotation of 15 degrees. We found one case had 20 degrees of internal rotation deformity due to the technical error which results in malunion.

Limb length discrepancy (LLD) occurred in 8% of 51 paediatric femoral shaft fractures treated with submuscular plating [38]. Of 14 proximal and distal femoral fractures using MIPO described by Krettek [32], there were three cases of 1.5 cm LLD and three cases of LLD more than 2 cm. In our study we found two cases of shortening more than 1 cm (1.4 and 1.7 cm). Both of these had segmental comminution since there was no cortical contact between the distal and proximal fragments for determining the correct length. In such cases, preparation of both lower limbs to compare the lengths or using the meterstick technique is recommend.[36-37]

In the frontal plane mal-alignment, there were no initial malreductions greater than five degrees because the screw reduced the plate and the bone closed together. There was one case of late angulation of the plate of ten degrees at six-months follow-up. In the sagittal plane, there were two patients with 12 and 14 degrees of recurvatum. However, these deformities posed no clinical morbidity with follow-up.

There are few reports of MIPO of the femoral shaft in young adults because femoral shaft fractures which can be fixed by plate are better stabilised with interlocking nails. Kanlic et al. [23] reported 51 cases of paediatric femur fractures treated with submuscular bridge plate with excellent healing in all cases and early functional recovery. There were four patients (8%) who had leg-length discrepancy, one patient with a broken plate, and one refracture of a pathological fracture after early plate removal. Sink et al.[28] described the percutaneous submuscular bridge plating in the treatment of 27 unstable paediatric femoral fractures with early stable bony union in 11.7 weeks without significant complications. These two reports describe paediatric femoral shaft fractures in which the healing is faster than in adults. There was a report describing the MIPO of the femoral shaft in adults using the condylar blade or condylar screw. Wenda et al. [21] reported 17 cases of comminuted femoral fractures treated with the MIPO technique, where 13 cases had excellent healing and three needed bone grafting.

CONCLUSION

Distal femoral fractures are a challenge for the orthopaedic surgeon considering the difficulties in fracture healing,

poor outcomes, and the high rate of complications, although the development of new surgical techniques[33-35]. In our opinion the use of locking plates is an emerging technique to treat this kind of fractures but it seems more challenging than expected. The orthopaedic surgeon should be able to use all the fixation devices available in order to face up the possible issues that can occur in the surgical management of distal femoral fractures.

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Original Article

Evaluation of the results of displaced supracondylar fracture of Humerus (Gartland Type II & III) in children treated by closed reduction and percutaneous cross k-wire fixation under C - Arm Guidance

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ABSTRACT

This study has been designed to assess the success rate of Closed reduction and percutaneous cross K-wire fixation with the help of C-Arm in the management of displaced supracondylar fracture of humerus (Gartland Type II & III) in Children. To assess the success rate of closed reduction and percutaneous cross K-wire fixation of displaced supracondylar fracture of humerus (Gartland Type II & III) in children. Prospective interventional study (Case series) was conducted from July 2014 to April -2016 in Dhaka Medical College Hospital. A total no. of 30 patients of displaced supracondylar fracture of humerus presenting between ages 3-12 years. All patients were treated by closed reduction and percutaneous cross K-wire fixation. Regular follow up was targeted for at least 9 months. Results were evaluate according to Flynn's grading. Mean age was 6.85± 2.37 years, number of patients were 30, left side were more affected. Male were more affected 22 (73%) than Female 8(27%). Average Hospital stay period was 1.26 days, mean follow up duration was 4.93 ± 0.739 months. There were five excellent (16.66%); twenty one good (70%), one (3.34%) fair and three (10%) poor results according to Flynn's grading. Complications included four(13.33%) case of pin tract infection, Four (13.33%) cases of Fracture blister, one (3.33%) case of ulnar nerve palsy, two (6.66%) cases of inadequate pin Fixation at first attempt. Displaced supracondylar fracture of humerus (Gartland Type II & III) treated by closed reduction and percutaneous cross K-wire fixation is a better method of treatment with less chance of complication.

Key words: Supracondylar fractures, percutaneous, cross k-wire.

INTRODUCTION:

Supracondylar fractures of the humerus account for 60% of all the fractures around the pediatric elbow.[5] The extension type of supracondylar fracture of the humerus is the most common, occurring in 95% of cases. About one-third show little or no displacement and in these treatment is simple. The remainder is associated with varying degrees of major displacement which is difficult to treat.[4] Closed reduction and percutaneous pinning under C-Arm guidance is the procedure of choice for the

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treatment of these fractures whenever possible and the original Swenson technique of cross pinning continues to be used today with excellent re-sults and low morbidity.[2] The most popular method of treating the severely displaced unstable supracondylar fracture was described by Dunlop. Other methods are modifications of Dunlop's, employing skeletal traction through the olecranon, pulling horizontally or vertically. Treatment in traction frequently results in significant loss of carrying angle. Treatment by open reduction and internal fixation is not popular because the method too frequently results in limitation of motion. Edmonds described a method of percutaneous Kirschner wire transfixation of supracondylar fractures in children.[3] Completely displaced supracondylar fracture of the distal humerus is a difficult injury to treat. The recent literature supports closed reduction and percutaneous pinning as the treatment of choice, but occasionally there is an irreducible supracondylar fracture with soft tissue interposition. A severely displaced supracondylar fracture during childhood is a challenging injury to treat, with the fear of developing Volkmann's ischemic contracture and later on the cubitus varus deformity, closed reduction and cast application is thought to be inappropriate for this injury; most surgeons now tend to favour closed reduction and percutaneous pinning.[8] The risk of iatrogenic ulnar nerve injury is always a concern during insertion of K-wire. It was found that the torque required to produce 10^0 of rotation is 37% less with the use of two lateral parallel pins than with the use of medial and lateral pins. It has been argued that insertion of two lateral cross-pin will provide a biomechanically stable fixation with avoiding the risk of ulnar nerve injury.[5]

MATERIALS AND METHODS:

Prospective interventional study (Case series) was conducted from July 2014 to April 2016 in Dhaka Medical College Hospital. Purposive sampling (Non randomized) was done according to availability of the patients and strictly considering the inclusion and exclusion criteria. A total no. of 30 patients of displaced supracondylar fracture of humerus presenting between ages 3-12 years. Displaced supracondylar fracture Gartland type –II and III (Extension type) and closed fracture were included. A complete history regarding the cause and mechanism of injury with duration was taken. Thorough physical examination was performed. After initial resuscitation with intravenous fluid, non steroidal analgesics and antibiotics. All cases with associated injuries were admitted in the ward. Informed written consent was taken from patient's guardian. Patient under general anaesthesia was placed on operation table with supine position and the child's arm on a radiolucent arm board. Gentle traction was applied by gripping the wrist and distal forearm and the forearm kept supinated and elbow was flexed about 20^0 to avoid tethering the neurovascular structures over an anteriorly displaced proximal fragment. Counter traction applied by the assistant on the arm. Three to four minutes after traction the length of the arm restored first. It disimpacted the fracture. Next any lateral or medial tilt was corrected by the fingers on the proximal fragment and thumb on the distal fragment. In this position the carrying angle was checked and compared with the normal side. After reduction of frontal plane the reduction was checked with fluoroscopy (C-arm). In a good reduction elbow could be fixed upto 120^0 without difficulty. In acute flexion the distal fragment is locked by the triceps bridge. To avoid dangerous complication radial pulse checked at each step of flexion and kept at a lower angle where vascularity is safe. The reduction was checked by fluoroscopic images in anteroposterior, lateral and oblique planes. When the reduction seems satisfactory, fracture was pinned. Using a hand drill or electric drill two K-wires 1.5 to 1.8 mm in diameter were inserted through both lateral and medial epicondyles. The pins were pushed up to the opposite cortex 3 cm proximal to the site of insertion. Positions of the pins were checked by fluoroscope. If the post reduction fluoroscopic images were satisfactory the pins end were cut outside the skin. A well padded long arm plaster splint was applied. The elbow was kept at a right angle and forearm pronated. Within 24 hours if there was no sign of neurovascular complication the patient allowed to go home and advised to come after 1 week for next visit. Regular follow up was targeted for at least 9 months. Results were evaluate according to Flynn's grading.[6] Data was collected, compiled and tabulated according to key variables and functional assessment scoring. Postoperative final outcomes were evaluated using confidence interval. For all analyses level of significance was set at 0.05 and p value <0.05 was considered as significant.

RESULTS AND OBSERVATIONS

A total number of 30 patients were enrolled in this study as per inclusion and exclusion criteria. Diagnosis of the supracondylar fracture of humerus was made by history, clinical examination and radiological evidence. Patients were treated with closed reduction and percutaneous cross k-wire fixation under C-Arm guidance. The youngest patient in our series is 3 years old and the oldest is 12 years. Majority were in 5-8years. Out of 30 patients more male 22(73%) were affected than female 8(27%). Among them 19(63%) presented with Left sided Supracondylar fracture of humerus and 11(37%) with Right sided Supracondylar fracture of humerus. 15 (50%) cases gave

history of fall from tree, 6 (20%) cases gave history of fall from bed, 4 (13%) cases gave history of fall during playing, 5 (17%) cases gave history of RTA due to fall from bicycle. Type-III fracture was predominant (63%), type –II fracture was (37%). Among them 16 (53.34%) were operated between (13-18) hours of receiving injury, 11 (36.66%) within (7-12) hours and 1 (3.34%) within (0-6) hours of injury and 2(6.67%) within (19-24) hours of injury, mean interval between injury and Operation was 8.06 ± 5.52 hours. 22 (73.33%) of the patients stayed in the hospital for 1 day and 8 (26.66%) of the patients stayed in the hospital for 2 days. The mean duration of hospital stay was 1.26 ± 0.4498 days. Mean loss of motion of elbow was 9.53 ± 5.048 degrees & mean loss of carrying angle was 8.5 ± 5.6124 degree's. Functional Outcome was analyzed by Flynn's grading.[6]

Table-I

Functional outcome Shows in loss of motion and carrying angle (n=30).

Loss of motion in degree	Loss of carrying angle in degree	Grading	Percent (%)
1-5	1-5	Excellent (5)	16.66
6-10	6-10	Good (21)	70
11-15	11-15	Fair (1)	3.34
16-22	18-25	Poor (3)	10

In this series 4 (13.33%) patients developed pin tract infection, 4 (13.33%) patients developed fracture blister. All are superficial infection and culture shown staphylococcal infection, according to sensitivity, antibiotic was given and cured. In this series 1 (3.33%) patients Ulnar nerve palsy and 2 (6.66%) patients had inadequate pin fixation in first attempt. The pins had to removed and re-fixed after second reduction. In this study, all patients were treated by closed reduction and percutaneous cross K-wire fixation. In this study there were 5 (16.66%) cases with excellent, 21 (70%) were good and 1 (3.34%) were fair and 3 (10%) were poor functional outcome in medial-lateral cross-pining. In this series, satisfactory result (Excellent, Good and Fair) of cross-pinning cases were 27(90%) and unsatisfactory result (poor) were 3(10%). among the population we have found almost 80% to 100% satisfactory result by this procedure. It is quite acceptable outcome.

DISCUSSION

This study was carried out in DMCH from July 2014 to April 2016. In this series supracondylar fractures have been classified according to Gartland's typing. The magnitude of displacement correlates with the severity of elbow swelling and neurovascular complication. Only the displaced supracondylar fractures of humerus in children were included in this study. These types of fractures are associated with higher degree of swelling. In this series, sample size was 30. The fracture was found more common in boys 22(73%) than girls 8(27%). In all series of supracondylar fracture, there was a higher frequency in male patients. Shoaib et al. in 2012 found 70% male & female 30% with sample size 20 and Sarwar in 2003 found 66.67% male & 33.34% female.[10,11] No author, however have mentioned the reason behind that higher male prevalence. Supracondylar fractures of humerus occur commonly in the first decade, peaks at 5 to 8 years of age and decrease in incidence until age 15 years. In this study mean age of the patients were 6.85 years. Edmonds, Roocroft & Mubarak in 2012, found mean age of 5.8 years and El-Adl et al. in 2008, found mean age of 6.1±3.07 years.[3,5] High incidence rate of supracondylar fracture in children is due to relative weakness of bone than combined strength of anterior capsule and collateral ligaments in a hyperextension elbow. In this study the older children were associated with greater displacement. In this study most common cause of supracondylar fracture was due to fall from tree 50%, fall from bed 20%, fall from bicycle 17%, fall during playing 13%. Sarwar in 2003, found most common cause fall from height 46.66%, fall from bed 6.66%, fall during playing 20%, fall due to RTA 26.68%.[10] There was no direct injury and in all patients elbow was in extension at the time of injury of fall. Position of the forearm at the time of impact determines the distal fragment, posterolateral and posteromedial. In this series, type II & III fractures were included, with no open fracture. The relative frequency was 19 out of 30(63%) type III and 11 out of 30(37%) type II. In 2011, Dua et al. in their series of supracondylar fracture also found type III fracture as most common.[2] Type III fractures were common in older children and associated with severe swelling and deformity. In this study, there was no vascular complication. Only 1 patient had ulnar nerve palsy. The incidence was 3.33% in this series. At 12 weeks of follow up the nerve function was improved. Pin tract infection 4 (13.33%), The infection was superficial and overcome by antibiotic therapy with culture and sensitivity but some degree of scar tissue remained, which could not interfere the final outcome. Fracture blister 4(13.34%), but the infection were superficial. After culture and sensitivity test, antibiotics was given in every cases and the problem was

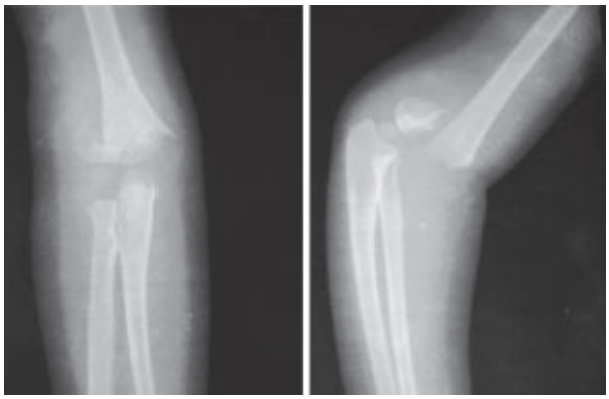

Fig-1: *Preoperative x-ray of 8 years old boy*

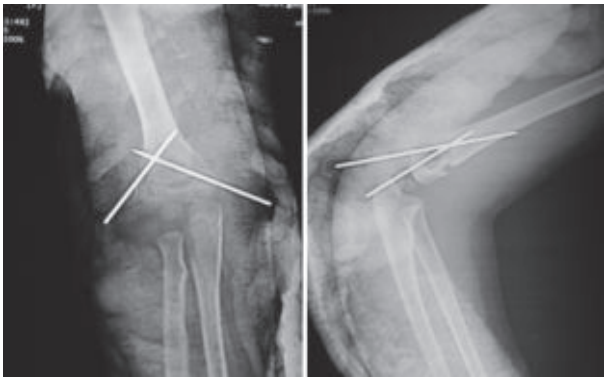

Fig-2: *Postoperative x-ray of 8 years old boy*

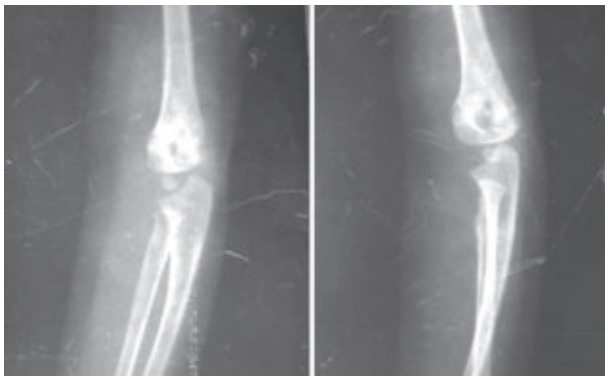

Fig-3: *Follow up x-ray of 8 years old boy*

solved. In other series, Flynn et al. 1974, cited an incidence of 18% vascular and 8% neural complications in his 72 displaced supracondylar fracture study.[6] In 2012, Shoaib et al. got 2(10%) patient cubitas varus, 1(5%) elbow stiffness, 2(10%) pin tract infection and 1(5%) transient ulnar nerve palsy, vascular compromise was reported in none of the patient.[11] In this study, closed reduction and percutaneous cross 'K'-wire fixation was done across the fracture to the proximal fragment. The limb immobilized in a back slab keeping forearm in neutral of pronation-supination and elbow at 90° flexion. Pins were removed at 3-4 weeks. All fractures united at 4 to 6 weeks. Out of 30 patients 5(16.66%) cases were excellent, 20(70%) were good and 1(3.34%) was fair and 3(10%) were poor result. The overall satisfactory result (including the excellent, good and fair) was 90%. In other series of supracondylar fracture, Pirone, Graham & Krajbich, 1988 has done a comparative study of 325 supracondylar fracture of the humerus in children by different methods of treatment. In 4.6 years follow up he reported 78% excellent and good results by percutaneous pinning technique, While only 51% excellent results in those treated by closed reduction and plaster immobilization.[9] In 1974, Flynn et al. achieved 98% satisfactory results.[6] In this study 10% with no loss of flexion of elbow. Among other 10% shows 1^0-5^0 loss of flexion, 60% shows 6^0-10^0 loss of flexion and 20% shows 11^0-15^0 loss of flexion. Mean loss of flexion of elbow was $9.53^0 \pm 5.048^0$. In other series, Anowar et al. 2011, the mean loss of elbow flexion was $8.38^0 \pm 3.10^0$ and Foead et al. 2004, the loss of elbow flexion was 8.68^0 in medial-lateral pin fixation, the loss of elbow flexion was 11.26^0 in two lateral pin fixations.[1,7] In this study, 10% with no loss of carrying angle, 13.33% shows loss of carrying angle was (1-5) degree, 56.66% shows (6-10) degree and 20% shows (11-15) degree. Mean loss of carrying angle was 8.5 ± 5.024 degree. In the management of displaced supracondylar fracture, the key to the success depends on the accuracy of reduction and maintenance of reduction. Immobilization procedure can be selected upon

Fig-4,5,6: *Final outcome of elbow after 12 weeks follow up*

the type of injury and surgeon's choice. A swollen elbow compromises the vascularity and is difficult to stabilize. So to ensure vascularity the elbow is kept at 90º or between 70º-90º. Percutaneous cross K-wire fixation can solve the problem. Good functional outcome is our goal. Considering all aspects, it can be concluded that closed reduction and percutaneous cross k-wire fixation is a better method of treatment of displaced supracondylar fracture of humerus (Gartland Type II & III) in children.

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Original Article

Outcome of Balloon Kyphoplasty in The Management of Osteoporotic Vertebral Compression Fracture

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ABSTRACT

Vertebral compression fractures are associated with chronic pain, decreased health related quality of life and high health care costs. Balloon kyphoplasty is a widely used vertebral augmentation procedure.To find out the outcome of balloon kyphoplasty in the management of osteoporotic vertebral compression fracture. This quasi-experimental study was carried out in the Department of Orthopaedics, BSMMU, Dhaka from July 2015 to June 2017. 20 patients with osteoporotic vertebral compression fracture diagnosed on the basis of presenting complains and clinical examination. Investigations were purposively selected according to the selection criteria. After preparing the patients for surgery, balloon kyphoplasty was done. Post-operatively, patients were evaluated clinically by Visual Analog Score (VAS), functionally by Oswestry Disability Index (ODI), kyphotic angle and anterior vertebral height (AVH). All the data were collected in predesigned questionnaire. In this study maximum, mean age of the patients was 63.60 ± 8.17 years within the range of 50 – 77. Female were predominant (85.0%) than male (15.0%). Most of the fractures were wedge (90.0%) and rest 10.0% cases were concave. Most of the fractures were moderate (90.0%) and rest 10.0% were severe type. Post operative complication (cement leakage) was in 2 (10.0%) cases. The mean VAS score was reduced significantly from 7.05 ± 0.60 to 1.90 ± 0.45. The mean ODI score was reduced significantly from 67.00 ± 3.72 to 17.50 ± 1.73. The mean Kyphotic angle was reduced significantly from 14.80 ± 0.80° to 7.12 ± 0.37°. The mean AVH was improved significantly from 53.95 ± 8.50% to 69.35 ± 3.25%.Balloon kyphoplasty is an effective procedure in the management of osteoporotic vertebral compression fracture.

Keywords: Balloon kyphoplasty, Osteoporotic vertebral compression fracture

INTRODUCTION

Osteoporosis is a systemic skeletal disorder characterized by compromised bone strength that predisposes individuals to increased fracture risk (Friedman, 2006). Worldwide, approximately 200 million women have osteoporosis (Johnell et al., 2004). It is estimated that 20% of individuals over 50 and 45% of white women over 50 haveosteoporotic VCFs (Lieberman et al., 2001).

The prevalence of low BMD among peri and postmenopausal Indian women was found 53% (Aggarwal et al., 2011).

Osteoporosis is a public health problem worldwide. Vertebral compression fractures occur spontaneously or more commonly occur as a result of minimal trauma from day-to-day activities, such as bending forward, twisting,

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lifting objects, and even sitting from a standing position onto a low chair. The risk of vertebral fractures rises rapidly with age for both men and women. In the United States and Europe, women are two to three times more likely than men to experi-ence a vertebral fracture (Cooper et al., 1992). In a population-based study, the age adjusted incidence of clinically diagnosed vertebral fracture was 145 per 100,000 person years in women compared to 73 per 100,000 person years in men (Cooper et al., 1992). The lifetime prevalence of clinical vertebral compression fracture among Caucasians is approximately 15% for women and 5% to 9% for men, based on epidemiological data from the USA and Sweden (Kanis et al., 2000; Melton et al., 1992). Preva-lence of vertebral compression fractures increases with age (O'Neill et al., 1996).

Acute osteoporotic VCF is usually associated with intense deep pain, tenderness to palpation at the site of the fracture and often lasts from 2 weeks to 3 months. Prolonged sitting, standing, bending, and motion exacerbate the pain. Rest, recumbency, heat, and diversion may produce symptomatic relief. Paraspinal muscle spasm and ligament tenderness are common and can extend several levels up or down from the site of fracture. Irritation or compression of nerve roots can result from the fracture, with pain radiating anteriorly along the rib cage with thoracic osteoporotic VCFs or down into the buttocks or legs with lumbar osteoporotic VCFs. Spinal cord compression and myelopathy are rare with osteoporotic VCFs (Truumees and Garfin, 2005).

There is substantial morbidity with osteoporotic VCFs. Patients experience reduced quality of life, difficulties with activities of daily living, loss of independence, depression or low self-esteem, impaired gait, poor balance, and higher mortality rates (Silverman, 1992; Gold, 1996; Lombardi et al., 2005). Vertebral body height loss and progressive kyphosis result in reduction in volume of the thoracic and abdominal cavities leading to reduced pulmonary function and early satiety, respectively (Silverman, 1992; Gold, 1996).

It is important to accurately diagnose vertebral compression fractures due to osteoporosis. Depending on the physician's findings from the patient's history, physical exam, and X-ray, additional diagnostic tests may also be needed. such as: 1. A CT scan, to see whether or not the fractured bone is stable and/or to see if the adjacent nerves near the fracture are being irritated or may be affected by the fracture. Because a CT scan can show soft tissue (e.g. nerves) as well as bone and it can take cross-sectional images of the spine, it provides the physician more information than an X-Ray. 2. An MRI scan may be ordered if the doctor suspects that there may be some other cause of the patient's pain (e.g. a herniated disc), or if there is a chance that nerves near the fracture are affected. An MRI scan shows a high level of detail of the soft tissues (e.g. nerves, discs) surrounding the fracture that may be affected. 3. A nuclear bone scan may be used to help determine when the fracture occurred. The age of the fracture is sometimes important to know to help guide treatment options (Boden, 2005).

The ideal goal of treatment of a patient with osteoporotic vertebral compression fracture is to alleviate pain and reduce and stabi-lize the fracture. There are various treatment modalities of osteoporotic vertebral compression fracture. They are general medical management, open surgi-cal treatment, and percutaneous vertebral body augmentation. Percutaneous vertebral body augmentation procedures include vertebroplasty and kyphoplasty. In kyphoplasty, a balloon is in-serted into the vertebral body with the dual purpose of fracture reduction and void creation. (Truumees et al., 2004; Ledlie and Renfro, 2006). It is well known that the degree of kyphosis correlates with poor levels of physical functioning (Kado et al., 1999). The advantages of kyphoplasty include better correction of the kyphotic deformity by restoration of height of the vertebral body. Grohs et al. showed that kyphoplasty provided a mean correction of the kyphotic angle of 6° (Grohs et al., 2005). Pain relief associated with percutaneous vertebral body aug-mentation treatment is as high as 96% at a mean of 48 month follow-up (Grados et al., 2000). A more recent randomized controlled trial showed that in patients with acute, painful, vertebral fractures, kyphop-lasty improved quality of life, function, mobility, and pain more rapidly than did non-surgical management, with significant dif-ferences in improvement between the groups at one month (Wardlaw et al., 2009). In a similar study of Yu et al. (2014) 187 patients with 251vertebras received balloon kyphoplasty. The mean VAS decreased from a preoperative value of 7.7 to 2.2 at one day ($p<0.05$) following operation and the Oswestry Disability Index improved from 56.8 to 18.3 ($p<0.05$). The kyphotic angle improved from a mean of 14.4° before surgery to 6.7° at one day after surgery ($p <0.05$). The mean anterior vertebral height increased significantly from 52% before surgery to 74.5% at one day after surgery ($p <0.05$) and 70.2% at one year follow-up. Minor cement extravasations were observed in 11.5% cases.The aim of this study is to evaluate the outcome of balloon kyphoplasty in the management of symptomatic vertebral compression fracture.

Meterials and Methods

Study design:
This was a Quasi-experimental study.

Duration of study
This study was conducted from July 2015 to June 2017.

Place of study:
This study was conducted in the Department of Orthopaedics, Bangubandhu Sheikh Mujib Medical University (BSMMU), Dhaka, Bangladesh.

Study population:
The patients with osteoporotic vertebral compression fracture diagnosed on the basis of presenting complains, clinical examination & investigations from spine unit, Department of Orthopaedic surgery, BSMMU.

Sampling method: Purposive sampling.

Selection criteria

Inclusion criteria:

1. Vertebral compression fracture (moderate and severe types) involving single level in dorso-lumbar region (T_7-L_1) due to Osteoporosis
2. Any sex
3. Age more than 50 years
4. X-ray, MRI, CT scan and BMD(>---2.5) suggestive of osteoporotic vertebral compression fracture.

Exclusion criteria:

1. Burst fracture.
2. Any other type of acute fracture (forearm, hip, etc.)
3. Infection.
4. Any other bone disease except osteoporosis that could affect the mechanical integrity of the vertebrae in the dorso-lumbar region of spine.

Sampling Technique:
All cases were selected purposively from the aforementioned study place.

Sample collection:
After explaining the study objectives, purpose and potential risks of the procedure in details informed written consent was collected from the patient's attendance. Detailed history, clinical examination, and all information were taken in a predesigned fully pretested data collection form.

Data collection:
Data were collected by using a pre tested and pre designed structured data collection form containing the variables of interest.

DISCUSSION:

Osteoporosis is a systemic skeletal disorder characterized by compromised bone strength that predisposes individuals to increased fracture risk (Friedman, 2006). The osteoporotic bone has a reduced num-ber, thickness, and connectivity of trabecular rods. This results in increased fragility of the bone and thereby predisposes the patients to have a fracture with relatively little trauma. The ideal goal of treatment of a osteoporotic VCF patient is to alleviate pain and reduce and stabi-lize the fracture. Balloon kyphoplasty is a minimally invasive surgical approach for the management of symptomatic vertebral compression fractures (VCFs)

Osteoporosis is rare in young adults and middle-aged men (Heinz, 2000). In this study, mean age of the patients was 63.60 ± 8.17 years within the range of 50 – 77. Mean age was 75.5±11.9 (42-96) of the study patients (Suzuki, 2009). Higher the age is more the risk of osteophorosis. Bone loss builds up over time and bones become weaker as we age (NIH, 2016).Chances of developing osteoporosis are greater among women. They have lower peak bone mass and smaller bones than men. They also lose bone more rapidly than men in middle age because of the dramatic reduction in estrogen levels that occurs with menopause (NIH, 2016). In this study, female were predominant (85.0%) than male (15.0%). Suzuki (2009) and Yu et al. (2014) also found female pre-dominancy in their study. Most of the patients were housewife. In this study most of the trauma due to a level fall was 90.0% and lift of a heavy objects was 10.0% which is consistent with the study of Suzuki, 2009.

The predominant fracture type was wedge fracture with T12 and L1 being the most common injured spine levels (Pintar et al., 2012). The prevalence and incidence of fractures are highest at T7–8 in the upper thoracolumbar spine, and at T12-L1 in the lower spine (Nevitt et al., 1999). In this study, Most of the fractures were at level T12 (35.0%) and L1 (30.0%). Most of the fractures were wedge (90.0%) and rest 10.0% were concave. Similar findings also found in the study of Suzuki (2009). Most of the fractures were moderate (90.0%) and rest 10.0% were severe. Suzuki (2009) found maximum grade of fracture deformation was modetare.Post operative complication (cement leakage) was in 2 (10.0%) cases. The

comprehensive meta-analysis of Taylor et al. (2007) summarized all published kyphoplasty complications. Cement leakages occurred in 8.1% of all cases. The rate of cement leakage was reported to be 7% - 11.5% following kyphoplasty (Yu et al., 2014).

In this study, pain and disability reduced progressively. Pre operative mean VAS was 7.05 ± 0.60 and after operation it reduced to 2.75 ± 0.55 after one month, 2.15 ± 0.37 after three months and 1.90 ± 0.45 after 6 months. The mean VAS score was reduced significantly from 7.05 ± 0.60 to 1.90 ± 0.45 which is almost similar to Yu et al. (2014) [7.7 ± 1.3 to 0.8 ± 0.2]. Pre operative mean ODI was 67.00 ± 3.72 and after operation it reduced to 18.50 ± 1.82 after one month, 18.05 ± 1.57 after three months and 17.50 ± 1.73 after 6 months. The mean ODI score was reduced significantly from 67.00 ± 3.72 to 17.50 ± 1.73 which is almost similar to result of Yu et al. (2014) [56.8 ± 4.2 to 15.2 ± 1.9]. Pre operative mean Kyphotic angle was 14.80 ± 0.80° and after operation it reduced to 7.14 ± 0.37° after one month, 7.14 ± 0.39° after three months and 7.12 ± 0.37° after 6 months. Kyphotic angle was reduced significantly which is almost similar to result of Yu et al. (2014) [14.4 ± 2.2° to 7.4 ± 1.1°] and Philips et al. (2003)[8.8° after six month]. Pre operative mean AVH was 53.95 ± 8.50% and after operation it increased to 70.40 ± 3.28% after one month, 70.35 ± 3.45% after three months and 69.35 ± 3.25% after 6 months. The mean AVH was improved significantly which is almost similar to result of Yu et al. (2014) [52.0 ± 6.9 to 72.2 ± 4.5].

CONCLUSION

VAS, and ODI score was reduced significantly. Kyphotic angle was also reduced significantly and anterior vertebral height was improved significantly in this study. So it can be concluded that Balloon kyphoplasty is an effective procedure in the management of osteoporotic vertebral compression fracture.

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Original Article

Results of Posterior Surgery in Thoraco-Lumbar Spine Injury

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Abstract

Thoraco-lumbar spine injury is common in our country. Mode of injury usually fall from height, RTA, fall of heavy weight. Age usually 15 to 55 yrs. Injury may be complete or incomplete. It is usually high energy trauma, younger group are more sufferer. To see the surgical outcome of Thoraco-lumbar spine injury with neurological deficit by posterior approach. It is a prospective study. Study period is April-2012 to December-2017.The study was done in NITOR and Private Hospital in Dhaka. Total patients are 166 in number, among them 141 were male and 25 were female. 2 patients has fracture D6,10 patients has Fracture D10,15 patients has D11,30 patients D12,75 patients L1, 20 patients L2, 10 patients L3, and 4 patients has fractureL4. 136 patients have ISCI among them 10 patients had ASIA-E, 25 patients had ASIA-D, 73 patients were ASIA-C, 28 patients had ASIA-B and 30 patients were ASIA-A (complete spinal cord injury). After surgery Neurological Improvement occurred in ISCI patients, ASIA-B and ASIA-C become ASIA-D or ASIA-E. No improvement in complete spinal cord injury patients. All most all patients were pain free after operation and mobilized immediately after surgery. 15 patients are lost from follow-up. Dural tear occurred in 2 cases during decompression, managed by repaired. Implant failure that is screw breakage occurred in 4 patients. Revision surgery was done in 2 cases. Bed sore developed in 2 cases in complete spinal cord injury. Posterior surgery in thoraco-lumbar spine injury is easier approach. Better correction of spinal deformity and wide decompression that is 360^0 decompression of spinal cord is possible by this approach. Three column stability can achieved by transpedicular screws and postero-lateral fusion by bone graft.

Key Word: Thoraco-lumbar spine injury, Posterior Surgery

INTRODUCTION

Unstable burst fractures of the thoracolumbar and lumbar spine often require surgical treatment by internal fixation[1]. Generally posterior fixation method is most commonly used, but the anterior fixation method is preferred in the case of severe neural canal involvement by bony fragment. The goals of surgical treatment of thoracolumbar spinal fractures include: 1) decompression of the spinal canal and nerve roots to facilitate neurological recovery, 2) restoration and maintenance of vertebral body height and alignment, 3) obtaining a rigid fixation to facilitate nursing care and to allow early ambulation and rehabilitation, 4) prevention of development of posttraumatic progressive deformity with neurological deficit, and 5) limiting the number of instrumented vertebral motion segments[2]. There are many previous studies for the treatment results of unstable

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thoracolumbar and lumbar burst fractures using the anterior and posterior fixation method, but there are also many different opinions for the optimal treatment method of unstable burst fractures. The aim of this study was to analyze the surgical treatment results of unstable thoracolumbar and lumbar burst fractures by posterior surgery only.

MATERIALS AND METHOD

1. Patients

It is a prospective study. Study period is April-2012 to December-2017.The study was done in NITOR and Private Hospital in Dhaka. Total patients are 166 in number, among them 141 are male and 25 are female. 2 patients has fracture D6, 10 patients has Fracture D10, 15 patients has D11, 30 patients D12, 75 patients L1, 20 patients L2, 10 patients L3, and 4 patients has fracture L4. 136 patients have ISCI among them 10 patients has ASIA-E, 25 patients had ASIA-D, 73 patients were ASIA-C, 28 patients had ASIA-B and 30 patients were ASIA-A (complete spinal cord injury).

2. Preoperative evaluation and operative timing

All patients had preoperative antero-posterior and lateral radiographs and MRI. 41 patients (89.1%) had CT scan evaluation before undergoing spine surgery. The mean time from injury to surgery was 11 days. 66 patients (39.76%) underwent surgery in less than 7 days after injury, 100 patients (60.24%) underwent surgery in more than 7 days after injury.

3. Spine fracture classification and level

Fractures were classified according to the AO classification system using the radiographs and CT scans. The AO system allows the classification of essentially any injury into a triad of descriptors, reflecting a progressive scale of injury and instability. There are 3 fundamental injury patterns determined by radiographic criteria. Type A represents compression injuries, with damage to the anterior/middle columns. Type B is characterized by anterior and posterior element injuries (3-column) with distraction. The more severe Type C lesions involve anterior and posterior element injuries, with a superimposed rotational deformity resulting from axial torque[1]. In this study, 0 patients were classified in type A (0%), 110 in type B (66.26%), 56 in type C (33.74%).

4. Radiologic and neurologic evaluation

The kyphosis angles were measured on lateral radiographs before and after surgery and at the final follow-up. Regional kyphosis was measured from the inferior endplate of the intact vertebra just above to the superior endplate of the intact vertebra just below the fracture (Fig. 1)[3]. Mean preoperative regional kyphosis measured 9.0 degrees (range, -8.4 to 27). This improved to a mean -5.5 degrees (range, -26.5 to 7.6) kyphosis at the early postoperative radiograph. Final radiographs showed a mean -2.3 degrees (range, -21.6 to 9) of kyphosis. Average follow up period was 15.9 months.

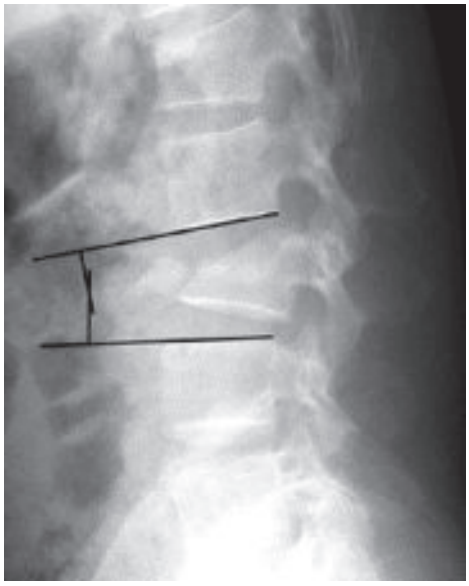


Fig-1: *Regional kyphosis was measured from the inferior endplate of the intact vertebra just above to the superior endplate of the intact vertebra just below the fracture*

Canal compromise was estimated from preoperative CT scans according to the method of Hashimoto (Fig. 2)[4]. On the CT slice where the canal was narrowest, the area original spinal canal was estimated (O), and the area

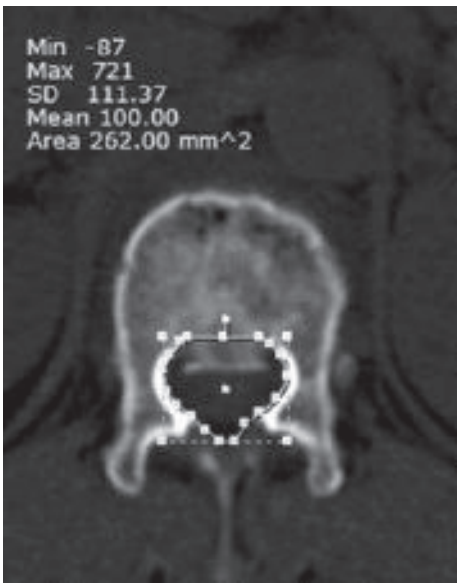


Fig-2: *Ratio of the area of the bony fragments retro pulsed into the spinal canal (B) to the estimated area of the original spinal canal (O). B is cross-sectional area of the bony fragments, and O is the estimated cross sectional area of the original spinal canal. The ratio (RBO) is B/O×100 (%)*

occupied by the bony fragments retropulsed into the spinal canal was measured (B). We calculated the ratio (B/O X 100%).

Preoperative and postoperative neurologic status was evaluated using the Frankel impairment scale. Of the 46 patients assessed, 10(6.02%) were classified as E, 25 patients (15.06%) were classified as D, 73 patients (43.97%) were classified as C, 28 patients (16.86%) classified as B, 30 patients (18.07%) classified as A.

5. Operative procedures

All patients were fixed with pedicle screws and rods posteriorly (Fig. 3). The patient was put in the prone position on a C-Arm compatible table. A standard posterior midline approach with sub-periosteal dissection of the

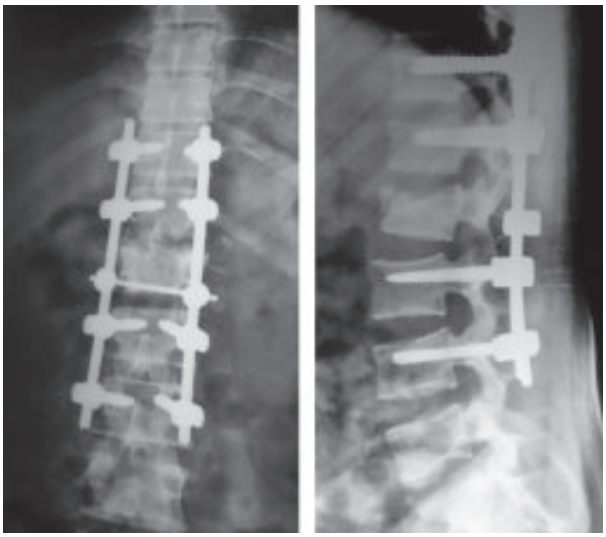


Fig-3-4: *A 25-years-old man with AO type B and incomplete neurologic deficit. (A) Antero-posterio postoperative radiograph (B) Postoperative lateralradiograph after posterior surgery.*

para-spinal musculature was done over the involved levels, exposing the spine out to the transverse processes. Anatomical structures at the fracture site should be careful identified, so as not to inadvertently injure the possibly exposed dural elements. Exposure was done at least two level above and below the fracture dislocated segment. Once the standard bony landmarks were identified, pedicle screws were inserted at the cephalad level, the screws were inserted purposefully flush to the laminar element, while the caudal screws were slightly proud. The injured level and position of screws checked by c-arm. The number of screws used varied according to the severity of fracture dislocation and the number of involved segments. Three to five segments are fixed with 6-10 pedicle-screws. Later, the jumped or impacted facets were released by resecting the superior and/or inferior articular processes. Contoured rods were placed and fixed to the distal pedicle-screws. Before tightening the proximal screw nuts, distraction was applied using instrumentation setting. This maneuver can help to reduce the dislocated spine both in the sagittal and the coronal planes. In some cases, complete reduction was hard to achieve at first; thus, additional maneuvers were needed such as adjusting the depth of the pedicle screws, re-shaping the rod contour to a more lordotic curve, and/or *in situ* contouring.

Decompression of the spinal canal was performed in each patient because of the protruding fracture fragments and the accompanying neurological deficit. Laminectomy (and at least one sided facetectomy) was performed to expose the dura and the lateral parts of the disc, without stretching the neural structures. Teareddural sac, if seen, was stitched to control cerebrospinal fluid (CSF) leak. The ruptured disc and bone fragments in the spinal canal were removed through the posterolateral approach, similar to the transforaminal lumbar interbody fusion (TLIF) technique. Some time intervertebral disc and endplates were also removed. Once the bone graft bed was prepared, autologous bone harvest from the resected posterior arch was implanted and packed tightly into the gap. Transverse connector was used in all Type C and most Type B injuries. Hemostasis was performed with absorbable gelatin sponge and hemostatic agents. In addition, posterolateral fusion was routinely performed before drainage and wound closure.

RESULTS

Preoperative patients data are presented in Table 1 and 2, and postoperative data are summarized in Table 3. After surgery segmental kyphosis was corrected from a mean of 7.2 to -6.2 degrees at early postoperative period and maintained at -2.8 degrees at the time of the last follow-up. So the mean corrected angle was 13.4 degrees ($p<0.001$) and 10 degrees ($p<0.001$) in the early postoperative period and the last follow-up, respectively.

Table -1

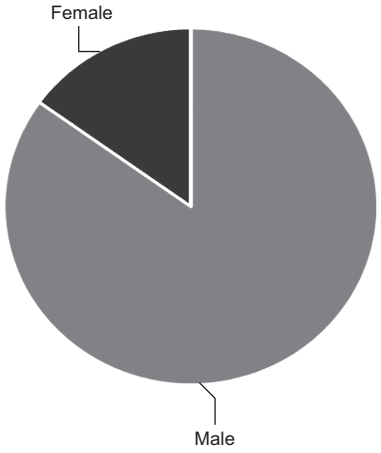
Sl no	Level of Injury	Number of Patients
1	Thoracic-6	02
2	Thoracic-10	10
3	Thoracic-11	15
4	Thoracic-12	30
5	Lumbar-1	75
6	Lumbar-2	20
7	Lumbar-3	10
8	Lumbar-4	04

Table - II

Sl.no	ASIA scale	No. of patients
1	ASIA-A	30
2	ASIA-B	28
3	ASIA-C	73
4	ASIA-D	25
5	ASIA-E	10

Neurologic deterioration did not occur in any patient. 136 of 166 patients (81.32%) with incomplete injuries improved at least 1 Frankel grade at last follow-up. No improvement in complete spinal cord injury patients. The mean surgical time was 305 minutes (p<0.001). The median estimated blood loss was about 500 ml.

No neurological or vascular complications were encountered during surgery. Dural tear occurred in 2 cases during decompression, managed by repaired. Implant failure that is screw breakage occurred in 4 patients. Revision surgery was done in 2 cases. Bed sore developed in 2 cases in complete spinal cord injury. Postoperatively superficial wound infection was seen in 1 patient.



Male Female ratio showing in pie chart.

DISCUSSION

The main goal of surgical treatment of thoracolumbar or lumbar spinal fractures is decompression of the spinal canal and nerve roots to facilitate neurological recovery and achievement of spinal stabilization with rigid internal fixation.

Several surgical techniques have been introduced for this goal, but optimal treatment for these injuries is controversial. Although some surgeons prefer to utilize posterior indirect decompression and instrumentation techniques others advocate an anterior only approach to directly decompress the neural elements followed by internal fixation. Still others recommend a combined anterior and posterior approach[1]. The main advantages of the anterior approach are that it allows direct visualization and decompression of the neural elements, and that it allows for direct reconstruction of anterior column support with a load-sharing construct. But patients with pulmonary compromise or morbid obesity may also limit the ability to use an anterior approach. While the obvious advantage of the posterior approach is its familiarity to all spine surgeons, the relative ease at placing pedicle screw instrumentation, and the biomechanical strength of posterior pedicle screw constructs. The approach avoids potential injury to intra- abdominal or retroperitoneal structures that are at risk during anterior exposures and the morbidity of performing a thoracotomy and/or taking down the diaphragm to access injuries at the thoracolumbar junction[5]. Moreover, posterior surgery has the advantage of being faster, less expensive and causing less blood loss. In this study, we performed the posterior only surgery if neural decompression was thought to be possible with posterior approach. Our data showed that the technique of decompression (direct or indirect) does not influence the rate of neurological improvement statistically. And some other reports also reported that there were no significant differences in Frankel grade improvement between anterior and posterior surgery[6-7]. However, our result should be interpreted with some caution, because the combined surgery group had more severe narrowing of spinal canal.

In radiologic evaluation, by posterior surgery could make about 15 degree of regional kyphosis correction. The mean corrected angle of kyphosis was more in combined surgery group at the early postoperative period and at the last follow-up. The secondary loss of kyphosis correction was not significantly different between both groups. However, data reported in the literature have shown that long-term loss of correction of 1-4 degrees after the anterior approach is reportedly less than after the posterior approach[9-13]. Payer[13] reported that posterior correction usually achieves complete kyphosis correction, but secondary loss of correction of between 7-16 degrees down to the initial posttraumatic angle is observed predominantly within the first postoperative year, and is mainly due to a collapse of the upper disc and upper half of the burst vertebral body. The use of anterior decompression and anterior instrumentation has the advantages to allows complete decompression of the neural elements, and direct reconstruction of anterior column support with a

loadsharing construct at the same time[14-18]. However, the biomechanical study of a single anterolateral fixation reported that the use of an additional dorsal fixation device should be considered for stabilization of a ventral bi-segmental defect[19].

In this study, we fixed 2 levels above and 2 level below the fracture for posterior instrumentation. Posterior instrumentation usually requires fixation of pedicle screws 2 levels above and 2 level below the fracture. Advances in spinal instrumentation led to the development of short-segment spinal instrumentation to avoid fusion of uninjured motion segments. The definition of short-segment posterior fixation is controversial. Typically, this refers to fixation 1 level above and 1 level below the fracture (2-motion segments). Some reports comparing long and short segment fixation for thoracolumbar fractures reported that the short segment fixation showed similar postoperative results with conventional posterior instrumentation[20-22]. Moreover, the short segment fixation can minimize spinal levels requiring fusion and have less perioperative morbidity and reduced hospitalization time. Although this approach has several advantages, it has been associated with loss of surgical reduction and instrumentation failure. Although the fixation using pedicle screws is rigid, loss of correction and metal failure can occur by repetitive transmission of body weight if the anterior column is not reconstructed. Some reports indicated instrumentation related problems like loss of correction, implant failure and bony failure after short segment fixation without anterior column reconstruction[23-24]. In this study, there was 4 case of implant-related complication (2 screws pull-outs and 2 screws broken) in the posterior alone surgery group during the follow-up period, which was revised successfully by extension of fusion below initial level of fusion.

CONCLUSION

Posterior surgery in thoraco-lumbar spine injury is easier approach. Better correction of spinal deformity and wide decompression that is 360^0 decompression of spinal cord is possible by this approach. Three column stability can achieved by transpedicular screws-rods system and good postero-lateral fusion by bone graft.

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Original Article

Arthroscopic Bankart Repair for Chronic Anterior Shoulder Instability

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Md. Nurul Alam Badsha[5], Md. Zahidur Rahman[6]

Abstract

The arthroscopic surgery is a less invasive technique of Bankart repair for chronic anterior traumatic shoulder instability. We would like to evaluate the outcomes of traumatic recurrent anterior dislocations of the shoulder treating arthroscopically with bio- absorbable suture anchors. Data from 74 shoulders patients were collected over 6 years (2010 - 2016). Each patient was followed-up over a period of 1 year. The patients underwent arthroscopic Bankart repair for chronic anterior shoulder instability using bio-absorbable suture anchors. These surgeries were performed at a single private hospital by a single surgeon with assistants over the time period. The patients were assessed with Constant and Murley Shoulder Scoring System. The scores were calculated before surgery and at maximum 6 years and minimum 1 year follow-up. The recurrence rates, range of motion as well post-operative function and return to sporting activities were evaluated. In our study, 6o patient (81.08%) were happy with excellent result, 9 patents(12.16%) were good, 02 patients(2.70%) were poor and 3 patients(4.05%) were unhappy with poor results. A total of 3 shoulders had a recurrence of shoulder instability. Of the 3, 2 of the recurrence of dislocation were due to sporting activities and fall on the slippery bath room, while the causes of spontaneous subluxation of 1 shoulder was unknwn although patient was with generalized ligamentous laxity and volumonus capsule-ligament complex. 88% of the patients returned to previous activities, while the remainder felt they could not return because they were afraid of a recurrence. Arthroscopic Bankart repair for chronic anterior shoulder instability with the use of bio-absorbable suture anchors is a reliable treatment method, with good clinical outcomes, excellent post-operative range of motion and low recurrence rates.

INTRODUCTION

Anterior glenohumeral subluxation or dislocation during sports, daily activities or road traffic accident is one of the most commonly seen in the clinical practice of orthopaedic arena. Several pathological conditions like Bankart lesions,hill sachs lesions or glenoid rim fractures may be associated with anterior shoulder instability[1]. The glenohumeral joint has been recognized as the most commonly dislocated synovial joint of the human body[2]. The stability of the glenohumeral joint is maintained by the socket-deepening effect of glenoid labrum and ligaments.

An avulsion of this anterior inferior labrum from the glenoid rim was first described by Perthes and Bankart in the early twentieth century[2]. Force acting in the direction of abduction and external rotation over the shoulder can cause anterior subluxation or dislocation resulting in instability[3]. A major problem following a primary traumatic anterior shoulder dislocation is the high risk of recurrence among young patients[4,6] and it starts within the second year of the first traumatic one. Recurrent shoulder dislocation or instability often preventing the individual from returning to pre injury activities[2]. Since then, several open and arthroscopic techniques have been described to address both capsuloligamentous laxity and labral pathologies preventing anterior shoulder instability. With the debate continuing regarding the indications for arthroscopic shoulder stabilization, recent studies have shown favorable outcomes with regards to the arthroscopic method[2]. Moreover, with continuing criticisms with

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regards to the wide dissection, loss of external rotation, and post operative pain associated with the open repair, the demand for arthroscopic surgery has increased over the last two decade. However, despite advances in the understanding and techniques of arthroscopic surgery, failure rates have reported to be as high as 30%. As arthroscopic techniques have continued to evolve over the last decade, it is important to evaluate if these new techniques have resulted in an improved outcome.

The following study aims to report and evaluate the pre-operative evaluation, thorough diagnostic arthroscopic examination for concomitant pathology, surgical techniques and the postoperative therapy program for a successful outcome of arthroscopic Bankart repair with the use of suture anchors for patients that were followed up for at least one year from the date of surgery.

PATIENTS AND METHODS

Seventy Seven patients underwent Arthroscopic Bankart repair with at least two episodes of anterior dislocation of the shoulder by a single surgeon with assistants in a Private Hospital from 2010 to 2016 . We conducted the study by collection of proper data from the patients of chronic anterior shoulder instability using a standard protocol. 3 patients were lost to follow-up for Constant and Murley Shoulder Scoring analysis and visual scale of instability. Inclusion criteria for surgery included recurrent anterior glenohumeral subluxation or dislocation after an initial episode of traumatic event, a bankart lesion confirmed by Magnetic resonance imaging (MRI) or arthroscopic examination and arthroscopic Bankart repair were done using bio-absorbable suture anchors. The exclusion criteria were posterior instability, multidirectional instability, Hill-Sachs lesions more than 25% of the humeral head and bony bankart (anterior glenoid fracture) lesion more than 25%. The degree of structural bony lesions was evaluated preoperatively by CT and during arthroscopy, an engaging hill sacs or an inverted pear glenoid were taken to have significant bony loss[5]. All patients demonstrated a positive apprehension test as well as a load and shift test.

Constant and Murley Shoulder Scoring measuring system was used to evaluate the effectiveness of the arthroscopic Bankart repair. It was introduced by Constant and Murley in 1986 and consists of four variables that are used to assess the function of the shoulder. The subjectives variables are Pain (15 points) and Activities of Daily Living (ADL- sleep,work, recreation/sport) (20 points).The objectives variables are Range of Motion(40 points) and Power (25 points).The functional outcome were graded as excellent, good, fair and poor showing in Table-I.

Table-I

Constant &Murley Score	Outcome
86 –100	Excellent
71- 85	Good
56 –70	Fair
0 – 55	Poor

All the patients in this study were male and age between 19 years to 33 years old. Dominant right shoulder were in 55 patients and left shoulder were in 22 patients. Patients were followed up in clinic at 2 weeks, 1 month, 2 months, 3months and then at 6 monthly intervals with a minimum of 1 year follow up. Pre and post operative range of motion, function and return to sports and preinjury activities were recorded. Any sensation of subluxation, recurrent shoulder dislocation and instability preventing return to full activity or requiring a further stabilizing procedure were regarded as treatment failure.

Surgical Technique

All the patients with anterior shoulder instability underwent operations with the use of a standardized surgical technique by the same surgeon. After induction of general anaesthesia, the patient was placed in lateral decubitus position (Fig.1) with affected shoulder up and a thorough examination was performed to assess the magnitude and direction of instability. The shoulder was prepared and draped in a sterile manner, and the bony landmarks were

Fig. 1: *Lateral decubitus.*

marked carefully to maintain orientation throughout the procedure. A standard posterior viewing portal (Fig. 2) was established approximately 2 cm inferior and 2 cm medial to the posterolateral acromial angle. Two anterior portals were established using outside-in technique with a spinal needle to establish the most appropriate placement of the cannulas. The anterosuperior portal was made in the rotator interval just inferior to the anterior edge of the acromion, and the anterorinferior portal was made just over the superior border of the subscapularis tendon and lateral to the tip of cracoid. A cannula of 5.5 mm diameter was inserted into the anterosuperior portal, and a large-diameter (8.5 mm) threaded cannula was placed in the anteroinferior portal.

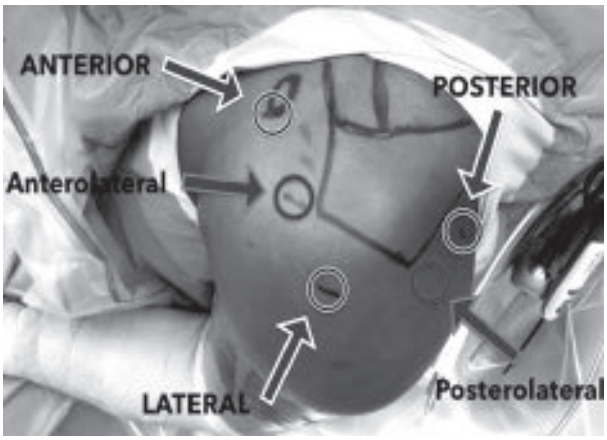

Fig.-2: *Portals*

Complete diagnostic arthroscopy was done through the posterior and anterior portals, with assessment of the glenoid labrum, capsule, rotator cuff and the humeral head for possible Hill-Sachs lesions.

Rotator interval closure was not performed and any other tears of the glenoid labrum were repaired. The detached labrum was mobilised from the anterior glenoid surface using a tissue elevator and power shaver. The goal was to mobilise the labrum such that it could be shifted superiorly and laterally. The glenoid neck was lightly abraded using a rasper and power burr. Commercially available bioabsorbable suture anchors were used in bankart repair.The first anchor was placed at the 5.30 o'clock position, on the glenoid articular surface 3 mm from the articular edge of the right shoulder. The most inferior placement would ideally be placed at the 6 o'clock position however this often is not possible due to limitations in the placement angle. The suture anchor used requires drilling a pilot hole or using a punch to create the pilot hole prior to impaction of the implant to a countersunk position in the bone. A suture passer or tissue penetrator is then passed under the Bankart lesion. The sutures were tied using the Duncun nonlocking sliding knot, which is easy to tie, has a low profile and possesses good holding strength . The second and third suture anchors were done at the 4.30 and 3.30 clock positions in the same manner. Postoperatively, the patients were placed in a sling for four weeks. They were allowed to do pendular motion exercises for the first three weeks, followed by forward active flexion of the arm to 90° from the third to the sixth week. They were also taught to do isometric rotator cuff exercises during these six weeks. Full shoulder mobilisation was allowed after six weeks. Sport activities were allowed at three months and contact sports at four months. There were no complications with regards to the arthroscopic technique. No bleeding, infection, compartment syndrome or neurological compromise were observed post-operatively.

RESULTS

Table -1 demonstrates the scores from The Constant and Murley Shoulder Scoring System evaluated the patient's pain, activities of daily living (ADL), Range of motion and Strength. In our study, 6o patients (81.08%) were happy with excellent result, 9 patents(12.16%) were good, 02 patients(2.70%) were poor and 3 patients(4.05%) were unhappy with poor results. A total of 3 shoulders had a recurrence of shoulder instability. One of the 3 recurrence dislocation was due to sporting activities. The second one was due fall on the slippery bath room, while the causes of spontaneous subluxation of the 3rd shoulder was unknown although patient was with generalized ligamentous laxity and volumonus capsule-ligament complex. 88% of the patients returned to previous activities, while the remainder felt they could not return because they were afraid of a recurrence. All of the patients apart from those who developed a recurrence demonstrated a negative load and shift as well as a negative anterior apprehension test on post-operative clinical examination. Patients were also asked to rate the feeling of stability of their shoulder pre and post operation on a scale of 0 to 10, with 10 being the most unstable. Mean shoulder instability score was 8.42 before surgery and 1.32 after surgery. No correlation could be established between the age, number of dislocation, duration from first and last dislocation to surgery and the rate of recurrence(6). Although Voos and his colleagues found associated ligamentous laxity and age under 25 to be risk factors for recurrence, these factors could not be established in our study .

DISCUSSION

Initially, arthroscopic repair of the Bankart lesion has been less satisfactory than the open technique [4]. However, many of these arthroscopic techniques described were using transglenoid sutures or bio-absorbable tacks(7). In the last few years, newer techniques for fixation of labrum and reconstruction of labrocapsular ligamentous complex with either bio or titanium suture anchors have started to evolve, with promising results. These suture anchors have increasingly been use in labral repair and labrocapsular reconstruction (8). Our study has shown that patients undergoing arthroscopic repair with these suture anchors have excellent clinical outcomes and similar recurrence rates as compared to open surgery. Suture anchors are low-profile fixation devices that minimize articular surface damage of the humeral head, offering anatomic reconstruction of the glenoid labrum as well as the glenohumeral capsuloligament complex. These suture anchors inserted arthroscopically with the aim of re-attaching the anterior inferior labrum along with the ligaments to the glenoid rim. Knots are placed on the capsular side of the Bankart lesion, recreating the socket-deepening bumper effect of the labrum and hence restoring the concavity compression mechanism of the glenoid labrum on the humeral head(9). Any redundant or lose capsule is also addressed during the same operation, allowing one to address any capsular laxity, restoring tension in the anterior-inferior glenohumeral ligament and stability to the glenohumeral joint. The arthroscopic bankart repair offers many advantages when compared to the open technique. It offers a minimally invasive approach with less surgical trauma and blood loss, with improvements in operating time, perioperative mobidity, analgesics use, hospital stay, time loss from work and decrease number of complications(10). We have also shown that post-operative range of motion is not sacrificed for the sake of stability. This allows the patients to return to sports or physically demanding jobs. The introduction of bioabsorable suture anchors also simplifies any revision surgery, reducing concerns regarding infected implants(11) and anchor migration leading to articular cartilage damage (12) . During surgery, either two, three or fore suture anchors are inserted, depending on the size of the Bankart lesion. Most of the bankart lesions were repaired with three anchor sutures in this study. Our results showed that patients who had only two suture anchors did not have a higher rate of recurrence. Patients with anteroinferior capsular laxity were treated accordingly by pinch tuck capsular plication as described earlier. Although some studies have shown that the presence of capsular laxity may affect the outcome of arthroscopic stabilization(13), while others have suggested that the elastic deformation of the glenohumeral ligament at the time of injury prevents the same degree of structural damage(14), we do not consider Bankart lesions associated with capsular laxity a contraindication to arthroscopic surgery. On the contrary, capsular plication can be done arthroscopically to address the issue of anteroinferior capsular laxity and this significantly augments the stability achieved with Bankart repair.

The majority of our patients were young physically active individuals, who engage of either sports or physically demanding jobs. Satisfactory range of motion, especially external rotation allows for performance during sports as well as proper functioning for activities during daily living. Several other studies published also reported a good range of motion after arthroscopic repair, often even better than repair with the open technique(15).The recurrence rate in our study was 4.05%, which is similar to other published studies.The recurrence shoulders were treated with corcoid bone block- Latarjet procedure. Recurrence rates using the open technique ranged from 0-22%(16). Warner et al initially published discouraging results with the arthroscopic techniques for contact sport athletics back in 1997(17), however with modern arthroscopic techniques, extremely strong suture anchors and secure repair techniques allowing the patients to undergo extensive rehabilitation our study and other supporting studies have shown early return to sporting and daily activities(18,19).

CONCLUSION:

Arthroscopic Bankart repair for chronic anterior shoulder instability with bioabsorbable suture anchors is a reliable treatment method, with good clinical outcomes, excellent post-operative shoulder motion and low recurrence rates.

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Original Article

Percutaneous Ilio-Sacral Screw Fixation For Unstable Posterior Ring Disruption of Pelvis: Early Experience in 10 Cases in Dhaka Medical College Hospital

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Unstable posterior pelvic ring injuries usually occur in poly trauma patients. Conservative treatment of these fractures can lead to malunion,chronic pain, limb length discrepancy. On the other hand ,Open reduction and internal fixation in an already compromised soft tissue cause more soft tissue injury, haematoma, infection and neurovascular damage . Percutaneous ilio-sacral screw fixation can be an alternative technique for ilio-sacral joint disruption and sacral fracture. This technique is the significant recent advancement worldwide. Our work is the first time in the history of pelvic surgery in Bangladesh. The purpose of the study is to evaluate clinical and radiological results of the treatment of patients with closed reduction and percutaneous Ilio-sacral screw fixation for unstable posterior ring disruption of pelvis. 10 patients either with sacral fracture ,or ilio-sacral joint disruption were treated by percutaneous ilio-sacral screw fixation in supine position under C-arm guidance between 1st December 2015 to 30th November 2016.Fractures were evaluated pre-operatively and post operatively by X-ray and CT scan.Position of the guide wire and screw were evaluated per-operatively by fluoroscopic AP, Inlet and outlet view. Tile's classification and Denis classification were used for pelvic fracture and sacral fracture respectively. Total 10 percutaneous ilio-sacral screws were placed in 10 patient. Male 8 patient, Female -2 patient. Average age was 35 years. Sacro-iliac joint injury: Tiles type B- 6, C-2 cases Sacral fracture involving zone II – 2 cases. Follow up period was 3 months to 12 months. No screw related problems were encountered. According to Majeed functional outcome good to excelent in 6 patient , fair in 4 patient. Percutaneous ilio-sacral screw fixation for sacro-iliac and sacral fracture with C- arm guidence is safe and minimally invasive technique. Accurate interpretation of X-ray and CT scans and per-operative clear C-arm images and interpretation are important to avoid possible complications.

Keywords: Unstable pelvic ring injury,Percutaneous Ilio-sacral screw.

INTRODUCTION:

Traumatic disruption of pelvic ring has become a major focus of orthpaedic interest in the past two decades. Fracture of the pelvis is increasing due to increase trend of motor vehicle accident. It is due to high velocity injury. This injury forms part of spectrum of polytrauma. The literature on pelvic trauma was mostly concern with life threatening problem and paid scant attention to the late musculoskeletal problems reported in a handful of article published prior to 2080[1]. Unfortunately this trend is continuing in most developing country including Bangladesh due to less available trained and expert pelvic – acetabulam surgeons. Despite the clinical impressions that most patients do well after conservative treatment,but literature shows the significant percentage of late musculoskeletal problem specially unstable vertical shear injury and patient with sacro-iliac dislocation[2,3]. The pelvis is a ring structure. In unstable pelvic ring fracture there is

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at least two break in the ring.Usually one in anterior ring before the acetabulam and another one in posterior ring after the acetabulam. The sacrum ,serving as the foundation of the spine ,transmits the stress between spine and pelvis through sacroiliac joints[4].Thus reconstruction of the spine-pelvic-junction to allow early weight bearing and to fascilitate nursing care,particularly for multiple injured patients[1] is mandatory.Open reduction and internal fixation of posterior ring injury in an already compromised soft tissue cause more soft tissue injury,haematoma, infection and neurovascular damage . Percutaneous ilio-sacral screw fixation can be an alternative technique for ilio-sacral joint disruption and sacral fracture. This technique is the significant recent advancement worldwide. Our work is the first time in the history of pelvic surgery in Bangladesh.

The purpose of the study is to evaluate clinical and radiological results of the treatment of patients with closed reduction and percutaneous Ilio-sacral screw fixation for unstable posterior ring disruption of pelvis.

MATERIAL AND METHOD:

This was a prospective study which was carried out at Dhaka Medical College Hospital,Dhaka, Bangladesh during the period from November 2015 to December 2016.our study comprising total 10 patient of either sex. Percutaneous ilio-sacral screws was given in 10 patients. Male- 8 patients, Female -2 pts.Average age - 35 years (range -15-60yrs) Tile classification was used to classify pelvic ring fracture and Denis brown classification system was used to classify sacral fracture. Tile's Type B in 6, type C in 2 cases, Sacral fracture zone II in 2 cases. Common mode of injury was motor vehicle injury (n= 8) Fall from height (n=1), Landslide injury (n=1). All patient had both anterior and posterior ring injury. Associated injury such as Urethral injury in 2 cases, degloving injury both thigh and lower abdomen and gut injury in 1 case, surgical emphysema, degloving injury right thigh in 1 case, blunt abdominal trauma in 2 cases, Both calcanian fracture in 1 case. After initial resuscitation under ATLS guideline, patient with unstable pelvic fracture with sacro-iliac joint disruption or sacral fracture were stabilized by external fixator or upper tibial skeletal traction. Radiografic evaluation of pelvis was done by standard Matta projections include – antero-posterior,inlet,outlet view and CT scan.

Inclusion criteria:

Age -15-60 years

Sex-Both male and female

Tile's type B and C injury.

Open fractures.

Exclusion criteria:

Morbidly obes patient

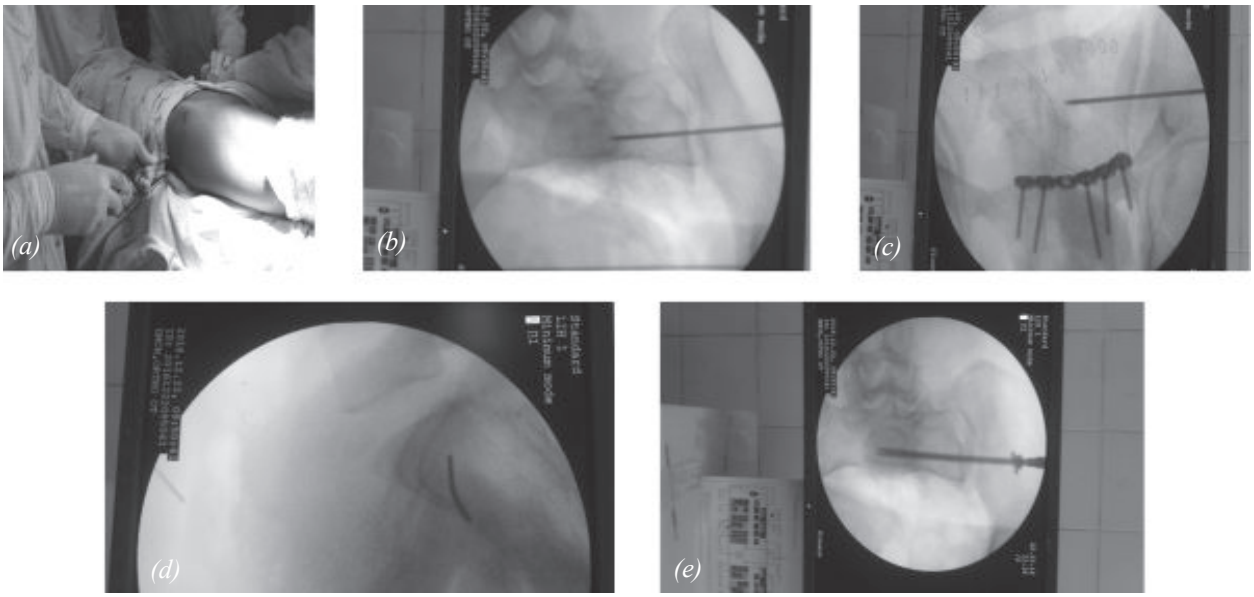
Age below 15 years and above 60 year.

Dysmorphic sacrum

Surgical technique:

Bowel preparation was done in every patient day before operation to enable fluoroscopic visualization of the radiographic landmarks. All patients were operated in supine position on radiolucent table .Pelvis was elevated with folded towel, kept at edge of table,both the lower limbs were kept parallel and at the same level of the pelvis. Before draping outlet view was taken to see wheather the bupm of the table give obstruction or not. Anterior ring fixation was obtained first by plate and screw by modified pfannenstiel approach. Placement of the percutaneous screw for posterior ring fixation was performed under C-arm guidance. The C arm was positioned opposite the side of the pelvis to be operated. Closed reduction was achieved via traction on the leg or via using joystick on the iliac crest if needed. The entry point was determined on the true lateral view in the S1 segment just below and behind the iliocortical density (ICD). Direction of the guide wire was posterior to anterior and slightly upwards in case of sacro-iliac joint disruption and horizontal for sacral fracture. A stab incision was made and 2 mm guide wire was gently tapped into iliac blade at the entry point.C-arm was then rotated to obtain inlet view to see wheather guide was within 1st sacral body or not and outlet view to see wheather guide wire was above the 1st sacral foramina or not.Once position of the guide was ensured in all views that it was not ouside the vertebral body or not into the vertebral canal,a required length of screw was measured indirectly.Appropritate length 7.2 mm partial threded cannulated cancellous screw was passed over guide wire under C-arm guidance after drilling with 4.5mm cannulated drill for ilio-sacral joint disruption and full threaded cannulated cancellous screw for sacral fracture.Generally we used one screw for fixation,two screw for only one case.

Post operatively radiographic evaluation was done with Matta and Tornetta criteria (5) and functional outcome were measured by using Majeed functional scores and clinical grading (6)



(a)

Fig.-1 *a) Guide wire insertion (b)K wire position- Inlet view(c) K-wire position outlet view. d) K-wire positioning – lateral view (e) Screw insetion- Inlet view.*

RESULTS:

The mean injury-to-surgery time was 12 days (rang: 4 - 21 days). The mean length of hospital stay was 14 (range 8-28) days. The mean follow –up period was 6 months (range 3-12 month). The mean time of percutaneous ilio-sacral screw was 50 minutes (range 30-90 minutes).

Partial weight bearing was started at 8 weeks and full weight bearing was given at 12 weeks. Maximum Follow-up was given for 12 monts with evaluation at 3 wks, 6 wks,12 wks and then every 6 wks interval upto 6 months and thereafter 3 monthly interval. No screw related problems were encountered. Two superficial infection was seen at abdominal wound which healed after antibiotic treatment

Functional outcome was assessed using Majeed (6) scoring system. Out of 10 cases 6 had good to excellent result and 4 patient had fair results. The mean Majeed score was 78.14

Radiographic results were excellent in 5 patient and good in 1 patient.

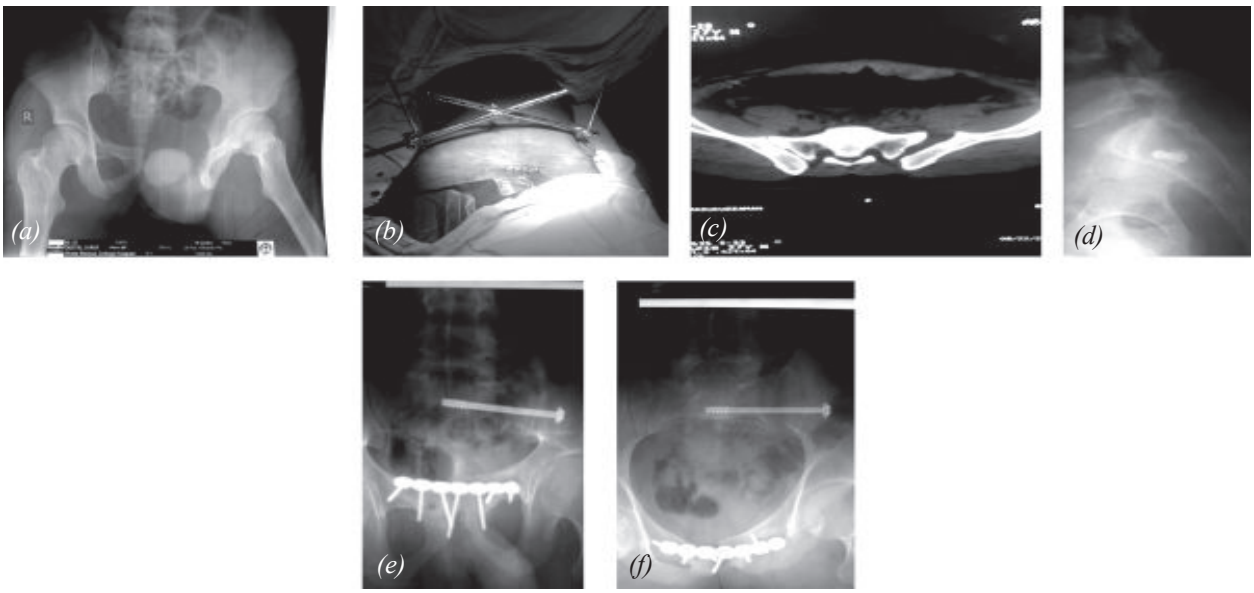


Fig.-2:*(a)Pre-operative X-ray. Tiles type B1 fracture.(b) Pt. with external fixator before operation (c) pre-operative CT scan (d) Post operative lateral view x-ray (e) Post operative outlet view x-ray (f) Post-operative inlet view x-ray.*

DISCUSSION

There are different modalities of treatment for unstable pelvic fractures. Conservative treatment associated with late complications. Application of external fixator- though it is life saving measure in unstable pelvic fractures, biomechanically it is not rigid enough for definitive treatment. So early anatomical reduction and stable internal fixation is the goal to provide improved outcome .But open reduction are associated with multiple complications. Routt et al in 1993 described technique of ilio-sacral screw fixation which is safe and minimally invasive[7]. The procedure is not affected by compromised soft tissues.But learning curve is steep and challenging for orthopaedic surgeon.

The delayed surgery for pelvic injuries is more challenging because the anatomy of the pelvic is altered and less recognizable[8]. According to standard protocols, the acceptable delay for these patients is between 4 to 6 days. In this study the mean interval between trauma and fixation was considerably high (mean 12 days). In a study between 1996 and 2007, Lindahl et al. have treated 797 patients with pelvic ring and acetabular fractures operatively. In the study, 15 operations were delayed (between 22–42 days from injury) and 24 late (> 6 weeks from injury) reconstructions[9]. Delay in our series due to association of multiple injury as well as delay in getting operation schedule.

Rate of screw malposition with C- arm guidance reported up to 2-15% and nerve injury upto 0.5-7.7%[2,8]. Konrad et al.(10) proposed that even with advances and usage of 3D fluoroscopic imaging, the malpositioning rate depended on the surgeon's experience with the navigation technique and anatomical knowledge. In our study no screw related problem was found except in one case justra cortical screw.

A report detailed the decrease in surgical time to perform the procedure over six years showed a reduction from 88.6 ± 60.3 mins to 44.3 ± 24.6 mins[11]. In our series mean time of ilio-sacral screw fixation was 50 minutes(range 40-90 minutes). With improved learning curve time decreases from early cases.

An investigation of the dimensions of the S1 vertebrae determined that insertion of two screws into S1 is dangerous[12]. In our series Ilio-sacral screw was given in 1st sacral vertebra in all cases as we have fixed anterior ring with reconstraction plate as well.

In this study, overall results were tabulated in four groups. i.e excellent, good, fair and poor aqccording to Majeed criteria out of 10 cases 6 had good to excellent result and 4 patient had fair results.

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Original Article

Evaluation of Results of Total Knee Replacement in Management of Patient with Advance Osteoarthritis

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Abstract

Advance osteoarthritis of knee is one of the most common and potentially most devastating events for an aged person. In our country, due to various reasons the incidence of advance osteoarthritis is rising day by day. Although there are various treatment options, total knee replacement is most suitable than other available techniques with good surgical outcome. It is usually recommended for aged patients who suffer from pain that keeps him or her awake at night, little or no relief from pain medications or walking aids, too much pain which causes to stop activities of daily living and have failed results from other conservative methods of therapy.

Keywords: Total Knee Replacement, Devastating events, Failure of conservative treatment

INTRODUCTION

Osteoarthritis is defined as a heterogeneous group of conditions that leads to symptoms and signs related to joints as a result of defective integrity of articular cartilage and related changes in the underlying bone and at joint margins. Osteoarthritis has become a major public health concern among musculoskeletal diseases. With steady increase in population of elderly persons it is fast becoming an important individual and societal burden (Bhan 2002).Osteoarthritis (OA) is one of the most prevalent joint disorders characterized by articular cartilage attrition and joint pain. Nowadays, OA is considered a disease of "the whole joint". The integrity and function of the cartilage can be influenced by pathological changes in structure and function of other joint tissues. Focal interaction among subchondral bone, marrow and cartilage in OA pathogenesis is drawing increasing attention (Chen 2015).Osteoarthritis is a primary source of disability and the knee joint is the most common joint to develop OA. Total knee arthroplasty (TKA) is the most frequently performed joint arthroplasty (Mizner et al. 2010). Knee osteoarthritis (OA) is a major public health issue and causes chron-ic pain and disability among elderly in most of the developed countries (Muraki et al. 2013).Knee osteoarthritis is an extraordinarily common disease with a standardized annual incidence of 24/10,000 population. The prevalence of knee osteoarthritis among individuals older than 70 years of age ranges from 20 to 50% (Merle-Vincenta et al. 2010).Osteoarthritis of the knee increases in prevalence with age and is more common in women than in men. Its risk factors are typically multi-factorial, meaning that there is usually no single cause, but rather combination of several different factors. The more risk factors an individual has, the greater chance they have of developing osteoarthritis. These risk factors may include but are not limited to: advancing age, genetic

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predisposition, mechanical overload from occupational and recreational activities, direct joint injury, lack of exercise, and being overweight or obese (Felson 2006).

Total knee arthroplasty (TKA) is an effective way to manage end-stage knee osteoarthritis, as it has been shown to alleviate pain and improve function. Over the years, many refinements have been made to this surgical procedure to improve patient outcomes, reduce postoperative complications and, ultimately, improve the patient's quality of life (Thambiah et al. 2015).Total knee arthroplasty (TKA) is a good treatment option in patients with incapacitation due to advanced knee osteoarthritis. Studies showed good outcomes in terms of pain and/or function in about 80% of patients (Merle-Vincenta et al 2010).Total knee arthroplasty (TKA) is a well-established treatment at the end stage of a degenerated knee joint. This operative treatment generally relieves pain, improves physical function, and has a high level of patient satisfaction (Bisschop et al. 2010)Total knee arthroplasty (TKA) is an effective method for alleviating pain and restoring knee function in patients with severe osteoarthritis. However, despite the improvements in surgical technique and postoperative care, it has been reported that up to 19% of patients are dissatisfied after their operations (Thambiah et al. 2015). The primary goals of total knee arthroplasty (TKA) are to relieve pain and improve function in advanced stage osteoarthritis of the knee (Kawinwonggowit et al. 2014).

Improved surgical techniques and rehabilitation protocols have resulted in excellent knee function and range of motion following total knee arthroplasty. Nevertheless, there remain 15-20% of patients with persistent dysfunction that is difficult to treat. Although problems after total knee arthroplasty are frequently linked to prosthetic malalignment, radiographic loosening, and co-morbidities, some cases are related to functional problems that are less evident clinically and/or radiographically (Vaidya et al. 2010)Total knee replacement has now become a well- established surgical procedure with very high rate of success in restoration of function and correction of deformity of severely arthritic knees (Kiran et al. 2005).Functional evaluation after knee arthroplasty remains challenging. The survival analysis that is typically used provides important information, but has its limitations: a patient may suffer from pain and functional limitation but not have undergone a revision. The classical evaluation scores, which are considered objective, often provide overly-optimistic results, for example the Knee Society scores (KSS) (Debette 2014).Patient satisfaction is influenced by many factors, such as the presence of residual pain, postoperative functionality and the presence of postoperative complications. Patient dissatisfaction has been reported to be as high as 19% among patients who have undergone TKA. Patient expectations prior to TKA have also been identified as an important factor in determining postoperative satisfaction. In addition, patient expectations can often be influenced by anecdotal evidence from friends and family members who have undergone TKA (Thambiah et al. 2015).

MATERIALS AND METHODS

- **Study design**: Prospective interventional study.
- **Place of study:** This study was carried out in the Department of Orthopaedic Surgery at Bangabandhu Sheik Mujib Medical University (BSMMU), Dhaka.
- **Study period: F**rom January 2014 to December 2015.
- **Study population:** Patients with advance osteoarthritis of knee joint diagnosed on the basis of presenting complains, clinical examination and investigations who was admitted in the above mentioned hospital during the study period was selected for the study population.
- **Ethical issue:** This protocol was primarily selected by the academic committee of the department of orthopaedics, BSMMU and approved by IRB (Institutional review board), BSMMU.
- **Sample Size:**

A total number of 20 patients with advance osteoarthritis of knee were included in this study due to time and financial constraints as well as unavailability of the patients (according to inclusion and exclusion criteria).

Inclusion criteria:

- Age: > 45 years.
- Gender: Both.
- Primary osteoarthritis of knee
- Osteoarthritis of knee secondary to :
  - Inflammatory arthritis,
  - post traumatic arthritis,

Exclusion criteria:

- Inability or unwillingness to comply with postoperative rehabilitation or follow up protocols.
- Active knee infection.
- Substantial neurological or musculoskeletal disorders that would adversely affect gait or early weight bearing after surgery.

DISCUSSION

The present single centered, prospective interventional study was conducted between the periods of January 2014 to December 2015 for duration of two years in the Department of Orthopaedic Surgery, Bangabandhu Sheikh Mujib Medical University, Dhaka. The present study was conducted to find out the results of total knee replacement in management of patient with advance osteoarthritis. All patients admitted in the Department of Orthopaedics, age more than 45 years with both sexes diagnosed as advance osteoarthritis of knee joint were the study population. Total 20 patients with advance osteoarthritis of knee joint were included in the study.

In this study, distribution of patients according to age was recorded. Maximum patients (40.0%) were in age group 51-60 years followed by 5 (25.0%), 5 (25.0%) and 2 (10.0) were in 61-70 years, >70 years and d"50 years age group respectively. Mean age was 64 ± 10 within range of 46-80. These figures were compared favorably with other workers. Reddy et al (2015) have reported that Mean age ± SD: 60.64±7.49 years. In other studies like Thambiah et al (2015) have reported that mean age of the patients was 64 (range 45–83) and Vaidya et al (2010) 64 years (range 48 to 80).

In this study, regarding sex female were predominant than male. Female male ratio was 1.22:1 indicating that female is more sufferer than male. Reddy et al (2015) have reported that 56% was male and 44% was female which is not consistent with the present study result. But Thambiah et al (2015) and Bisschop et al (2010) have published a similar result which is consistent with the present study result. Regarding the type of osteoarthritis, primary osteoarthritis was 18 (90.0%) and secondary osteoarthritis 2 (10.0%). Reddy et al (2015) have reported that 77.8% was primary osteoarthritis and 22.2% was secondary. Most indications were primary osteoarthritis 51.3%, rheumatoid arthritis 43.6% and posttraumatic arthritis 5.2% (Bisschop et al 2010). So the study showed correlation with other studies.In this study, Maximum 8 (40.0%) cases had varus deformity followed by 5 (25.0%) cases had fixed flexion deformity, 5 (25.0%) cases had combined deformity and 2 (10.0%) cases had valgus deformity. Other study showed pre operative no deformity was 48.1%, fixed flexion deformity 29.6%, varus deformity 14.8% and valgus deformity 7.4% (Reddy et al 2015) which is not consistent with the present study result.

In this study, comparison of pre and post operative Knee Society Clinical Score, pre operative Knee Society Clinical Score was <60 in all cases and post operative Knee Society Clinical Score was 80 - 100 in 8 (40.0%) cases, 60 – 69 in 6 (30.0%) cases, 70 – 79 in 6 (30.0%). Mean Knee Society clinical score was 41.2 ± 8.0 in pre operatively and 77.5 ± 10.6 in post operatively. There was statistical significant difference in Knee Society Clinical Score between pre and post operatively. Reddy et al (2015) showed pre operative Knee Society Clinical Score was <60 and post operative Knee Society Clinical Score was 80 - 100 in 77.7% cases, 70 – 79 in 14.8% cases, 60 – 69 in 7.40% and total clinical score (knee society clinical score) preoperatively it was 47.56 which improved to 84.33 postoperatively. In other studies like Fitch (2014) showed preoperatively it was 46 & postoperatively 84, Richard (2006) preoperatively 48 & postoperatively 86 (Callahan et al.1995) preoperatively 40 & postoperatively 80 and Rand and IIstrup (1991) preoperatively 32 and postoperatively 84. All studies were show statistical significant difference in Knee Society Clinical Score between pre and post operative which are consistent with the present study result.

Regarding comparison of pre and post operative Knee Society Functional Score, pre operative Knee Society Functional Score was <60 in all cases and post operative Knee Society Functional Score was 80 - 100 in 17 (85.0%) cases, 60 – 69 in 2 (10.0%) cases, 70 – 79 in 1 (5.0%). Mean Knee Society Functional Score was 40.7 ± 7.4 in pre operatively and 84.5 ± 10.8 in post operatively. There was statistical significant difference in Knee Society Functional Score between pre and post operative. In other studies showed total functional score (knee society functional score) preoperatively it was 46.52 which improved to 80.81 postoperatively (Reddy et al 2015), preoperatively it was 48 and postoperatively 87 (Fitch 2014), preoperatively it was 44 and postoperatively 82 (Richard 2006), preoperatively 38 and postoperatively 79 (Callahan et al. 1995) and preoperatively it was 49 and postoperatively 86 (Rand and IIstrup 1991). All studies were show statistical significant difference in Knee Society Functional Score between pre and post operative which are consistent with the present study result.

In this study, complications of the postoperative patients were recorded. Most of the patients (85.0%) had no post operative complications. One (5.0%) had knee stiffness, 1 (5.0%) had extension lag >10º and 1 (5.0%) had infection. In another study similar result has been shown by Reddy et al (2015) and have reported that 77.8% of patients no post operative complications were seen, among the remaining patients 11.1% had post operative stiffness 7.4% had post operative extensor lag 3.7% had post operative infection. No evidence of Deep Vein thrombosis

or pulmonary embolism, periprosthetic fractures, neurovascular complications.In this study, according to outcome of the patients 9 (45.0%) patients condition was excellent, 8 (40.0%) patients condition was good and 3 (15.0%) patient condition was fair. In another study, post operatively 77.8% patients had excellent, 14.8% patients had good and 7.4% patients had fair results clinically & functionally (Reddy et al 2015). This result is not consistent with the present study result. But Bhan et al (2002) have published 93% good to excellent results were achieved. So this result is consistent with the present study result.

According to result, 17 (85.0%) patients condition was satisfactory and 3 (15%) was unsatisfactory. In a study by Thambiah et al (2015) 92.8% were reported to be satisfactory. 89.8% of patients were satisfied (Merle-Vincent et al. 2010). In other studies like Yuan et al (2007), which examined the patient outcomes of a group of 60 patients, the patient satisfaction rate was reported to be 91% and Nunez et al (2009), in their study involving 112 patients, reported an 86% satisfaction rate. The results of the present study are consistent with those four studies.

CONCLUSION

Total knee replacement has in the past four decades revolutionized the treatment of osteoarthritis, rheumatoid knee & other arthritic knees. With these satisfactory results we conclude that total knee replacement provided total relief of pain and improve functional outcome in patient with advance osteoarthritis of knee. If performed taking into consideration pre-operation selection of patients, intra operative soft tissue balancing, correct overall alignment of prosthesis and postoperative proper rehabilitation of patients. It is a relatively safe and sure procedure in the hands of the experienced or the guided. It forms the integral part of the general orthopedic set up and with proper patient selection; proper procedure and rehabilitation could continue to achieve the final goal.

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Original Article

To Start or Not to Start DVT Prophylaxis in THR & TKR Patients

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Abstract

The prevalence of deep vein thrombosis after total knee replacement and total hip replacement has been quoted to be between 46% and 84% in the Western literature. The aims of this study were to determine its prevalence in the Bangladeshi population and to assess the need for prophylaxis against deep vein thrombosis. We examined data on 22 consecutive patients undergoing THR And TKR in Arthroplasty unit NITOR, and assessed the possible risk factors: age, sex, weight, previous surgery, unilateral or bilateral surgery, postoperative rehabilitation, tourniquet and operating time and time of skeletal traction preoperatively. No prophylaxis was given to these patients. On clinical suspicion, Some patients underwent a duplex scan of both lower limbs and D-Dimer level on the second postoperative day. Treatment was instituted only if proximal deep vein thrombosis was detected. The overall incidence of deep vein thrombosis was 13.2% with 80% of it occurring distally. Deep vein thrombosis was more common in total hip replacement (22.2%)in those patient who were given prolong skeletal traction preoperatively and who underwent previous surgery around hip. No thrombosis found in TKR patients. Partial thrombosis was present in 71.4% and occurred predominantly in the ipsilateral leg. There was no evidence of propagation. In those patient who underwent any kind of failed hip surgery and was in skeletal traction for muscle contraction and going through hip or knee replacement surgery, are good candidate for DVT prophylaxis.

Key Words: Thromboprophylxis, total knee replacement, total hip replacement

INTRODUCTION:

Thromboprophylaxis is still very controversial in orthopaedics despite many trials on the subject. There is little doubt that prophylaxis for venous thromboembolism (VTE) is required in orthopaedic patients undergoing major operations such as major lower limb joint replacement.

The controversy lies in whether the use of pharmacological prophylaxis is mandatory or whether the risk of complications from anticoagulation (i.e. bleeding) outweighs the benefits. The **prevalence** of deep vein thrombosis after total knee replacement and total hip replacement has been quoted to be between 46% and 84% in the Western literature.

The **prevalence** of deep vein thrombosis after total knee replacement and total hip replacement has been quoted to be between 46% and 84% in the Western literature.

METHODOLOGY:

- The aims of this study were to determine its prevalence in the BANGLADESHI population and to assess the need for prophylaxis against deep vein thrombosis.
- Total 22 Patient Studied under Arthroplasty unit in NITOR
- Number of THR patients were 19 and number of TKR patients were 3.
- Study Period was: July 2017—December 2017

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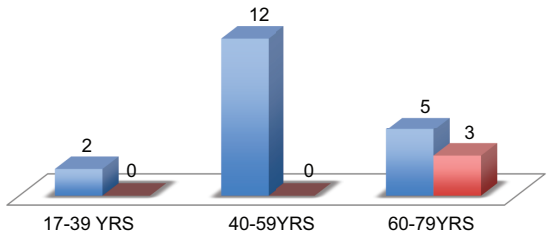


Fig.-1

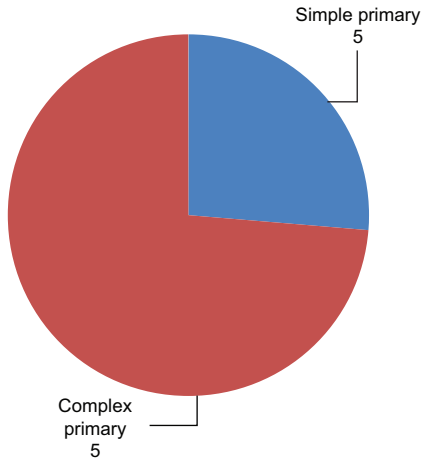
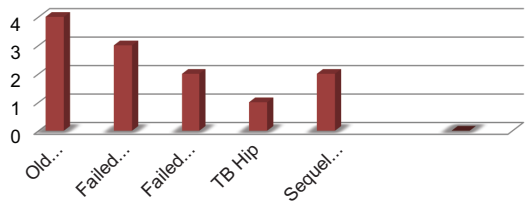


Fig.-2



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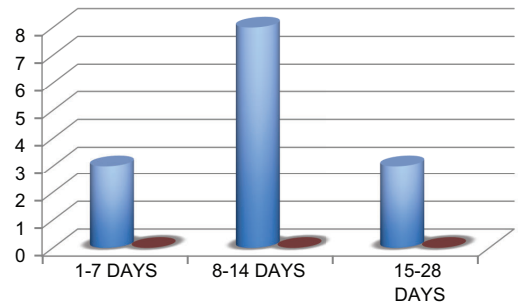

Fig.-4

- Cause of prolong traction before complex tha
- Duration of skeletal traction for tha patients mainly due to overcome muscle contracture
- result:

Immediate post operative all 22 patients were given d-dimer level estimation'

- The 2 raised d dimer patients underwent doppler study, dvt diagnosed, lmwh was given according to protocol.
- After 3 days repeat d dimer done showed decreased level..
- These two patients were something in common:
- They both were more than 60 yrs age
- Both patients were in skeletal traction for more than two weeks
- Both of them are male
- One was old dislocation of hip with acetabular injury
- Another one was infected prosthetic replacement
- When to start prophylaxis
- Preoperative or post operative start of prophylaxis for venous thromboembolism with low molecular weight heparin in elective hip surgery
- 2000 patient studied
- No difference if lmwh started 12 hrs before or after surgery
- Arch Intern Med.2002 jul 8;162(13):1451-6. Strebel N, Prins M,
- Agnelli G, Buller HR
- This practice is based on recent publications from the American College of Chest Physicians (ACCP) 2012 and the American Academy of Orthopaedic Surgeons (AAOS) 2011.
- All patients should be offered mechanical prophylaxis e.g. foot pumps/anti- embolism stockings.
- Encourage mobilisation as early as possible.
- All patients should be aware of the risks of DVT/PE associated with THA and TKA.
- *Enoxaparin 40mg is commenced 6-12hrs post-surgery for 72hrs*
- All patients should be commenced on Proton Pump Inhibitor(PPI) e.g. Pantoprazole 40mg od
- Aspirin 150mg is commenced at 72hrs and continued for 4 weeks after THA and TKA
- When to Start Prophylaxis
- Provided there is no contraindications, start pharmacological VTE prophylaxis after surgery
- RIVAROXABAN-starting 6-10 hours after surgery

- DABIGATRAN- starting 1-4 hrs after surgery
- LMWH- starting **6-12 hours** after surgery
- Is LMWH EFFECTIVE?
- A metaanalysis of 3999 patients undergoing major orthopaedic surgery, LMWH compared with placebo reduced venographic DVT by 52% and any PE by 57%
- The controversy lies in whether the use of *pharmacological* prophylaxis is mandatory or whether the risk of complications from anticoagulation (i.e. bleeding) outweighs the benefits.
- LMWH Complications
- Major Bleeding 1-4%
- Wound hematoma 11%
- Osteopenia 2-2.5%
- Anaemia 3%
- Ecchymosis 3%
- Thrombocytopenia 1.5%
- If the risk of bleeding from any site is more than the risk of VTE, offer mechanical prophylaxis(foot pumps/anti- embolism stockings) only.
- On Discharge
- ÿÛÜ
- ÿÛÜ Each patient should be made aware of the signs/ symptoms of VTE
- Each patient should be warned of the risks of GI upset/bleeding, particularly with concomitant drugs which increase the risk of bleeding e.g. NSAIDS
- If NSAIDS are prescribed Ibuprofen may be preferable to Diclofenac, with a stop date
- ÿÛÜ
- **Patients normally on Aspirin:**
- Aspirin 75mg is rarely stopped pre-operatively. Increase the dose to 150mg od post- operatively with mechanical prophylaxis and Enoxaparin as per recommendations.
- **Patients normally on Aspirin and Clopidogrel**:
- Clopidogrel is discontinued 7 days prior to surgery while Aspirin is continued. Continue Aspirin post-operatively with mechanical prophylaxis and Enoxaparin.
- Clopidogrel is recommenced after cessation of Enoxaparin i.e. at 72hours postoperatively.

CONCLUSION:

In those AGED patients who underwent any kind of failed hip surgery and was in PROLONG skeletal traction and going through hip or knee replacement surgery, are good candidate for DVT prophylaxis.

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Original Article

Augmented Repair of Degenerative Tears of Tendo Achilles Using Peroneus Brevis Tendon In Pabna Medical College, Hospital: Early Results

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Abstract

Reconstruction of degenerated ruptures of the tendoachilles is a challenge. Ruptured tendons and the remaining tendon ends are abnormal. A number of methods have been described in literature reconstruct the tendoachilles, but with variable results. We used peroneus brevis tendon in 16 patients to augment the repair of degenerated tendoachilles tears by creating a dynamic loop as described by Teuffer et. al. All patients were followed up for atleast 6 months. At the last postoperative visit, 14 out of 20 patients were able to do a toe raise. Eighty-five per cent of patients had excellent or good results and 15% had fair or poor results using modified Rupp scoring. Advantages offered by this procedure are the use of a single incision and mini incision and use of a dispensable tendon such as the peroneus brevis without entirely depending on the damaged tendon for healing.

Key words: Tendo Achilles, Degenerative Tears, Peroneus Brevis Tendon, Early Results

INTRODUCTION

Degenerative ruptures of tendoachilles typically occur after the age of 30 years. An inciting event may be related to atrophy of the tendon as commonly occurs in weekend athletes. The injury mechanism usually involves eccentric loading on a dorsiflexed ankle with the knee extended[45]. The tendon has no true synovial sheath, unlike the flexor tendons of the hand; rather, it is covered only by a paratenon and exogenous healing (from synovial fluid) is not expected to occur. Side effects of gout, hyperparathyroidism, steroids and flouroquinolones may contribute to tendon rupture[6]. In the past, we initially treated this injury with end suturing and a plaster cast, but this was associated with high rates of reruptures and weakened push off. Hence, there is rationale to perform reconstruction using an expendable yet healthy tendon such as the peroneus brevis. Here, we present a study of sixteen patients treated with this technique.

MATERIALS AND METHODS

Sixteen patients with a degenerative tendo achilles tear were repaired using peroneus brevis tendon between July 2013 and June 2014. All the patients presented acutely or within a few days due to inability to walk normally post-injury. Clinical presentation was typical with pain and a snapping sensation behind the ankle following a sudden jerk while engaging in sports or similar activity. The patients complained of difficulty in walking and inability

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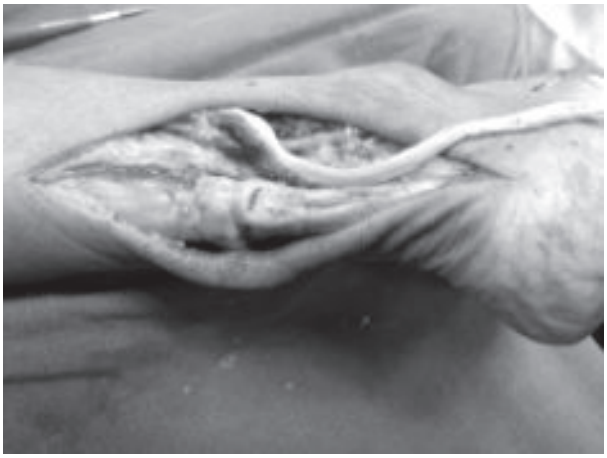
to run. Clinical examination revealed local site tenderness, inability to actively plantarflex the ankle (passive plantarflexion was possible) and positive Thompsons' test[7]. Ankle radiographs were obtained to rule out calcaneal fractures; patients with such fractures were excluded from the study. All patients underwent operative treatment after giving written informed consent. With the patient in prone position, a posterolateral longitudinal incision was made along the tendoachilles also exposing the calcaneal tuberosity. The sural nerve was identified and retracted proximally in the wound. Incision was made through the tendoachilles sheath to expose the ruptured ends (Figure 1a). Scar tissue was resected and the tendon dissected proximally to free it if needed (Figure 1b). The peroneus brevis was then detached from its insertion on the fifth metatarsal following a mini incision and brought through to the first wound (Figure 1c). Ruptured tendon ends were approximated using the modified Krackows' technique with No. 1 proline suture (Figure 1d). We then drilled a hole large enough for the peroneus brevis through the transverse diameter of the calcaneal tuberosity. The peroneus brevis was passed through this hole and then back proximally beside the site of rupture for reinforcement; finally, it was sutured to itself to produce a dynamic loop similar to modified Teuffer technique (Figure 1e). Patients were put in a plaster cast with the ankle in 10-15^0 plantarflexion and the knee in 15 degree of flexion for 4 weeks. This was followed by a below knee cast with the ankle in neutral position for another 4 weeks. Weight bearing was started 6 weeks post-operatively and cast was discontinued 8 weeks post operatively. A progressive strengthening rehabilitation programme followed.

Fig. 1a: *Showing incised tendo Achilles sheath and torn tendon.*

Fig .-1b: *Showing tendon dissected proximally with freshened torn ends and freed sural nerve.*

Fig. 1c: *Freshened torn ends of tendo Achilles and peroneus brevis harvested from insertion via a mini incision and brought through to the primary wound.*

Fig.1d: *Showing repair of tendo Achilles using Krackow's technique.*



Fi g.1e: *Augmentation of repair using peroneus brevis and modified Teuffer technique. A hole large enough for the peroneus brevis to pass through the transverse diameter of the calcaneal tuberosity. The peroneus brevis was passed through this hole and then back proximally beside the site of rupture for reinforcement finally, it was sutured to itself to produce a dynamic loop similar to modified Teuffer technique.*

RESULTS

Of the 16 patients, 10 were female and 6 male, and average age was 41 years (range, 38-51y). Three patients were on long term steroids for respiratory complaints, one had gout, and the remaining patients had no significant medical or surgical history. All patients were followed up for at least 6 months. (range, 3-9 months) (Table I). All patients were asked return for an evaluation by one of the authors who was not involved in the surgical management of any of the cases, and were examined using objective and subjective criteria. Objectively, ankle range of motion ability to perform a toe raise, and neurological status of the foot were examined.Subjective criteria included the Rupp score, as modified by Kerkhoffs et al. (Table IV). In addition to information gathered in the follow-up interview, information was also gathered from the patients' medical record. Results were rated as excellent (>30 points), good (15-30 points), fair (5-15 points) and poor (<5 points) (Table-II) Average dorsiflexion was 180 (compared to 240 on the non-injured side) and average plantar flexion was 260 (compared to 350 on the non-injured side). Results of testing the patient's ability to toe raise for 60 seconds, 10 patients were able to sustain, while 4 patients were able to raise the toe but could not sustain it. Two patients could not do raise the toe at all. One patients complained of sensory hypoesthesia at 6 months follow-up. For Rupp scoring, 75% patients had excellent or good results and 25% had fair or poor results. One patient suffered a re-rupture, but refused further surgery and was managed using ankle foot orthosis. 6 patient had a superficial postoperative infection, which was managed with debridement followed by wound closure regular dressing. Two of patients developed hypertrophic scarring and have problems with footwear. (See Table III, complications).

Table-I

Demographic Features

Demographic Features		No. of patient
Gender	Male	6
	Female	10
Side	Left	9
	Right	7

Table II

Objective and Subjective measures at follow-up

Objective criteria		Operated side	Non-operated side
Range of motion	Dorsiflexion	Average-18^0	Average-24^0
	Plantarflexion	Average-26^0	Average-35^0
Toe raise	Sustained Present but	10	
	< 60 Seconds	4	
	Unable	2	
Neurological Examination	Sensory hypoesthesia in area of distribution of sural nerve	1	
	Normal	15	

Objective criteria: Modified Rupp Score	No. of patient (n=20)	Percentage(%)
Excellent	9	56%
Good	3	19%
Fair	3	19%
Poor	1	6%

Table III

Complications following surgery

Complication	No. of patients
Rerupture	1
Superficial infection	6
Hypertrohic scar	2
Hypoesthesia	2

Table IV

Modified Rupp Score

1. Subjective Satisdaction	Excellent	5
	Good	1
	Satisfactory	-1
	Poor	-5
2. Do you experience pain on bearin weight?	None	5
	With extended weight	1
	bearing	-2
	With slight weight bearing	-5
	Continuous pain	
3. Do you experience pain independent of weight bearing	None	5
	Pain associated with weather	1
	Pain sometimes associated with rest	-2
	Continuous pain	-5
4. Has you ankle function decreased since the operation	No	±2
	Reduction of muscle strength	±2
	Tendency of swelling	±2
	Tendency of cramp	±2
5. Do you fear re-rupture?	Yes	-1
	No	-1
	Does not apply	0
6. Do you have limitations in your work?	None	5
	Minor	-1
	Major	-3
	Changed profession due to	-5
	Achilles tendon problem	
7 Do you have limitations in sporting activities	Does not apply	0
	None	5
	Minor	-1
	Major	-3
	Stopped activity due to Achilles tendon problem	-5
Total	>30	Excellent
	15-3-	Good
	5-15	Poor
	<5	Fair

DISCUSSION

Treatment of a degenerative tendoachilles tear is a tricky proposition. Results of Achilles tendon repair have been variable. As noted by Lagergren and Lindholm[8], the tendoachilles region 2 to 6 cm above the calcaneal insertion has the poorest blood supply. Carr and Norris[9] demonstrated that the midsection of the tendon is most prone to rupture, as this is the area of the tendon in which there is a reduced percentage and number of blood vessels. In addition, the tendo achilles is devoid of a true synovial sheath and has only a paratenon which is more prone to inflammation. Histological examination of ruptured tendon ends confirmed these findings[4]. In the present study, all but one study participant had prodromal symptoms of tendonitis in the form of pain, and reported either acutely or within a few days of onset of inability to walk properly. There are many treatment options for Achilles tendon rupture and many have long been a matter of controversy, including closed methods[10,11], open surgical repair, percutaneous sutures[12], v-y lengthening of the gastrocnemius[13], augmented repair with central gastrosoleus aponeurosis[1], and reconstruction using flexor hallucis longus [14-15]. We performed reconstruction using peroneus brevis based on the premise that the torn ends of the tendons are already unhealthy[4]. Further, the healing capacity of the injured tendon is further limited due to

hypovascularity resulting in decreased tissue regeneration with a high probability of re-rupture. The use of peroneus brevis serves two advantages; 1) it incorporates a healthy tendon with more reliable healing potential; 2) it is an expendable tendon and there is little disability in its absence. Overall, our results were satisfactory withn 75% good or excellent results as per modified Rupp criteria. Similarly, Teuffer[2] et all. Reported that this is a dynamic loop repair technique which is biomechanically more sound than static repair. Nevertheless achilles tendon reconstruction using peroneus brevis has certain disadvantages. For instance, this more extensive approach requires specialized surgical expertise. Infection, though rare is a possibility. Superficial infection and skin loss occurred in six patient in the present study and was managed with thorough debridement. Altered wound healing in the form of hypertrophic scarring can result into difficulty in shoe wearing. Similar augmented techniques are reported in the literature. For instance, Demirel et al. noted that primary repair of acute tendo achilles rupture augmented with the gastrosoleus. Turn down flip technique in combination with immediate weightbearing ambulation results in good outcomes overall, but is associated with similar complication rates noted above. There are a number of shortcomings of our study. Firstly, the sample size of 16 patients is too low. also, no one in the present study was a professional athlete, members of a subpopulation who would likely have higher expectations for such a procedure.

CONCLUSION

Results of reconstruction of Achilles tendon ruptures using peroneus brevis tendon show a strong and stable repair that allows early weight bearing ambulation with favorable clinical results in most patients. Disadvantages of the procedure should be shared in detail with patients when obtaining informed consent. Care must be taken to prevent wound problems and deep infection that can necessitate more extensive dissection. Further studies that include professional athletes should be performed to confirm efficacy of this augmented technique.

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Original Article

Evaluation of Motor and Sensory Recovery After Surgical Repair of Low Median And Ulnar Nerve Injuries

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Abstract

Peripheral nerve injuries are common involving the upper extremity. Low median and ulnar nerves are easily damaged, resulting in loss of motor and sensory function of hand. Traumatic cut injury of median and ulnar nerve in forearm and wrist can cause disabling sensory and motor function of hand. The recovery following primary repair is faster than other methods. To evaluate the motor and sensory recovery after surgical repair of low median and ulnar nerve injuries. This study was carried out between January 2014 to December 2015 in the department of Orthopaedic Surgery, BSMMU, Dhaka. Total number of patients were 20. Amongst them 10 ulnar, 6 median and 4 combined median & ulnar nerve injuries. Total no of injured nerves were 24. Amongst them 14 were ulnar nerves and 10 were median nerves. All the injured nerves were repaired by epineurial neurorrhaphy. It was a clinical trial (quasi experimental study). All the patients were presented early and repaired by primary, delayed primary and early secondary repair. The age incidence was 16 years to 48 years. The maximum number of patients 8(40%) were in the age group of 3rd decade. There were 17(85%) male and 3 (15%) female patients. 10(45%) of nerve lesions were combined with tendon injuries. Timing of repair ranged from 18 days to 86 days. Diagnosis was done on the basis of clinical findings and electrodiagnostic study. All the lesions were at the low level. The ulnar nerve was the commonest injured nerve 10(50%) in this study. Repair in younger age group showed better prognosis. Small (up to 20 mm) nerve defects had better prognosis. Regarding complications 1(5%) patient suffered from superficial wound infection, 2(10%) patients suffered from hypertrophic scar. Postoperative follow-up period was minimum 6 months to maximum 18 months. Overall functional outcome was excellent in 9(37.5%), good in 8(33.3%), fair in 6(25%) and poor in 1(4.2%) cases. Satisfactory outcome was 9(64.2%) out of 14 in ulnar nerve, 8(80%) out of 10 in median nerve. Repair of the low median and ulnar nerve injuries were analyzed with respect to the age of the patient, timing of repair, length of nerve defect and level of nerve injury. Median nerves repair were somewhat more successful than those of the ulnar nerves.

Keywords: Nerve injuries, Motor and Sensory Recovery, Median Nerve, Better result

INTRODUCTION

Ulnar nerve injuries are classified as high or low. Low injuries occur distal to the origins of the motor branches to the FCU and ring and little finger flexor digitorum profundus (FDP) muscles. Strength of the extrinsic hand muscles is unaffected, but sensation is lost on the ulnar border of the hand and in the ring and little fingers, and the ulnar innervated intrinsic muscles are paralyzed. This results in weakness of thumb pinch, claw deformity, loss of the normal pattern of finger flexion, and significant loss of hand dexterity and strength. High injuries occur above the origins of the motor branches to the FCU and ring and little finger FDP muscles. In this situation, loss of active ring and little fingure DIP joint flexion and wrist flexion

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compound the aforementioned findings, although paradoxically, the claw deformity tends to be less severe. Median nerve injuries are classified as high or low, depending on whether the lesion is proximal or distal to the origin of the anterior interosseous nerve in the proximal forearm. In low injuries, the thenar intrinsic muscles innervated by the median nerve, usually the abductor pollicis brevis (APB), opponens pollicis, and superficial head of the flexor pollicis brevis (FPB), are paralyzed. In high injuries, the pronator teres, flexor carpi radialis (FCR), all the finger superficiales, index and middle finger profundi, FPL, and pronator quadratus muscles are also paralyzed. (Wolfe, Holchkiss et al 2010),The endoneurium surrounds individual myelinated axons and groups of unmyelinated ones. Fascicles are collections of axons which are surrounded by perineurium. The peripheral nerve trunk is a collection of fascicles, and the epineurial (external) epineurium surrounds the nerve trunk proper. The endoneurium is longitudinally oriented while the perineurium and epineurium are circumferential (Sunderland, 1990).

The surgical treatment of peripheral nerve injuries is still a challenging and highly demanding procedure. The results have been improved upon by different advances in microsurgical techniques (Sinis *et al.,2009).*After performed nerve repair, intensive and time-consuming rehabilitation is needed. The highest incidence of nerve injuries can be observed in young men aged 16–35, with women only contributing to 20–30% of all cases .(Noble, C. A. Munro, et al., 1998).Under ideal conditions axon regrowth from the proximal stump occurs at 1 mm/day. The time after which irreversible muscle atrophy has occurred and operation cannot provide beneût is 12–18 months. The Schwann cells and the endoneurial tubes remain viable for 18–24 months after injury. If they do not receive a regenerating axon within this span of time, the tubes degenerate. Re-innervation must occur not only before the muscle undergoes irreversible changes, but before the endoneurial tubes will no longer support nerve re-growth. The time distance equation thus has two primary variables: irreversible changes in critical target structures after 12–18 months, and axon regrowth at 1 mm/day from the site of injury or the site of surgical repair. Good outcome is considered return of function to MRC grade 3/5 (muscle can move against gravity but not resistance). Another major precept of peripheral nerve surgery is ‘‘when you have nothing, a little means a lot”. The primary surgical techniques used include external neurolysis, end-to-end repair, nerve grafting and nerve transfer (Spinner and Kline, 2000).

Nerve repair is classified as primary repair (0 days delay), delayed primary repair (1 day to 1 month), early secondary repair (1 to 3 months), and secondary repair (3 to 6 months, 6 to 12 months, and more than 1 year delay). (Aleid C. J. Ruij et al., 2004).

MATERIALS AND MATHODS:

Study design:
This is a clinical trial (quasi experimental study) .

Duration of the study:
From January 2014 to December 2015 .

Sample size and sampling technique:
Sample size **:** 20 patients**.**

Study population:

The patients with low median and ulnar nerve injuries were diagnosed on the basis of presenting complaints, clinical examinations & investigations.

Place Of The Study:

Department of orthopaedic Surgery, Bangabandhu Sheikh Mujib Medical University, Dhaka, Bangladesh.

Inclusion Criteria:

1. Sharp cutting injury to low median or ulnar nerve.
2. Sharp cutting injury to combined low median and ulnar nerve.
3. Duration of low median and ulnar nerve injuries less than 3 months.
4. Supple wrist, MCP and IP joints of fingers.
5. Patients upto 50 years of age.

Exclusion Criteria:

1. Lacerated injury to low median or ulnar nerve.
2. Lacerated injury to combined low median and ulnar nerve.
3. Duration of low median and ulnar nerve injuries more than 3 months.
4. Stiffness of joints.
5. Post operative follow-up less than 6 months.
6. Patients more than 50 years of age.

DISCUSSION:

Many factors are thought to affect nerve recovery, including age, type of injury, timing of repair, length of follow up, nerve orientation and alignment (Tupper 1988).In our study the age of patients ranged from 16 years to 48 years. The mean age was 29.1 + SD 8.7 years. The

highest incidence was in the third decade. There were 17 male (85%) and 3 female (15%) patients in this study (ratio 5.66 : 1). Male patient's incidence was higher than in the study of Thomas Vordemvenne et al., (2006). In that study male female ratio was 1.53 : 1. That means male incidence was 1.5 times more. In our study right sided injury was 15 (75%) and left sided injury was 5 (25%). . In subrata kumar pramanik's (2006) study showed left sided injury was (60%) and right sided injury was (40%). Low ulnar nerve injury was 10 (50%), low median nerve injury was 6 (30%), combined ulnar and median nerve injuries were 4 (20%) and additional flexor tendon injury was 10 (50%), out of 20 patients. In the study of Thomas Vordemvenne (2006), ulnar nerve injury was 39.4%, median nerve injury was 49.3%, combined ulnar and median nerve injuries were 4.3%, additional flexor tendon injury was 59.5%.

In our study, sensory recovery after surgical repair of low median nerve injury was 3(30)% patients attained level S3+, 5(50)% patient attained level S3, 2(20)% patient attained level S2, out of 10. In the study of Thomas Vordemvenne (2006), 11% patients attained level S4, 29% patient attained level S3+, 7% patient attained level S3, 46% patient attained level S2, and 7% patient attained level S1. In our study, sensory recovery after surgical repair of low ulnar nerve injury was 6(42.8)% patients attained level S3+, 3(21.3)% patients attained level S3, 4(28.6)% patient attained level S2, and 1(7.1)% patients attained level S1, out of 14. In the study of Thomas Vordemvenne (2006), 20% patient attained level S3+, 20% patient attained level S3, 55% patient attained level S2, and 5% patient attained S1. In our study, motor recovery after surgical repair of low median nerve injury was 3(30)% patients attained level M4, 5(50)% patients attained level M3, 2(20)% patients attained level M2, out of 10. In the study of Thomas Vordemvenne (2006), motor recovery of low median nerve injury was 43% patients attained level M5, 14% patients attained level M4, 39% patients attained level M3 and 5% patients attained level M2. In our study, motor recovery after surgical repair of low ulnar nerve injury was 6(42.8)% patients attained level M4, 3(21.5)% patients attained level M3, 4(28.6)% patients attained level M2, and 1(7.1)% patients attained level M1, out of 14. In the study of Thomas Vordemvenne (2006), motor recovery of low ulnar nerve injury was 20% patients attained level M4, 55% patients attained level M3, and 15% patients attained level M2.

Nicholson and seddon as well as Sakellarides, observed that the upper limit of a gap beyond which result will deteriorate is approximately 25 mm (Jobe & Martin 2003). In Sakellarides' study (1961) gap up to 25 mm showed good to excellent result in 60% of cases. In our study gap upto 20 mm showed 15(88.2%) satisfactory result out of 17, which is better than that of Sakellarides. But the gap > 20 mm showed 2(28.6%) satisfactory result and 5(71.4%) cases showed unsatisfactory result, out of 7. That is statistically significant. Gap between the nerve ends less than 2.5 cm showed satisfactory outcome than the gap more than 2.5 cm trial have been closed with the suture-line under some tension. Tension at the suture-line is the most important factor influencing the results of neurorrhaphy (Berger & Millesi 1988). In our study excellent result of ulnar nerve was 6(42.8%), median nerve 3(30%). Good result was found in ulnar nerve 3(21.5%), median nerve 5(50%). Fair result was found in ulnar nerve 4(28.6%), median nerve 2(20%). Poor result was found in ulnar nerve 1(7.1%) and median nerve 0(00%). The overall result was excellent in 9(37.5%), good in 8(33.3%), fair in 6(25%) and poor in 1(4.2%). Mohammed Ali Mohseni (2010) showed the result of primary repair was excellent in 23%, good in 55% and fair in 22%. The result of secondary repair was good in 32% cases, fair in 44% cases and bad in 24% cases. The result of nerve grafting was good in 33.3%, fair in 40% and bad in 26.6%. Omer, in reviewing peripheral nerve injuries in upper limbs found the most successful results in patients younger than 20 years (Jobe & Martin). In Hossain's study 3 cases of below 10 years of age showed 100% and 8 cases between 10 - 20 years showed 61.5% good to excellent results. In our study good to excellent results 100% of cases aged 10 - 20 years. Nerve repair in younger age group showed remarkable recovery. It may be due to their ability to full regeneration, less scaring and better adaptability in the CNS (Almquist & Olopsson 1970).Regarding the level of lesions, Nicholson and Seddon (1957) showed good to excellent motor and sensory recovery in 42% of high lesion of median nerve repair and 77% motor and 50% sensory recovery for high ulnar nerve repair. Sakellarides (1962) showed good to excellent motor and sensory recovery in 30% of cases of high ulnar and motor in 11% and sensory in 55% cases of high median nerve repair. In our study good to excellent motor and sensory recovery in 80% cases of low median nerve and 64.2% of low ulnar nerve repair. This study showed overall satisfactory recovery in 17 (70.8%) of low lesions. Hossain (1986) showed more success in low level of lesions. Sunderland (1991) showed more success in low level of lesions (cited in Lee & Wolfe 2000).

Sakellarides (1962) showed good to excellent motor recovery in 39.5% and sensory recovery in 49% for median nerve repair, but for ulnar nerve repair, motor recovery

was 39.5% and sensory recovery was 43%. Hossain (1986) showed good to excellent motor and sensory recovery for median nerve repair in 60% and for ulnar nerve repair 47% and for combined median and ulnar nerve repair 33%. The good to excellent results in our study is more in median nerve, 8(80%) than the ulnar nerve, 9(64.2%). Mohammad Ali Mohseni et al (2010) showed that if a nerve grafting is longer than 20 mm, late results will gradually deteriorating. For gaps <20 mm neurological recovery is moderate, for gaps 20 – 40 mm recovery is generally poor. In our study 17 injured nerves that had upto 20 mm distance between cut ends were repaired, amongst them 15(88.2%) regained satisfactory and 2(11.8%) unsatisfactory. Another 7 injured nerves that had >20 mm gap between cut ends were repaired, amongst them 2(28.6%) regained satisfactory and 5(71.4%) unsatisfactory which is statistically significant. In our study 12 injured nerves that were upto 6 cm proximal to wrist joint were repaired, amongst them 10(83.3%) regained satisfactory and 2(16.7%) unsatisfactory. Another 12 injured nerves that were 7 - 12 cm proximal to wrist joint were repaired, amongst them 7(58.3%) regained satisfactory and 5(41.7%) unsatisfactory, which is statistically not significant. In Mohammad Ali Mohseni et al (2010) showed that after low level repairs, motor recovery potential was similar for median and ulnar nerve. Aleid C. J. et al (2004) showed that the use of primary repair for clean cut injuries and early secondary repair they found a similar tendency for sensory recovery. In our study In our study 15 injured nerves that were upto 45 days of injury were repaired, amongst them 12(80%) regained satisfactory and 3(20%) unsatisfactory. Another 9 injured nerves that were 46 – 60 days were repaired, amongst them 5(55.6%) regained satisfactory and 4(44%) unsatisfactory, which is statistically not significant. In a large compilation of data from a 40-year period, Mackinon and Dellon (cited in Lee & Wolfe 2000) reported that very good (excellent) results (M4, S3+) were obtained in approximately 20% to 40% of cases. In our study excellent results were 9(37.5%) of 24 cases. Lee and Wolfe (2000) said, "Unfortunately, with only 50% of patients regaining useful function". Hossain (1986) showed overall satisfactory results in 15 (50%) of 30 patients with median, ulnar and combined median and ulnar nerve injuries. In our study overall satisfactory results found in 17 (70.8)% of 24 cases.

Among the complications, only one patient suffered from superficial wound infection (case no-6) and healed with regular dressing and oral antibiotics. Two patients developed hypertrophic scar (case no.9 & case no. 15) In Hossain's study 2 patients suffered from wound infection and one patient developed mild Volkmann's ischaemia. Duration of follow up ranged from minimum 6 months to maximum 18 months. Most authors believe that 2 - 5 years are necessary to determine the maximal recovery, especially with more proximal nerve lesions (Tupper 1988). We wanted to see the outcome of this procedure for the treatment of median and ulnar nerve injuries. The outcome was categorized in this study as excellent, good, fair and poor according to internationally accepted report of the Nerve Injuries Committee of the British Medical Research Council (1954), which was also used by Nicholson and Seddon and by Sakellarrides.For statistical analysis excellent and good categories were regarded as satisfactory and fair and poor categories were regarded as unsatisfa-ctory.

CONCLUSION:

Motor and sensory recovery after primary, delayed primary and early secondary repair of low median and ulnar nerve injuries by epineurial neurorrhaphy is satisfactory. Clinical evaluation of the results were done on a neurological basis. The outcome of younger age group is better than that of older age group and the outcome of less gap between cut ends is better than that of more gap between cut ends.

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Original Article

Propeller Flaps in Distal Lower Limb Reconstruction: Case Series Study in Rangpur Medical College Hospital

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ABSTRACT

In reconstruction of lower limb soft tissue defects, muscle flap have been the 'Gold Standard 'for Gustillo Anderson Grade IIIB fracture involving upper and middle third defects.Lower third defects usually reconstructed with free flaps. Flap surgery like fasciocutaneous, adipofascial and superthin flaps may be harvested for the purpose of reconstruction thereby minimizing morbidity from muscle inclusion into the flap. Perforator(propeller)flaps are suitable options for reconstruction of soft tissue defects in the lower limb. Besides having a more reliable vascular pedicle than traditional flap, propeller flaps allow for great freedom in design and for wide mobilization that extend the possibility of reconstructing difficult wound with local tissues and minimal donor site morbidity. Between January 2016 to January 2017, 8 consecutive patient,18-45years old were referred to department of orthopedics of RpMCH for soft tissue reconstruction of lower extremity. 6 wounds were Gustillo Anderson grade IIIB &Two were expose Achilis tendon. All patients were operated under spinal anesthesia. All patients tolerated the procedure well except one, there was complete flap loss.However the remainder of the flap survived and wound healed completely.5 flaps were based on the peroneal artery perforators, two were based on anterior tibial artery perforators& one perforator was posterior tibial artery. One flap there was distal congestion but improved on day three post-operatively. 7 out of eight (87.5%)flaps were survived for middle and distal third leg reconstruction. Propeller flaps is a versatile option for reconstruction of lower leg soft tissue defects.

Keywords: Propeller flap,Reconstruction.

INTRODUCTION

In the last few years, propeller flaps have become an appealing option for coverage of a large range of defects. Besides having a more reliable vascular pedicle than traditional flap, propeller flaps allow for great freedom in design and for wide mobilization that extend the possibility of reconstructing difficult wounds with local tissues and minimal donor-site morbidity. They also allow one-stage reconstruction of defects that usually require multiple procedures. Harvesting of a propeller flap requires accurate patient selection, preoperative planning and dissection technique. Complication rate can be kept low, provided that potential problems are prevented, promptly recognized and adequately treated.[1]

The term "propeller flap" was first used in 1991 by Hyakusoku et al.[2] to describe an adipocutaneous flap based on a central subcutaneous pedicle with a shape resembling a propeller that was rotated 90 degrees.In 2006, combining the concept of propeller flaps and perforator based flaps, Hallock[3] reported a fasciocutaneous flap that was similar in shape to the one described by Hyakusoku but was based on a skeletonized perforating vessel and was rotated 180

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degrees on an eccentric pivot point. Teo[4]gave the greatest contribution to the surgical technique and the application of the perforator propeller flap.

In the last few years, the introduction of the propeller flaps gained great popularity; these flaps have been increasingly used for reconstruction of soft tissue defects of different parts of the body, and surgical technique has been refined and well described by several authors .[5-9]Perforator propeller flaps have a reliable vascular pedicle and can undergo wide mobilization and rotation; their harvest is fast and easy and does not require microsurgery; however, accurate patient selection, preoperative planning and dissection technique are mandatory to prevent complications.[10-18]

MATERIALS AND METHODS

Between January 2016 to January 2017, 8 consecutive patient, 18-45years old were referred to RpMCH for soft tissue reconstruction of lower extremity. 6 wounds were Gustillo Anderson grade IIIB &Two were expose Achilis tendon. All patients were operated under spinal anesthesia.Perforators were marked and planned preoperatively with an 8 Mhz hand held Doppler device.The proximal limb of the flap is equal to the distal limb of the flap and the wound defect size with the perforator as pivot point.Perforator vessels were identified by unidirectional pulsatile flow.

SURGICAL TECHNIQUE

PREOPERATIVE PLANNING

A hand held Doppler probe is always sufficient for preoperative vascular assessment. The whole region should be investigated to have a clear preoperative picture of the location of all perforators or of the axial vessels. If a propeller axial flap is planned, identification of the vessel is easier because its position is constant and well known. A flap is marked around the perforator with the best pulse and location (or around the axial vessel), possibly allowing for primary closure of the donor site. Different options can be taken into account if more than one vessel is identified. An alternative flap is always planned as a "plan B." An exploratory incision is planned without interfering with the alternative local flaps or such as to allow access to the recipient vessels, when plan B is a free flap. If possible, the skin incision is placed along previous scars or natural folds. A common mistake at the beginning is insufficiently wide exploratory incision that restrains vision and interferes with accurate identification of perforators. The incision is our window to the perforator and must be wide enough.

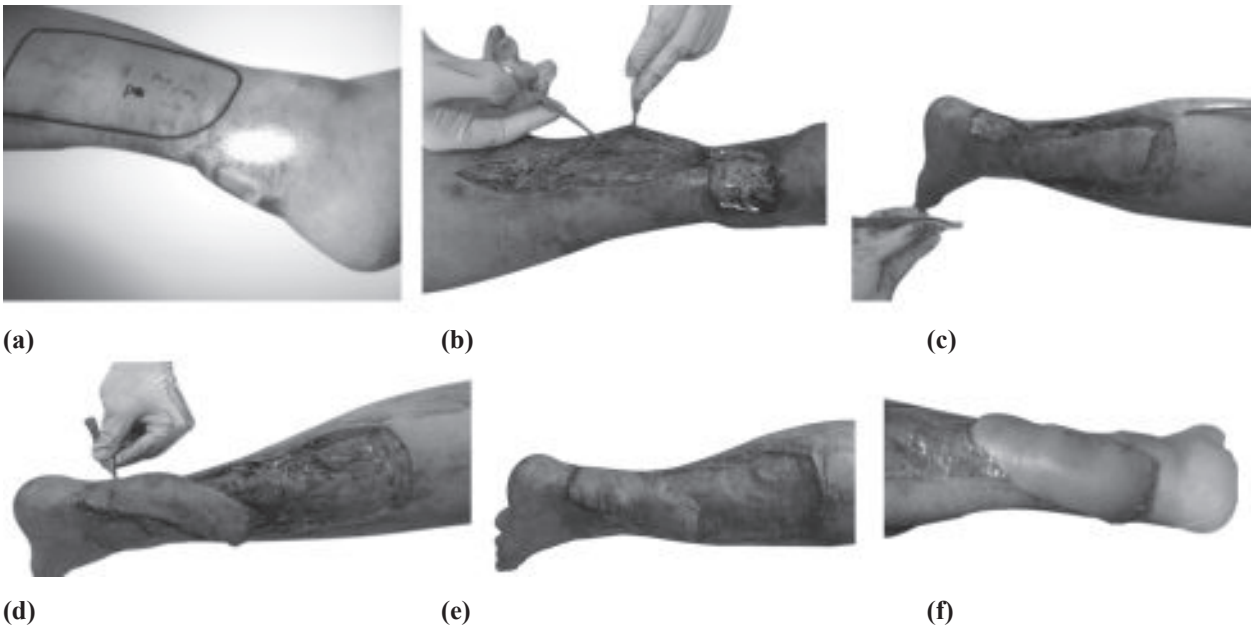

Figure 1: *(a) Left Achilles tendon exposure after open repair. The flap has been drawn around the perforator with the best sound. (b & c) A wide exploratory incision is performed to visualize it. (c) Optimal perforator visualization, such as that shown in the picture, must be possible through the exploratory incision. When exposure is inadequate, the incision should be lengthened. In this case the proximal perforator was directed to the skin and the distal to the soleus muscle. (d) The flap has been islanded and left on the perforator alone to let the circulation settle. While the flap's circulation settles before rotation, donor site closure can be accomplished. After rotation, the pedicle is always double checked for torsions, traction, or kinking that must be, if present, immediately eliminated. (e) Closure with STSG. Note that the flap is a little longer than required to compensate postoperative swelling. (f) Six months postoperative result shows complete flap survival.*

3.2. FLAP DISSECTION

Through the exploratory incision suprafascial or subfascial dissection under loupe magnification is used to identify all the perforators around the defect. Once all perforators have been identified, the best one is chosen based on caliber, pulsatility, course and orientation, number and caliber of accompanying veins, and proximity to the defect and to a sensory nerve (the biggest perforators usually accompany sensory nerves all over the body). Then, in cases of suprafascial dissection, the fascial opening is widened and the perforator is freed from any surrounding tissue and dissected as long as possible (up to the source vessel) in order to achieve an adequate length of the pedicle along which to distribute the torsion . Care should be taken in order to divide any attachment of the perforator to the surrounding tissues, like side branches (that must be ligated and not cauterized to avoid thermal damage to the perforator) or fibrous bands. As demonstrated by Wong et al.[19], the risk of vessel buckling is decreased when, for a perforator of 1 mm diameter, the vessel length is more than 3 cm. To prevent spasm, no tension must be placed on the perforator which should be manipulated as little as possible.

If needed, the flap is redrawn around the chosen perforator. Differently from traditional flaps, traditional length/width ratios do not apply to propeller flaps because the pedicle usually penetrates the flap around its central part: this means that a 25/5 cm flap should not be considered a 5/1 flap .The possibility of achieving donor-site closure should be the main concern about flap size, rather than concerns about flap perfusion.[20]If perfusion is deemed insufficient, the flap should be supercharged, whenever possible. For this reason, adequate length of superficial veins and of other perforators entering the flap must be preserved.

3.3. Flap Insetting

A crucial step in warranting survival of these flaps is to wait for the circulation to settle before flap rotation for at least 20 minutes. After rotating the flap to its new position, its pedicle should be checked for twisting or buckling and further dissected if any limitation exists to an even distribution of the torsion. Clockwise and counter clockwise rotations are evaluated and the best one in terms of vessel rotation is chosen. The sense of rotation should be documented should the flap need to be reexplored. The flap is then secured in position and observed for color, capillary refilling, and bleeding. If insufficient arterial inflow is observed due to arterial spasm caused by surgical manipulation, the flap should be brought back to its original position until spasm resolution (usually about 20 minutes) and its pedicle rinsed with lidocaine or papaverine. If the spasm persists after derotation, the flap should not be transferred anyway but rather left in place and delayed a few days before wound coverage.

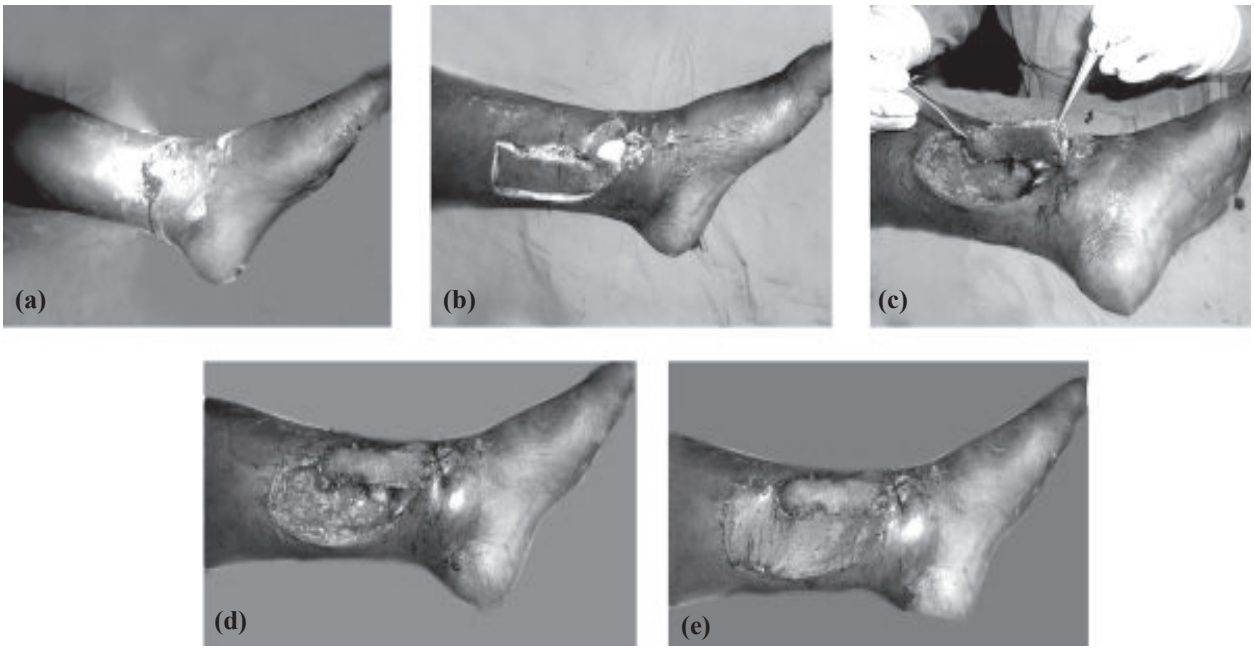

Fig.-2: *(a)defect in the distal part of leg (b) identification, marking &incision was given around anterior tibial artery perforator flap (c)after flap elevation(d)flap inset(f)donor site was skin grated.*

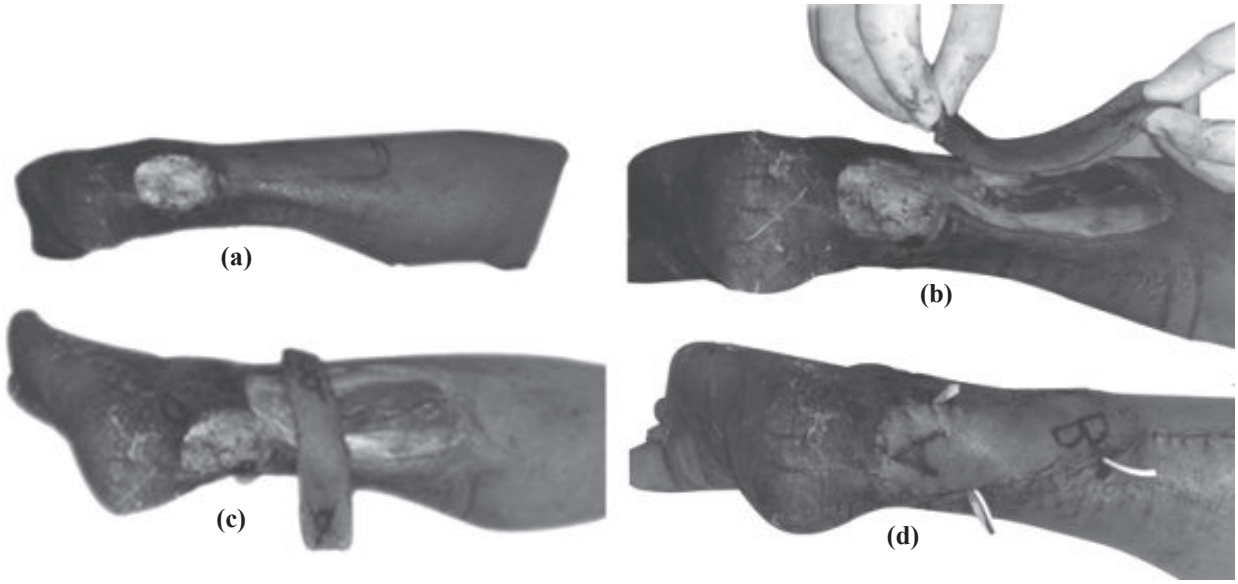

Fig.-3 (a,b,c,d): *Propeller flap For TendoAchillis coverage.*

3.4. Postoperative Care

Limbs should be kept in a splint for the first postoperative days; compression on the flap should be avoided and elevation should be maintained for head and limbs flaps.

Flaps are checked every second hourly during the first postoperative days, to allow for prompt identification of eventual complications.

3.5 Complications: Prevention and Management

3.5.1. Arterial Insufficiency

This complication is extremely rare: accurate planning of the flap and choice of the perforator help preventing it. When, due to persistence of arterial spasm, the flap remains pale due to insufficient arterial inflow, the flap can be derotated to its original position for a few days before rotating it.

3.5.2. Venous Insufficiency

Venous congestion is the most frequent complication of propeller flaps, because veins are more prone to torsion than arteries. Venous insufficiency should be distinguished from the temporary congestion that often characterizes perforator flaps and fades out with stabilization of flow. True venous insufficiency worsens with time and should be promptly recognized and treated. When it is limited to an apical part of the flap, its evolution is observed. A small number of cases evolve in necrosis, which is usually superficial, so that deep vital tissue is still present at the recipient site.

Cases of mild venous congestions in thin flaps can be addressed with leech therapy.[21]When venous congestion is significant and worsens over time, reexploration and venous supercharging are the best option, in case a superficial or perforating vein of the flap was prepared during dissection. Should venous supercharging not be feasible, an alternative option is to temporarily derotate the flap (a few days) to relieve torsion on the pedicle and let the circulation settle.[22]

3.5.3. Partial Necrosis

Total flap loss is rare. Partial necrosis seems to occur in about 5% of cases and is often limited to the skin. After eschar removal, an adequate bed for a skin graft is often present. Healing by secondary intention is another alternative for small wounds.

Ethical consideration: The ethics & Research committee of Rangpur Medical College Hospital approved the study & was carried out.

RESULTS:

All patients tolerated the procedure well except one, there was complete flap loss. However the remainder of the flap survived and wound healed completely.5 flaps were based on the peroneal artery perforator ,two were based on anterior tibial artery perforator &one perforator was posterior tibial artery. One flap there was distal congestion but improved on day three post-operatively.7 out of eight (87.5%)flaps were survived for middle and distal third leg reconstruction.

Table-I

Demographics of Patients

No.	Age	Sex	Cause	Comorbids	Size	Location	Perforator	Complication
1	20	M	Trauma	None	5x5 cm	Distal third of leg	Posterior Tibial	Nil
2	21	M	Trauma	None	6x4 cm	Middle third of leg	Anterior Tibial	Initial Congestion-no necrosis
3	18	M	Trauma	None	10x3 cm	Distal third of leg	Anterior Tibial	Flap loss
4	30	M	Trauma	None	5x5 cm	Distal third of leg	Peroneal	Nil
5	40	M	Trauma	None	5x4 cm	Middle third of leg	Peroneal	Nil
6	25	F	Trauma	None	3x3 cm	Distal third of leg	Peroneal	Nil
7	35	F	Trauma	None	6x4 cm	Distal third of leg	Peroneal	Nil
8	45	M	Trauma	Diabetic	7x4 cm	Distal third of leg	Peroneal	Nil

DISCUSSION:

For a reconstructive surgeon to be able to utilize these perforator flaps in reconstructive surgery,he/she needs to be familiar with the structural anatomy and vascular anatomy of the area involved as it provides a framework for flap elevation. Early description of cutaneous blood supply and vascular territories was provided by Carl Manchot in the late 1880s.Subsequently,comprehensive vascular studies of the human integument were provided by Taylor and palmer.[29]There are a total of 93 perforators in the lower extremity with an average diameter of 0.7mm and able to supply a flap 47cm2 in size. The structural anatomy of the tissue planned for reconstruction and the flap to be used should also be taken into consideration by the reconstructive surgeon. For example, the characteristic anatomy of parent tissue in the lower third of the leg is particularly thin,fasciocutaneous with limited underlying muscle.For this reason free flap or pedicle flap reconstruction with tissue from more proximal regions of the body are anatomically and aesthetically not very suitable for reconstruction of the distal third of the leg.Bulky tissue from the thigh (e.g.Anterolateral Thigh Free Flap-if inadequately thinned)and proximal regions of the leg(ReversreSural Flap) are large flaps which do not aesthetically fit the reconstructed area and may be functionally inappropriate. The radial forearm flap which arises from an anatomical region similar to that of the distal third of the leg may be a better match for reconstruction of the lower third of the leg. However this necessitates a fairly large flap and the donor site defect for a radial forearm which may in turn be aesthetically unpleasing or functionally limiting. Secondly, distal one third leg defects, were previously deemed difficult regions to reconstruct due to its distance from common pedicle muscle flaps and also due to its poor vascularity. It is through the understanding of detailed vascular and tissue anatomy that the reconstructive surgeon is able to employ a suitable solution for a tissue defect in the region. In addition to understanding the vascular and structural anatomy of the region to be reconstructed,the reconstructive surgeon should have at his disposal the accurate surgical techniques and equipments to enable him to safely dissect these perforators intra-operatively. Prior to dissection or flap harvest,the position and course of these perforators can be determined with the use of hand held Doppler's, Duplex scans or even CT and MRI scans.[30]

In our centers we only used an 8MHz hand held Doppler for preoperative identification of suitable perforators.Dissection of perforator's intra-op should be done with the use of surgical loupes preferably with 3.5x magnification. Dissection should be done in a bloodless field for accurate identification of perforators and adequate size of perforators can be assessed by the visible pulsations of the perforator and the size of the fascial defect through which the vessel has perforated. Once the perforators are identified,a lifeboat/back up plan should always be in place in case on inadvertent trauma to the chosen perforator. This can be by identifying extra veins for use as a means of turbo-charging a flap or to convert the pedicle flap into a free flap. Even since the first publication by koshima and soeda[30]in 1986,there have been several publications on the use of perforator flaps for reconstructions of a multitude of defects. The use of perforator flaps for reconstruction of a multitude of defect. The lower extremity seems to be region of interest as it represents a new paradigm shift in management. This region previously deemed fit for only free microsurgical transfer is now being reconstructed with fasciocutaneous flaps from adjacent regions based on perforators of the three source vessels of the lower limb. Based on the four principles of the

perforasome theory introduced by saint-Cyr et al.[31]We bagan using pedicled perforator flaps for lower extremity reconstruction and found that our patients spent less time under general anaesthesia,less time in ward and had minimum complications. The reconstructed region was more aesthetically pleasing and the pedicled perforator flaps were a better reconstructive fit for the region.All our cases were post trauma involving middle and distal third of the lower extremity .we have had 87.5%success with propeller flaps for lower third reconstruction so far. We have also had 87.5%success in total with all our propeller flaps. Benefits of the use of perforator flaps are that 1.better aesthetic as the donor is from the adjacent area 2.donor site morbidity is minimized 3.Less time taken for flap harvest 4.less blood loss comparative to other option 5.patients only requires spinal anaesthesia as opposed to general anaesthesia in free flap surgery 6.good option in non tertiary care centers 7.Decreased hospital stay 8.does not require sophisticated instrumentsfor raising of these flaps 9.It requires a certain amount of skill which in time most surgeons are able to master.

CONCLUSIONS

Perforator propeller flaps are valid reconstructive options for difficult wounds and can be raised from adjacent part of the defect. Their harvesting is easy and fast, provided that an accurate dissection technique is applied and allows for great freedom in design and choice of the donor site.

Propeller perforator flaps represent an alternative to free flaps when traditional flaps are not an option, allow to reconstruct even complex wounds with local tissues and a low donor-site morbidity and present several advantages over traditional pedicle flaps, their freedom in design allows to reconstruct complex defects usually requiring multiple procedures in a single stage, accelerating recovery, minimizing morbidity and discomfort for the patient and allowing a better aesthetic result and concealing of scars.

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Original Article

Evaluation of Replacement Hemiarthroplasty for Femoral Component by Cemented Bipolar Prosthesis in Fracture Neck of Femur

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ABSTRACT:

Intracapsular fracture of the proximal femur accounts for a major share of fracture in the elderly. The primary goal of treatment is to return the patient to his or her pre-fracture functional status. The randomized prospective trial was done on cemented bipolar hemiarthroplasty in active patients with non-pathological fracture of femoral neck. The study was done in the Department of Orthopaedics and Traumatology at Dhaka Medical College Hospital, Dhaka to compare the subjective, objective and functional outcome of the patients suffering from intracapsular fracture of neck of femur from 01.01.2010 to 30.06.2011. Total number of patient was 15. Mean age was 71.87 (ranging 60-89) years. 11 patients were female and 4 patients were male (Male: Female = 73.33: 26.66). 3 patients had fracture neck of femur of right side and 12 patients had fracture neck of femur of left side. Regarding the cause of fracture neck femur, 11 patients fall on slippery ground, 2 patients stumbling, 1 patient fall from stair, 1 patient fall from riksa. Average time of operation was more than 100 minutes which was statistically significance ($p < 0.002$). At the end of 6 months of post-operative period according to Harris Hip Score (pain, limping, support, distance of walking, ability to climb stair, wearing shoe, sitting capacity, use of public transport, fixed deformity and range of movement) 5 patients were excellent, 6 patients were good, 4 patients were fair. In final outcome, 11 patients were satisfactory and 4 patients were unsatisfactory. The outcome of fracture neck femur treated by replacement hemiarthroplasty for femoral component by cemented bipolar prosthesis showed excellent to good result in majority of the case.

Key words: Fracture Neck of Femur, Hemiarthroplasty, Cemented Bipolar

INTRODUCTION

Fracture of the neck of the femur have always presented great challenges to orthopedic surgeons and remain in many ways today the unsolved fracture as far as treatment and results are concerned. This is a common fracture in the elderly. Any treatment which requires prolong immobilizations brings about the hazards like thromboembolic pneumonia, cardio-pulmonary problem, urinary tract infection and decubitus ulcer etc. in the elderly patients[1]. Therefore the aim of all treatment is to provide pain free, immediate and unrestricted mobilization to reduce the morbidity and mortality.

More than 85% of the populations living in the rural area in Bangladesh attend the hospital late, ranging from several days to months due to illiteracy, superstition, bad communication system, poor socio-economic condition and unavailability of orthopaedic center. They usually present with non-union, absorption of the neck, avascular necrosis and associated other medical problem after subcapital fracture of femur. As a result, the first basic

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principle of treatment, that is early anatomical reduction and internal fixation is very often beyond reach[2]. Also many surgeon had come to believe that prognosis of a displaced subcapital fracture is so poor that treatment by reduction and internal fixation should be abandoned in favor of primary prosthetic replacement.

Because of above mentioned problems, replacement hemiarthroplasty by unipolar Austin Moore, Thompson prosthesis or cemented bipolar prosthesis can be considered as one of the acceptable means of treatment of displaced femoral neck fracture in the aged[3].

Anatomical reduction and internal fixation with or without muscle pedicle bone graft are the different modalities of treatment of femoral neck fracture to avoid prolong immobilization. But internal fixation of different displaced femoral neck fractures in aged group cause high incidence of non-union and avascular necrosis[4].

Despite the frequency with which displaced intracapsular femoral neck fractures occur, best management remains undecided. It is accepted that surgery is the mainstay of treatment, but debate continues on the role of internal fixation versus hemiarthroplasty, unipolar versus bipolar hemirathroplasty and whether or not the prosthesis should be cemented. The two most commonly performed procedures for the fractures in the frail or elderly are the uncemented and the cemented hemiarthroplasty. The choice of implant appears to be influenced by the surgeon's opinion on the use of cement. Concerns about the possible effects of cement on the cardippulmonary system, and technically more difficult revision, may lead one surgeon to use an uncemented implant; others may worry about early loosening associated with pain and poor function, and choose a cemented implant. Whether or not to cement the hemirthroplasty is an issue that divides orthopeadic surgeons. The aim of this study was to establish whether the advantages of cement outweigh the disadvantages[5].

The cemented bipolar concept was one of the needs to establish firm fixation of the stem in the femoral shaft. Yet eliminated shear force between the metallic prosthetic head and acetabular cartilage. Most motion would occur at the inner bearing, whereas the outer bearing would provide stability but remain free to allow motion during extreme demand of excursion. This was essentially Charley's total hip concept built into one piece prosthesis[6].

Using cemented bipolar prosthesis, in addition to early ambulation, weight bearing, and restoration of stability and walking activity, patients appeared to have less post-operative pain and greater range of motion but in the unipolar prosthesis where chance of acetabular erosion leading to painful hip and narrow range of movement[7].

To deal with all these problems, replacement hemiarthroplasty by using cemented bipolar prosthesis can be considered as one accepted means of treatment of high femoral neck fracture in aged[8].

MATERIALS AND METHOD:

The cross sectional prospective study was done in the Department of Orthopaedics and Traumatology at Dhaka Medical College Hospital to evaluate the subjective, objective and functional outcome of the patients suffering from intracapsular fracture of neck of femur by cemented bipolar prosthesis on 15 patients during the period of January 2010 to June 2011.

Inclusion criteria:

1. Fracture neck femur garden type III & IV within 2 months of injury.
2. Age- 60 years onwards.

Exclusion criteria:

1. Age below 50 years.
2. Active hip joint infection or elsewhere in the body.
3. Advanced osteoarthritis involves the acetabulum.
4. Rheumatoid arthritis.
5. Pathological fracture of neck femur.
6. The patient who, would not followed up for a period of at least 6 months.

A pre-tested and pre-designed pro forma containing history and examination finding of the patient and operative procedure and follow up were used to collect the data. Data were compiled and tabulated according to key variables. All statistical analysis of different variables was analyzed according to standard statistical method by using SPSS method in computer.

Summary of the surgical procedure is as follows:

Position of the patient: Ture lateral position

Approach: Moore or southern approach

Head delivery: Capsulotomy, internal rotation followed by use of skid.

Prosthesis insertion: manual insertion of bone cement, then prosthesis inserted after proper anteversion and neck snugly fitted with calcar.

The result of hemiarthroplasty in the management of the fracture neck of the femur was formulated on the basis of the modified Harris hip rating system. The success of

operation, prosthesis replacement of femoral head in aged patient depends on:

1. Restoration of pain free mobile hip,
2. Adequate movement of the hip,
3. Function of the hip e.g. limp, support, walking ability, prayer and toilet use; and
4. Correction of deformity.

In assessing the functional result of hip arthroplasty there were several grading system such as Harris hip score system, k' Aubigne hip score system, Postel's grading system and Charnley grading system. Most of the authors used modified Harris hip score system. So in the present study modified Harris hip score system is used in assessing functional result of hemiarthroplasty using bipolar prosthesis.

RESULTS:

A total of 16 patients of fracture neck of femur were included in the study to evaluate the result of replacement hemiarthroplasty for femoral component by cemented bipolar prosthesis. Out of total 16 patients 1 patient was dropped out, being not available for follow-up. The patients were randomized assigned to treatment with cemented bipolar prosthesis. All data were collected by open ended structural questionnaire. The salient result based on minimum 06 months (24 weeks) follow up was assed scrupulously.

In this study, the mean age of the patients were 71.87±7.57 years ranging from 60-89 years. Maximum age incidence (80%) was found in 61-70 years age group followed by age group 81-89 which was 13.3% and 6.7% was in 60 years group.

Table-I

Age distribution of the patients (n=15).

Age	Number of patients	Percentage
60	1	6.7
61-70	6	40.0
71-80	6	40.0
81 >	2	13.3
Total	15	100

Out of 15 patients 11 (73.3%) were female and 04 (26.7%) male. Female are more sufferer for the fracture neck femur than male.

Occupation of the subjects demonstrates that house-wife comprised the main bulk (66.66%). Other occupants were service holders (13.3%), businessmen (13.3%) and farmer (6.6%).

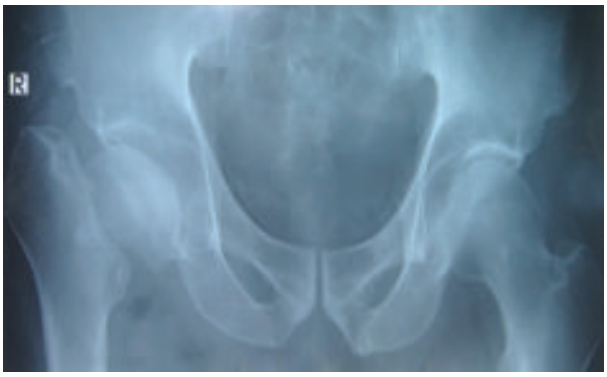

Fig.-2a: *Preoperative X-ray*

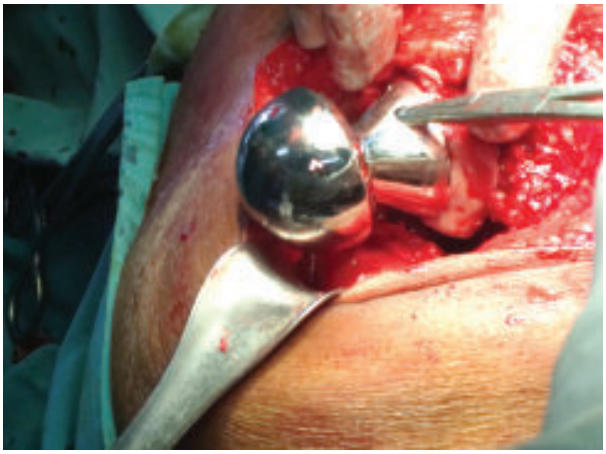

Fig.-2b: *Insertion of prosthesis.(By maintaining anteversion)*

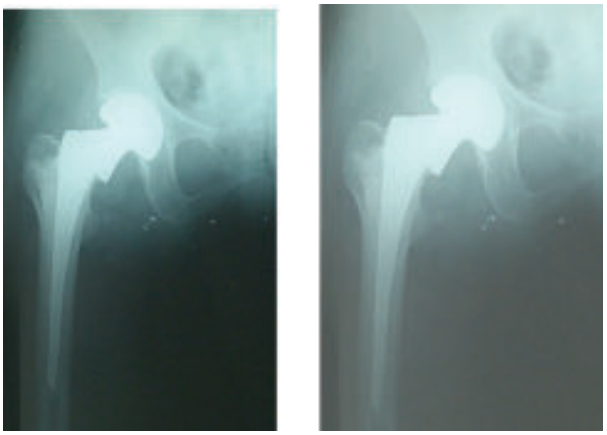

Fig.2c: *Postoperative X-ray (at 2nd POD), b. Postoperative X-ray (after 24 weeks)*

Among the patients 12 (80%) had left side and 03 (20%) had right hip lesion. In this study fall on slippery ground occurred for 11 cases (73.3%), stumbling 2 cases (13.33%) 1 cases (6.67%) were due to fall from stairs & 1 cases (6.7%) fall from rickshaw. Among the patients, 73% needed blood transfusion during operation, while the remaining 27% did not need so. 40% of the patients required >100 minutes for operation to be completed, followed by 46.6% between 81-100 minutes and 13.33% between 71-80 minutes. The average time of operation was 95±11.55 minutes.

The average duration of the hospital stay 12.73 days ranging from 10 – 24 days. Maximum frequency of hospital stay were 12 days (33.33%) followed by 10 days (13.33%), 11 and 13 days (20%) , and 15 and 24 days for (6.6%). At the end of final follow up 5 (33.3%) patients were pain free, 8 (53.3%) had slight pain. Out of 15, 2 (13.3%) patients had mild pain at the end of 24 weeks (Third follow up).

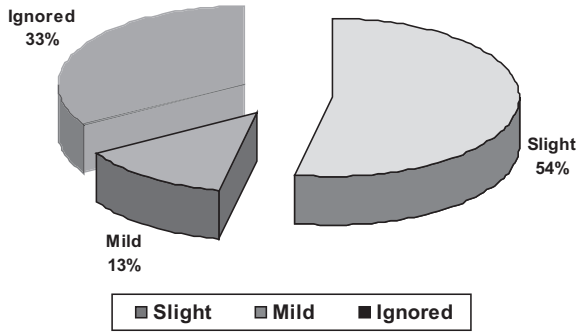

Fig.-3: *Distribution of the patients by Harris hip score on pain (n=15)*

No limping was found for 4 (26.66%) patients, slight limping 10 (66.66%) patients, moderate limping 1 (6.66%) patient.

Table-II

Distribution of the patients by Harris hip score on limping (n=15)

Limping	Number of patients	Percentage
No limping	4	26.66
Slight	10	66.7
Moderate	1	6.7
Total	15	100

Two patients (13.33%) was able to walk without support, 7 (46.66%) patients walk with cane, 6 (40%) patients with 1 crutch.

Distance of walking significantly increased at the end of 24 weeks. 4 (26.7%) could walk unlimited while 8 (53.3%) could do it for 6-blocks and 3 (20%) for 2-3 blocks only.

Table-III

Distribution of the patients by distance of walking Ability to climb stairs

Distance of walking	Number of patients	Percentage
Unlimited	4	26.7
6 block	8	53.3
2 or 3 block	3	20.0
Indoors only	0	0.0
Total	15	100

At the end of 24 weeks all the patients were able to claim stairs normally with some difficulty for 2 cases but not use railing.

13 patients (86.67%) wear shoes normally and 2 patients (13.33%) do it with difficulty. Ability of wearing shoes increased significantly ($p<0.002$) after 24 weeks of operation.

Sitting capacity of the patient significantly improved ($p<0.002$) 2 (13.3%) patients were capable to use sitting on high chair while 13 (86.7%) could use ordinary chair.

14 patients (93.34%) could use public transport independently which was statistically significant ($p<0.0004$). And 1 patient was unable to use public transport after a minimum follow up of 24 weeks (6 months), postoperatively.

All of the patients recovered from deformity postoperatively.

Range of motion improved for 13 patients (86.67%) were full, 2 (13.33%) had near normal range of motion.

Table-IV

Distribution of the patients by Harris hip score on range of motion

Range of motion	Number of patients	Percentage
211-300^o	13	86.67
161-210^o	2	13.33
101-160^o	0	0
61-100^o	0	0
31-60^o	0	0
0-30^o	0	0

According to the Harris Hip score, post-operative score of >90 was termed excellent, 80-89 was good, 70-79 was fair and <70 was termed as poor outcome. In our study, 5 (33.33%) patients recovered with excellent outcome, 6 (40%) with good outcome and 4 (26.67%) with fair outcome.

Table-V

Distribution of the patients by Harris hip score on functional outcome (n=15).

Functional outcome	Number of patients	Percentage
Excellent	5	33.33
Good	6	40
Fair	4	26.67
Poor	0	0

According to HHS, after 24 weeks of follow up, 11 (73.33%) patients' outcome were satisfactory. 4 (26.67%) were unsatisfactory in this regard.

DISCUSSION:

Complications occurring at treatment of displaced femoral neck fracture in elderly by osteosynthesis are failure to anatomical reduction, delayed union, non-union, absorption of the neck of femur and avascular necrosis of femoral head and technical failure, which need subsequent re-operation that increase morbidity and mortality of the patient. Despite the most accurate anatomical alignment and most rigid fragment fixation, many patients fail to normal use of their hips[9].

The conventional one piece Moore or Thompson device use in the treatment of the fracture of the proximal femur represents a significant step forwards. However, the incidence of unsatisfactory results remained unacceptably high in many studies. The most significant problems observed were femoral stem loosening, acetabular erosion, intrusion of the prosthesis into pelvis and difficulties with total hip revision when the stem were cemented[9]. These factors led to the development of cemented bipolar prosthesis introduced by Batman. Prosthesis device by Austin-Moore and Thompson have been used extensively during last forty years and result have been gratifying in older, more sedentary individuals who do not stress their hips excessively. But slightly younger and physically active patient tend to develop problem[10].

Endoprosthetic replacement of the femoral head can provide early ambulation, weight bearing, restoration of stability, walking activities and reasonably good range of movement to accomplish the functional activities such as squatting and sitting on prayer position[11].

In this study, 15 patients' average age was 71.87 years (range 60-89 years). Most common age group was between 61-80 years which constitute 80% of the series. This result corresponds of the series reported by Moshein et al.(Range 58-92 years, average 74.20 years)[12], Talukdar et al. (Range 55-75 years average 63 years)[11], Amir, et al. (Range 45-84 years, average 65 years)[13].

Simplest of currently available bipolar prosthesis like Indian Version and the Monk prosthesis have an Austin Moore type stem and the small femoral head cannot be detached from metallic cup UHMWPG insert complex. Better and modified versions of bipolar prosthesis have a modular system with interchangeable stems (Fenestrated, solid, straight, long porous coated, press fit, cement compatible), inter-changeable small diameter head (metallic or ceramic) which allows adjustment of neck length, different size of outer metallic cup UHMWPE insert with press fit looking mechanism over small head[10].

Bipolar prosthesis was designed primarily with the aim of reducing the frictional stresses and thereby decreasing acetabular erosion and stem loosening. Shock absorbing character also reduces impact load on acetabulum during weight bearing.

In this study fracture neck femur of right side involvement was in 20% cases while left side was fractured in 80% cases which is compatible to other studies. Mistry et al found right side involvement in 40% and left side 60% in his study[14] and Reza et al. found 26.6% at right side and 73.3% at left side.

In this study at the end of 6 months 5 patients had no pain, 2 patients had mild pain and 8 patients had moderate pain. Khan et al. reported greater deterioration in pain, walking ability, use of walking aids, an activity daily living in the uncemented group[15].

So, in the present study overall outcome had longest track record in the cemented bipolar prosthesis as our study was merely 18 months, which is not sufficient for overall assessment and comments.

CONCLUSION:

Evaluation of the results of replacement hemi-arthroplasty for femoral component by cemented bipolar prosthesis is satisfactory and can be considered as a rational choice in the treatment of fracture neck of the femur. To evaluate the cemented bipolar prosthesis as a significant surgical procedure for fracture neck of the femur needs long-term and large population study.

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Original Article

Excision and primary closure of Pilonidal sinus with a drain :a modification of conventional technique

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Abstract:

Surgical management of pilonidal sinus is a challenge to the surgeon. We have conducted this study to determine the effectiveness of excision and primary closure of pilonidal sinus with a 12 Fr simple drain. This retrospective study was conducted in Cox's Bazar Medical college hospital in the department of surgery from January 2014 to December 2016. 58 patients of American Society of Anesthesiologist (ASA) physical status I & II who were undergoing surgical treatment of pilonidal sinus were enrolled in this study. Age ranged from 18-40 years. All patients were male. Average hospitalization period was 2 days. Work-off period was 14 days. Out of 58 patients wound infection was found in four (6.8%) patients. No patients developed haematoma as there was drain.Wound dehiscence was found in five (8.6%) patients.Fortynine (77.5%) patients having no complication. Recurrence of pilonidal sinus was found in four (6.8%) patients. Excision and primary closure of pilonidal sinus with a 12 Fr simple drain was significantly better outcome in terms of wound healing, work-off period, cost of treatment and recurrence.

Keywards: Pilonidal sinus, surgical treatment

INTRODUCTION

Pilonidal sinus is a disease that most commonly arises in the hair follicles of natal cleft of the sacrococcygeal area. It has an acquired etiology and is mainly encountered in young males of working age[1].

Pilonidal sinus usually presents as an abscess or a chronically discharging, painful sinus tract. Irrespective of the mode of presentation the painful nature of the condition causes significant morbidity, often with a protracted loss of normal activity. The ideal therapy would be a quick cure that allowed patients to return rapidly to normal activity, with minimal morbidity and a low risk of complications[1].

There has been a debate on the appropriate surgical treatment options. Total excision of the post sacral fascia is the most frequently applied surgical option[2,4,5]. The defect management on the excised area is a challenge . Our clinical study was performed to see the effectiveness of excision and primary closure of pilonidal sinus with a 12 Fr simple drain.

METHODS

This retrospective study was conducted in Cox's Bazar Medical college hospital in the department of surgery from January 2014 to December 2016. 58 patients of American Society of Anesthesiologist (ASA) physical status I & II who were undergoing surgical treatment of pilonidal sinus

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were enrolled in this study after explaining about the surgical procedure and complication of spinal anesthesia and obtaining written consent. Age ranged from 18-40 years.

After admission, shaving of the operative field was done on the morning of operation in each patient. Prophylactic 1 gram ceftriaxone and 500 mg of flucloxacillin was administered preoperatively through a peripheral venous line. All operations were performed under spinal anesthesia with the patient placed in prone position. Buttocks were retracted using adhesive tape in order to obtain a better visualization of the operative field . After skin preparation, the anus was excluded from the area with surgical drapes. All tracts were excised. Dissection and haemostasis were achieved by electro-cautery. After appropriate haemostasis the defect was completely closed by 1/0 polypropylene taper cut with a 12 Fr simple drain with no tension. The drain was externated through a separate stab incision.

Postoperative analgesia was achieved by per-rectal administration of diclofenac Sodium 50 mg twice daily and continued for 5 days. Standard wound care protocol was followed for each individual. Oral antibiotics were continued for 14 days. Stitches and drain removed after this period. All the patient were followed up after 15,30 and 45 days.

RESULTS

The results of the study are described in terms of time to wound healing, rate of surgical site infection and time to return to work.

All 58 patients were male (range18-40 years).

Table-1

Postoperative complications of surgical wound(n=58)

Findings of patients	Number of patients	Percentage
Infection	04	6.8%
Haematoma	0	
Wound dehiscence	05	8.6%
None	45	77.5%
Recurrence	04	6.8%

Average hospitalization period was 2 days. Work-off period was 14 days. Out of 58 patients wound infection was found in four (6.8%) patients. No patients developed haematoma as there was drain.Wound dehiscence was found in five (8.6%) patients.Fortynine (77.5%) patients having no complication. Recurrence of pilonidal sinus was found in four (6.8%) patients.

DISCUSSION

Pilonidal sinus predominantly affects younger male population and therefore this disease has an economic impact [5-9].After surgery for pilonidal sinus wound management is a challenge to the surgeons.Wound healed more quickly when primary closure is used [2,3].

Hospitalization and work-off period are important measures of outcome. They are strongly related to personal, socio-cultural, socio-economic levels, type of job, social assurance and behavioral pattern[2]. Within these aspects, we observed shorter hospitalization period in patients who underwent excision and primary closure with a drain.

There are several techniques for management of pilonidal sinus like laying open, marsupialization, primary closure, limberg flap transposition[2,3]. Incidence of wound healing and work-off period is long in case of laying open and marsupialization. Longest work-off periods is seen in marsupializated patient. Laying open seems to be longer wound care management. Limberg flap transposition is superior but expensive and it has longer hospitalization and chance of flap necrosis is there [2,3].

In our study, most of the patients comes from low and middle socioeconomic status. Early recovery and rapid return to normal activity along with low cost is their priority. We perform excision and primary closure of pilonidal sinus with a 12 Fr simple drain with only 2 day hospitalization and minimum complication.

CONCLUSION AND RECOMMENDATION

The study shows that, excision and primary closure of pilonidal sinus with a 12 Fr simple drain was significantly better outcome in terms of wound healing, work-off period, cost of treatment and recurrence. However, our experience enables us to recommend this as a simple and cost effective option to treat pilonidal sinus. Further studies are recommended.

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Traumatic Bilateral Hip Dislocation- A Case Report

Gazi Ahsanul Munir[1], Mohammad Moazzem Hossain[2], Md. Zahidur Rahman[3]

Bilateral Hip Dislocation occurring as a result of trauma is a rare condition. Simultaneous traumatic asymmetric bilateral hip dislocations are very rare and unusual injurypattern in which one hip dislocates posteriorly, and the contralateral hip dislocates anteriorly.Acase is reported of asymmetrical bilateral traumatic hip dislocation without an associated fracture of pelvis or femur occurring in an adult with no previous history of hip abnormality or ligamentous laxity. Unusual Mechanism of this injury is described.

HIGHLIGHTS:

Hip dislocation is considered an orthopedic emergency and should be reduced as soon as possible to decrease the rate of complications.

Bilateral hip dislocation is very rare representing approximately ***0.01%–0.02%*** of all joint dislocations and usually results from high energy trauma mostly motor vehicle collisions.

CASE REPORT:

A 50 years old man was involved in a road traffic accident on 01st January 2017, in which he was sitting on right side of the driver in an easy bike, a battery operated three wheeler. This vehicle hit a second vehicle travelling in the opposite direction. Before collision he tried to take his both legs flexed with fear and he felt severe pain in his hip and unable to make straight. On examination, his right leg was extremely rotated and abducted whereas left leg was held in adduction, internal rotation and flexion. An X-ray Pelvis with both hip joint A/P view was performed. X-ray revealed bilateral hip dislocation with displaced femoral head antero-inferiorly on the Right side and postero-superiorly on the left side. There was no associated fracture of the acetabulum or femur. The Patient was advised to admit in the hospital but he gone for traditional treatment by Kobiraj, a traditional local bone healer. Next day due to severe pain and unusual posture the patient admitted and both hips were reduced under spinal anaesthesia.

Posterior dislocation corrected in a single trial but anterior dislocation corrected in second attempt. After reduction a radiograph was done which confirmed the concentric reduction of both hip without any intra articular fragments. Surface traction was given on both limb and bed rest for three weeksfollowed by non-weight bearing for another six weeks.

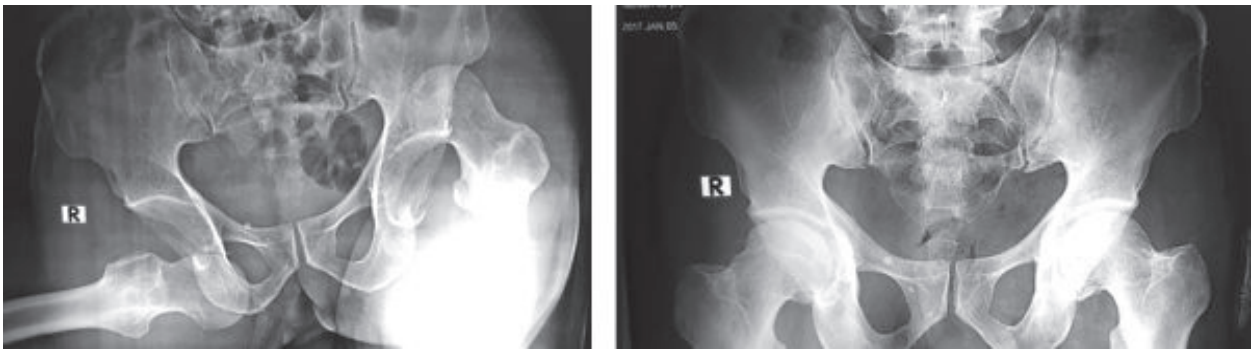

Fig.-1: *Before and after Reduction*

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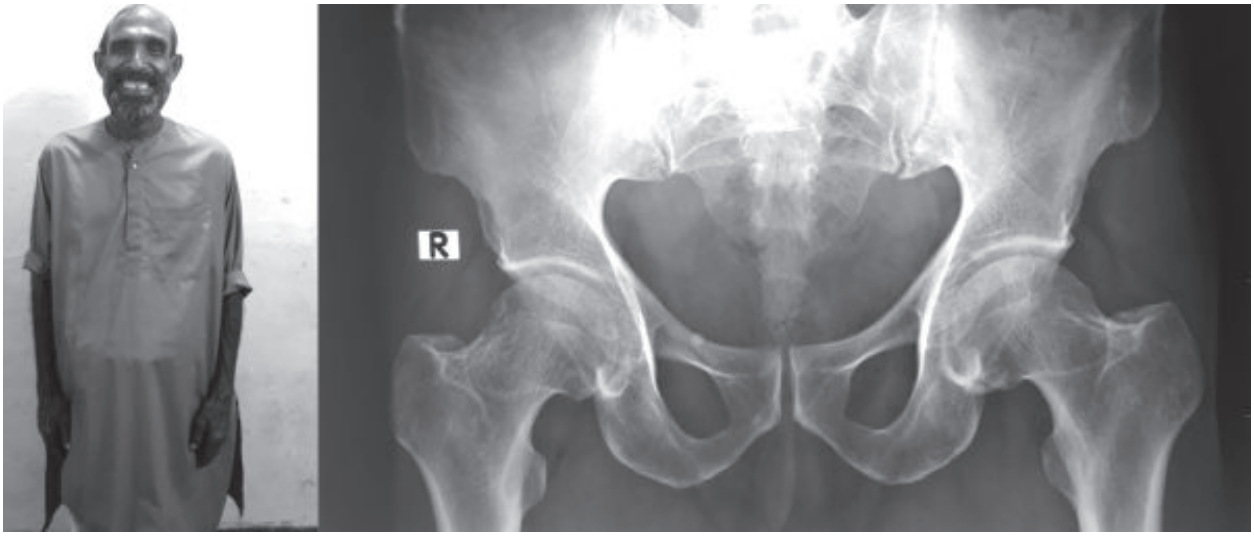

Fig.-2: *After One year follow-up*

DISCUSSION:

Traumatic hip dislocation is classified based on dislocation and the degree of joint disruption including any associated joint fracture. Commonly used classifications systems are: a) The Epstein classification of anterior hip dislocation, b)Pipkin sub-classification and c) Thompson-Epstein Classification of posterior dislocation. Hip dislocations can be classified as simple or complex. Simple injuries are dislocations without associated fractures, whereas complex injuries include either acetabular or proximal femoral fractures. Posterior dislocations represent the majority of these injuries, occurring due to an axial load of the femur, with the hip flexed and adducted. Usually, the axial load is transmitted through a flexed knee, as in dashboard injuries.

Because of deep acetabular cavity and surrounding strong ligamentous structures dislocation of normal hip joint is very rare. Posterior hip dislocation is common occurring as a result of high energy trauma mostly in RTA which accounts about 90%. The dislocation results when sufficient force is applied in the long axis of femoral shaft

Anterior dislocations, in contrast, occur with the hip in abduction and external rotation, and the position of the femoral head can be either inferior or superior to the acetabulum. Motor vehicle accidents are the leading cause of hip dislocations, followed by falls from significant heights; sports related injuries have also been reported in literature.

Bilateral simultaneous hip dislocations are extremely rare injury, a reported 1.25% of all hip dislocations. These injuries are rarely present as isolated dislocations, and often associate fractures, usually of the acetabulum. A patient with a dislocated hip usually presents acute pain and evident deformity, with an inability to tolerate active or passive range of motion.

To detect simple or complex injuries, x-ray is mandatory. CT scan can be done to detect presence of intra-articular fragments.Soft tissue injuries such as avulsions of the labrum may be assessed by magnetic resonance imaging, but are not requested routinely.

Treatment of hip dislocations can be either operative or nonoperative, but upmost importance is emergent reduction of the joint. Delay in reduction of dislocated hip results in avascular necrosis in around 26% of patients. Early mobilization results in a prompt return to weight bearing, but the outcome and relationship with complications such as avascular necrosis is largely debated.

Closed reduction of dislocated hip implies general anesthesia and an adequate positioning of the patient. Traction in line with the deformity is the principle of reduction. Several techniques have been described, all of which include traction and counter-traction as part of the maneuver. Post reduction imaging studies must be performed to assess the quality of the reduction and presence of associated injuries that may have been neglected initially. Open reduction is performed in the case of an irreducible dislocation.

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