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Editorial

Bone Deformities and Limb Lengthening - Treatment Methods

Md. Golam Sarwar

BONE DEFORMITIES CAN BE CAUSED BY SEVERAL FACTORS, INCLUDING:

- congenital defect (from birth)
- abnormal growth during childhood
- bone trauma or fracture due to an accident or other incident
- disease (such as bone tumors)
- metabolic disorders of bone and soft tissue

These injuries can also lead to an associated loss of the soft tissues such as skin and/or muscle.

Bone deformities can consist of a bend or twist in the bone, shift in bone position, or a difference in bone length. In many cases, an osteotomy (a cut made in the bone) is used to correct the deformity. Read below to learn more about treatment options for bone deformities, but keep in mind that our NITOR specialists cater treatment to patients specific needs. A comprehensive, individualized treatment plan is ideal when treating any musculoskeletal disorder.

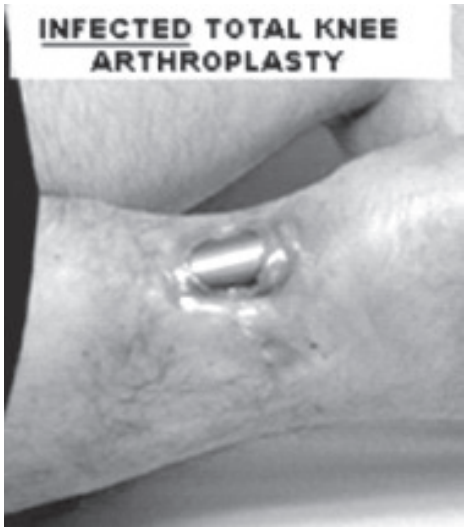


Fig.-1

Working in collaboration with local, national, and international facilities, and surgery specialists at NITOR have spearheaded numerous scientific investigations that have led to practical treatment solutions bringing immediate benefits to patients and families throughout the nation.

Bone deformities can have a serious functional effect on the patient and should be treated based on the individual's needs and goals.

Limb lengthening is a gradual process commonly used to treat differences in bone length through new bone and soft tissue growth. Regeneration of bone and soft tissue occur as they are gently pulled apart at an approximate rate of one millimetre per day. The total amount of time required for the limb lengthening process is dependent on the length of growth needed in each individual case.

LIMB LENGTHENING CONSISTS OF TWO PHASES:

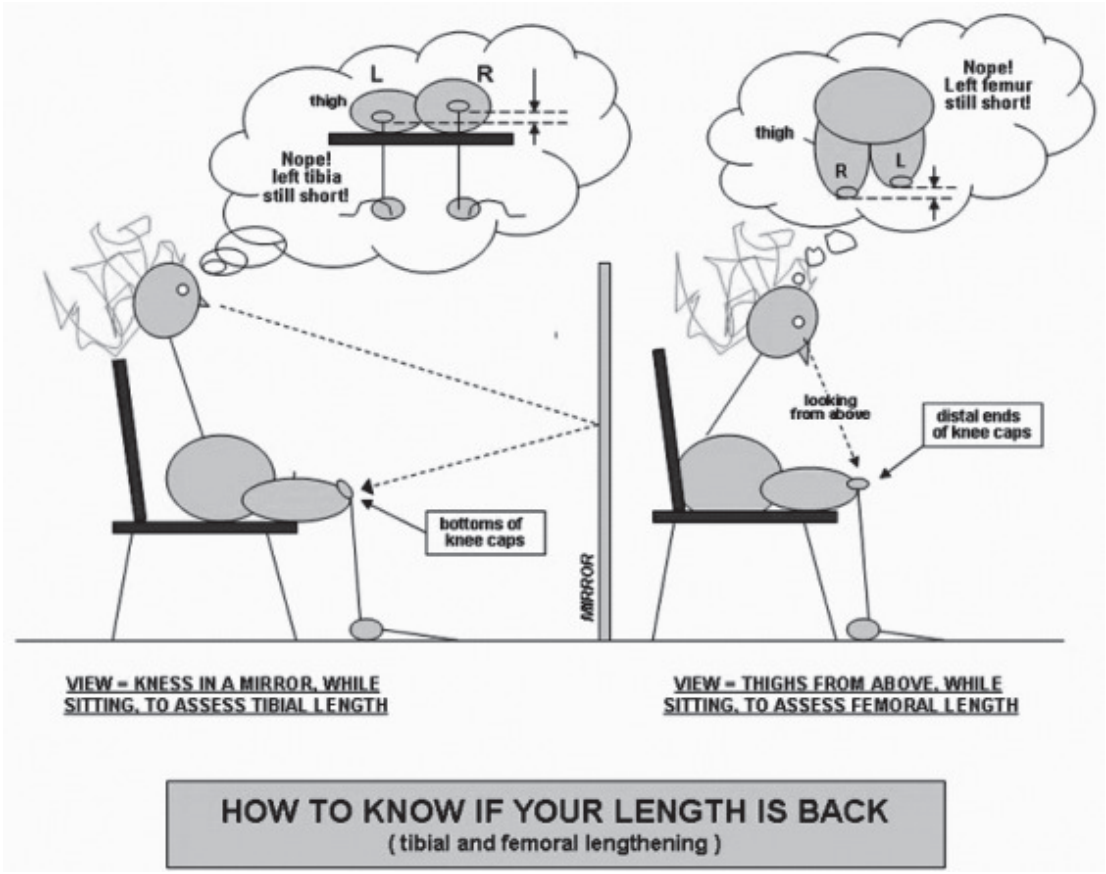
- The distraction phase: during which the limb is lengthened to its desired measurement
- The consolidation phase: as the newly formed bone hardens and calcifies to its full strength

To protect the bone during these phases, the process of lengthening is performed using either internal or external fixation devices attached to the bony fragments. The treatment options depend on the individual deformity. To learn more about these treatment methods, read on further, below. Patients can determine their own progress on lengthening lower extremities by observing the cartoon that follows.

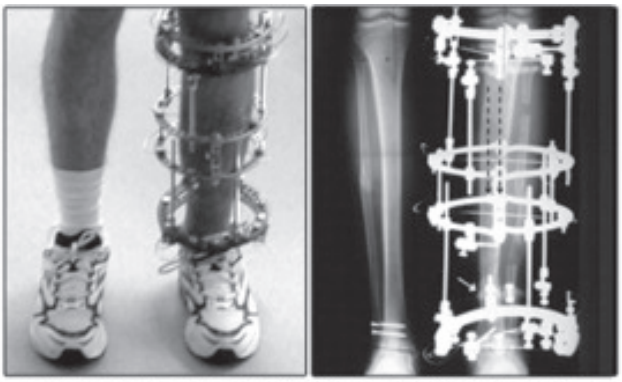
MEASURING LENGTHS

Tibial lengthens: when your feet are flat on the floor and together while seated and someone observes your knees

Assistant Professor of Orthopaedic Surgery, NITOR, Dhaka



from the front, discrepancies in tibial length are easily measured by marking the lower-most point of each knee cap, holding a straight-edge(level to the ground) against the two points and measuring the difference in heights (inches or millimeters). Just be sure the thighs, knees, legs and feet are together and parallel. To measure for femoral length: sit in a chair with your back and buttocks flush up against the back of the chair. Then, with your knees bent at 90 degrees and your legs and feet together and pointed straight out from your body, measure the difference in how far out your knee caps project from your body.



AN ILIZAROV, CIRCULAR FIXATOR USED TO STABILIZE AND LENGTHEN THE TIBIA

SMALL WIRES AND PINS FIX THE BONE TO THE FRAME UNTIL HEALING OCCURS

FIXATION STRATEGIES AND THE METHODS OF ILIZAROV

Although the orthopaedic surgeons at NITOR have experience using many different methods for limb lengthening and the repair of significant bone deformities, the external fixator designed by the Russian surgeon, Professor Gavri ilIlizarov, is the one most commonly used at our national practice.

The Ilizarov Method of External Fixation is gentle to the surrounding tissues and therefore, is associated with a low risk for infection. Stability is provided by a frame (seen above), situated outside the body. It is attached by pins to bone above and below the injury . The pins transfer mechanical stresses to the frame, allowing the site to heal and the patient to function during treatment. To avoid infection, the reconstruction takes place between the sets of pins and avoids the use of internal hardware.

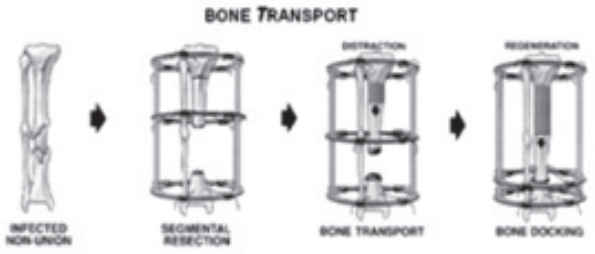
Like any other treatment modality, the methods of Ilizarov have a near perfect success record if performed in conjunction with balanced institutional resources, a favorable clinical environment, and on a patient with an injury that lends well to this kind of treatment.

THE TREATMENT METHODS EXPLAINED

Below, Dr.MM Bari and Dr. MAG Molla explains fixation strategies and the Ilizarov method.

The instrument most commonly used to repair significant bone deformities is an external fixator designed by the Russian surgeon, Gavri ilIlizarov. To stabilize the extremity during repair, the device attaches to the normal skeleton, on either side of the injury, with sets of small, criss crossed wires. To repair segmental bone defects, various methods are utilized:

- shortening the frame and limb to allow end-to-end healing.
- bone transport: an internal, segmental lengthening (figure one).
- compression/distraction: a combination of methods wherein the bone is simultaneously shortened and the limb lengthened, with or without an interval of bone transport.

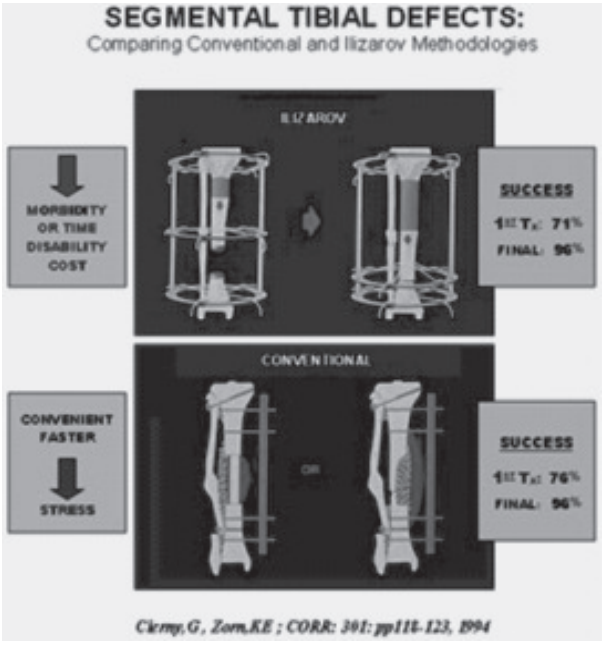


THE PROTOCOL

The wound is debrided (cleaned), and the limb stabilized with a transport frame. A length of bone, above or below the defect, is then prepared and fixed to the frame with wires; an osteotomy (cut through the bone) is gently performed to separate the chosen piece from the remaining bone - this piece will be the transport segment. Injury from the osteotomy will also initiate a local, reparative process in the remaining bone (the regenerate). When the frame slowly moves the transport segment toward the defect, the regenerate is placed under tension (distraction) and elongates to completely fill the distraction gap. When distraction stops at the end of transport or lengthening, the regenerate will consolidate into bone. The new, generated segment is exactly the length and size of the original, bony defect. Traversing the defect, the transport segment must correctly interface with and heal to the docking site (other side) with a solid, bony union.

Defects in bone can be due to trauma (i.e., motor vehicle accident), a birth deformity (congenital defect), a surgical excision for disease (i.e., infection) or a disease process, itself (i.e., tumors). These injuries can also lead to an associated loss of the soft tissues such as skin and/or muscle. If such a composite loss exposes the transport segment or docking site, wires can be inserted in such a way as to capture soft tissue for transport with the bone segment. An "open" transport uses distraction methods to simultaneously close a hard and soft tissue defect. Conversely, if the overlying tissues are intact, the bone and wires will simply pass through them.

Figure two, below, posts results of the first study to compare Ilizarov with conventional methods when managing infected non-unions of the tibia with significant bony defects. In the first treatment, the tissues were aligned, restored and allowed to heal; in the second treatment, a definitive reconstruction was performed and followed by two or more years (final outcome).



The transport segment and its wires exert a slow, constant pressure on anything in their path. Soft tissues respond to this pressure in a natural way, dieing back just enough to allow the objects to pass on through. The process is gentle and constant, very similar to the way our gums will melt away to allow an adult tooth to push up into place. The bone simply pushes through and the wires and pins leave thin, linear scars to mark their passage.

Original Article

Evaluation of the results of Femoral Shaft Fractures in Children Treated by Early Hip Spica Cast

Bijoy Sankar Parial[1], Muhammad Shahiduzzaman[2], Mohammad Khurshed Alam[3], Rasel Al Zilane[4], Indrani Adhikary[5], Mohammad Mahbubur Rahman Khan[6]

Abstract

Femoral shaft fractures in children are usually treated by initial traction for 3 to 4 weeks followed by an additional period of immobilization in hip spica cast till union occurs. Such treatment however would involve prolonged hospital stay thereby increasing cost and occupancy of hospital beds. Early hip spica cast application of femoral shaft fractures in children is a useful alternative to the traditional method of treatment. It allows for a short hospital stay thereby avoiding all the problems associated with prolonged hospitalization.

This prospective observational study was conducted on 20 patients with femur shaft fractures over a period of two years. All the children of both sexes from 2 to 12 years of age with fractures shaft of femur presented within seven days of injury. Spica cast was applied after preliminary skin traction. Follow up was done in OPD up to 6 months. The functional result was assessed according to Flynn's scoring criteria.

The mean age of patient was 5.65 years; range 2 to 12 years. Male-female ratio was 3:1. Mean duration of hospital stay was 4.1 days. Radiological union in all cases were achieved in a mean time of 7.65 weeks. Full weight bearing was possible in a mean time of 10.07 weeks. The result was excellent in sixteen patients (80%), successful in two (10%) and poor in two patients (10%).

Early spica cast is simple, effective and definite method of treatment with minimal complications and acceptable results in pediatric age group.

INTRODUCTION

Injury has drawn attention of policy-makers and development activists of Bangladesh since the Bangladesh Health and Injury Survey which revealed an annual estimate of 70,000 injury-related deaths in Bangladesh, the children being the worst victims (43% of the total injury related deaths).[1] The socioeconomic impact of injury-related disability is magnified in low-income countries, where there are often poorly developed trauma care and rehabilitation systems and little or no social welfare infrastructure. Cost effective treatment providing this population is a big challenge.[2]

In pediatric fracture, femoral fractures have negative impact not only on the patient but also their family network.[3] They accounts for 1.6% of all fractures in pediatric population.[4] Seventy percent of femoral fractures involve the shaft.

Femur fractures are the most common orthopedic injuries that require hospitalization of children. Fractures of the femoral shaft in children are usually treated by initial traction for 3 to 4 weeks followed by an additional period of immobilization in hip spica cast till union occurs. Such treatment however would involve prolonged hospital stay thereby increasing cost and occupancy of hospital beds.

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Because of the characteristics of fracture in children, the use of early hip spica immobilization for the treatment of femoral shaft fracture is an alternative to the conventional method of treatment. It has the advantages of avoiding prolonged hospital stay, reducing costs and prevention of separation anxiety in children.

MATERIALS & METHODS

This observational study was carried out at the Dhaka medical college hospital, Dhaka over a period of two years between January 2013 to December 2014. Children of 2-12 years with closed or Gustilo type 1 open diaphyseal femur fractures were subject of this study. Hip spica was applied on day 1 to day 7 depending on shortening of affected limb, swelling of the thigh, stability of fracture and availability of patient. The cast placed with the child's hips flexed approximately 45 degrees and 20 degrees of abduction; the knees should be flexed to 45 degrees. Some external rotation needed to correct the rotational deformity of the distal fragment. The patients were allowed to go home after cast application. The parent/guardian was given written and verbal instructions about proper cast care. Patients were followed in outdoor department weekly for first 3 weeks. Fourth, fifth and sixth visits were arranged after 6 weeks, 3 months and 6 months respectively. The functional result was assessed according to Flynn's scoring criteria (Table I). The excellent and successful results were considered as satisfactory. The poor results were considered as unsatisfactory.[5]

RESULTS

Out of total 20 cases, 15 (75%) were male and 5 (25%) were female. The age of the patients ranged from 2 to 12 years with mean age 5.65 years (Table II). Right side involvement was 65% and left side involvement was 35%. There was no case with bilateral femur involvement. Majority 18 (90 %) of the injuries was closed type and the rest 2 (10 %) was open type. In terms of type of fracture, 12 (60%) was transverse fracture, 6 (30%) Oblique fracture and 2 (10%) minimally comminuted. Mechanism of injury was motor vehicle accident 10 (50%), pedestrian-motor vehicle collision 7 (35%) and fall from a height 3 (15%). Interval between injury and casting of 16 (80%) patients within 3 days, 2 (10%) between 4-5 days and 2 (10%) between 6-7 days. Mean interval between injury and casting was 2.85 days (Table III). 16 (80%) of the patients stayed in the hospital for 0-5 days and the rest 4 (20%) patients 6-10 days. The mean duration of hospital stay was 4.1 days (Table IV).

Table I

Flynn's scoring

Flynn's scoring criteria

	Excellent	Successful	Poor
Limb length discrepancy	<1.0 cm	<2.0 cm	Poor >2.0 cm
Malalignment	5°	10°	>10°
Pain	Absent	Absent	Present
Complication	Absent	Mild	Major complication and/or extended period for resolvable morbidity

Statistical analysis was performed using SPSS software. Statistical significance was defined as p-value <0.05 with 95% confidence interval

Table II

Age of Patients

Age in years	Frequency	Percentage	Mean (years) ± SD
2 – 5	11	55	
6 – 10	7	35	5.65 ± 2.889
11 –12	2	10	
Total	20	100.0	

Table III

Time interval between injury and casting

Time interval	Frequency	Percentage	Mean (Days) ± SD
1-3 days	16	80	
4-5 days	2	10	2.85 ± 1.69
6-7 days	2	10	

Table IV

Duration of hospital stay

Duration	Frequency	Percentage	Mean (Days) ± SD
1-5 days	16	80	4.1±2 .269
6-10 days	4	20	

All (100%) of fractures were united. Radiological evaluation of fracture site union showed that 15 (75%) cases united within 6 – 9 weeks and 5 (25%) cases united within 10-12 weeks. The mean union time was 7.65 weeks (Table V). Average union time of fracture was 7.45 weeks for 1-5 years age group children, 8.14 weeks for 6-10 years age group children and 12.00 weeks for 11-12 years age group children. Fracture of younger children femur united early (Table VI). After assessing the radiological status of union, full weight bearing was possible in 15 (75%) of cases within 8- 12 weeks and rest 5 (25%) of cases within 13- 16weeks. The mean duration of full weight bearing was 10.07 weeks (Table VII).

Table V

Union time

Union time (weeks)	Frequency	Percentage	Mean (Weeks) ± SD
6-9	15	75	7.65 ± 1.663
10-12	5	25	

Table VI

Relation between Age and Union

Age (years)	No. of children	Percentage	Average union time (weeks)± SD
1-5	11	55	7.45 ±1 1.036
6-10	7	35	8.14 ± 1.773
11-12	2	10	12.00 ± 0.000
Total	20	100	7.65 ± 1.663

Table VII

Full weight bearing

Weight bearing time (wks)	Frequency	Percentage	Mean (Weeks) ± SD
8- 12 weeks	15	75	10.07 ± 2.47
13- 16 weeks	5	25	

In terms of minor/major complications like skin irritation due to cast was 3 (15%) of the patients and at end of followed up period 16 (80%) of the patients had leg length inequality by <1 cm, 3 (15%) by < 2cm, 1(5%) by >2 cm (Table VIII). Deformity in Sagital plane like antero-posterior angulation and in the coronal plane like varus / valgus deformity occurred < 5º in 15 (75%) patients, 5º-10º in 03 (15%) patients > 10º in 02 (10%) patients respectively.

Table VIII

Incidence of limb length discrepancy

Limb length inequality	Frequency	Percentage
<1cm	16	80
<2cm	3	15
>2cm	1	5

12 (60%) of the patients exhibited wide range of knee motion (130-140º), 6 (30%) patients slightly restricted knee motion (110 - 129º), and 2 (10%) moderately restricted knee motion (90 - 109 º) (Table IX). 16 (80%) of the patients returned to routine preinjury activities, 3 (15%) patients to preinjury activities with mild limitations and 1 (5%) to routine activities with moderate limitations.

Table IX

Range of knee motion

Range of knee motion (degree)	Frequency	Percentage
130-140	12	60
110-129	6	30
90-109	2	10

16 (80) % of the patients had excellent outcome, 2(10%) patients had successful outcome and 2 (10%) poor outcome according to Flynn's scoring criteria. Final assessment revealed that 90% of children had satisfactory result and 10% had unsatisfactory.



Fig.-1: *Patient after application of hip-spica.*



Fig.-2: *X-ray after 2 weeks.*



Fig.-3: *X-ray after 6 months of injury*



Fig.-4: *After 6 months- Patient in standing.*



Fig.-5: *After 6 months- Patient in sitting.*

DISCUSSION

The goal of treatment in fracture of femoral shaft in children is to achieve union without discrepancy in limb length and deformity. To achieve this many treatment options are available. Determining the ideal treatment for each child depends on the age of the child, the location and type of fracture, the family environment, the knowledge and ability of the surgeon and to a lesser degree, financial considerations.[6]

Conservative treatment of femur shaft fractures in children is skin traction followed by a hip spica and also early reduction and hip spica cast gaining popularity as a successful treatment modality.[7]

Regarding demographic data, in present study mean age of the children was 5.65 years with a male to female ratio of 3:1. Similar findings have been reported in International literature.[8-9]

Right side involvement was 65% and left side involvement was 35%. There was no case with bilateral femur involvement in this study. Shah et al, [9] reported right femur fractured in 17 (68%) and the left one in the remaining 8 (32%).

Femoral shaft fractures in children often result from automobile accidents, falls from high places, and other high-energy trauma. In this study, mechanism of injury was found 10 (50%) of the patients sustained injury from motor vehicle accident, 7 (35%) from pedestrian- motor vehicle collision and 3 (15%) due to fall from a height. Shah et al,[9] reported in their study motor vehicle vs. pedestrian 35%, motor vehicle accident 35% and 30% fall.

Regarding configuration of fracture in this study, 12 (60%) were transverse fracture, 6 (30%) were short oblique and 2(10%) were minimally comminuted fracture. In the study of Muzzafar and colleagues,[8] transverse fracture 62.50%, short oblique 12.50%, minimally comminuted 20%.

In this study, interval between injury and casting of 16 (80%) patients within 3 days, 2 (10%) between 4-5 days and 2 (10%) between 6-7 days. Mean interval between injury and casting was 2.85 days. Shivana and Swami,[10] reported average interval between injury and casting was 3.3 days.

In the study of Alzubady[11] reported spica cast is simple, safe, effective and definitive method of treatment. It is cheap and associated with short hospital stay. In this study hospital stay of 16 (80%) patients was 1-5 days and 4 (20%) patients stayed 6-10 days. The mean duration of hospital stay was 4.1 days. In the series of Shah et al.[9] the hospital stay ranged from 3-15 days and in the series of Muzzafar and colleagues[8] the median hospital stay was 5 (ranged 2-9) days. Early spica application had the advantage of shorter hospital stay and overall lower cost of treatment.

Union has really never been a problem in pediatric femoral fractures. The main challenge is malunion, especially angular deformity, rotational malunion and leg length discrepancy.[12] In this study all fractures were united and there was no delayed or non-union. The mean union time was 7.65 weeks. Near about similar to the study of Tripathi, Ali and Bachhar,[13] where the mean duration of healing of fracture was 8.55 weeks. Esenyel et al.[14] treated 207 patients with hip spica casting and there was no nonunion or delayed union.

In this study there was full range of knee and hip movement of 12 (60%) patients and 6 (30%) with mild restriction, 2(10%) with moderate restriction, similar to the study of Bashir and Nand[15].

The primary problems with early femoral casting were shortening and angulations of the fracture.[14] In this series, we had malalignment like angulations less than 5 degree towards varus/valgus or antero/posterior angulations of 15 (75%) of cases and 3 (15%) cases exist between 5 to 10 degree and only 2 (10%) cases more than 10 degree which was similar to the study of Bashir and Nand[15].

Full weight bearing was possible in 15 (75%) of cases within 8- 12 weeks and rest 5 (25%) o f cases within 13-16weeks. The mean duration of full weight bearing was 10.07 weeks. Ruhullah and colleagues,[16] reported mean duration of weight bearing 10 weeks.

Lee et al.[17] treated 63 children by early spica method. Shortening of >2 cm was the commonest complication of early (within 7 days of injury) spica casting in 43% (22/51) of the patients. 17 Patients with unacceptable shortening after spica casting required cast removal and traction for 2 weeks before recasting. In this series 16 (80%) of the patients had leg length inequality by <1 cm and 3 (15%) of the patients had leg length inequality by <2 cm and 1(5%) of the patients had leg length inequality by >2cm. In the study of Alzubady and Almuhana[11] 30% of patients had leg length inequality, Muzzafar and colleagues[8] reported 20% of patients developed leg length inequality.

In the final outcome of the study according Flynn's scoring criteria, demonstrated that (80%) of the patients had excellent outcome, 2 (10%) patients had successful outcome and 2(10%) had poor outcome. Similar findings reported in Dulgeroglu et al.[18] where excellent in 35 cases (72%), good in 9 cases (19%), moderate in 4 cases (9%).

Sidiqui et al.[19] compared the results of femur shaft fractures in children with skin traction followed by spica cast versus early spica cast. The results of their treatment were satisfactory in 81% and unsatisfactory in 19% cases. Three (14.3%) patients developed more than 2 cm shortening and two (9.5%) patients unacceptable angulation, the latter was corrected by wedging the cast. All the patients had a shortening between 8-18 mm (average 10.5 mm). Although they found satisfactory results treated with early spica cast and good results in children treated with skin traction followed by spica cast and there were fewer complications in this group, but the hospital stay was prolonged making the treatment costly.

Singh and Associates[20] suggested that early closed reduction and placement of hip spica cast is a safe and reliable treatment option.

As per review literature many authors did not find much difference in the outcome between early spica cast and skin traction followed by spica cast in conservative treatment of femur shaft fracture in children.[21]

Al-Mohrij and colleagues[22] in their study conducted at Saudi Arabia concluded that hip spica casting without traction for femoral fracture in children aged 0-4 year's produces excellent results and continues to be the treatment of choice.

The major advantage of early spica is a short hospital stay allowing cost containment and rapid return to the child's everyday environment. However, frequent follow-up with repeated radiographs is required in the first 3 weeks to detect shortening and displacement of the fracture in the spica cast.

CONCLUSIONS

Early hip spica cast may be the preferred method for the treatment femoral shaft fractures in children aged 2 to 12 years.

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Original Article

Ilizarov Method - A Limb Salvage Device in A Child

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Abstract :

Ilizarov method is the best weapon for the treatment of the limb length discrepancy, especially in traumatic or congenital shortening of long bones. Post burn bony defect can be corrected by osteosynthesis. We treated a 7 years old boy, suffering from 33% electric burn affecting face, trunk, left upper limb & both lower limbs with loss of soft tissue of medial side of right leg along with dead and exposed of some segment (about 14cm) of Left tibia . Initially the patient was managed by plastic surgeons in the form of surgical toileting, wound debridement and wound coverage by split thickness skin graft. After about 6 weeks, we applied Ilizarov fixator on the affected limb and maintained it for 7 days to increase vascularity. As there was minimum bone in the proximal part, we did corticotomy at the distal end. After 7 days further, we started distal to proximal bone transport at a rate of 1mm per day. Staged excision of about 2.5 to 3cm dead bone was done, after transporting the same length of bone each time. In 5 such sittings, a total of 14 cm bone was excised. Thus the burned portion was replaced by new bone, bony union was achieved after applying compression. Now the patient able to walk individually, without any difficulty.

So, we found that, Ilizarov method is a good option for the management of post burn bone loss. To our knowledge, such an application of the Ilizarov external fixation device in post burn bone loss has yet to be reported.

Key-words : Ilizarov method, limb salvage, electric burn.

INTRODUCTION

Limb lengthening has always been a challenging problem for the orthopaedic surgeon. Codivilla reported the first lengthening procedure in 1905.[1] In the early 1950s, Gavriil Ilizarov revolutionized the field of limb lengthening.[2] He developed the *law of tension-stress*, which describes the process of new bone and soft tissue regeneration under the effect of slow and gradual distraction.[3,4] His biological principles can be summarized as :

1. Minimal disturbance of bone by corticotomy.
2. Delay before distraction of about 5 to 10 days.[5,6,7]
3. Rate of distraction of about 1 mm per day.
4. Rhythm of distraction of about 0.25mm every 6 hours.
5. Site of the osteotomy; metaphyseal lengthening leads to better osteogenesis.
6. Number of lengthening sites (unifocal or bifocal).[2]

In children, the common indications of Ilizarov method are : limb lengthening,[8,9] angular & multiplanar deformities,[10] foot deformities,[11] congenital anomalies of the lower limbs,[12] joint contractures,[13] congenital pseudoarthrosis of the tibia,[14] non-union and infected non-union of fractures,[15] some acute fractures,[16] arthrodesis,[17] etc.

The Ilizarov method can cause a variety of problems and complications.[18.19] like, pin tract infection, pain, swelling of the limb, neurovascular complications, contractures of the soft tissues, subluxation and dislocation of the adjacent joints, bony problems at the lengthened site, osteoporosis of the lengthened bone, angular deformity or pathological fracture, psychological problems, etc.

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THE CASE REPORT

Our patient, a 7 years old boy, suffering from 33% electric burn affecting face, trunk, left upper limb & both lower limbs, was being treated at the City Hospital, Lalmatia, Dhaka. The burn was associated with loss of muscle and soft tissue of medial medial side of right leg and dead and exposed of some segment of left tibia. Treatment was aimed through a multi-disciplinary approach, as we planned to salvage the limb, rather than amputation. At first emphasis was given on wound coverage and soft tissue care. Initially the patient was managed by the plastic surgeon in the form of surgical toileting, wound dedridement and wound coverage by split thickness skin graft. About 14 cm of the total 25 cm length of the tibia was destroyed due to burn. After about 6 weeks, we applied Ilizarov fixator on the affected limb, and maintained it for about 7 days to increase local vascularity. As there was minimum bone in the proximal part, corticotomy was done at the distal end of the left tibia. After waiting for 7 days more , bone transport was started from distal to proximal by gradual distraction, at a rate of 1mm per day, dividing it 12 hourly. After 3 weeks, formation of new bone was noticed radiologically at the corticotomy site. Staged excision of about 2.5cm to 3cm of exposed dead bone from the proximal part of the distal segment was then done at 3 to 4 weeks interval, after transporting the same length of bone each time. In 5 such sittings, a total of 14 cm bone was excised and after transporting 14 cm of bone, we planned to excise 2cm of tibia from proximal part. Then we applied compression; due to compression the dead bone became vascularised and bony union was achieved. Finally, the length of left tibia was 26 cm.

Physiotherapy (range of motion and strengthening exercises) was started immediately after application of Ilizarov fixator, and walking was encouraged with the fixator. After clinical and radiological evaluation of bony union (complete bridging of the lengthened site and the appearance of new cortex at the lengthened site), the fixator was removed 18 months after it's application. A brace was then applied for about 6 weeks. Thereafter, the patient was followed at every month, both clinically and radiologically. Now, after about 2 years of application of Ilizarov ring fixator, the patient was found to walk individually without any difficulty.

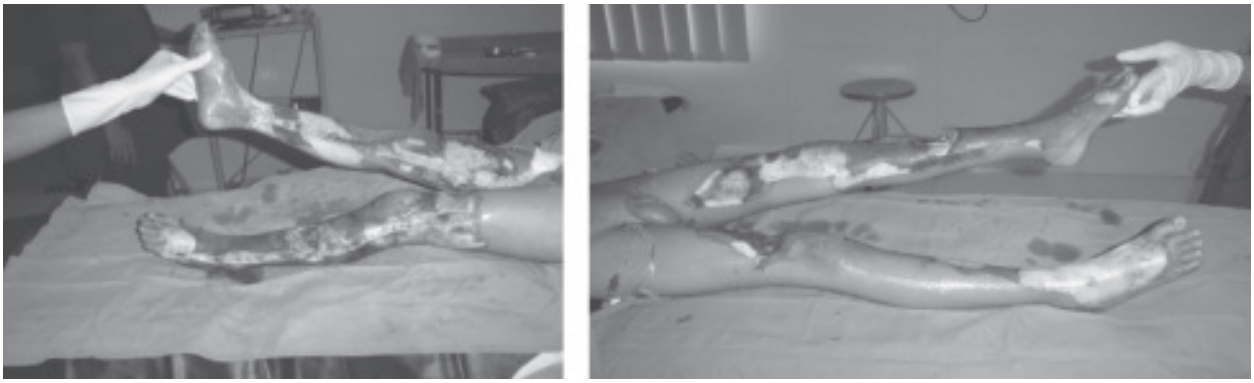


Fig-.1 : *Initial condition before soft tissue management*

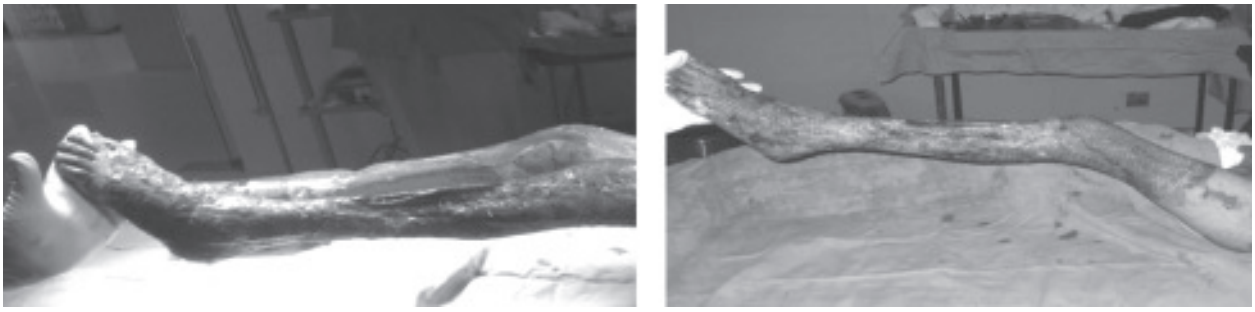


Fig-.2 : *After wound coverage, showing necrosed part of the upper shaft of tibia*



Fig-.3 : *After application of Ilizarov fixator*

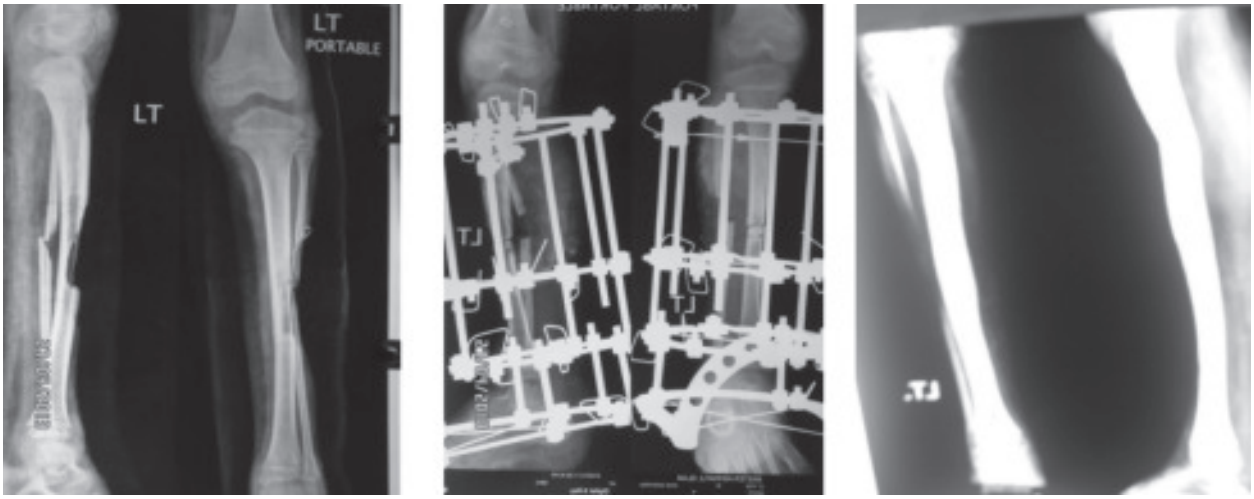


Fig-.4 : *a) Initial x-ray, b) After application & c) After removal of Ilizarov fixator*

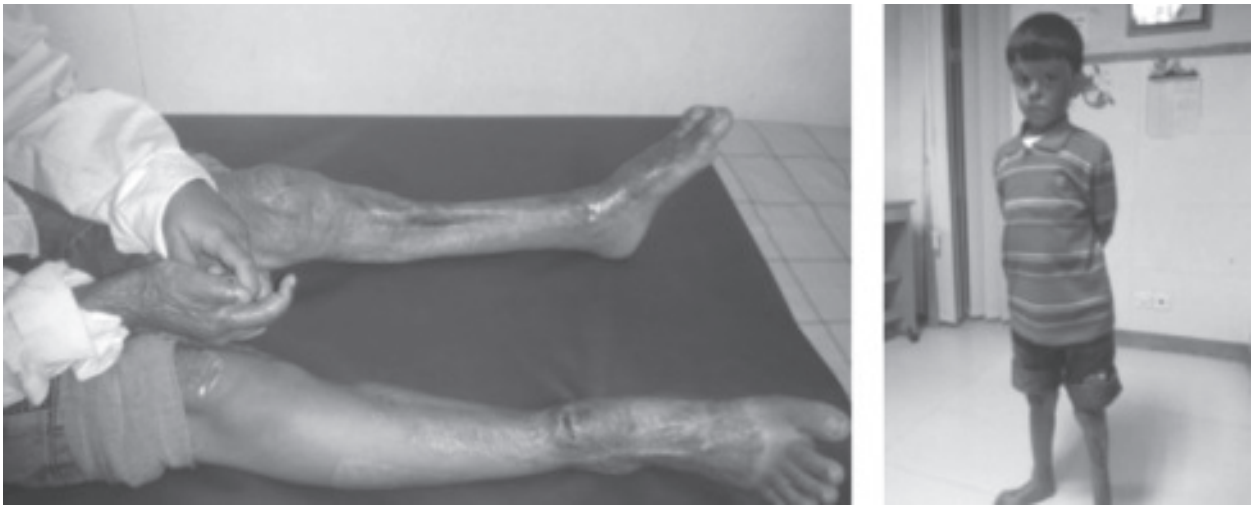


Fig-.5 : *Final appearance during the last follow up*

DISCUSSION

To our knowledge, application of the Ilizarov external fixation device in post burn bone loss has yet to be reported. We treated the case through a multi-disciplinary approach. After initial soft tissue treatment by the plastic surgeon, we started our treatment, by applying Ilizarov fixator.

Ilizarov described the concept of *corticotomy,* where only the cortex of the bone is cut, preserving the periosteum

and medullary cavity, the aim was minimal disturbance of the existing viable bone. In this case, as there was minimum bone in the proximal part, corticotomy was done at the distal end of the left tibia. After corticotomy, a delay before distraction allows *osteogenesis* to begin.[4] Duration of delay varies from 5 days in a child to about 10 days in a skeletally-mature patient.[5,6,7] Metaphyseal lengthening leads to better osteogenesis. In the 1980s, DeBastiani developed the *callotasis* method of limb lengthening.[20] He recommended a longer delay about 2 weeks before distraction to allow for callus formation. In this case, bone transport was started from distal to proximal by gradual distraction after a delay of 7 days. For proper lengthening, the rate of distraction should be 1mm/day, with an optimum rhythm of distraction of 0.25mm every 6 hours.[4] In this case, we applied distal to proximal gradual distraction at a rate of 1mm per day, with a rhythm of .5mm every 12 hours.

Lengthening before the age of 5 years is seldom recommended, unless there is a specific indication.[4] Increasing the length of the bone by up to 20% to 25% of the original length usually gives good results.[21,22] But in this case, as about 14 cm of the total 25 cm length of the tibia was destroyed due to burn, more than 50% of original bone needed to be lengthened.

The duration of the consolidation depends on the amount of lengthening; approximately 1 month for every 1cm of lengthening. In this case, we kept the fixator for about 18 months for a total of 14cm lengthening.

CONCLUSION

Ilizarov method is a good option for the management of post burn bone loss.

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Original Article

Socio Demographic Characteristic of Spinal Tuberculosis Patient - A Study In National Tuberculsis Control Hospital, Dhaka, Bangladesh

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Abstract

Spinal tuberculosis accounts for 50% of skeletal tuberculosis,15% of extrapulmonary tuberculosis and 1-3% of all cases of tuberculosis but the scientific study regarding spinal tuberculosis comparatively less specially in context to Bangladesh. The purpose of the study was to find out the socio demographic characteristic of patient suffering from spinal tuberculosis. This cross sectional study was done in National tuberculosis control hospital Dhaka, Bangladesh. Data were collected from patient with a structured questionnaire. Eighty one patient were included in this study. The study reveals that 73% of the patient suffering from spinal tuberculosis were in the age group between 11-40 years.It was found that 39% of patient were illiterate and 36% have educational level below SSC. This study also reveals that 46% of patient suffering from spinal tuberculosis were house wife and next frequent occupational groups suffering from spinal tuberculosis were service holder and student respectively which combindly constitute 26% of sample. About 74% of patient were of lower income group having a monthly family income below taka 10001. Spinal tuberculosis is prevalent among adolescent and adult with higher frequency in illiterate and lower education level people. This study also reveal that spinal tuberculosis is more frequent among the low income family members and people who are suffering from malnutrition.

Key word: Sociodemographic, spinal, Tuberculosis, characteristics

INTRODUCTION

Spinal Tuberculosis is a destructive form of skeletal tuberculosis which accounts for 50% of skeletal Tuberculosis, 15% cases of extra pulmonary Tuberculosis and 1-3% of all cases of TB.[1,2,4] Spinal Tuberculosis is one of the oldest diseases known to mankind and has been found in Egyptian mummies dating back to 3400BC [2,3]. Tuberculosis was a leading cause of mortality in the beginning of twentieth century[4].Improvement in the socioeconomic status led to a major decline in its prevalence. Malnutrition, poor sanitation and exanthematous fever are the factors contributing to the spread of the disease[5] Spinal tuberculosis is a dangerous form of skeletal tuberculosis as it can be associated with neurological deficit due to compression of adjacent neural structures and significant spinal deformity,so early diagnosis and management of spinal tuberculosis has special importance in preventing these serious complications.[6] The incidence of spinal tuberculosis is increasing in developed countries also. Genetic susceptibility has recently been demonstrated..

The exact incidence and prevalence of spinal tuberculosis is not known and study regarding spinal tuberculosis is few in Bangladesh. The aim of this study is to find out the socio demographic characteristic of patient suffering from spinal tuberculosis in context of Bangladesh.

METHODS

Type of study: A cross sectional study.

Period of study: From January 2011 to December 2014.
Place of study: National tuberculosis control hospital, Dhaka, Bangladesh.

Research instrument: Data with pre structured data sheet were collected from hospital record.

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Sample size: A total of 81 patient were taken purposively as a sample size.

Data collection : Data were collected by searching the hospital records of patient.

Data analysis The collected data were checked,edited and processed with computer keeping in view the objectives of the study..

RESULTS

Table-I

Distribution of the patient of spinal tuberculosis by their age(n-81)

Age group (years)	Total No (%)	Percentage
0-10	02	2.46
11-20	18	22.22
21-30	24	29.62
31-40	17	20.98
41-50	10	12.34
51-60	08	9.87
>60	02	2.46
Total	81	100.00

The age range of total patient was 1-75 years. Among them highest majority (29.62%) was in the age group 21-30 years. Only (2.46%) was below the age 10 years.

Table-II

Distribution of spinal tuberculosis patient by sex

Sex	No of patient	Percentage
Male	36	44.44
Female	45	55.66
Total	81	100.00

Regarding sex distribution 55.66% of the study population was female and 44.44% was male.

Table-III

Distribution of patient by their occupation

Occupation	Total No	Percentage
Businessman	01	1.23
Service holder	11	13.58
Day laborer	03	3.70
Driver	02	2.46
Student	10	12.34
House wife	37	45.67
Worker	04	4.93
Child	07	8.64
Others(U/P)	06	7.40
Total	81	100.00

According to occupation , large majority(45.67%) were house wife. Service holder(13.58%)and student (12.34%) were the next respective major groups.

Table-IV

Distribution of patient of spinal tuberculosis by their educational level (n=81)

Education	No	Percentage
Illiterate	32	39.50
Class 1-V	15	18.51
Class V1-X	14	17.28
SSC&HSC	12	14.81
Graduate & above	07	8.64
Total	81	100.00

Regarding the educational level of the study population 39.50% was illiterate and another 35.79% had a education level between class I-X.

Table-V

Distribution of patient by income group(n=81)

Monthly family income	No	Percentage
Up to 5000	35	43.20
5001-10000	25	30.86
10001-20000	14	17.28
20001-30000	02	2.46
>30000	05	6.17
Total	81	100.00

In consideration of income group this study reveals that the highest majority of the patient suffering from spinal tuberculosis belongs to the lowest income group (up to taka 5000 BDT per month) and only 6.17% of patient suffering from spinal tuberculosis comes from family those had monthly income above 30000 BDT.

DISCUSSION

Predisposing factor for tuberculosis include poverty, overcrowding, illiteracy, malnutrition, alcoholism, drug abuse, diabetes mellitus, immunosuppressive treatment and HIV infection. These are also predisposing factors for spinal tuberculosis[7].

The majority of the patient in this study were within the age group 21-30 years which is about 29.62% of total patient. The next frequent age groups were between 11-20 years and 31-40 years which were respectively 22.22%

and 20.98% of total patient included in this study. So the majority of the patient suffering from spinal tuberculosis were between the ages 11-40 years were 73% of total patient.. Only 2% 0f patient of this series are below the age of 10 years. Spinal TB usually affect infant and young children. In this study,age group of the patient who are more frequently involved are higher than some other studies[8,9]. This finding might be due to higher status of immunization against tuberculosis in Bangladesh.

In this study about 56% of suffer were female and 44% male reflecting a slight female predominance but some of the other studies have reported a male predominance [10] . This finding in the study might be explained by the fact that female specially those who were the guardian or mother takes food after completion of eating of other family members ,as a consequences they have to take residual food which contain least nutritional items and even lesser amount, these happening are more commonly adopted by the family of lower and least income group. This culture and heritage is prevalent among the middle class and poor families of Bangladesh.

By occupation the large majority, about 46% are house wife and the next frequent occupational groups are service holder and student which are respectively 14% and 12% of the patient. So by occupation house wife, service holder and student are the most frequently involved patients. This finding that house wife in Bangladesh specially those of low income group are traditionally suffer from malnutrition due to their culture of taking least residual family food, similarly student coming from low income group and residing in mess and service holder of low pay scale group are suffering from malnutrition due to poor quality and quantity of food.and living in poor sanitation area which are compatible with the socioeconomic condition favorable for predisposition of the disease.

In consideration of educational level majority of the patient belongs to lower level of education, 39.50% of patient were illiterate and about 35.79% patient have educational level between class 1-X.. Only 9% of patient are graduate and above. Reflecting that spinal tuberculosis are more common among illiterate and lower education level people. In context of income group majority 43.20% had a monthly a monthly family income up to 5000 BDT and another 30.86% of patient has monthly family income between 5001-10000 BDT and only 6.17% had monthly family income above 30000 BDT. reflecting that spinal tuberculosis is more common among the lowest income group.

CONCLUSION

This study reveals that the incidence of spinal tuberculosis is comparatively less below the age of 10 years in Bangladesh which is due to a higher status of immunization against tuberculosis among the children of Bangladesh. This study also reflect that female specially house wives of lower income group are more commonly suffer from spinal tuberculosis in our country.

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Original Article

Treatment of idiopathic club foot using the Ponseti method – One Year Experience in PTC, DMCH

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Abstract

PTC (Ponseti Training Centre) in Dhaka Medical College starts its journey on 27th April 2015.On 26th April it completes one year. We report our one year experience of using the Ponseti method for the treatment of congenital idiopathic club foot in PTC, DMCH .Between April 2015 and April 2016 we treated 58 feet in 35 children by this method and another 17 feet 10 patients are on treatment. The standard protocol described by Ponseti was used. The Pirani score was used for assessment. The results were assessed in terms of the number of casts applied and the need for tenotomy of tendo Achillis and the mean follow-up time was 9.5 months (2 to 12 month). Tenotomy was required in 42 of the 58 feet. 4 patients are lost from the follow up.

INTRODUCTION

Congenital idiopathic club foot is a complex foot deformity in an otherwise normal child consisting of four components: equinus, heel varus, forefoot adduction and cavus. [1]The aim of treatment is to achieve a painless, plantigrade foot with good mobility, with no need for special or modified shoes. Most orthopaedic surgeons agree that the initial treatment should be non-surgical and should start as soon as possible after birth.[2] Many methods have been described, most of which involve serial manipulation and casting.[3] Complications may follow surgical treatment and many club feet treated surgically are painful, stiff and weak.[4] In 1950, Ponseti[3, 6] developed a method of treating club foot using manipulation and casting. The clinical correction achieved by this method has been reported to produce a functional, plantigrade foot without the need for posteromedial release in 85% to 90% of cases.[5,7] The correction achieved has been reported as being long lasting with some patients followed up to their fourth or fifth decade. [6] Our aim of this study is to review our one year experience of treating club foot by the Ponseti method.

PATIENTS AND METHODS

Between April 2015 and April 2016, 45 consecutive children with 75 club feet were treated at our institution by the Ponseti method. There were 29 (64.4%) boys and 16 (35.5) girls. Of these 30 (66.6%) had bilateral and 15 (33.4%) unilateral club feet. They had been referred from local maternity units, general practitioners, and sasthosebica of BRAC. Children with other congenital deformities, syndromes or neurological causes of club feet were excluded. Assessment of the deformity was by the Pirani club foot score,[13] at a mean period of follow-up of 9.5 months (2 to 12 month). The results were evaluated for correction of deformity, the number of casts required, the need for a tenotomy of tendo Achillis, and relapse of the deformity.

Compliance with the foot abduction orthosis (Denis Browne splint) is thought to be essential for the prevention of relapse after the initial correction.[14] The information given by parents at follow-up visits was used to judge compliance with the use of the splint. Poor compliance was defined as failure to use the splint continuously for at least 23 hours a day for the first 3 month. We used the protocol described by Ponseti [3, 15] which was started as soon as possible after birth. Simultaneous correction of cavus, forefoot adduction and heel varus (except equinus) followed Ponseti's technique with initial manipulation and immobilisation in an above- knee plaster cast at weekly

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intervals. Tenotomy of tendo Achillis was performed, if necessary, under local anaesthesia as an out- patient procedure. This was followed by the use of a foot-abduction orthosis (Denis Browne splint) with 70Ú of external rotation on the affected side and 40Ú of external rotation on the normal side. The brace was used on a full-time basis for three months followed by night- and nap-time use for up to four years.

RESULTS

The mean age at presentation was 12 weeks (1 to 36week). Of the 45 patients, 30 (66.6%) presented within 12 weeks of birth, 10 (22%) between 12 and 24 weeks and 5 (11%) at 24 to 36 weeks. Initial treatment in 5 feet had been started elsewhere before presentation to our department. This was mainly by manipulation, stretching and application of a plaster cast. Minimum cast required is 5 and maximum cast required is 15. The mean Pirani score at presentation was: hind-foot contracture score 2.5 (2 to 3), mid-foot contracture scores 2.5 (2 to 3), and a total score of 5.0 (4 to 6). The mean Pirani score after treatment for the feet was: hind-foot score 0.5 (0 to 1), mid-foot score 0 and a total of 0.5 (0 to 1). The mean number of casts required was eight (4 to 17). Tenotomy was required in 42 (72.4%) of feet. Of the 58 feet, 58 (100%) responded to initial casting. Other problems encountered during treatment were slipping of the plaster in five children and bruising of the legs and swelling of the toes in seven.

DISCUSSION

The method of serial manipulation and casting developed by Ponseti for congenital club foot was instituted in an effort to achieve a plantigrade, functional foot without the need of a major surgical intervention. Open surgery was avoided in 89% of cases by this technique of manipulation, casting and limited surgery.[6] At our institution, the treatment commonly used before the Ponseti method was introduced was stretching and strapping for between three and five months which often resulted in partial correction. The partially corrected feet were then treated by posteromedial soft-tissue release. Various techniques of posteromedial soft-tissue release for resistant club foot have been described[16] and excellent or good results after open release have been achieved in 52% to 91% of cases.[8] However, most of these cases had a relatively short follow-up, ranging between two and eight years. The long-term results have been disappointing with increasing pain in the foot, and disability.[17, 18] The short- and medium term complications of posteromedial soft tissue release range from simple wound infection to disruption of wound. Overcorrection, loss of correction and relapse has also been reported.[11, 19] Long-term complications include stiffness and weakness leading to premature arthritis.[8] In most feet the standard accepted practice of serial manipulations and posteromedial soft tissue release produced excellent short term but disappointing long term results; this encouraged us to change to the Ponseti method. This series represents our early experience with this method. In 100% of feet, the deformity was corrected avoiding the need for posteromedial soft-tissue release. Few casting techniques have been described in detail in the literature. Kite illustrated his method in 1964. He recommended abduction of the forefoot against pressure at the calcaneocuboid joint. Ponseti described this manoeuvre as Kite's error because it blocked the correction of hind-foot varus and internal rotation. Posteromedial soft-tissue release was avoided in 100% of our cases, but percutaneous tenotomy was required in 72%. Many parents reported difficulty in keeping the foot/feet in this splint. Some found it difûcult to apply the splint single-handed and others reported that their child was unable to kick the legs freely and was unable to roll over in bed with the feet in the splint. These problems caused frustration in the family and often sleepless nights leading to poor compliance. We have introduced some methods to improve the compliance. We have found that parents need to be better informed, especially about the importance of continued splintage and the potential for relapse with poor compliance. This can be done by careful explanation at the start of treatment and by providing information leaûets explaining the deformity and treatment. Our study is limited by the number of children and the relatively short follow-up. Our initial experience with the use of the Ponseti method suggests that it is a simple and effective method of treating congenital idiopathic club foot.

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Original Article

Comminuted Fractures of the Proximal Ulna - Preliminary Results with an Anatomically Preshaped Locking Compression Plate (LCP) System

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Abstract:

Comminuted olecrenon fracture has become more frequent in the recent years due to the increase in the incidence of RTA. Many treatment options are available for these fractures with variable results. Between March 2014 and July 2015, 10 patients with comminuted fractures of the olecrenon were managed with the anatomically preshaped LCP .Out of the 10 patients, 7 were male and 3 were female. The patients were followed up as outpatient basis with a mean duration of 12 months. Postoperative range of motion, objective muscle-strengths testing and patient's satisfaction were evaluated. All patients had follow-up radiographs. Out of 10, 1 patient is lost from the follow up. The mean arc of elbow motion was 10-130 degree. There were satisfactory result in seven cases and unsatisfactory in two cases. There were one patient with symptomatic hardware and one patient complained about deficit of motion. Nine fractures healed with ulnohumeral congruity after a mean time to union of 16 weeks. No loss of reduction is noted in any of the patient.

INTRODUCTION

Regarding forearm injuries in adults, complex fractures of the olecrenon with severe comminution have become more frequent in the recent years. However, these fractures still remain a treatment challenge for trauma surgeons. To allow early functional mobilisation and to prevent stiffness of the elbow joint, the fracture fixation has to provide secure stability.[1] Especially for severely comminuted olecranon fractures, plate fixation has evolved as gold standard treatment.[2,3] In more recent times, the use of locked plating is being advocated more and more frequently.[4,5]

Following the AO principles of fracture management and internal fixation, a contoured 3.5-mm locking compression plate (LCP) with bicortical screw fixation is advised for multifragmentary articular fractures of the olecranon.[6] The application of a contoured LCP has shown both biomechanically and clinically good results for comminuted olecranon fractures.[7, 8]

The purpose of the present investigation is to report our experiences with the anatomically preshaped 3.5-mm LCP olecranon plate in 10 patients with different types of comminuted proximal ulnar fractures.

PATIENTS AND METHODS

Between March 2014 to July 2015, 10 patients with comminuted olecrenon fracture were choosen for this study. There were seven men and three women with an average age of 45 years (range, 28–65 years) at the time of surgery. The right elbow was involved in four patients, and the left elbow in six patients. The fracture types were classified based on the radiographs taken immediately after injury and intra-operative findings. There were no open fracture and not associated with peripheral nerve injuries or forearm compartment syndromes.

According to the AO classification there was four extra-articular, multifragmentary metaphyseal ulnar fracture (type 21-A1.3); five unifocal multifragmentary olecranon fractures (type 21-B1.1); one bifocal multifragmentary fracture of the olecranon and the coronoid (type 21-B1.3).

The mean interval between injury and operation was 11 days. Mean hospital stay is 16 days. The mechanism of

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injury was a fall from height for two patients, a bicycle accident for one patient, and in seven cases, and the injury was the result of a high-energy trauma from a traffic accident-associated polytrauma.

RESULTS

All the patients are followed up as outpatient basis after 2 week. At the first follow up visit, stitch and long arm back slab is removed and gentle passive elbow movement within the pain limit is advised.

At a minimum follow-up time of 6 months, patients were invited to return for clinical evaluation. The range of motion of the elbow, the forearm rotation and the stability of the elbow were assessed. Patient's satisfaction for elbow use was inquired on an ordinary scale between 1 and 5 (indicating 1, highly satisfied; 2, satisfied; 3, moderate; 4, unsatisfied; 5 highly unsatisfied).

The measurements included maximum extension and flexion, as well as maximum supination and pronation .Preoperative, postoperative and follow-up radiographs were obtained. Antero-posterior and lateral radiographs were evaluated for fracture healing, failure of the implant and loss of reduction.

A total of 10 patients are followed up with a follow-up period of 16 months (4–16 months). One patient was lost from our follow up. The postoperative arc of fiexion at the time of the latest follow-up was from a mean extension deficit of 13 degree (0 - 50 degree) to a mean fiexion of 136 degree (120- 150 degree) in six patients. Three patient complains of elbow stiffness with an average elbow movement is 25-110 degree. The arc of rotation of the forearm was from a mean supination of 71 degree (10 - 80 degree) to a mean pronation of 74 degree (10 - 80 degree). None of the patients had elbow instability. Forearm strength was rated as normal in seven patients, two patients complain of mild weakness in their elbow movement. None of the patients had any varus–valgus or posterolateral rotatory instability.

Patient's satisfaction for elbow use was rated as highly satisfied in six cases and as moderately satisfied in two cases. Only one patient was unsatisfied.

DISCUSSION

The aim of the present study is to illustrate our clinical results for patients with comminuted fractures of the olecrenon treated by the anatomically preshaped 3.5-mm LCP olecranon plate. Anatomically preformed implants have already shown promising results in distal femoral and distal tibial fracture management. [9, 10] The LCP olecranon plate combines the principle of angular stable fixation with a preformed design.Like regular LCP systems, the implant provides the possibility of interfragmentary compression using combi-holes.[11] In the present group of patients, we found the LCP olecranon fixation is

a reliable and effective fixation device for complex fractures of the olecrenon. After a mean follow-up of 16 months, 7 of 10 evaluated patients rated good or excellent elbow outcomes .The average arc of elbow motion was 10-135 degree. Only two patients has extension deficit of 25 degree. Only in two patients, hardware was the cause of clinical restrictions. One patient complained of pain at the hardware site. There was no mechanical failure of the implant itself or any secondary loss of reduction. Our findings are comparable with those reported in the current literature for contoured olecranon plating. Recently, Buijze and Kloen reported on 16 patients with comminuted olecranon fractures including four Monteggia fractures, which were managed with contoured LCP fixation combined with an intramedullary screw. After a mean follow-up of 22 months, very good results were retrospectively shown with respect to validated subjective elbow scores. These functional results are comparable with our findings. In their case series, all fractures went on to union. This is similar to our series. The 3.5-mm LCP olecranon plate matches the anatomy of the olecranon.

The present study has some weaknesses, including a small number of patients and the short duration of follow-up. Further studies with increased sample size and longer follow-up are needed to validate significant advantages compared with other available plating systems. Nevertheless, the preliminary good or excellent functional results, the high union rate and the low incidence of hardware-related complications have encouraged us to continue using the implant.

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Original Article

Evaluation of the Result of Surgical Treatment of Prolapsed Lumbar Intervertebral Disc by Fenestration and Discectomy

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Abstract

Low back pain is a common problem both in adult an old age. Prolapsed lumbar intervertebral disc is a primary cause of low back pain. About 10% of cases of lumbago sciatica need surgical treatment. Treatment for lumbar disc prolapse is a common practice in surgery. Modern method is removal of disc with minimally invasive technique (Fenestration). The purpose of this study is to assess the outcome, complication and return to normal activity by fenestration & discectomy. This is a prospective interventional study of 32 patients who underwent fenestration & discectomy carried out at NITOR & different private hospitals between October 2011 to December 2014. Total follow up time was 6 months to 1 year. Out of 32 patients 23 were male & 9 were female, age ranged from 20 years to 60 years. More common site of disc prolapse was at the level of L_4-L_5 (56.3%) & L_5-S_1 (31.3%), more involvement at left side 20 (55.6%). We assay physical examination, patient's ability to return to work or to normal activity by Modified Macnab Criteria and out of 32 patients 23 patients (71.9%) had excellent functional outcome, followed by 6 (18.7%) good functional outcome & 2 (6.2%) Fair and 1 (3.1%) had poor functional outcome. 3 patients developed complications e.g. discitis in 2 patients &dural tear in 1 patients. With this procedure the acceptable outcome was achieved in 29 patients out of 32 patients (90.6%). So this procedure is a satisfactory safe, effective & acceptable to our patients. It reduces the morbidity & increases the chance of successful outcome.

INTRODUCTION

Low back pain is a common problem both in adult and old age. Hult 1954 estimates that upto 80%of the population is affected by this symptom at sometime in life[1]. Its causes are legion and an exact diagnosis is often difficult. The disability with which it is usually associated is often severe and prolonged. Low back pain due tolumbar disc prolapse is a leading cause of morbidity throughoutthe world affecting mainly the young adult[2]. The intervertebraldisc is a fibrocartilageneousstructure which is composed of inner semiliquid nucleus pulposusand outer collagenous and cartilageneous annulusfibrosus[3].

In the commonestpatten of intervertebral disc prolapse, a tear in the annulus allows protrusion of semiliquid nucleuspulposus. This may be limited by intact fibresat the periphery of the annulus (Contained disc prolapse)[4]. In other cases extrusion of nucleus is usually more extensive and the prolapsed materials may be cut off from its source (Sequestrated disc prolapse)[4]. Disc acts as a cushion &shock absorber & allows some movement and flexibility of spine[4]. More than 90% of prolapsed lumbar intervertebral disc patients can be managed satisfactorily with conservative treatment even in the presence of some neurological deficit[2]. About 10% of patients of lumbar disc prolapserequire surgery[2]. Diagnosis of PLID is usually made on the basis of history, clinical and radiological findings. Confirmation is obtainedby means of MRI finding of evidence of disc prolapse compressing nerve root. Open discectomy is the most common surgical

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treatment for PILD patients. There are several techniques like laminectomy and discectomy,fenestration & discectomy, percutaneous lumbar discectomy, microdiscectomy & endoscopic microdiscectomy[2].

In Fenestration & discectomy as it is a minimally invasive procedure a small incisionis used. So, there is less tissue trauma, less postoperative pain, less hospital stay &early return to work.

MATERIALS& METHODS

This is a prospective interventional study carried out atNitor&different private hospitals inDhaka from October 2012 to December 2014. Total Number of patientswas32 who underwent fenestration & discectomy. Among them 23 were males & 9 were females, age ranged from 20 years to 60 years with a follow up period of 6 months to 1 year. Patients were selected on the basis ofhistory,physical examination, radiological& MRI findings. It is also selected on basis of inclusion and exclusion criteria. Inclusion criteria were 1. Dominant leg pain than back pain, 2.Restricted SLR, 3.Signs of root compression-motor, sensory, reflex, 4.Positive root compression on MRI, 5.PLID at one level, Unilateral or bilateral. Exclusion criteriaswere 1. PLID due to direct trauma, 2. PLID associated with other spinal pathology, Spinal tumour, infection, 4. Recurrentnumber disc surgery, 5.Caudaequina syndrome.

RESULT

This prospective study of treatment of lumbar disc prolapse by fenestration &discectomy was carried out in 32 patients to find out the common cause of lumbar disc prolapse, age and sex incidence and to propose a protocol for treating such cases. The result of fenestration of discectomy of lumbar disc prolapse wasevaluated by using Modified Macnab[13] Criteria

Modified Macnab	Criteria for characterising outcome after surgery (Macnab 1971)
Result	Criteria
Excellent	No Pain; no restriction of mobility; return to work and level of activity
Good	Occasional nonradicularpain; relief of presenting symptoms; able to return to modified work
Fair	Some improved functional capacity; still handicapped and unemployed
Poor	Continued objective symptoms of root involvement: additional operative intervention needed at the index level irrespective of length of postoperatively follow-up

Among 32 patients 23 were males & 9 were females, age ranged from 20 years to 60 years. More common sites of disc prolapse were L4-L5(18), L5-S_1 (10), and more involvement at left side (20).

Table-I

Age distribution of the patients (n=32)

Age in years	Number	Percentage (%)
<20	0	0
21-30	8	25
31-40	13	40.62
41-50	6	18.8
51-60	5	15.6

Table-II

Sex distribution of the patients (n=32)

Sex	Number of cases	Percentage (%)
Male	23	71.88
Female	9	28.8

Table-III

Occupational distribution of the patients (n=32)

Occupation	Number	Percentage (%)
Serviceman	9	28.1
Businessman	6	18.8
Farmer	6	18.8
Shopkeeper	5	15.6
Housewife	6	18.8

Table-IV

Distribution of motor weakness of the patients (n=32)

Motor weakness	Number	Percentage (%)
EHL (L5)	19	59.4
FHL	5	15.6
None (Intact)	8	25

Table-V

Distribution of sensory impairment of the patients (n=32)

Sensory weakness	Number	Percentage (%)
EHL (L5)	17	53.1
FHL	8	25
None (Intact)	7	21.9

Table-VI

Distribution of the patients according to X-ray findings(n=32)

X-ray findings (Plain X-ray lumbosacral Spines)	Number (32)	Percentage (%)
Transitional vertebrae (Lumbarization/sacralization)	8	25
Lossof lumbarlordosis	22	68.8
Diminished disc space	7	21.9

Table-VII

Distribution of the patients according to MRI findings (n=32)

MRI findings	Number	Percentage (%)
Posterolateral disc prolapse	23	71.9
Posterior (central) disc prolapse	9	28.1

Table-VIII

Distribution of level of disc prolpase (n=32)

Level	Number	Percentage (%)
L4-L5	18	56.3
L5-S1	10	31.3
both level	4	12.5

Table-IX

Distribution of disc prolpase by side (n=32)

Side	Number	Percentage (%)
Left	20	55.6
Right	5	13.9
Central	11	30.6

Table-X

Distribution of disc prolapse by operative findings (n=32)

Disc prolapse	Number	Percentage (%)
Posterolateral	25	69.5
Central	11	30.5

Table-XI

Post operative hospital stay (n=32)

Hospital stay (days)	Minimum	Maximum	Mean
Range (3-6)	3	6	4.8 1.22

Table-XII

Distribution of patients by post operative complications (n=32)

Post Operative Complications	Number	Percentage (%)
Discitis	2	6.2
Dural tear	1	3.1

Table-XIII

Duration of post operative follow-up (n=32)

Follow up in months	Number	Percentage (%)
Up to 6 months	19	59.3
7-9 months	5	15.6
10-12 months	8	25

Table-XIV

Percentage distribution of pain in different visit (n=32)

Pain score	Preoperative	1st Visit		2nd Visit		3rd Visit	
		No	%	No	%	No	%
Absent (0)	0	3	9.3%	9	28.1	26	81.2
Occasional (1)	0	3	9.3	5	15.6	2	3.1
Mild (2)	0	5	15.6	11	34.3	2	6.2
Moderate (3)	100	21	65.6	7	21.9	3	9.3

Table-XV

Percentage distribution of muscle spasm(n=32)

Muscle spasm	Preoperative	1st visit	2nd visit	3rd visit
Absent	11.7	75	91.3	100
Present	88.3	25	8.7	00

Table-XVI

Percentage distribution of mobility of Spine (n=32)

Visit	Restricted mobility	Percentage
Preoperative	28	87.5
1st Visit	19	59.38
2nd Visit	11	34.38
3rd Visit	5	15.6

Table-XVII

Functional outcome of the study (n=32)

Result	Number of patients	Percentage (%)
Excellent	23	71.9
Good	6	18.7
Fair	2	6.2
Poor	1	3.1

Table-XVIII

Final outcome of the study (n=32)

Result	Number of patients	Percentage (%)
Satisfactory	29	87.88
Unsatisfactory	3	9.38

Among 32 patients 23 (71.9%) cases were excellent, 6 (18.7%) cases were good, 2 (6.2%) cases were fair & 1 (3.1%) case was poor. The overall result was analyzed by categorizing satisfactory (excellent and good) 29 (87.88%) cases and unsatisfactory (fair & poor) 3 (9.38%) cases.

DISCUSSION

Disc prolapse may occur at any age, but is uncommon in the very young and very old. The patient is usually a fit adult of 20-45 years though sometimes there is a history of mild, recurrent backache in the past. Typically while lifting or stooping him or she has severe back pain and is unable to straighten up. Either then or a day or two later pain is felt in the buttock and lower limb (sciatica)[3].

Diagnosis delayis a common problem in PLID. It is necessary to obtain a detailed patient's history & clinical and radiological investigations for proper diagnosis. MRI findings have led us to detect the lession localization, involvement of the disc and its compressive effect on spinal cord.

The satisfactory result of the surgery of PLID patients largely depends on appropriate patient's selection. In this series 21.7% of patients were in 21-30 years, 40.6% of patients were in 31-40 years, 30.4% of patients were above 40 years.The lowest incidence in the series is 21 years and highest was 60 years.

Brown and pont[5] (1963) in their series found that 72% of patients were males and 28% females. There was 20% female and 80% male in the Raff[6] et al (1959) series. Shanon&paul's[7](1979) works included 25% female and 75% male patients. All patients of Nabi[8] et al (1982) series were male. There were 84.5% male & 15.49% female patients in the khan[9] et al (1991) series.

In this study there were 71.9% male & 28.1% female. The low incidence of female patients is probably due to conservative life style of the female population.

Brown and pont's[5](1962) studies showed subjective motor weakness in 8.3% cases& bladder and boweldysfunction in 3% cases. In our series 75% of the patients had motor weakness out of which 59.4% had EHLweakness&15.6% FHL weakness. Remaining 25% have no motor weakness. Sensory deficit was 78.1%of which53.1% was in L5& 25%was inS_1distribution level. Remaining 21.9% had no sensory deficit. No patient had bowel and bladder involvement.

Brown and pont[5] (1963) reported in their series that 65.2% patients had prolapse at L4-L5 level, 22.4% at L5-S_1 level and 12.4% at L3-L4 level. In our series 56.3% in L4-L5 level, 31.3% at L5-S_1 level and 12.5% at both level.

Brown& pont[5](1963) reported that 36.49% of caseshad right sided prolapse, 40.17% had left sided prolapse and 25.4% had central prolapse. In our series 55.6% patients had left sided prolapse and 13.9% had right sided prolapse and 30.6% had central prolapse. 32 patients had 36 disc prolapsebecause 4 patients had disc prolapse at two level.

Postoperative hospital stay is one of the importantparts of this study. In this series postoperative hospital stay wasminimum 3 days and maximum 6 days with a mean 4.8 $\pm$ 1.22 days.

O'connel[10] et al (1961) reported that 3% patients developed wound infection, haematoma formation in 2%, Pulmonary embolism 1% and postoperative pain in the back &groin in 1.6%. In our study postoperative discitis was developed in 2 patients (6.2%).They were managed conservatively by absolute bed rest, antibiotics andanalgesics. One patient developed per operative duraltear (3.1%) that was repaired with4-0 vicry and there was no post operative CSF leakage.

The detailed follow up evaluations were scheduled to be conducted on each patient at 1 month, 3 months, 6 months

and12 months after surgery. The evaluations included clinically and radiologically. Minimum duration of follow up was 6 months & maximum was 12 months and 59.3% patients had followed up 6 months, 15.6% had 7-9 months &25% had 10-12 months.

During follow uppain score, muscle spasms, mobility of the spine, SLR were assessed. In the final visit absence of pain was in 81.2%,occasional pain in 3.1%, mild pain was 6.2% and moderate pain was in 9.3%. Muscle spasm was absent in all patients after operation. 15.6% of the patients had restriction of mobility of the spine at 3rd visit. Preoperatively SLR was 41.326.2 degree. Following operations SLR significantly improved from baseline to 88.329.2 at 3rd visit.

Regarding the subjective assessment of this series, it was observed most 71.9% of the patients had excellent functional outcome,18.7% good, 6.2% fair and 3.1% had poor functional outcome. In this study over all a satisfactory result of found in 29 (87.88%) cases and non-satisfactory in 3 (9.38%) cases.

CONCLUSION

Fenestration is open lumbar discectomy but minimally invasive. This technique avoids muscle related trauma, the risk of paravertebral muscle denervation caused by extensive exposure and potential spinal destabilization due to excessive bone-resection.Based on the results shown above it is concluded that surgical treatment of prolapsed lumbar intervertebral disc by fenestration an discectomy is an effective, safe and acceptable method. It reduces the complications and increases the chance of successful outcome.

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Original Article

Clinical, MRI and Arthroscopic Correlation in Meniscal And Anterior Cruciate Ligament Injuries

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Abstract

The present prospective study aimed to compare the relation between clinical and arthroscopic findings of knee injuries with the relation of MRI findings and arthroscopic findings. The study was conducted at National Institute of Traumatology & Orthopaedic Rehabilitation, Dhaka over a period of 2 years. Patients of knee injury were the study population. Patients with cruciate ligaments and/or menisci injury leading to persistent instability of knee for at least 1.5 months and non-responsive to conservative treatment and without osteoarthritis and associated intra-articular fracture about knee were included in the study. Patients with cruciate ligaments and/or menisci injury with previously operated for knee injuries, osteoarthritis of knee and cruciate ligaments and menisci injury associated with intraarticular fracture about knee were excluded from the study. A total of 30 cases fulfilling the criteria were consecutively included in the study.

INTRODUCTION

The knee is the largest joint of the body. It is a mechanically complex joint. The knee is one of the most frequently injured joint because of its anatomical structure, its exposure to external forces and the functional demands placed on it. Structurally, this is an unstable joint, because the articular surfaces are not congruent.

Meniscal function is essential to the normal function of the knee joint. The menisci act as a joint filter, compensating for gross incongruity between femoral and tibial articulating surfaces. It prevents capsular and synovial impingement during flexion, extension movements, have joint lubricating function, distribute synovial fluid throughout the joint and aiding the nutrition of the articular cartilage (Robert et al, 2008).

The cruciate ligaments provide both antero-posterior and rotatory stability. They also help to resist excessive valgus and varus angulation. Both cruciate ligaments have a layered structure and some fibres of each ligament are taut is all positions of the knee. Anterior displacement of tibia (the anterior drawer sign) is resisted by posteromedial part of the anterior cruciate ligament and medial capsule. Posterior displacement is prevented by the posterior cruciate ligament (Solomon et al, 2001).

Traumatic lessions of the menisci are produced most commonly by rotation as the flexed knee moves toward an extended position. The medial meniscus, being for less mobile on the tibia, can become implated between the condyles and injury can result. The most common location for injury is the posterior horn of the meniscus and longitudinal tears are the most common type of injury. The other types are transverse and obligue tears, a combination of longitudinal and transverse tears, tears associated with cystic menisci, tears associated with discoid menisci. In knee injuries diagnostic arthroscopy is a useful tool among all the joints and is most accessible. However, a direct look inside is not a substitute for clinical examination. A detailed history and meticulous assessment of the physical signs are indispensable preliminaries and remains the sheet anchor of diagnosis. It is not that arthroscopy fails to disclose what is there; the problem is

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that it shows too much and the clinician will still have to decide which of the abnormalities detected are the causes of the patient's complaints (Solomon et al, 2001). Arthroscopy should be considered as a diagnostic aid used in conjunction with a good history, complete physical examination and appropriate radiographs. In our country, most patients are from poor socio-economic condition.

MRI bears an extra financial burden to them (Phillips, 2008). MRI scanning of the knee joint has often been regarded as the noninvasive alternative to diagnostic arthroscopy. In day to day clinical practice, MRI scan is routinely used to support the diagnosis for meniscal or ACL injuries prior to recommending arthroscopic examination and surgery (F. Rayan, D. Shukla 2008). Review of the available literature suggests that there are a number of studies looking at two out of the three diagnostic tools(clinical examination, MRI and arthroscopy), so my study is designed to identify correlation of all three methods for all cases in this study.

MATERIALS AND METHODS

3. 1 Study design:

Cross sectional, analytical study.

3. 2 Duration of Study:

July 2009 to June 2011

3.2 Place of study:

National Institute of Traumatology & Orthopaedic Rehabilitation (NITOR), Dhaka

3.3 Study population and sampling:

Convenience sampling method was used to select 30 (thirty) patients.

3.3.1 Inclusion criteria:

- Anterior cruciate ligament and meniscal injury leading to persistent instability of knee for at least 1 month after injuries that were non responsive to conservative treatment.
- ACL and meniscal injuries without osteoarthritis and associated intra-articular fracture about knee

3.3.2 Exclusion criteria:

- Previous operation of knee injuries
- Osteoarthritis of knee

Associated intra-articular fracture of knee

RESULTS & DISCUSSION

The result from the study demonstrate that mean age of the subjects was 29.3 years and the minimum and maximum ages were 16 and 50 years respectively and all of the subjects were male. Over 26% of the subjects were service-holders followed by 40% students, 13.3% businessmen, 10% farmers, 3.3% day labourers and 6.7% people were on uniformed service. Madhusudhan (2008) reported a higher mean age (52 years) in his series with a age range from 18–70 years which is not consistent with the findings of our study.

The median duration of suffering was 10.5 months and the lowest and highest durations were 1.5 and 60 months respectively. About 46.7% of the subjects had right knee affected and the rest (53.3%) left knees affected. Over 56% of the subjects received injuries during sports activities and 43.3% received them while they were working. Jah (2005) reported about 43% of injuries with right knee and 57% with left knee affected. The mechanism of trauma was a non-professional sports injury in more than three-quarter (78.6%) of the patients, a motor car accident in 10 patients and a fall in 5 patients which are not consistent with findings of the present study

Pain and giving way were predominant complaints (80% and 60% respectively). On examination, quadriceps wasting, positive Lachman Test, positive Anterior Drawer Test were frequently observed (73.3%, 70% and 73.8% respectively). Positive McMurray Test was found in 46.7% Clinical diagnosis demonstrates that about three-quarters (73.3%) of the subjects had anterior cruciate ligament (ACL) injury and 43.3% medial meniscus injury. Very few were diagnosed as having lateral meniscus injury. Isolated injuries were found 73.3% and combined injuries were 26.7%. MRI diagnosis demonstrates that more than three-quarters (80%) of the subjects had anterior cruciate ligament (ACL) injury and 60% medial meniscus injury. Isolated injuries were found 50% and combined injuries were 50%. Arthroscopically 73.3% subjects were diagnosed as having ACL injury and 20% with medial meniscus injury. Only 13.3% had lateral meniscus injury. Isolated injuries were found 73.3% and combined injuries were 16.7%.

The diagnostic accuracy of clinical examination was 93.3% for ACL, 86.7% for medial meniscus injury and 90% for lateral meniscus injury. The sensitivity of clinical diagnosis was 95.2% for ACL injury, 90.9% for medial meniscus injury and 50% lateral meniscus injury. The specificity was 88.9% for ACL injury, 84.2% for medial meniscus injury and 96.2% for lateral meniscus injury.

The sensitivities of the clinical diagnosis for the corresponding injuries were 85.7%, 100%, 100% 84.6% respectively and the specificities for the corresponding injuries were 95.9%, 100%, 95.6% and 91.2% respectively.

The diagnostic accuracy of MRI study was 76.7% for ACL, 53.3% for medial meniscus injury and 90% for lateral

meniscus injury. The sensitivity of clinical diagnosis was 86.4% for ACL injury, 60% for medial meniscus injury and 50% lateral meniscus injury. The specificity was 50% for ACL injury, 50% for medial meniscus injury and 92.9% for lateral meniscus injury.

CONCLUSION

We examined the correlation between clinical examination, MRI scan and arthroscopy for meniscal and ACL injuries. By analyzing the data we came into the conclusion that carefully performed clinically examination can give better or equal diagnosis of meniscal or ACL injuries than MRI scan. MRI scan can be used to rule out the above mentioned injuries other than to diagnose them. When clinical signs and symptoms are inconclusive a MRI scan may be beneficial in avoiding unnecessary arthroscopic surgery. But when clinical examination is in favor of meniscal and/or ACL injuries, a MRI scan prior to arthroscopic examination is of little importance. So it can be said that MRI scan should not be used as a primary diagnostic tool for diagnosing meniscal and ACL injuries.

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Original Article

Clinical Outcome of Lumbar Disc Prolapse by Surgical Management (Fenestration & Discectomy) in Pabna

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Summary

Surgical treatment for lumbar disc prolapse is a common practice in spine surgery. The purpose of this study is to assess the treatment outcome of lumbar disc prolapse by fenestration & discectomy. This is a prospective study of 30 patients who underwent lumbar discectomy, carried out at PMCH & Private clinic between January 2014 to December 2015. Total follow up time was six months to two years with 80% of patients having at least one year follow-up. 14 were male & 16 were female; age ranged from 21 to 45 years with mean age 33 years. More common sites of disc prolapse were at the level of L4/5(25), L5/S1, more involvement at the left side(20). On the findings of physical examination & the patients ability to return to work or to normal activity, 24 patients (80%) were considered to have satisfactory outcome at the end of minimum one year follow-up. 3 patients (10%) developed complications viz. wound infection in 2 patients, discitis in 1 patient. All these complications were managed conservatively. We found that the procedure is very safe, cost effective & quite acceptable to our patients. The morbidity was minimum & mean hospital stay was 5 days & overall results were satisfactory.

Key words: **Lumbar disc, fenestration, discectomy.**

INTRODUCTION

Low Back Pain (LBP) which is second only to common cold with a lifetime prevalence of 60-90% & an annual incidence of 5% with sciatica ranges from 11 to 40%. No population appears immune. Up to 35% of sedentary workers & 47% of physical labourers relate a history of LBP[1]. Low back pain due to lumbar disc prolapse is a major cause of morbidity throughout world affecting mainly the young adults. Disc is fibrocartilagenous structure, cushioned between the vertebrae, acts as a shock absorber, allows movement & flexibility.

Large majority of the patients of PLID (>90%) can be managed satisfactorily with conservative treatment even in the presence of neurological deficit. Several studies have shown that most herniations reabsorb over time. If left untreated they decrease in size by a process of dehydration & phagocytosis[2]. About 50% of patients recover within one month, & 96% function normally by 6 months. About 10% of patients with lumbar disc herniation require surgery[3].

To achieve the best result of surgery it must have radiographic evidence of a herniated lumbar disc compressing the nerve root to a degree significant enough to cause clinical radiculopathy at the correseponding level[4]. The present trend is removal of the disc with minimally invasive technique. Disc surgery has evolved over a period of time beginning with laminectomy to modern day minimally invasive technique like percutaneous procedure, micro discectomy & recently introduced endoscopic micro discectomy. However open discectomy is still considered the "gold standard" by the spine community for the surgical treatment of herniated discs that are causing severe weakness or pain. Open discectomy allows the surgeon the greatest ability to see & explore the surgical site[5].

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MATERIALS AND METHODS

This is a prospective study, carried out at PMCH & Private clinic, Pabna from January 2014 to August 2016. Total number of patients 30 who underwent lumber discectomy (fenestration technique). The patients were selected on the basis of inclusion & exclusion criteria. Inclusion criteria were 1.Dominant leg pain than back pain. 2. Restricted SLRT. 3. Signs of root compression- Motor, Sensory, Reflex. 4. Positive radiology – MRI. 5. PLID at one or two level, unilateral or bilateral. 6. Patients of both sexes – male & female. Exclusion criteria were 1. PLID due to direct trauma with fracture-dislocation of vertebrae. 2. PLID associated with other spinal pathology. 3. Recurrent lumbar disc prolapse. 4. Cauda equina syndrome. We obtained preoperative maker film in all cases to identify the proper level. We did a standard interlaminar fenestration through midline incision & cutting the ligamentum flava & removed the herniated disc by retracting the dura.

Follow up of the patients were done on OPD basis with history taking & assessment of the back pain on functional scale, clinical examination & radiological investigation in certain patients.

RESULTS

The results of discectomy of 30 cases were evaluated by using Modified Macnab criteria[6].

Excellent: No pain; no restriction of mobility; return to work & level of activity.

Good: Occasional nonradicular pain, relief of presenting symptoms; able to return to modified work.

Fair: Some improved functional capacity; still handicapped & unemployed.

Poor: Continued objective symptoms of root involvement, additional operative interventional needed at index level irrespective of length of post operative follow up.

Among 30 patients, 14 were male & 16 were female, age ranged from 21 to 45 years with mean age 33 years. More common sites of disc prolapse were at the level of L4/5 (25) and L5/S1 (5), more involvement at the Lt side (20). On the findings of physical examination & the patients ability to return to work or to normal activity, 24 (80%) patients were considered to have satisfactory outcome at the end of minimum one year follow-up. 3 (10%) patients developed complications viz. wound infection in 2 patients, discitis in 1 patients. All these complications were managed conservatively.

Table-I

Sex distribution of patients

Sex	No of cases	Percentage
Male	14	46.67%
Female	16	53.33%

Table-I shows distribution of sex. There were 14 (46.67%) male & 16 (53.33%) female.

Table-II

Age distribution of patients

Range of age	Number	Percentage
21-30	12	40%
31-40	10	33.33%
41-45	08	26.67%

Table-II shows distribution of age. The highest number of cases 12 (40%) were in the 2nd decade.

Table-III

Occupation of patients

Occupation	Number	Percentage
Manual worker	22	73.33%
Sedentary	08	26.67%

Table-III shows distribution of occupation. By occupation 22 (73.33%) were manual workers, 08 (26.67%) were sedentary workers.

Table-IV

Level of disc herniation

Level	Number	Percentage
L4/5	25	83.33%
L5/S1	05	16.67%

Table-IV shows level of disc herniation. Most common site of disc prolapse was at the level of L4/5 25 (83.33%).

Table-V

Side of disc herniation

Side of disc herniation	Number	Percentage
Right	06	20%
Left	20	66.67%
Bilateral(central)	04	13.33%

Table-V shows side of disc herniation. More involvement was at the left side 20 (66.67%).

Table-VI

Complication (10%)

Complication	Number	Percentage
Wound infection	2	6.67%
Discitis	1	3.33%

Table VI showing complications. 3 (10%) patients developed complications.

Table VII

Functional outcome study

Result	Number of patients	Percentage
Excellent	14	46.67%
Good	10	33.33%
Fair	3	10%
Poor	3	10%

Table VII shows functional outcome. Here excellent in 14 (46.67%), good in 10 (33.33%), fair in 3(10%) cases & poor in 3 (10%).

Table-VIII

Final outcome of the study

Result	No. of patients	Percentage
Satisfactory	24	80%
Unsatisfactory	06	20%

Table VIII shows final outcome. Satisfactory outcome in 24 (80%) & Unsatisfactory outcome in 06 (20%) cases.

DISCUSSION

In developing countries like Bangladesh, the underlying cause of back pain is usualy undiagnosed & untreated. This is primarily due to our ignorance, poverty, fatilistic attitude & most importantly due to lack of proper facilities for their diagnosis & management. The key to good results in disc surgery is appropriate patient selection. In this series of 30 cases, those patients were selected who fulfilled the criteria for surgical treatment as in other national & international series. Prolapsed disc usually occurs in the adult population, both among the young & the old. But the highest incidence of prolapsed disc in most of the reported series has been 30-50 years of age. In series of, Raff[10] in 1959, most of the patients were between the ages of 30-50 years, the youngest being 11 years old & the oldest 84 years old; Khan[11] in 1991, 91.21% of patients were aged between 21-50 years. In this series of 40% of the patients were in the age group of 21-30 years. The lowest age incidence in the present series was 21 years and highest was 45 years. Most of the reported series found 72-75% were male & 20-25% female10,11. In this series 46.67% were male and 53.33% were female patients, 73.33% cases were manual worker & 26.66% were sedentary population.

EVALUATION OF THE RESULTS

By using Modified Macnab[8] criteria we grade the patient's outcome in 4 categories- Excellent, Good, Fare & Poor. The outcome based on- pain, restriction of mobility, return to work & level of activity. We reported subjective outcome (e.g. patient report of symptoms & satisfaction), objective outcomes (e.g. findings of clinical examination) & functional outcomes (e.g. ability to work). Williams[12] in 1978 defined surgical 'Cure as those patients being economically productive & comfortable without the need for analgesic medication. He reported 91% cure rate in 530 patients followed upto 5.5 years after micro discectomy. Ramani[13] in 1996 reported 98% of patient's relieved radicular pain in his 250 patients of micro discectomy. Khan et al[11] in 1991, showed in their series 88.43% cases were either cured or benefited after disc surgery. There was recurrence of symptoms in 5.43% cases & symptoms became worse in 5.43% cases. In the Ali[14] in 1995, series there was complete relief of symptoms after operation in 66.66% cases & partial relief of symptoms in 28.88% cases; i.e-95.55% cases were either cured or benefited from surgery. In our series out of total 30 patients- Excellent in 46.67%, good in 33.33%, fair in 10% & poor in 10% cases. Satisfactory outcome in 80% cases & unsatisfactory in 20% cases. Average length of hospital stays was 5 days. 10% patients developed complications.

CONCLUSION

Prolapsed lumbar intervertebral disc is the primary cause of low back pain & sciatica. About 10% cases of lumbago & sciatica need surgical treatment. Fenestration & Discectomy is a rapidly changing field & undoubtly there will be important advances during the upcoming years.

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Original Article

Surgical Outcome of Brachial Plexus Surgery: Our Experience

Asif Ahmed Kabir[1], Md. Awlad Hussain[2], Md. Subir Hossain[3], Purnendu Biswas[4]

Abstract

Number of road traffic accidents including motorcycle accidents are increasing in developing country like Bangladesh. Most of these accidents lead to brachial plexus injury. In my study total 27 patients were included. Significant advances have been made in the microsurgical mangement of the injured brachial plexus.In this study most of the patients achieved good to excellent functional outcome after surgery. But for patients with global brachial plexus injury operative plan should be modified.

INTRODUCTION

The brachial plexus is a beautiful, intricate, and complex structure that comprises connections of the spinal nerves to their terminal branches in the upper extremity.

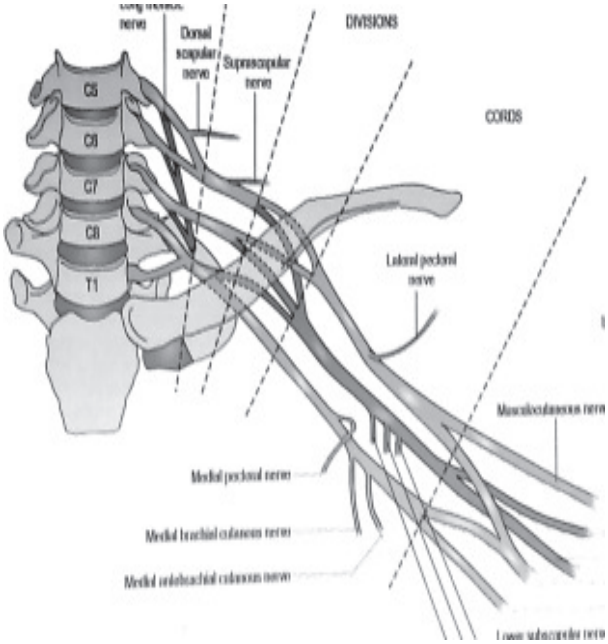


Fig.-1: *Anatomy of Brachial Plexus.*

The surgical treatment of brachial plexus injuries is relatively straightforward, once an accurate diagnosis is made.

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OBJECTIVE

Our aim is to improve the upper limb function of brachial plexus injury patients.

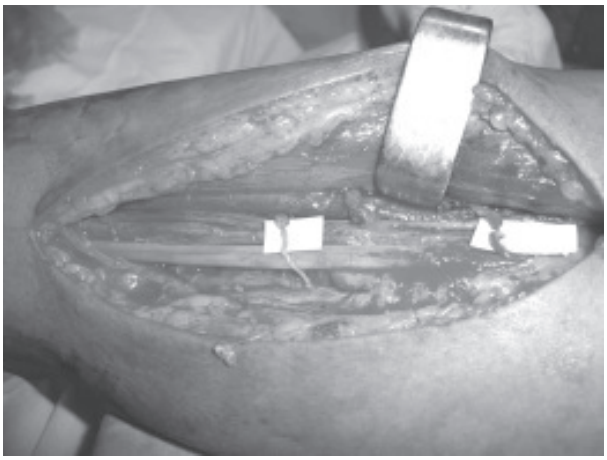


Fig: Ob*erline II transfer.*

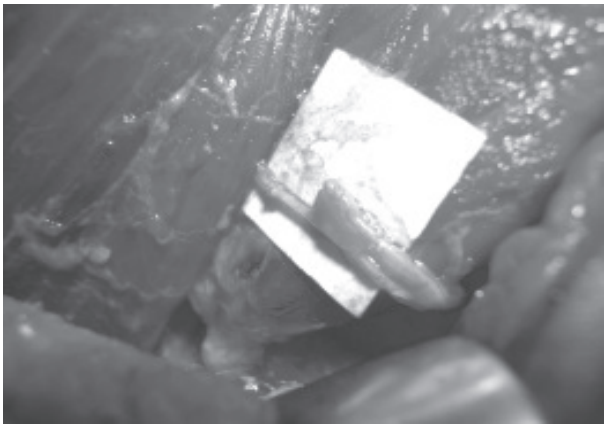


Fig: *Nerve to long head of triceps was transferred to anterior branch of Axilllary nerve.*

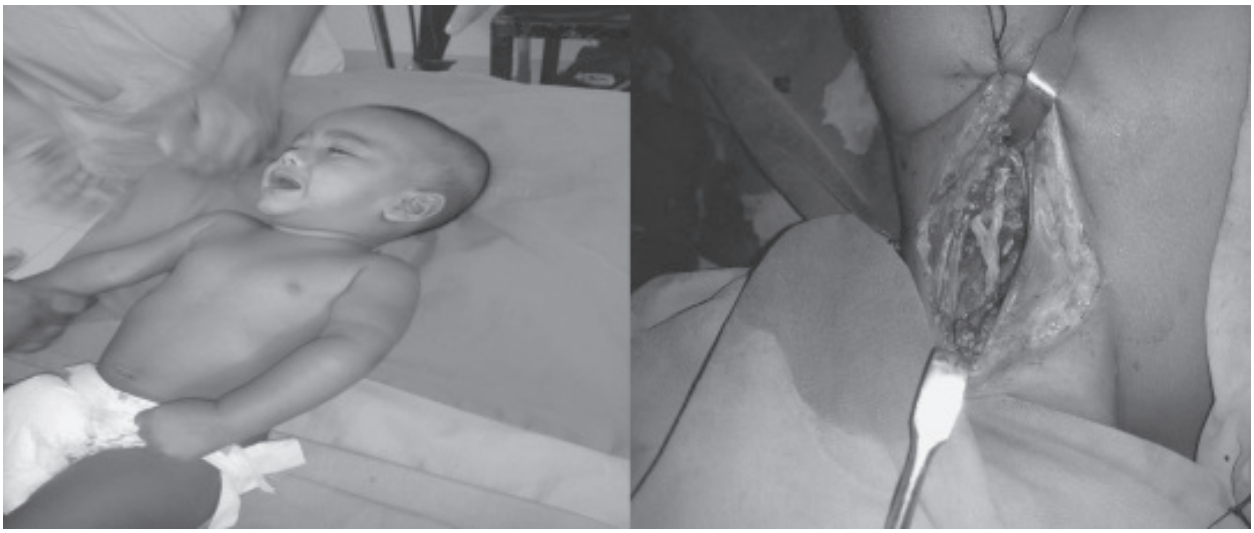


Fig: *Interpositional sural nerve graft was done Erb's palsy.*

MATERIAL AND METHOD

Study	:	Prospective study
Sample size	:	Total patient 20 Post traumatic injury 19 Erb's palsy 1
Study time	:	May 2013 –October 2015
Study place	:	Kurmitola general hospital, Central international medical college hospital and other places.

RESULTS:

10 out of 13 upper brachial plexus injury patients developed good upper limb function. 2 patients were lost. One had no improvement.

3 patients had global injury. 1 patient had no improvement. One had good elbow flexion. One patient's result is yet to come.

3 patients had sharp penetrating injury. 2 of them developed good upper limb function. One patient's result is yet to come.

One baby had Erb's palsy, result is yet to come.

CONCLUSION:

Reconstruction of fully functional upper limb in patients who have sustained a brachial plexus injury is still suboptimal, especially for those patients with pen plexus injuries though significant advances have been made in microsurgical management of the injured brachial plexus.

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Original Article

Degenerative Lumbar Canal Stenosis: Results of Operative Treatment

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ABSTRACT

Lumbar canal stenosis (LCS) is most commonly due to degenerative changes in middle age or older individuals. LCS is being more commonly diagnosed and may relate to better access to advanced imaging and to an aging population and the most usual indication for spinal surgery.

To see the outcome of operative management of degenerative lumbar canal stenosis.

Records of 42 men and 23 women aged 40 to 60 (mean, 49.5) years who underwent decompressive operation for degenerative lumbar canal stenosis between October 2003 and December 2015 at Bangabandhu Sheikh Mujib Medical University (BSMMU) and in our private settings, Dhaka, were analyzed retrospectively. Post-operative follow-up at the time of discharge, 3 months and 6 months and 12 months were undertaken. Demographic data and surgical data including estimated blood loss (EBL), length of surgery, number of decompressive levels, complications and length of hospitalization were collected. Each of the patients was evaluated by the visual analogue scale (VAS) for pain, disability by using of Oswestry Disability Index (ODI), and Modified Macnab Criteria (MMC) for assessment of improvement.

The mean follow-up duration was 2.5 (range, 1–12) years. Most of the patients were over 41 years old. Mean age was 49.30 (±7.93) within the range of 40–65 years. Males (64.61%) were predominant by females (35.38%). Maximum 40 (61.54%) patients were manual worker and rest 25 (38.46%) patients were sedentary worker. Maximum 45 (69.23%) patients had multilevel Stenosis and 20 (30.77%) patients had single level of stenosis. Mean estimated blood loss (EBL) was 125 ml (range: 50-200), mean surgery time was 153 min (range: 75-240), and average hospital stay was 6.12 days (range: 5 to 9). Only 3 (4.61%) patients had superficial wound infection, 3 (4.61%) patients had dural tear, and 2 (3.07%) patients had discitis. Most of the patients 56 (86.15%) Modified Macnab Criteria (MMC) was poor before operation but after operation at 3rd follow up (12m) 20 (30.77%), 33 (50.76%), 9 (13.85%) and 3 (4.61%) patients MMC was excellent, good, fair and poor respectively. Mean (SD) ODI was 70.20 (±6.01) before operation and reduced to 17.36 (±12.43) after operation at 3rd (12month) follow up. Mean (SD) VAS was 7.26 (±0.94) before operation and reduced to 1.76 (±1.61) ($p < 0.003$) after operation at 3rd follow up. Maximum 52 (80.0%) patients were satisfied with the treatment.

Decompressive operation is an effective method for the management of degenerative lumbar canal stenosis.

Keywords: Lumbar canal stenosis, degenerative, operative treatment.

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INTRODUCTION

Spinal stenosis is one of the end processes in the pathogenesis of low back pain.[1] The initial concept of spinal stenosis was developed in 1911.[2] Approximately 1.2 million people in the United States have back and leg pain that is related to spinal stenosis.[3] Lumbar canal stenosis is defined as a syndrome in which narrowing of the spinal canal and intervertebral foramen related to degeneration of the lumbar intervertebral disks and/or joints, causes specific symptoms of the lumbar region and lower limbs.[4–6] The prevalence of "degenerative" lumbar canal stenosis has been suggested as ranging from 1.7 to 13.1%.[7] Lumbar spinal canal stenosis is bilateral neurogenic claudication as well as intermittent pain radiating to the thigh or the leg, or both, that is worse with prolonged standing, activity, or lumbar extension and that is relieved by sitting, lying down, or lumbar flexion.[8] In addition, patients often describe intermittent burning, numbness, heaviness, or weakness radiating to the lower extremity.[9] Degenerative lumbar canal stenosis is the most frequent indication for spinal surgery in patients past 65 years.[10]

Degenerative LCS anatomically can involve the central canal, lateral recess, foramina or any combination of these locations. Central canal stenosis may result from a decrease in the anteroposterior, transverse or combined diameter secondary to loss of disc height with or without bulging of the intervertebral disc, and hypertrophy of the facet joints and the ligamentum flavum. Fibrosis is the main cause of ligamentum flavum hypertrophy which is caused by accumulated of mechanical stress, especially along the dorsal aspect of the ligamentum flavum. [11]

As lumbar spinal stenosis is not life-threatening and rapid catastrophic neurological deterioration is very rare, the decision to perform an operation should be made after non-operative management has failed to relieve pain and to improve function. The presence of non-progressive neurological deficits has been shown to relate poorly with physical function and therefore is not a reason to operate.[12]

Progression of a neurological deficit or the development of a cauda equina syndrome are two indications for urgent operative decompression. Non-operative management has been shown to be less successful in patients who have more severe pain and functional limitation.[13]

Many surgical techniques have been described, all based on the principles of decompression alone or decompression and fusion with or without instrumentation.[14] Classically decompressive procedures involved removal of disc and removal of the posterior elements including the lamina, spinous processes, interspinous ligaments, and sometimes under cutting the facet joints.[15]

Alternative techniques of decompression for the management of degenerative central and lateral-recess stenosis of the lumbar spine were designed in an attempt to preserve more of the posterior osseous and ligamentous structures, theoretically diminishing the problem of postoperative instability. These techniques include a beveled operative management with angular resection of only the anterior portion of the lateral aspect of the lamina, [16] selective single or multiple unilateral or bilateral laminotomy.[17] and lumbar laminoplasty.[18, 19]

Treatments of degenerative lumbar canal stenosis remain challenging because of their number, variety and complexity. The primary objective of this study was to find out surgical outcomes following decompressive procedures for LCS in a large retrospective cohort of patients. Secondary goals included examination of clinical data pertaining to Demographic data and surgical data including estimated blood loss (EBL), length of surgery, number of decompressive levels, complications and length of hospitalization were collected.

METHOD

During the period of October 2003 and December2015, a total of 75 patients presented with the diagnosis of lumbar spinal canal stenosis and were operated on. Of these, 65 patients fulfilled our criteria of degenerative spinal stenosis (midsagittal antero- posterior diameter of the lumbar spinal canal at the most constricted level did not exceed 11-14 mm in MRI)(fig-1). and were thus selected for study. Patients with previous lumbar spine surgery (mostly disc surgery) and all patients with spondylolytic (isthmic) spondylolisthesis and instability by doing dynamic plain X-ray were excluded from the study .Eight patients lost from follow-up and two patient died during the follow-up period of causes unrelated to the spinal disease.

Post-operative follow-up at the time of discharge, 3 months and 6 months and 12 months were undertaken. Demographic data like age, gender, occupation, site of involvement and surgical data including estimated blood loss (EBL), length of surgery, number of decompressive levels, complications and length of hospitalization were collected. All patients were evaluated clinically and radiographically before and after surgery. Each of the patients was evaluated by the visual analogue scale (VAS) for pain, disability by using of Oswestry Disability Index (ODI), and Modified Macnab Criteria (MMC) for assessment of improvement. Informed verbal & written consent was taken from all patients. After proper

evaluation of these patients, intervention was done by decompressive operative management. Statistical analysis was performed by using window based software devised with Statistical Packages for Social Sciences (SPSS-12) (SPSS Inc, Chicago, IL, USA). A p value of <0.05 was considered statistically significant.

Surgical Technique: All the operations were performed by same surgeon. Patients were placed in a prone position under general anesthesia with modified kneeling with two sand bags under each side of trunk which allows the abdomen to hang free, minimizing epidural venous dilation and bleeding. Many surgical technique have been described, all based on the principles of decompression alone or decompression and fusion with or without instrumentation.[14] Classically decompressive procedures involved removal of the disc and removal of the posterior elements including the lamina, spinous process, interspinous ligaments and sometimes the facet joints.[15] A midline incision was made 5-10 cm long, in most instances from spinous process of the fourth lumbar vertebrae to the first sacral spinous process or regardless of the location. Then the subperiosteal dissection strips the muscles from the spines and laminae of these vertebrae on both sides of the lesion. Retract the muscles with a self retaining retractor and expose interspinous space of desire level and confirm level by C-arm or by verifying the position of sacrum by palpation. Secure haemastosis with electrocautery, bone wax and packs. denude the laminae and ligamentum flavum with curette. Ether hemi, Partial or total laminectomy was made with help of up cut to decompress the canal. Next retract the dura medially and identify nerve root and then retract the nerve root medially so that the underlying extruded fragment or pathology removed. Remove all cotton pledgets and control residual bleeding with Gelfoam. Closed the wound with absorbable sutures in the supraspinous ligament and subcutaneous tissue. Skin were close by non absorbable sutures or skin staples. After surgery neurological function was closely monitored. The patients were allowed to turn in bed at will and to select a position of comfort such as semi-Fowler position. Hydration was maintained and used adequate analgesic. Drain was removed on 2nd post operative period and discharge was permitted when the patient is was able to walk an void (usually 3-5 days).Isometric abdominal and lower extremity exercise were reinstituted. Lifting, bending and stooping were prohibited for first several weeks. The suture was removed in 10-14 days. Between the 4th and 6th postoperative week back school instruction was resumed or started provided pain is minimal. Lifting, bending and stooping were gradually restarted after the 6th week depending upon patient's improvement.

RESULT

The average follow-up period was 2.5 years (range 1-12 years). The follow-up included examination of the circulation in the lower extremities, neurological examination, plain X-ray lumbar spine antero –posterior and lateral view, dynamic roentgenogram of the lumbar spine and MRI. Most of the patients were over 41 years old. Mean age was 49.30 (±7.93) within the range of 40 – 65 years. Males (64.61%) were predominant by females (35.38%). Maximum 40 (61.54%) patients were manual worker and rest 25 (38.46%) patients were sedentary worker. Maximum 45 (69.23%) patients had multilevel Stenosis and 20 (30.77%) patients had single level of stenosis. Mean estimated blood loss (EBL) was 125 ml (range: 50-200), mean surgery time was 115 min (range: (75–185), and average hospital stay was 6.12 days (range: 5 to 9). Only 3 (4.61%) patients had superficial wound infection, 3 (4.61%) patients had dural tear, and 2 (3.07%) patients had discitis. Most of the patients 56 (86.15%) Modified Macnab Criteria (MMC) was poor before operation but after operation at 3rd follow up (12m) 20 (30.77%), 33 (50.76%), 9 (13.85%) and 3 (4.61%) patients MMC was excellent, good, fair and poor respectively. Mean (SD) ODI was 70.20 (±6.01) before operation and reduced to 17.36 (±12.43) after operation at 3rd (12month) follow up. Mean (SD) VAS was 7.26 (±0.94) before operation and reduced to 1.76 (±1.61) ($p < 0.003$) after operation at 3rd follow up (at 12 month). Maximum 52 (80.0%) patients were satisfied with the treatment.

Table I

Demographic and clinical profile of the patients (n=65)

Age	Frequency	Percentage
Age		
< 40	11	16.92
41 – 50	30	46.15
>50	24	36.92
Total	65	100.00
Mean ± SD (Min - Max)	49.30(± 7.93)	(40 - 65)
Gender		
Male	42	64.61
Female	23	35.39
Occupational status		
Manual Worker	40	61.54
Sedentary Worker	25	38.46
Level of Stenosis		
Single	20	30.77
Multi level	45	69.23

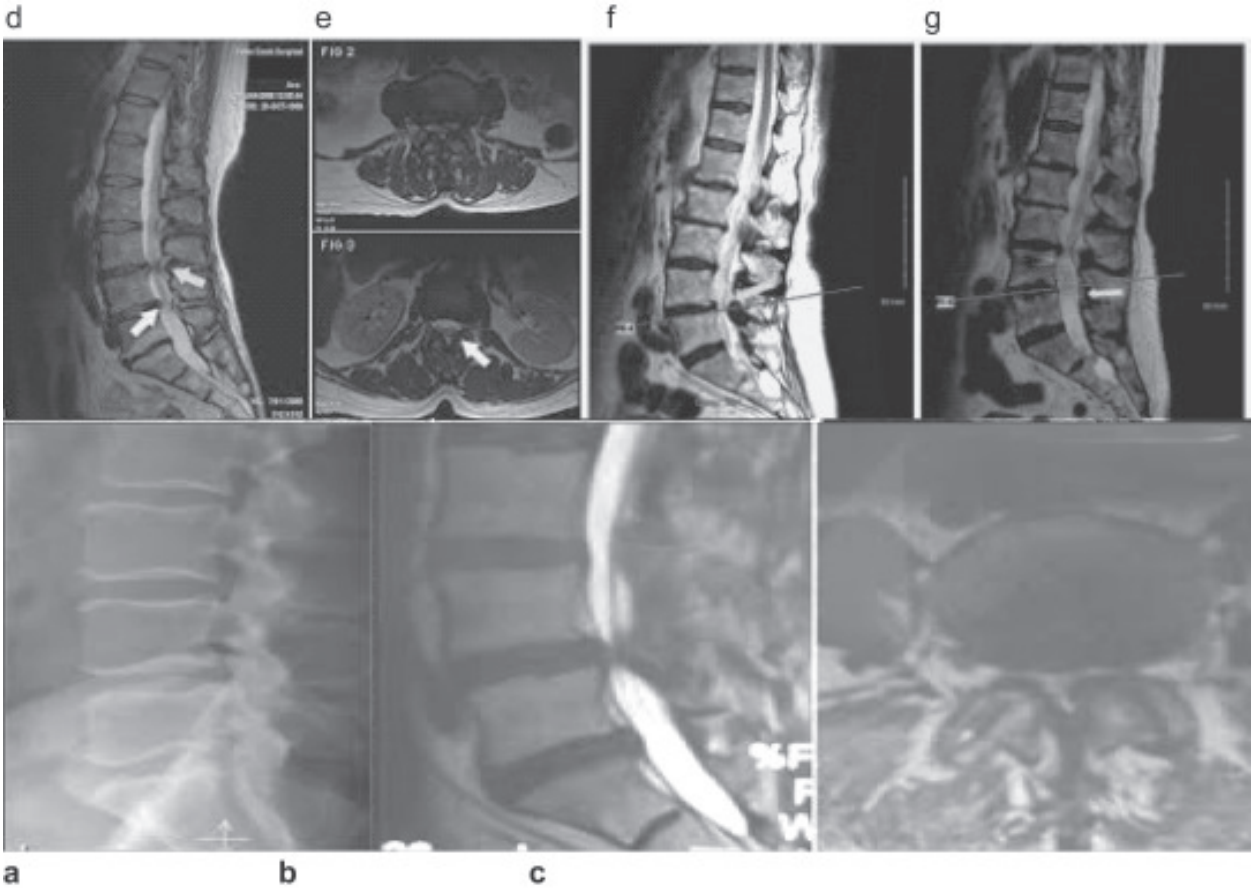


Fig-1: *a, plain X-ray, b, d, f and e, c, pre-operative sagittal and axial MRI. g, post operative sagittal MRI*

Table II

Clinical profile of the patients (n=65)

Level of stenosis/types of decompressive operation	Frequency	Percentage
Single	20	30.77
L4/5	13	20.00
L5/S1	7	10.77
Multiple	**45**	**69.23**
L1/2+L2/3+L3/4	7	10.77
L2/3+L3/4+L4/5	7	10.77
L3/4+L4/5+L5/S1	4	6.15
L4/5+L5/S1	27	41.53
Decompressive operation		
Laminotomy and Discectomy	33	50.77
Laminectomy, Laminotomy and Discectomy	17	26.15
Laminotomy and Discectomy and foramiotomy	10	15.38
Laminotomy and foramiotomy	3	4.61
Laminectomy, Laminotomy, Discectomy; foramiotomy and stabilization	2	3.07
Complications		
Discitis	2	3.07
Superficial wound infection	3	4.61
Dural tear	3	4.61

Table-III

Surgical data

Parameter	n (range)
Estimated blood loss (ml)	125 (50–200)
Surgical length (min)	115 (75–185)
Length of hospitalization (d®)	6.12 (5-9)

Table IV

Distribution of patients by Modified Macnab Criteria (n=65).

	Poor	Fair	Good	Excellent
Before operation	56 (86.15)	9 (13.85)		
At the time of discharge	4 (6.15)	56(86.15)	5(6.69)	
1st follow up(3m)	9(13.85)	43(66.15)	13(20.00)	
2nd follow up(6m)	7(10.77)	15(23.07)	39(60.00)	4(6.15)
3rd follow up(12m)	3 (4.61)	9 (13.85)	33(50.76)	20(30.77)

Table V

Result of patients by ODI and VAS

	Mean ± SD	Min – Max
Oswestry Disability Index (ODI)		
Before operation	70.20 ± 6.01	55.0 - 80.0
At 12 month follow up	17.36 ± 12.43	5.0 - 60.0
Visual Analogue Scale (VAS)		
Before operation	7.26 ± 0.94	6.0 - 9.0
At 12 month follow up	1.76 ± 1.61	0.0 - 5.0
Final outcome		
Satisfactory	52 (80.00%)	
Unsatisfactory	13 (20.00%)	

Table VI

Modified Mcnab criteria.[34]

	Description
Excellent	No pain; no restriction of activity.
Good	Occasional back or leg pain of sufficient severity to interfere with the Patients' ability to do their normal work or their capacity to enjoy themselves in their leisure hours.
Fair	Improved functional capacity, but handicapped by intermittent pain of sufficient severity to curtail or modify work or leisure activities.
Poor	No improvement or insufficient improvement to enable increase in activities; further operative intervention required.

Discussion

Despite a common perception that patients with LCS have invariably progressive symptoms, the natural history of patients treated non-surgically does not support this belief.[20,21]

According to a recent review from the North American Spine Society, the clinical course of mild or moderate symptomatic LCS patient can be favorable in 30 to 50%, but less is known about the natural history of patients presenting with severe symptoms.[22]

Most patients with symptomatic LCS are tried on a variety of conservative treatments in spite of little evidence to guide their care. Much of the evidence for these treatments is extrapolated from studies of patients with non-specific low back pain or patients with radiculopathy due to a disc herniation. The need for better evidence from studies involving patients with LCS is recognized.[22, 23]

The natural long-term outcome of conservative management is often unsatisfactory and surgery is required with increasing frequency in management of degenerative lumbar canal stenosis. In our study maximum 30 (46.15%) patients were in age group 41 - 50. Mean (SD) age was 49.30 (± 7.93) with in the rage of 40 – 65 years and males (64.61%) were predominant by females (35.38%) (Table I). But in the study of Nath et al. (2012), Pao et al. (2009) and Jolles et al. (2001), the mean age was 45.1 years, 62.0 years and 61.0 years respectively and Male (73.3%) were also predominant than female (26.7%) in these study.[24, 25, 26] In this study maximum 40 (61.54%) patients were manual worker and rest 25 (38.46%) patients were sedentary worker. Maximum 45 (69.23%) patients had multilevel stenosis, 20 (30.77%) patients had single level of stenosis (Table I) and most common level of involvement was L4/5 level in 51 (78.46%) patients (Table II) which were almost similar to other studies.[24,25] According to MRI findings in our study 30 (46.15%) patients had central stenosis,11 (16.92%) patients had lateral stenosis and 24 (36.93%) patients had foraminal stenosis which was consistent with Sirvanci et al. study.[27] In this study 63 (96.92%) patients had low back pain, 58 (89.23%) patients had low back pain and leg pain, 61 (93.85%) patients had neurogenic claudication, 33(50.77%) patients had weakness in lower limb and 2 (3.07%) patients had bowel and bladder involvement which were almost similar to the study of Cavusoglu et al.[28]

In connection to the type of decompressive operation, maximum 33 (50.77%) patients had Laminotomy and Discectomy followed by 17 (26.15%) patients had Laminectomy, Laminotomy and Discectomy, 10 (15.38%) patients had Laminotomy and Discectomy and foramiotomy, 3 (4.61%) patients had Laminotomy and foramiotomy and 2 (3.07%) patients had laminectomy, Laminotomy, Discectomy, foramiotomy and stabilization. But in study by Nath et al[24] , in their prospective study performed laminectomy (6.30%), Laminotomy and Discectomy (71.8%), Laminotomy and Discectomy with instrumented stabilization (15.6%) and Laminotomy and Discectomy with posterior interbody fusion (6.3%).In another study found no difference in the outcome between patients with or without fusion in a comprehensive literature review, with a satisfactory of rate about 70% in all procedure.[29]

With regard to operative complications, only 3 (4.61%) patients had superficial wound infection, 3(4.61%) patients had dural tear, and 2 (3.07%) patients had discitis. The dural tear resolved after bed rest for 2-3 days with broad spectrum antibiotic and analgesic. The superficial wound infections were settled after local dressing and antibiotic coverage after culture and sensitivity. .Discitis improved after prolong antibiotic and analgesic coverage along with bed rest.

Most of the patients 56 (86.15%) according to Modified Macnab Criteria (MMC) (Table V1) was poor before operation but after operation at 12 month follow up 20 (30.77%), 33 (50.76%), 9 (13.85%) and 3 (4.61%) patients in MMC was excellent, good, fair and poor respectively but in study of Nath et al[24] showed that 64.0%, 28.0% and 8.0% patients excellent, good and fair outcome respectively after 1 year follow up. Another two studies [25,30] showed 80% good or excellent results and 86% good outcome.

Mean (SD) ODI was 70.20 (±6.01) before operation which was significantly improved to a mean 17.36 (±12.43, $p < 0.002$) after operation at 12month follow up which were almost similar to other studies.25, 28

The VAS score was reduced in all cases. Mean (SD) VAS was 7.26 (±0.94) before operation and reduced to 1.76 (±1.61) ($p < 0.003$) after operation at 12 month follow up which was similar to other study.31

Maximum 52 (80.0%) patients were satisfied with the treatment. Getty[32] reviewed 31 patients and found 84% of them were satisfied. Posteacchini [33] described that 76-80% of the patients of lumbar canal stenosis had satisfactory result from surgery. Another two studies showed 84.9% and 79% patients were satisfied with their treatment respectively.[25, 26]

The most important practical point of view in our study is that the clinical diagnosis of LCS is based upon a history

of symptoms consistent with neurogenic claudication and a physical examination that is commonly normal but can rule out other etiologies. The use of MRI is required to rule out other serious etiologies or when invasive procedures are being considered. Conservative therapies, activity modification, medications and physical treatments, are appropriate for first line management of symptomatic patients. When symptoms are not controlled with conservative therapies, a steroid injection (caudal or intralaminar with fluoroscopic guidance) should be considered. For patients with persistent severe pain and disabling functional impairment, a shared decision making process should be used to address the possible role of surgical intervention.[34]

CONCLUSION

LCS is a complex clinical syndrome resulting from degenerative changes in the lumbar spine. Patients presenting with lumbar canal stenosis, decompressive surgery has a favorable effect on low back pain and leg pain and on overall disability. So decompressive operation is effective modalities of treatment for degenerative lumbar canal stenosis.

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Original Article

Microenvironment That Underlies Healing of Bone Wounds: Why Do Bone Wounds Heal: A Short Review

Sultana Gulshana Banu[1], G. M. Jahangir Hossain[2]

ABSTRACT

Healing of bone wounds is simply an increase and acceleration in the biological events that normally occur in bones for their physiological development, metabolism and remodelling. It involves signaling through hormones, growth factors and transcription factors induced by changes in the bone microenvironment caused by trauma. The initial leading role is played by the wound haematoma which is a reservoir of hypoxic necrotic tissue deprived of essential nutrients. The tissue hypoxia acts as major stimulus for inflammation, angiogenesis and osteogenesis, operating through induction of pro-inflammatory cytokines, vascular endothelial growth factors (VEGFs), and hypoxia-inducible factor 1(HIF1). A number of genes are upregulated in the haematoma cells for functioning of various factors through the stages of bone wound healing. The processes are complex, overlapping but well organized and regulated, and actually reflect an enhancement of the physiological events of bone regeneration and remodelling that target areas needing repair.

Key words: Healing, wound haematoma, pro-inflammatory cytokines, vascular endothelial growth factors (VEGFs), hypoxia-inducible factor 1(HIF1).

INTRODUCTION

Healing of bone wounds, either accidental or surgical, is a complex biological process that tries to restore the skeletal structure and its biomechanical function to the pre-injury level. It involves complex cell integration and cell-intercellular matrix interaction, with a rich participation from various growth factors[1,2]. Bone has an intrinsic capacity to regenerate, and it undergoes continuous remodelling for normal skeletal development throughout the life. Defects caused by trauma, infection or surgical resection need an enhanced capacity for regeneration to be reconstructed[2]. The events operate at tissue, cellular and molecular levels, and many of these recapitulate the processes involved in early embryonic skeletal development[1,2,3].

Normal bone homeostasis: modelling and remodelling:

Bone maintains its structural homeostasis by modelling and remodelling. Modelling is the process by which bones adapt to, or change their overall shape in response to the physiological influences and mechanical forces they encounter[4]. Remodelling is the process of bone renewal. It involves removal of old bone from the skeleton and formation of new bone with subsequent mineralization[4]. While during modelling bones widen and change their axes upon biomechanical forces exerted on them from day-to-day activities, sequential phases of bone resorption and formation take place in remodelling process that try to maintain normal bone shape and mineralization. Remodelling starts in the early intrauterine life and continues till death. Modelling is mostly active in the growing age and is much less frequent than remodelling in the adulthood[4,5]. Though remodelling is a random process, it targets areas that need repair [6].

What factors stimulate an wounded bone to heal:

Healing of bone wound progresses through three major sequential but overlapping stages: inflammatory, reparative and remodelling stages. These stages again are composed

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of various biochemicomechanical steps. For example, the inflammatory stage goes through important steps of haematoma formation, inflammation and angiogenesis or granulation tissue formation[7]. Throughout these stages a series of molecular, cellular and tissue transformations occur in a well-orchestrated concert. The events are very natural and considered physiological rather than pathological, where the term 'recovery' is often used synonymously with 'healing'[8].

Injury to bone brings changes to its microenvironment. Bone is a highly vascular organ. Any wound disrupts the vasculature depriving the bone cells of oxygen, nutrients including calcium and phosphate, growth factors and many other materials that are essential for their development. At the very beginning of a wound, tissue hypoxia, lack of nutrients and necrosis at the bone ends result from cut off blood supply. The overlying periosteum, surrounding soft tissue, and the marrow content are damaged. The extravasated blood is clotted filling the gap and traps red blood cells within its fibrin meshwork forming a haematoma[7,8]. The dead osteocytes from the necrosed bone ends add to the necrotic material which elicits an intense inflammatory response. Large number of acute and later chronic inflammatory cells are recruited to the injury site, invade the haematoma, and start clearing the tissue debris[7,9]. Low oxygen tension in the haematoma leads to anaerobic glycolysis with increased concentration of lactate and low pH[10]. The changes generate molecular signals which are conducted via hormones, growth factors and mechanical regulation, and act on lineage-specific stem cells in the periosteum and bone-marrow. The progenitor cells differentiate into various cellular phenotypes, for example chondroblasts, osteoblasts, osteocytes and osteoclasts which actively participate in the cartilage and bone production and remodelling[7,10,11].

WHAT HAPPENS AT SUBMOLECULAR LEVEL

It has been observed that changes in micronvironment of bone caused by a wound involve a number of genes that are upregulated. The crucial role played to induce an enhanced regeneration and remodelling in the wounded bone is by haematoma. Animal models showed a delay in fracture healing upon removal of the fracture haematoma (FH), and an induction of bone formation by subcutaneous implantation of the fracture haematoma[12,13]. The haematoma of a bone wound is not only a reservoir of hypoxic dead and dying tissue, it also contains numerous immune cells that come from the severed blood vessels and the damaged bone-marrow[10]. The innate immune cells and the CD4+ T lymphocytes well adapt to the oxygen-deprived microenvironment[14]. A unique transcription factor called 'hypoxia-inducible factor 1'(HIF1) acts as a regulator to adapt to this oxygen depleted state[15]. It regulates cellular adaptation to oxygen deprivation by switching cell energy metabolism from oxidative phosphorylation to glycolytic pathways. Several genes are upregulated by HIF1 to activate enzymes of anaerobic glycolysis like lactate dehydrogenase (LDHA) and phosphoglycerate kinase 1 (PGK1) genes[16].

Again, proper healing of bone wound needs adequate blood supply with nutrients. Compromised blood supply in accidental or surgically wounded bone should essentially be restored. This is done by angiogenesis. Hypoxia is an important stimulant of angiogenesis[17]. It causes expression of vascular endothelial growth factors (VEGFs) which induce proliferation of vascular endothelium and formation of granulation tissue. VEGFs also stabilize HIF protein which in turn maintains a hypoxic condition as a persistent stimulus[18].

The reparative stage of bone healing gradually ensues with formation of soft and hard callus. Chondroblasts and osteoblasts come into play from committed undifferentiated mesenchymal cells in the bone-marrow, periosteal and endosteal reserves. The vascular (granulation) tissue is also a reservoir of pluripotent stem cells, chondroblasts and osteoblasts[8]. The committed osteoprogenitor cells proliferate and differentiate into osteoblasts that synthesize and subsequently mineralize bone matrix. This osteogenesis thus largely depends on angiogenesis and both are regulated by an interplay of HIF1 and VEGFs. The committment of undifferentiated mesenchymal cells to bone-forming osteoblasts is also closely regulated by at least two transcription factors: Runx2 and Osterix. Increased expression of these two factors has been found experimentally in the early fracture haematoma[10,19].

Studies also showed increased local expression in the haematoma cells of HIF1, LDHA, VEGF, genes of pro-inflammatory factors like interleukins 8 and 6 (IL-8, IL-6), chemokine receptor gene e.g. CXCR4, and osteoblast marker SPP1. LDHA gene upregulation was seen 6-72 hours post-fracture, reflecting adaptation to hypoxia[10]. IL-8, IL-6, CXCR4 and VEGF expression indicate hypoxia-mediated inflammation and angiogenesis. Runx2 and SPP1 upregulation reflects osteogenic differentiation[10].

CONCLUSION

The microenvironment in the bone wound haematoma plays the driving force in healing and restoration of the

wound. Hypoxia, low tissue pH and lack of nutrients induce inflammation, angiogenesis and osteogenesis. The hypoxia-inducible factor, in addition, regulate angiogenesis and differentiation of mesenchymal cell lineage. Only a few of so many events operating in bone wound healing are discussed here. These events are very basic and so natural that healing is inevitable unless interrupted by complications.

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Original Article

Open Reduction and Internal Fixation by Locking Compression Plate – An Excellent Option for the Treatment of Fracture of the Distal Femur

Mohammad Mahfuzur Rahman[1], Kamruzzaman[2], Md. Jahangir Alam[3], A.F.M. Ruhal Haque[4], Asit Baran Dam[5]

Abstract

Our aim was to evaluate the results of open reduction and internal fixation by locking compression plate in upper tibial fractures/ tibial plateau fractures. Fracture of the upper tibia is now very common in orthopaedic practice due to present speedy life. It is most common in MVA. Although treatment option varies from surgeon to surgeon and types of fracture but open reduction and internal fixation by locking compression plate is the excellent option for the treatment of fracture of the upper tibia. It has a great role in rapid healing by ensuring absolute stability. Now a days this method becoming familiar to the orthopaedic surgeons worldwide. This was a randomized prospective study carried out at Trauma Center, Shyamoli, Dhaka from December 2013 to May 2015. 28 patients were selected for the study irrespective of sex and age ranges from 21 yrs to 59 yrs. Among them 16 patients were right sided, 11 patients were left sided and 1 was bilateral. All the patients were treated by open reduction and internal fixation by locking compression plates under C-arm control. All the fractures were united well within 12 weeks without any complications except two cases who had delayed union. They united within 18 weeks. open reduction and internal fixation by locking compression plate is an excellent treatment option for the fracture of the distal femur. It can ensure excellent absolute fixation which encourage rapid healing with maintaining good articular congruity. So we should perform open reduction and internal fixation by locking plate in fracture of the distal femur.

INTRODUCTION

Fractures around the knee joint are one of the most common fractures encountered and fractures of the distal femur are more common and are associated with high morbidity and mortality. The majority of the fractures are secondary to high velocity trauma, usually from motor vehicle accidents, fall from height etc. The fractures of the distal femur are difficult to treat which are associated with many complications.

Previously, there was a great reluctance towards operative management of the fractures of the distal femur due to high incidence of infection, non-union, mal-union, inadequate fixation and lack of proper instruments, implants and as well as antibiotics . Then fractures were managed by conservative methods. But, some problems were associated with conservative management. These are difficulties in reduction or maintaining the reduction. Also there were prolong immobilization which limited the utility of conservative management. The then traditional measurements (following the principles of Watson Jones & John Charnley) like manipulation of fracture and immobilization, however met with problems like deformity, prolonged bed rest, knee stiffness, joint incongruity, malunion, quadriceps wasting, knee instability and post-traumatic osteoarthritis.

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Now a days with the evolvement of orthopaedics, trends of management of the fractures of the distal femur – both intra-articular and supracondylar – have changed with more inclination to surgery with many internal fixation devices namely the dynamic condylar screw and plate, buttress plate, 95° angled blade plate, retrograde interlocking nail, locking compression plate etc. The aim of surgical management was to restore congruent articular surfaces of the femoral condyles maintaining the mechanical axis which eventually can achieve functional painless and good range of motion in the knee joint. The various clinical studies established that, bone beneath a rigid conventional plate are thin and atropic which are prone for secondary displacement due to insufficient buttressing and secondary fractures after removal of plate, fracture site take longer period to osteosynthesis due to interruption of vascular supply to bone due to soft tissue and periosteal stripping. So there was the invention of a new concept of biological fixation of the plates. But this needs the conventional plates to be accurately contoured to achieve good fixation, osteoporosis also posed the same problem for poor fixation with conventional plates. As more and more concepts about biological fixation become clearer the innovation of plates progressed lead to development of the Less Invasive Stabilizing System(LISS). Research to combine these methods has lead to the development of the locking compression plate(LCP). This plate has been regarded as technically mature which offers both locking and compression screw fixation of the distal femur and has proven to worth in complex fracture situations and in osteoporosis.

MATERIALS AND METHOD

It was a randomized, prospective clinical study, done at Trauma Center, Shyamoli, Dhaka during December 2013 to May 2015. 28 patients were selected for the study. Mean age of the patients about 40yrs(range 21yrs to 59yrs). 45% of the patients were motor cycle accidents. Other causes are MVA, fall from height, valgus or varus stress, twisting etc.

16 patients were right sided, 11were left sided and 1 was bilateral. All the patients were operated within 10 days of trauma. All the patients were operated by open reduction and internal fixation by locking compression plate.

SURGICAL TECHNIQUE

- Anaesthesia : Sub arachnoid block (Spinal anaesthesia)
- Position of the patient : Supine with a pillow below the knee.
- Incision: Lateral incision was made parallel to the shaft of the femur in all cases.
- Periosteum was elevated as minimum as possible.
- Anatomical reduction and interfragmentary compression of the articular components done manually as far as possible under direct vision. If possible, indirect closed reduction done without exposing the fracture.
- The plate length, axial and rotational alignments were checked by C- Arm image intensifier, if available.
- Temporary fixation was achieved by using multiple 1.5 mm K-wires. In case of intercondylar fractures, the fractured condyles were to convert into a single condylar block before fixation with LCP. In some cases, medial and lateral condyle were fixed with 6.5mm cancellous screws, directed lateral to medial before the LCP . Care was taken not to interfare with the other screws of the LCP.
- Plate was fixed and held in position by k-wires. Then the metaphyseal portion of the plate is fixed by 5.5mm cannulated locking screws. The shaft is fixed with the plate by 5mm self-tapping locking screws.
- Wound closure done after securing haemostasis and

Post Operative Care

- Operated limbs were kept elevated for at least 48 hours.
- Drain removed after 48 hours.
- Isometric quadriceps exercise was advised when pain allow or from the next day.
- Stitches removed after 12-14 days.
- Knee bending exercise was advised. Partial weight bearing was delayed until 6 weeks. If visible radiological callus seen, partial weight bearing is allowed.
- Full weight bearing walking is started after satisfactory visible callus is seen, usually after 12-16 weeks.

RESULTS

All the patients were operated within 10 days of the fracture and followed up at least for 1 year.



Fig.-1



Fig.-2

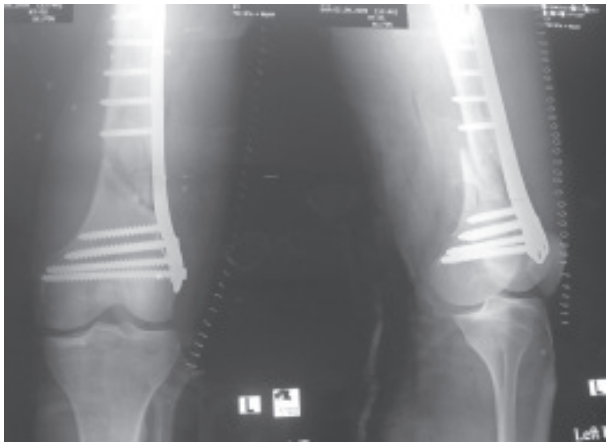


Fig.-3

Assessment of outcome of treatment:

Grading of outcome:

A. Clinically:
   i. Symptoms:
      Pain
      Swelling
      Stiffness
      Disfigurement
      Walking capacity
   ii. Signs:
      Tenderness
      Deformity
      Range of motion
      Stability
      Shortening

B. Radiological signs:
   Presence or absence of callus
   Alignment of angulation of fracture.

Criteria for evaluation of results of points:

i. Pain:
   a. No pain – 6
   b. Occasional pain – 5
   c. Stabbing pain in certain position, moderate pain – 4
   d. Severe pain, constant pain around knee after activity – 2
   e. Night pain, at rest – 0.

ii. Walking capacity:
   a. Normal walking capacity in relation to age – 6
   b. Walking capacity out doors for at least one hour – 4

c. Walking capacity out door > 15 minutes – 2
d. Walking capacity – walking indoor only – 1
e. Wheel chair bound/ bed ridden – 0

iii. Extension of leg:
a. Normal extension – 6
b. Lack of extension(0°- 10°) – 4
c. Lack of extension(>10°) – 2

iv. Range of motion:
a. At least 135° - 6
b. At least 120°- 5
c. At least 90° - 4
d. At least 60° - 2
e. At least 30°- 1
f. 0° - 0

v. Stability:
a. Normal in extension and 20° flexion – 6
b. Abnormal in 20° flexion – 5
c. Unstable in extension(<10°) – 4
d. Unstable in extension(>10°) – 2

Excellent result – total minimum of 27 points
Good result – total minimum of 20 points
Fair result – total minimum of 10 points
Poor result – total minimum of 6 points

Clinical results

Clinical result	No. of cases	Percentage
Excellent	17	60.71
Good	06	21.43
Fair	03	10.72
Poor	02	7.14
Total	28	100

DISCUSSION

The incidence of distal femoral fractures, one of the most common fractures, is increasing day by day due to MVA. The surgical treatment options for this fracture are also being modified day by day. With the aim of early restoration of alignment and strength of bone and function of the knee joint as well with minimal injury to the soft tissue, locking compression plate has been developed and now is being popularized .

It is the method where absolute stability is ensured. As a result, fracture heals early and patient can return back to his normal daily job rapidly. In our study, we presented 28 patients who underwent for open reduction and internal fixation by locking compression plate for fractures of distal femur, major cause of which was MVA. Among the 28 cases, 11 were intercondylar fractures . Others were fractures of the distal femur and supracondylar fractures for whom surgery was indicated. In this series, open reduction and internal fixation by locking compression plate done with less soft tissue injury and minimal periosteal injury as far as possible. We ensured good articular congruity. We also ensured rigid fixation and buttress effect. We did bridging type of fixation in case of metaphyseal comminuted fractures. Post operative hospital stay was 5 days to 15 days, mean post operative stay 10 days. The time for fracture healing was 12 to 18 weeks. Inspite of some complications like pain, infection, knee stiffness, we achieved 60.71%excellent result, 21.43% good, 10.72%fair and 7.14% poor result .

CONCLUSION

Treatment of distal femoral fractures with locking compression plate has an excellent outcome. It causes minimal soft tissue injury as well as periosteal injury and ensures excellent absolute fixation which encourage rapid healing. The anchorage of the locking head screw is excellent even in osteoporotic bone. Bone graft is not essential for the defect in the metaphyseal region even in osteoporotic bone. Locking compression plate provides a good biological fixation also. For satisfactory result to obtain, accurate positioning and fixation are required.

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Original Article

The Role of Early Movement in Restoring Functional Status of Dislocated Elbow Joint Treated by Closed Reduction

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ABSTRACT

The aim of this study was to find out a better method of management of dislocated elbow joint treated by closed reduction, to reduce the cost of treatment and to gain full range of elbow movement. 32 patients were selected and divided in 2 groups, having 17 patients in group A whom early movement of elbow joint after closed reduction was initiated within 10 days, 15 patients were in group B whom early movement was initiated within 21 days. The results were evaluated according to the suggestion of of Mehlhoffet al. (1988) and found excellent in 10 cases, good in 5 cases and fair in 2 cases in group A, and in group B, excellent in 7 cases, good in 3 cases and fair in 3 cases and poor in 2 cases. Initiation of early movement after reduction of elbow dislocation by closed maneuver is essential in restoring the functional status of elbow joint. This reduces elbow stiffness, pain, swelling and residual deformity and thus makes the individual able to resume normal work earlier. Therefore, early movement may be advised after reduction of elbow dislocation to improve the functional status of elbow joint.

INTRODUCTION

The elbow isone of the highly constrained and stable joint ;yet dislocation is not uncommon. Because of its intrinsic stability redislocation is rare in elbow joint in contrast to shoulder joint. The opposing tension of triceps and flexors coupled with the hinge-like articulation confers stability that permits capsular healing even during active motion. The important medial and lateral stabilizing ligaments are also capable of healing with enoughmechanical integritythat repair for acute instability is seldom necessary (Hotchkiss, 1996).

In the adult, dislocation of the elbow is the second most common dislocation of major joint after that of the shoulder, accounting for 11 to 28 percent of all the injuries of elbow. The prevailing opinion is that the injury is relatively benign and has a generally favorable prognosis (Mehlhoff*et al.,* 1988). Most commonly this occurs in those less than 30 yrs of age, and outnumbers females by about 2:1 ratio (Morrey, 1993). Surprisingly, despite the prevalence, until recently, there have been relatively few analysis of this injury (Josepfsson*et al.,* 1984).

Acute elbow dislocation is an orthopaedicemergency. It should be reduced as early as possible to preventcomplications. It is sometimes confused with supracondylar fracture of humerus clinically so an x-ray should be done for correct diagnosis and proper management. Closed reduction of dislocated elbow is easier and patientgets comfort immediately after reduction. In case of unreduced old dislocation or failedclosed reduction, open reduction may be encountered. Early initiation of elbow movement, after reduction decreases pain and increasesfunctional status and reducesresidual disability of the patient and makes the patient fit for early resumption of work.

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Long term immobilization encouragesadhesion, fibrosis and contractures, all of which decreases the range of motion. The pericapsular structures of the elbow are particularly involved when a contracture developes during immobilization. The limitation of movement that has been observed at follow –up parallels the duration of immobilization during treatment. There is clinical evidence tosuggest that early mobilization is safe and does not increase the risk of redislocation. Prolonged immobilization of the elbow at 90 0 of flexion leads to shortening and fibrosis of the anterior part of the capsule, which then becomes adherent to the periarticular structures (Mehlhoff*et al.,* 1988). Closed reduction of dislocated elbow provides excellent bony stabilization, joint congruity, early mobilization of the patient, economical and reduced prolonged hospital stay. Therefore, itwaslogicalto treat our patients with simpledislocation by closed reduction with initiation of early movement in one group and late movement of the elbow joint in the other to evaluate the results in the context of our socioeconomic condition.

OBJECTIVES

Objectives of this study was -

- To achieve increased range of motion of elbow joint in treated case of dislocation.
- To reduce flexion contracture and deformity of elbow joint
- To reduce residual pain, periarticular oedema and other complications of prolonged immobilization.

MATERIALSAND METHOD

This prospective study was was carried out at the National Institute of Traumatology and Orthopaedic Rehabilitation (NITOR), Dhaka from January 2001 to December 2002.

The patients were recruited from NITOR. Out of 38 cases with dislocation of elbow joint, 6 patient did not report for subsequent follow –up visit. Therefore, finaly this study comprised of 32 cases.

The patient were divided into two groups :

a) Group A :Consist of 17 patients who were for early mobilization (10 days) after closed reduction.

b) Group B:Consist of 15 patients who were advised for late mobilization (21 days) after closed reduction.

Selection Criteria :

a) Cases were randomly selected irrespective of sex and occupation, but only adult patients (fused epiphysis) were included.

b) Only simple and recent dislocations were included.

Exclusion Criteria:

a) Age less than 16 years.

b) Old unreduced /open dislocation.

c) Fracture/habitual /recurrent dislocation.

Clinical Assessment :

1) Complete history regarding cause, mechanism and duration of injury was taken.

2) The appearance was relatively typical with extremity held in slight flexion or in extention having few degrees of motion with pain and swelling.

3) The forearm was apparently shorter and the olecranon was prominent posteriorly.

4) Normal bony landmarks of the elbow (isometric triangle) revealed distortion(two humeral condyles and tip of olecranon).

5) The antecubital fossa appeared full because of the distal humerus.

6) Concavity of the radial head was palpable posteriorly because of posterolateral type of displacement.

7) Range of motion of elbow was limited in all direction including pronation and supination.

8) A thorough clinical and neurovascular examination was carried out and the vital signs were recorded.

Radiological Findings:

1) Marked backward and sideways displacement of proximal end of ulna along with radius.

2) Superior radioulnar joint remains undisplaced. a. Soft tissue swelling.

Procedure for Closed Reduction :The principles of treatment were to restore the articular alignment of the elbow with due promptness without causing further damage or overlookingneurovascular complications or associated musculoskeletal injuries. All closed reductions are done in emergency operation theatre at National Institute of Traumatology and Orthopaedic Rehabilitation (NITOR), Dhaka within 48 hours of dislocation under general anesthesia, adequate muscle relaxation and analgesic.

The patient was fully relaxed under general anesthesia in supine position. Assistant held the arm of dislocated elbow, the forearm was pulled and slightly flexed. With one hand sideways, displacement was corrected. The elbow was further flexed while olecranon process was pushed forward and lower end of humerus pushed

backwards. When the elbow was relocated, olecranon remained in the trochlear grove.

After reduction, elbow was checked for full range of motion and stability. Immobilization of the reduced elbow joint done at 90 0 flexion and neutral rotation with long arm posterior slab. The distal nerve and circulation were checked again.

Check X-ray was taken to confirm the elbow joint reduction. A simple collar and caff sling was applied (Wilson, 1992;Morrey, 1993;SOLOMON *et al,*. 2001).

Post Reduction Care:

In all patients reductions are done after admission and observed for next 24 to 48 hours. The arm immobilized by back slab and arm held in a collar and caff or on a pillow and observed for :Radial pulse, capillary filling time and colour, active finger and shoulder exercise, distal motor and sensory function, adequateanalgesic, radiographs must be taken to confirm the accuracy of reduction.

All patients are discharged with the following advice :

1) In group A, gentle active movement started at 10 days and in group B, keeping the arm fixed on the table or within the elbow bag when active movement discarded.
2) All passive or forcible movements were forbidden becauseit increases stiffness and may produce myocitisossificans.
3) No external massage.
4) Analgesic in intolerable pain.
5) Report at 10 days for next 21 days, fortnightly for 3 months and monthly for 6 to 12 months.
6) At follow –up, range of motion of affected elbow was compared with contralateral normal elbow. Any loss of extension recorded and measured by Gonimeter.
7) Follow –up radiographs were examined for any further dislocation, subluxation or heterotrophic calcification.
8) Each patient was carefully questioned with regard to pain, discomfort and aching in the affected elbow. These symptoms are graded as none, mild moderate or severe.

Rehabilitation :

Rehabilitation starts from the very beginning of elbow joint and early ambulation to prevent muscle wasting and joint stiffness.

Follow-up : The patients were followed up regularly as per follow-up schedule for at least 6 months and maximum 16 months (average 10 months). During each visit they were examined clinically with emphasis on pain and range of motion inelbow joint and assessed radiologically.

Data analysis :

All necessary and relevant information regarding patients were recorded meticulouly and methodically as far as possible in apredesigned data sheet and they were compiled and tabulatedaccodding to the key variables. Statistical analysis of different variables were analysed according to standard statistical method and calculated by scientific calculator.

Assessment of outcome :Evaluation of the results of the cases in this study were done on the basis of clinical and radiological findings. In analyzing the results following criteria were considered :

Range of elbow movement, postreduction complications, total hospital stay, residual deformities, functional ability. The end result of treatment was categorized by the following criteria : Excellent, good, fair and poor.

Table-I

Rating of symptoms and grading of results.

Rating	Range of motion flexion Contracture (extension loss in degrees)	Pain (aching)	Instability vulgusimposed	Neurovascular deficit(palsy/ ischaemi a /contracture)
Excellent	<5	None	None	None
Good	<15	Mild	Mild	None
Fair	<30	Moderate	Moderate	None
Poor	>30	Severe	Severerecurrent dislocation	Any

OBSERVATION AND RESULTS

Total 32 patients were studies. Group A (n=17) patients were advised immobilization at 10 days and Group-B (n=15) patients at 21 days after close reduction of dislocated elbow joint.

The age in group A ranges from 18 to 65 years. Mean age was 35. 9 years. The age in group B ranges from 21 to 60 years. Mean age was 34. 6 years. Highest no of pts of group A (35. 2%), group B(40%) belonged to third and fourth decade of life.

In group A hightest no of pts (64. 7%)are male and group B (66. 6%)are male. Regarding occupation like farmer, housewife, service holder, student, businessman, highest no of pts in group A (35. 2%) and in group B(40%) were farmers. Cause of injury like –RTA, fall from height, RTA was most common, in group A -70. 5% and in group B -66. 6%. Highest no of involvement was on left side, in group A 64. 7% and in group B 66. 6%. 40% of group A and 25% of group B patients had associated Colle's fracture, 60% of group A and 75% of group B patients had ankle sprain. In group A 76, 4 % and in group B 66. 6% pts stayed in the hospital for 1 day.

During each follow –up patients were examined to exclude complication and treat accordingly whenever these were diagnosed. Some of them had more than one complication.

Table II

Incidence of complications

		No of patients	Percentage
Group A	Extension loss	11	64. 7
	Pain	7	41. 1
	Joint instability	7	41. 1
Group B	Extension loss	10	66. 6
	Pain	6	40. 0
	Joint instability	6	40. 0

Final results were evaluated according to grading system.

Table III

Final results

Results	No of patients	Percentage	
Group A	Excellent	10	58. 8
	Good	5	29. 4
	Fair	2	11. 7
	Poor	0	0. 0
Group B	Excellent	7	46. 3
	Good	3	20. 0
	Fair	3	20. 0
	Poor	2	13. 3

Table-IV

Overall final outcome

Group	Satisfactory (%)	Unsatisfactory (%)
A	83. 20	16. 80
B	66. 67	33. 33

CASE ILLUSTRATIONS

Case No -1 (Group A)



Miss Rehana Akhter, 18 yrs old admitted in the hospital on 14. 01. 02 with the history of fall on slippery ground and sustained trauma overright elbow. Then she developed pain and swelling and unable to move the elbow joint. Her general examination was normal and local examination reveals –swelling over right elbow, tenderness, elbow was in slight flexion, forearm short, all movements of right elbow joint was restricted. No distal neurological deficit was present. X-ray right elbow A/P & lateral view shows –posterior dislocation of elbow joint. Diagnosis was closed posterior dislocation of elbow joint. Close

reduction under general anaesthesia was done and immobilized by long arm back –slab in 900 flexion. Follow –up after 10 days cast was removed. Mild pain and swelling was present. Range of motion :45-120

0flexion, 500supaination, 450pronation. Patient was advised to support the elbow with elbow bag, intermittent active movement of the elbow joint and follow- up after 3weeks. After 3 wks, elbow bag was removed. Pain, swelling absent. Range of motion: 15-1350flexion, 700 supaination, 650 pronation. After 6 wks Range of motion :0-1400 flexion, 800 supination, 750 pronation. After 6 months full range of movement of right elbow was present. After 10 months full range of movement, no neurovascular deficit, no joint instability was present. Result was excellent.

Case No -2(Group B)

Mrs Salma Alam, 41yrs old admitted in the hospital on 15. 09. 01 with the history of fall on slippery ground and sustained trauma over right elbow and left ankle joint. Then she developed pain and swelling and unable to move the right elbow &left ankle joint. Her general examination was normal and local examination reveals – moderate swelling over right elbow, tenderness, elbow was in slight flexion, forearm short, all movements of right elbow joint was restricted. No distal neurological deficit was present. Tenderness and swelling over

left ankle joint was present. X-ray right elbow A/P & lateral view shows –posterior dislocation of elbow joint. X-rat left ankle showed nobony lesion. Diagnosis was closed posterior dislocation of right elbow joint with left ankle sprain. Close reduction under general anaesthesia was done and immobilized by long arm back –slab in 900flexion. Short –leg back –slab given on left ankle. Follow –up after 10 days cast was removed. Mild pain and swelling was present. Range of motion :50 -1100 flexion, 450supaination, 400 pronation. Patient was advised to support

the elbow with elbow bag, intermittent active movement of the elbowjoint and follow- up after 3weeks. After 3 wks, elbow bag was removed. Mild pain, swelling absent. Range of motion:20-1250flexion, 650supaination, 600pronation. After 6 wks Range of motion :10-1400flexion, full supination, full pronation. After 6 months -10-1400flexionfull supination, full pronation. After 11 months mild pain, 10-1400flexionfull supination, full pronation, no neurovascular deficit , no joint instability was present. Result was good.



Case No -3(Group B)

Mrs. Showkat Begum, 41yrs old admitted in the hospital on 10. 05. 02 with the history of RTA and sustained trauma over right elbow and RIGHT ankle joint. Then she developed pain and swelling and unable to move the right elbow &right ankle joint. Her general examination was normal and local examination reveals – moderate swelling over right elbow, tenderness, elbow was in slight flexion, forearm short, all movements of right elbow joint was restricted. No distal neurological deficit was present. Tenderness and swelling over right ankle joint was present. X-ray right elbow A/P & lateral view shows –posterior dislocation of right elbow joint. X-ray right ankle showed no bony lesion. Diagnosis was closed posterior dislocation of right elbow joint with right ankle sprain. Close reduction under general anaesthesia was done and immobilized by long arm back –slab in 900 flexion. Short – leg back –slab given on left ankle. Follow –up after 10 days cast was removed. Mild pain and swelling was present. Range of motion :50 -1100 flexion, 400 supination, 350pronation. Patient was advised to support the elbow with elbow bag, intermittent active movement of the elbow joint and follow- up after 6weeks. After 6wks, elbow bag was removed. Moderate pain and mild swelling was present. Range of motion: 40-1200 flexion, 600supaination, 550pronation. After 12wks swelling was absent, ulnar paresis present and moderate pain was present. Range of motion :35-1300flexion, 700 supination, 650pronation. After 6 months - ulnar paresis and moderate pain was present. 35-1350flexion, 800 supination, 750 pronation.. Final follow-up after 8 monthsulnar paresis present and moderate pain was present, 32-1400flexion800supination, 750 pronation was present. Result was poor.

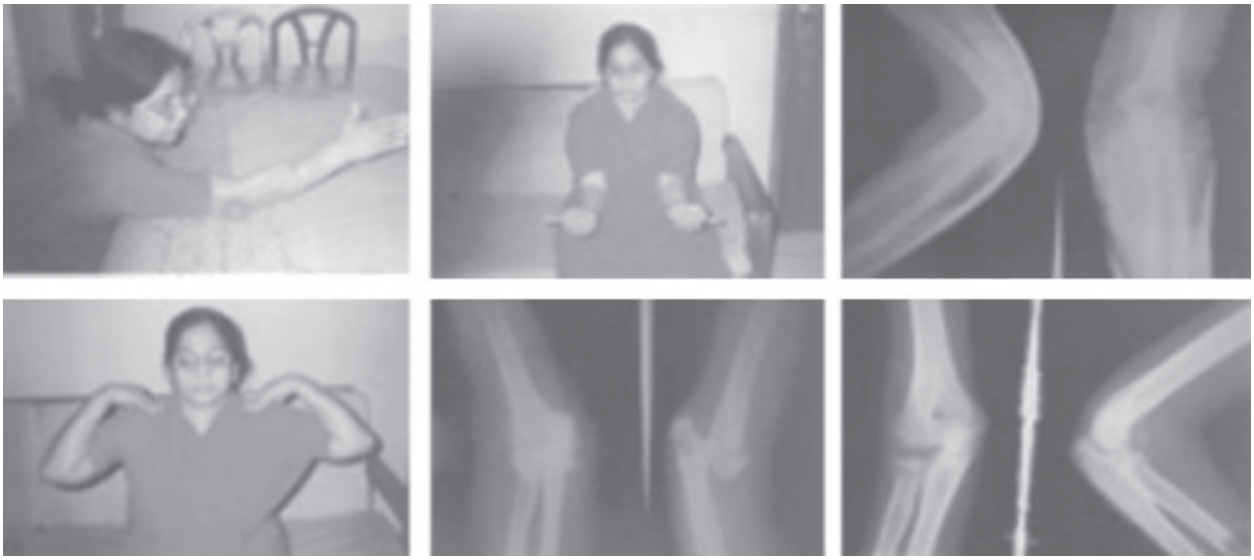
DISCUSSION

Dislocation of elbow joint is relatively common problem in daily orthopaedic practice. Three factors must be evaluated in deciding on the timing and reduction of dislocation, as it is an orthopaedic emergency :

1) The extent of injury in multiple organ system of the patient.
2) Type of dislocation and evaluation of neurovascular deficit.
3) The technical consideration.

Early reduction is urgent and early movement is absolutely necessary to improve the functional status of dislocated elbow regardless of the method of reduction. Close reduction is easier and patient gets comfort immediately and needshighly competent surgeons together with good radiological equipments, techniciansand nurses. It is observed in this series that average age of the pts were 35. 9 yrs in group A and 34. 6 yrs in group B. In a series of Mehlhoff *et al*. (1988), average age of the pts was 39. 2 years.

In group A high test no of pts (64. 7%)are male and group B (66. 6%)are male. In a series of Mehlhoff *et al.* (1988), 34(65. 3%) were male and 18 (34. 6%) were female. Highest no of involvement was on left side, in group A 64. 7% and in group B 66. 6%. In a series of Mehlhoff*etal.* (1988), right elbow affected in 25 (48%) pts and left elbow affected in 27 (51. 9%). Inthisseries cause of injury like –RTA, fall from height, RTA was most common, in group A -70. 5% and in group B -66. 6%In a series of Mehlhoff*et al.* (1988), causes of injury were RTA in 8(15%) pts and sports injury in 5 (10%) pts. In this series 40% of group A and 25% of



group B patients had associated Colle's fracture, 60% of group A and 75% of group B patients had ankle sprain. In a series of Mehlhoff*et al*. (1988), associated injuries were present in 5(10%) patients. In this series in group A, extension loss aws seen in 11(64. 7%) patients, pain in 7(41. 1%) and joint stability in 7(41. 1%) patients. In group B, extension loss was seen in 10(66. 6%) patients, pain in 6(40%) and joint stability in 6(40%) patients. In a study of series of Mehlhoff*et al*. (1988), the average loss of extension (flexion contracture) at the last follow –up examination was12. 30 (range 0 to 460), flexion contracture was more than 300 in 7(15%). 24(45%) reported pain, it was mild in 17 pts and moderate in 7 pts. There was no gross instability of the elbow or recurrent dislocation. Kairy and Rahim (1993) found in there series that in group 1, there were pain in 3(13. 6%) pts extension loos in 1(4. 5%)pts and was 300flexion contracture and in others less than 150. There was no gross instability. In group II, pain was present in 7(35%) patients, extension loss in 12(60%)pts and there was no gross instability of elbow joint. Protzman (1978) found that in his series all pts had full flexion, pronation and supination. There was average 7. 10 loss of extension. In this series, in group A, excellent result was seen in 10 (58. 8%)patients, good in 5(29. 4%) and fair in2(11. 7%) patients. There was no poor result. In group B, excellent result in 7(46. 3%), good in 3(20%), fair in 3 (20%) and poor in 2(13, 3%) patients. In a study of series of Mehlhoff*etal.* (1988), excellent result was seen in 36(69. 2%), good in 16(30. 7%) patients. No fair or poor results were seen. Most commonly, after closed reduction, the elbow is immobilized with the extremity dependent. The joint is held at 900 flexion in a posterior splint and forearm is in neutral rotation. Long time immobilization encourages adhesion, fibrosis, contractures all of which decrease the range of motion. The pericapsular structures of elbow are particularly involved when a contracture develops during immobilization. The initiation of motions that have been observed at follow –up parallels the duration of immobilization during treatment. Early initiation of elbow movement resultedleast flexion contracture and other complications. There is clinical evidence to suggest that early mobilization is safe and does not increase the risk of redislocation.

SUMMARY

The present study was carried out at the National Institute of Traumatology and Orthopaedic Rehabilitation (NITOR), Dhaka from January 2001 to December 2002 to evaluate the results of "the role of early movement in restoring functional status of dislocated elbow joint treated by closed reduction ". The aim of this study was to find out a better method of management and to reduce cost of treatment and to gain full range of movement. In this study, 38 cases were selected. Out of them 6 did not report the subsequent follow –up. Hence the study comprised of 32 cases, They were selected randomly, irrespective of

sex. but only adult patients (fused epiphysis) were included. Among 32 cases, early movement were initiated within 10 days in 17patients (Group A)and late movement was initiated within 21 days in 1patients (Group B).

In group A, 11(64.7%) patients were male and mean age was 35. 9 years. In group B, 10(66. 6 %) patients were male 5 (33. 3 %) were female and mean age was 34. 6 years. Most of the dislocations in both groups were due to RTA (70. 5%) in group A and 66. 6% in group B. Most of the close reduction were done immediately after admission. Duration of hospital stay in group A and group B were 1-3 days. Among complications extension loss was seen in 11(64. 7%), pain in 7(41. 1%) and joint instability in 7 (41.1 %) in group A and in group B extension loss was seen in 10(66. 6%), pain in 6(40%) and joint instability in 6 (40%) patients. The results were evaluated according to the suggestion of of Mehlhoff*et al.* (1988) and found excellent in 10 cases, good in 5 cases and fair in 2 cases in group A, and in group B, excellent in 7 cases, good in 3 cases and fair in 3 cases and poor in 2 cases.

CONCLUSION

Initiation of early movement after reduction of elbow dislocation by closed maneuver is essential in restoring the functional status of elbow joint. This reduces elbow stiffness, pain, swelling and residual deformity and thus makes the individual able to resume normal work earlier. Therefore, early movement may be advised after reduction of elbow dislocation to improve the functional status of elbow joint.

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Original Article

Evaluation of the Results of Arthroscopic Anterior Cruciate Ligament Reconstruction By Semitendinosus And Gracilis Autograft and Partial Menisectomy

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Abstract

The choice of graft for anterior cruciate ligament reconstruction is a matter of debate, with the BPTB graft and quadruple graft of semitendinosus and gracilis being the two most popular options. Objective of this study was to evaluate the results of arthroscopic ACL reconstruction by graft of semitendinosus and gracilis tendon and partial meniscectomy. This prospective interventional study was conducted from Jan 2012 to December 2013 at National Institute of Traumatology and Orthopaedic Rehabilitation (NITOR), Dhaka. Fourteen (14) patients with ACL and meniscus injuries were treated at the form of arthroscopic reconstruction of ACL by quadruple autograft of semitendinosus and gracilis tendon and partial meniscectomy. Accelerated ACL reconstruction rehabilitation protocol was followed. Patients were visited routinely and final outcome evaluation done at 24 weeks. Subjective and objective evaluation done according to IKDC knee examination form. Lysholm knee scoring scale was used to compare preoperative and postoperative score and to evaluate final outcome. Preoperatively all patient had either grade II or grade III positive Lachman test. Post operatively significant improvement was found, 86% had grade I and only 14% had grade II positive Lachman test. Preoperative Lysholm knee score was 52.64 and postoperative score was 90 that shows significant improvement ($p<0.05$). According to Lysholm knee scoring scale, excellent results (95–100 points) were obtained in 5 (33%) patients,good results (85–94 points) in 8 (53%) patients, fair and poor (7% each). For arthroscopic ACL reconstruction by BPTB graft and quadruple graft of semitendinosus and gracilis being two important graft options. Choice of semitendinosus and gracilis tendon, better outcome can be achieved than BPTB graft.

INTRODUCTION

Anterior cruciate ligament is an intra-articular, extra synovial structure present in the central complex of knee joint. It functions in concert with all other anatomical structures in the knee joint to control and limit motion and to maintain both static and dynamic equilibrium. It is commonly injured in athletic activities specially contact sports and motor vehicle accidents

Surgical treatment of and techniques for ligament injuries in the knee have improved significantly over the past two decades. Today, arthroscopic reconstruction of the ACL with autogenous graft material is widely used for patients with anterior knee instability. The two most commonly used grafts are the central one-third of the patellar ligament (bone-tendon-bone, BTB) and the hamstring tendon (semitendinosus-gracilis, STG) construct.

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The anterior cruciate ligament (ACL) is an intra-articular ligament of the knee (Engle, 1991) whose primary function is to limit anterior tibial translation relative to the femur (Moore, 1992). Rupture of the ACL is a debilitating condition which can result in episodes of instability, pain and swelling, particularly during activities involving sidestepping and pivoting. Therefore, ACL reconstruction is advised following ligament rupture so athletes can return to an active and competitive lifestyle without experiencing episodes of instability .

The choice of graft for anterior cruciate ligament reconstruction is a matter of debate, with patellar and hamstring tendons being the two most popular autologous graft options. Clinical and radiographic outcomes of anterior cruciate ligament reconstruction with these grafts fixed with modern devices and with use of accurate and proven surgical and rehabilitation techniques, both the grafts are an equivalent option for anterior cruciate ligament reconstruction.

ACL reconstruction with a ST (semitendinosus) graft and a BPTB graft provided similar stability, knee function, and health-related quality of life, outcomes and resulted in fewer problems with kneeling and sensory loss.

SURGICAL PROCEDURE

After giving adequate anesthesia (spinal/spinal and epidural/ general), the patient was placed in supine position. The affected knee was correctly identified and a high pneumatic tourniquet applied. Using a sterile esmarch bandage the limb was exsanguinated, and the tourniquet inflated.

GRAFT HARVEST

An oblique skin incision of about 4 cm was given, centered approximately 4 cm medial and just distal to the tibial tubercle or about three finger width below the medial joint line. Semitendinosus and gracilis tendon was hooked under Pes Anserinus fascia. Deep fascial bands were dissected.



Fig.-1: *Incision and graft harvesting.*



Fig.-2: *Harvested semitendinosus tendon.*

Open -end stripper was passed over the tendon one by one and advanced carefully in line with it giving firm, steady but gentle pressure and simultaneously applying counter- traction using the previously placed suture. Thus graft was harvested.

Graft Preparation

Grafts were placed on graft master board on the back table. Then stripped off their residual muscle fibers proximally using the blunt end of scalpel blade. The tendon folded in quadruple and were placed together using a number 5 ethibond suture and using Krakow's technique. Overall prepared graft length was 7-8 cm and diameter was 8-9 mm. The tendons were looped (using an umbilical tape around the stitched tendons) and passed through various holes in the graft sizer. Pretensioning of the graft was done by tying the suture over the post on the graft master board so that all three strands can be placed under equal tension.

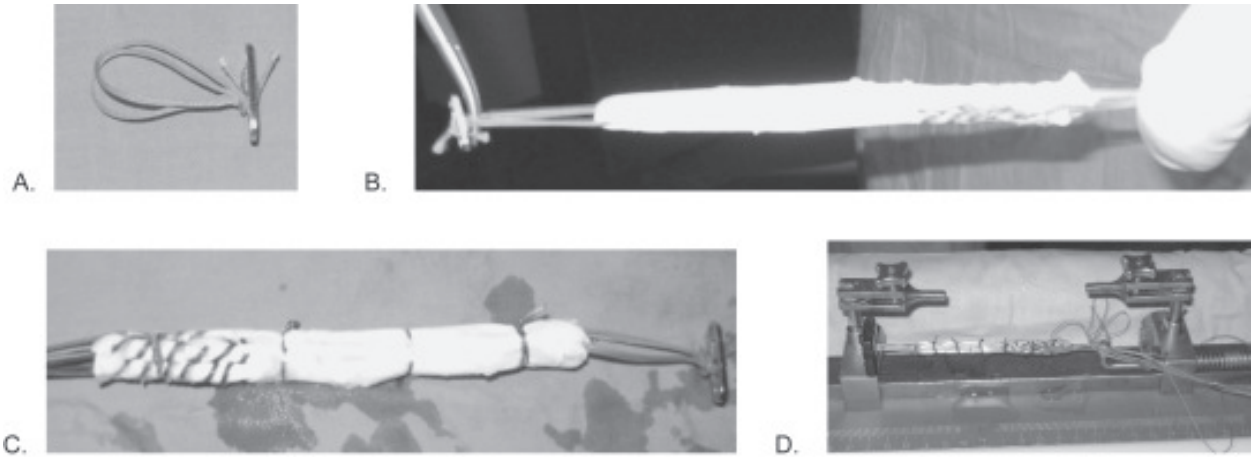


Fig.-3: *Graft preparation, a- Endobutton, b- Fixing with endobutton, c- Prepared graft, d- Pretensioning of the graft.*

Arthroscopy

An anterolateral and an anteromedial port was made through lateral and medial aspect of knee. Arthroscope was introduced and knee was examined systematically in the *'W* sequence, starting from the suprapatellar pouch, then the patellofemoral joint, medial gutter, medial meniscus, intercondylar notch, lateral meniscus and lateral gutter after making high anterolateral portal. Once all the pathologies were recorded a second anteromedial portal (working portal) was made at the inferior pole of patella, 1cm medial to patellar tendon. All associated pathologies were dealt with appropriately like partial menisectomy for a meniscal tear that was unstable to probing, chondral defect shaving and removal of loose bodies.

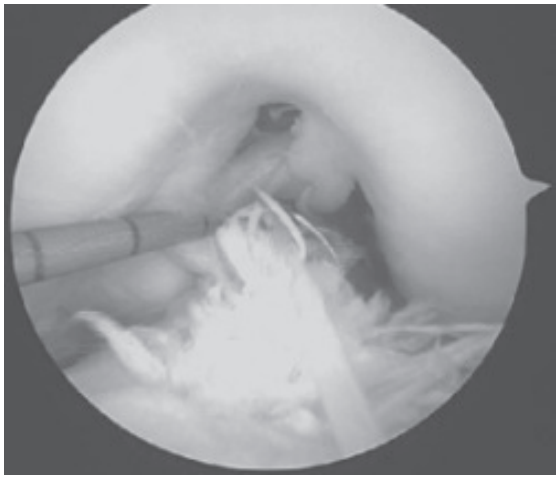


Fig.-4: *Athroscopic view of torn ACL (After UW Orthopaedics and Sports Medicine, Seattle.htm)*

Tunnel Placement

Tibial Tunnel

The acufex tibial guide was introduced into the joint through the anteromedial portal after setting the inclination of the zig at 55 degrees. The aimer was placed on the center of the tibial foot print which lies about 7 mm anterior to the PCL in the midpoint and just medial to the posterior edge of the anterior horn of lateral meniscus.

The sleeve was inserted into the guide upto the tibial cortex (through the incision used for graft harvesting) at about 2cm medial to the tibial tubercle and 4 cm below the joint line. A guide pin was drilled into the joint through the sleeve.

The tunnel was then reamed with a cannulated headed reamer placed over the guide pin, starting from 7mm size up to the size determined by graft sizer. Length of the tibial tunnel usually 3-4cm.



Fig.-5: *Tibial tunnel preparation*

FEMORAL TUNNEL

Femoral tunnel was made with a transtibial femoral guide system and a single-incision technique. Femoral offset guide was introduced into the joint through the tibial tunnel and engaged into "over the top" position with the knee in70 to 90° flexion. The guide was aimed at 1 to 2 o'clock position in the left knee and 10 to 11 o'clock in the right knee.

An appropriate sized offset guide was used so as to leave about 2mm of posterior cortical wall after drilling the femoral tunnel and depth at least 2cm and the diameter of the tunnel should correspond to the diameter of the graft. Because the bone of the distal femur is denser than the tibial metaphysis,

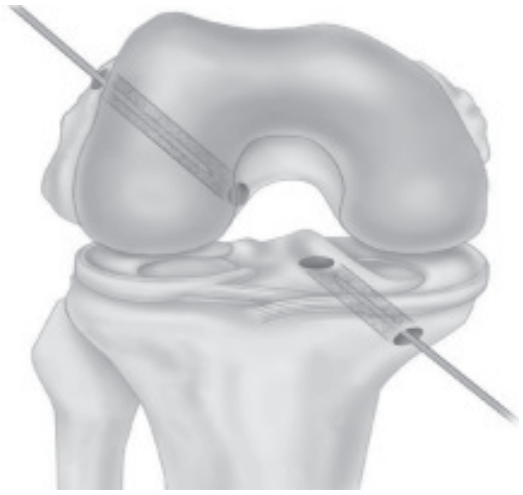


Fig.-6: *Tunnel coincide with anatomical center of normal ACL. (RILEY. 2013.*

The guide pin was then drilled through the intercondylar region and lateral femoral cortex to emerge out of the anterolateral aspect of the thigh.

An appropriate sized cannulated calibrated acorn-type reamer was threaded over the pin and femoral tunnel reamed upto the 40mm mark on the calibrated reamer. The sharp edges of the femoral tunnel were smoothened by shaver and debris removed.

GRAFT FIXATION

Graft were fixed using endobutton on femoral side and either interference screw (metallic or biodegradable) or cancellous screw as tibial post was used at tibial side.



Fig.-7: *A/P radiograph, femoral fixation with endobutton and tibial fixation with an AO screw and spiked washer post.*

CLOSURE

The sartorial fascia and subcutaneous tissue was stitched with an interrupted 2.0 vicryl suture and skin was closed with interrupted prolene sutures. The portal sites were usually left open for drainage. A sterile dressing was applied. After applying a pressure bandage, tourniquet deflated and tourniquet time noted. Knee was subsequently placed in a brace locked in extension.

Complication of ACL reconstruction:

Complications of anterior cruciate ligament surgery can be caused by preoperative, intraoperative, and postoperative factors.The most common postoperative complications are motion (primarily extension) deficits and persistent anterior knee pain, more when reconstruction with patellar tendon autografts.

Preoperative effusion, limited range of motion, and concomitant knee ligament injuries make poor postoperative motion more likely. Intraoperative factors associated with motion deficits most often are incorrect tunnel position and inadequate notchplasty, which can result in over tightening or impingement of the graft, leading to loss of extension. Postoperative factors include prolonged immobilization and inadequate or inappropriate rehabilitation.

Complications from ACL surgery generally arise during surgery. Peroperative complications include the following:

- Extravasation of irrigation fluid during arthroscopy
- Paraesthesias along the lateral aspect of the knee
- Bruising and/or hematoma formation
- Improper alignment of the tunnels, causing graft impingement

Postoperative complications- The main complication of ACL surgery during the postoperative period is rupture of the graft.

Postoperative Care and Rehabilitation

Patient was encouraged to lie supine with foot end elevated for 24 hours, as spinal anaesthesia given during procedure. Round the clock analgesia (initially i.v., later oral) administered to assist in physiotherapy. Wound inspection done on 3rd postoperative day. Only if the wound was healthy and patient's compliance for physiotherapy was assured, the patient discharged on oral antibiotics. Sutures were removed on 14th postoperative day.

Materials and Methods

This was a Quasi experimental study (Prospective Study) from January 2012 to December 2013 in National Institute of Traumatology and Orthopaedic Rehabilitation (NITOR), Sher-E-Bangla Nagar, Dhaka. Patients presented with unilateral knee complaints and clinically diagnosed as ACL injury with meniscus injury of both sexes in the Orthopedic outpatient department of National Institute of Traumatology and Orthopaedic Rehabilitation (NITOR), Sher-E-Bangla Nagar, Dhaka. The modalities of treatment

was discussed wiyh the patient with its merits and demerits. The follow up and rehabilitation protocol were also explained to the patient .Total 14 patients were undergone for operation during study period and fulfilled the enrolment criteria.

RESULTS

This prospective study was carried out from December 2011 to May 2013 at NITOR. A total of 14 cases were selected for the study. Follow up given for 6 months to 12 months and final outcome was recorded at 6 months.

The following results were obtained

Age distribution:

Table-I

Age distribution of patients (n=14)

Age group	Number of patients	Percentage (%)	Mean±SD
15-20	0	0	
21-25	6	43	
26-30	6	43	
31-35	1	7	27.28±11.975
36-40	1	7	
41-45	0	0	
Total	14	100	

Mean age was 27.28 wears with SD±11.975 years, age range was 23-38 years.

Subjective functional outcome:

Table-II

Subjective functional outcome evaluation after at months (n=14).

Subjective outcome		Number of patient		Percentage	
		Preoperative	Postoperative	Preoperative	Postoperative
Knee function	Normal	0	5	0	36
	Near normal	0	8	0	57
	Abnormal	14	1	100	7
Pain	Mild	0	7	0	50
	Moderate	11	7	79	50
	Severe	3	0	21	0
Giving way	No	0	13	0	93
	Occasional or more	14	1	100	7
Swelling	No swelling	0	13	0	93
	Mild swelling	14	1	100	7

Preoperative clinical evaluation showed that all patients had abnormal knee function, mild to moderate pain. All patients complained of swelling and giving way.

Postoperatively 93% patients regained normal to near normal knee function and knee stability. Significant improvement of pain and swelling also occurred.

Objective functional outcome:

Table-III

Objective functional outcome evaluation at six months (n=14).

Objective outcome		No. of patient		Percentage	
		Preoperative	Postoperative	Preoperative	Postoperative
Knee flexion	<130	3	2	21	14
	135	11	12	79	86
Lachman test	G-I	0	12	0	86
	G-II	8	2	57	14
	G-III	6	0	43	0
Drawer test	Positive	13	2	93	14
	Negative	1	12	7	86
Pivot shift test	Positive	00	00	00	00
	Negative	14	14	100	100
McMurray test	Positive	10	2	71%	14%
	Negative	4	12	29%	86%

Lachman test was positive in all patients among them grade II 57% and grade three was 43%. 93% patients had anterior drawer test positive, 7% had negative or equivocal anterior drawer test. Pivot shift test was negative in all cases. Mc Murray test was positive in 71% cases. 79% patients had 135º knee flexion and 21% had less than 130º flexion preoperatively.

Post operatively Lachman test improved significantly, grade I in 86% cases and grade II was in 14% cases. Anterior drawer was positive in 14% cases. Pivot shift test was negative in all cases McMurry test positive 14%. After operation 86% had 135º knee flexion and 14% had less than 130º flexion.

This table describes the distribution of post operative outcome. Excellent 36%, good 50%, fair 7% and poor was 7%.

Out of 14 patients, 12 (86%) had satisfactory (excellent + good), 2 (14%) had unsatisfactory (fair+ poor) outcome.

Confidence level of final outcome:

Confidence interval (CI)= p±1.96"pq/n
At 95% confidence level.

Here p = 86, q = 100-p=100-86=14, n =14.
So, (CI) = 86 ± 1.96×9.27
= 86 ± 18.17
= 68 – 104

So, among the population we will found 68% - 104% satisfactory result by this procedure. It is quite acceptable outcome.

DISCUSSION

In our study we evaluate the results of arthroscopic ACL reconstruction by Quadruple autograft of semitendinosus and gracilis at National Institute of Traumatology and Orthopaedic Rehabilitation (NITOR), Sher-E-Bangla Nagar, Dhaka, from January 2012 to December 2013.

We had 14 patients, male 13 and female one. Mean age was 27.28 years with SD±11.975, age range was 23-38 years. Majority of the patients (86%) were from age 21 to 30 years. Eriksson, et al., (2001) had study over 164 patients, age ranges were between 15 and 45 years (Mean 25.7±6.9 years) which is comparable with present study.

None of the patients were sportsman, 21% were student, service holder 28%, day labor 14%, businessman 21%, house wife and other service holder were (7% each). Right side involvement was 50% and left side involvement was 50%. The cause of injury was sporting activity in 50%, RTA 43% and accidental fall in 7% cases.

The ideal time for ACL reconstruction is at least after 6-8 weeks after subsidence of post traumatic inflammatory response. Again too much delay do not bring good results. So duration from injury to operation was studied. Mean duration was 27.42 month with SD (±22.13) months.

In our series, 50% patient stayed in hospital after operation less than 5 days. Mean hospital stay was 6.14days and SD±4.464 days. Buss et al (1993) investigated 67 ACL reconstructions and found mean hospital stay was 5 days (range 3 to 8 days).

Early post operative period was uneventful in 86% cases. One patient had infection at tibial screw site after discharge from the hospital which was subsequently managed by follow-up dressing and antibiotics.

Preoperative clinical evaluation showed that all patients had abnormal knee function, mild to moderate pain. All patients complained of swelling and giving way.

Postoperatively 93% patients regained normal to near normal knee function and knee stability. Significant improvement of pain and swelling also occurred.

Preoperatively, Lachman test was positive in all patients among them grade II 57% and grade three was 43%. 93% patients had anterior drawer test positive, 7% had negative or equivocal anterior drawer test. Pivot shift test was negative in all cases. McMurray test was positive in 71% cases. 79% patients had 135º knee flexion and 21% had less than 130º flexion.

Post operatively Lachman test improved significantly, grade-I in 86% cases and grade II was in 14% cases. In Williams et al (2004) study post operative Lachman test was negative in 89% patients after 28 months of reconstruction of ACL by four stranded hamstring tendon. Anterior drawer was positive in 14% cases. Pivot shift test was negative in all cases. McMurry test positive 14% cases. After operation 86% had 135º knee flexion and 14% had less than 130º flexion. Buss et al (1993) also reported.negative pivot shift test in 89% cases in his study. So present study is closely comparable with that of Buss study.

Regarding final outcome, out of 14 patients, 12 (86%) had satisfactory (excellent + good), 2 (14%) had unsatisfactory (fair+ poor) outcome. Confidence interval (CI) At 95% confidence level is 70% – 103%. So among the population we found 68% - 104% satisfactory result by the procedure. It was quite acceptable outcome.

CONCLUSION

Anterior cruciate ligament and meniscus injury frequently occurs in young adult population, which reduces activity level and become economic burden. So, early reconstruction of the ACL and partial meniscectomy is necessary to make them fit and return to their original activity level.

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Original Article

Outcome of Operative Treatment of Neglected Dislocation of the Elbow

Md. Anisur Rahman[1], Farzana Khondoker[2], Md. Shariful Haque[3], Md. Zahidul Islam Bhuiyan[4]

Abstract

Neglected dislocation of the elbow is a common problem in the developing countries especially in Bangladesh, because of the recourse of patients to the traditional medicine. The management of the old unreduced dislocation of the elbow is a challenging problem to orthopaedic surgeon. The objective of the study is to evaluate the functional outcome of open reduction in neglected dislocation of the elbow. A total of 12 patients with old elbow dislocation, open reduction and early postoperative range of motion was began and the functional results were noted according to Mayo Elbow Performance Score. The mean elbow range of motion at final follow up was 94 degrees. According to Mayo Elbow Performance Score 2 patients achieved excellent results, 4 patients achieved good and another 4 patients achieved fair results and 2 patients achieved poor results. We recommend open reduction and early postoperative physiotherapy gives a useful functional range of movement.

Key words: Neglected, dislocation, elbow.

INTRODUCTION

Neglected dislocations of the elbow became exceptional in developed countries. However, they remain rather frequent in developing countries, because of the recourse of patients to the traditional medicine[1,2], the misunderstanding of the gravity of the lesions and the difficulties of access to the specialized centers. They are defined as an untreated dislocation of the elbow dating 3 weeks or more[1,3,4,5]. The management of late cases of unreduced dislocation is a challenging problem for the orthopaedic surgeon[6]. There are many views have been expressed about the role of open reduction. Wilson emphasized the poor result of open reduction and advocated arthodesis particularly for labourers and arthoplasty for normal individuals[7]. But more recent papers supports open reduction as a worth while procedure irrespective of age, and duration of dislocation[7,8,9]. Speed in 1925 introduced Triceps lengthening by V-Y musculo-plasty for late open reduction where contracted Triceps hinders reduction. This technique has been adopted by many authors [4,7,10,11]. Our objective of the study is to evaluate the outcome of open reduction and early physical therapy of neglected dislocation of the elbow using V-Y musculoplasty and by adopting the Mayo Elbow Performance Score.

MATERIALS AND METHODS

Twelve patients, aged between 18 to 50 years (average 31 years) were treated for the dislocation between July 2013 to June 2015 in private hospital of Rangpur. Dislocations associated with fracture were excluded from the study. The study review of the result of 12 cases, duration of follow up was 12 to 24 weeks. All the dislocation were unilateral. 8 cases with right and 4 cases with left elbow. Male and female ratio was 3:1. Deformity and restriction of movement were presenting complaints. Radiologic features were those of posterior or posterolateral dislocation of elbow. Duration of dislocation was from 3-13 weeks and there was no preoperative neurovascular complication.

Through a posterolateral incision Triceps apponeurosis was raised as a distally based flap, then Triceps muscle

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freed subperiosteally and the dislocated elbow was exposed, In all cases Olecranon and coronoid fosa were filled up with soft tissue, After excision of all soft tissue, the medial and lateral ligaments of the joint were divided before reduction. Reduction was easily done but the joint was unstable. K-wire fixation was done between olecranon and humerus keeping the elbow at 60-80 degree flexion. Periosteums with Triceps were sutured over posterior aspect of humerus with V-Y strip of the triceps apponeurosis to overcome the shortening. Tourniquet was released before closure & haemostasis was done. Closed drain was given in all cases. After 3 weeks both K were and cast removed, Collar and cuff sling applied for another 3 weeks. Active mobilization of the elbow was encouraged after 4-5 days of removal of K-wire with toleration of pain. We used broad spectrum antibiotics one dose preoperatively and two weeks post operatively to prevent infection.

At follow up post operative range of motion was measured and the clinical result were graded according to Mayo Elbow Performance Score (Chart-1).

Results:

The mean age of patients was 33 years (18 - 50). The majority of our patients were male (75%). Etiologies were dominated by the falls in 66.66% of cases, the road accidents in 16.66% of cases and also sports injuries in 16.66% of cases. Right upper limb was affected in 8 cases and left upper limb was affected in 4 cases. The mean deadline of consultation was 49 days after the trauma. 93.5% of patients were initially handled by traditional ways (Jbira, traditional massages).

The clinical examination has noted, in our patients, a stiff elbow with flexion between 15Ú and 35Ú. After removing the K-wire and immobilization, the physiotherapy was maintained immediately. After follow-up of 24 weeks, the functional results were estimated by Mayo Elbow Performance Score based on 4 criteria: the pain, the mobility and the stability of the elbow as well as the resumption of the function of the upper limb. We objectified two excellent scores, four good scores, four fair scores and two poor scores (Chart-2).

Chart 1. *Mayo elbow performance score.*

Pain (max., 45 points)
None (45 points)
Mild (30 points)
Moderate (15 points)
Severe (0 points)
Range of motion (max., 20 points)
Arc > 100 degrees (20 points)
Arc 50 to 100 degrees (15 points)
Arc < 50 degrees (5 points)
Stability (max., 10 points)
Stable (10 points)
Moderately unstable (5 points)
Grossly unstable (0 points)
Function (max., 25 points)
Able to comb hair (5 points)
Able to feed oneself (5 points)
Able to perform personal hygiene tasks (5 points)
Able to on shirt (5 points)
Able to put on shoes (5 points)

Chart 2. Resume of our series results

Case	Age(yrs)	Deadline(Days)	Preoperative ROM	Postoperative ROM	Mayo Score
1	23	65	Fixed at 10°	10°- 80°Arc-70°	F
2	31	35	ROM 10°-20°Arc-10°	10°- 100°Arc-90°	G
3	40	30	ROM 10°-30°Arc-20°	10°- 90°Arc-80°	G
4	18	21	ROM 20°-30°Arc-10°	10°- 110°Arc-100°	E
5	47	88	Fixed at 10°	10°- 50°Arc-40°	P
6	30	28	ROM 20°-40°Arc-20°	10°- 90°Arc-80°	G
7	26	42	ROM 30°-40°Arc-10°	20°- 90°Arc-70°	F
8	24	60	Fixed at 20°	10°- 80°Arc-70°	F
9	48	34	ROM 40°-50°Arc-10°	10°- 100°Arc-90°	G
10	50	22	ROM 10°-30°Arc-20°	10°- 110°Arc-100°	E
11	29	91	Fixed at 10°	10°- 50°Arc-40°	P
12	36	70	Fixed at 20°	10°- 80°Arc-70°	F

(E) excellent, (G) good, (F) fair, (P) poor.

DISCUSSION

Neglected dislocation of elbow is the dislocation which has been left untreated for more than three weeks. In our series all the patients were initially treated by local bonesetters by massage and immobilization in elbow extension. Neglected elbow dislocation causes stiff elbow and weakness in hand, which not only delays the diagnosis and the treatment, but also led to complications[12].

Chowdhury AM et al.[13] stated that in most cases duration of dislocation was less than 12 weeks. The range of motion achieved after open reduction is much better than pre operative range of motion.

Accurate reduction, maintenance of reduction in post operative period, and post operative therapeutic exercise are the key to success. Balchandani[14] in his series of open reduction commented that post operative therapeutic exercise is essential for good result.

Josefsson and coll.[15] indicated that there were no significant differences between the results of conservative and surgical treatment. One year later, in the same newspaper, Mehlhoff and coll.[16] reported a bad result profit after conservative treatment processing. Martini[17] prefers to abstain in front of a stiffness considered functional, what seems to us sensible especially with the high rate of bad results reported in the literature.

Azmi *et al*.[18] reported 62.5% of bad results further to surgical reductions. In the surgical treatment of these injuries, several technical processes can be used. The reduction with fixation in 90Ú of flexion by pinning after liberation of the joint. In cases where the elbow is fixed in extension with retraction of the tricipital tendon, a plastic surgery to lengthen the latter with V-Y technique can be realized by posterior approach.

Masataka[19] reported in a series of 3 cases of neglected dislocations treated by posterior approach with reintegration or reconstruction of the ligament by using a transplant of the palmaris longus tendon. An early physiotherapy was maintained dice second week on articulated orthosis. The results were excellent in all patients (Mayo score of 97).

A technique of stabilization by tendinous transplant taken in depends on the Palmaris longus or the extensor carpi radialis longus, described in 1987 by Arafiles[20]. This technique allows an early mobilization of the elbow.

Jupiter[21] in 2002 reported five cases of neglected dislocations treated surgically then stabilized by an external fixation allowing an early passive mobilization. After a mean follow-up of 38 months, a stable and concentric reduction was obtained.

Ait Essi *et al.*[22] reported a neglected dislocation of elbow in a teenager which was reduced with an enlargement of the great sigmoid cavity. Very good results were observed after six months of follow-up.

In our study, most cases duration of dislocation was less than 10 weeks. The range of motion with stability of the joint achieved after open reduction and early physiotherapy is much more better than pre operative range of motion and functional statement.

CONCLUSION

Considering all above we can conclude that open reduction of a neglected dislocation of elbow is a worth while procedure. There may be limitation of range of movement but a useful functional range of movement can be achieved by open reduction and post operative physiotherapy.

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Case Report

Treatment of GCT Distal Radius with en Block Excision with Reconstruction by Autogenous Non Vascularized Fibular Graft - 2 Case Report

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SUMMARY

Giant cell tumours of the bone are aggressive and potentially malignant lesions . Juxtaarticular giant cell tumours of the lower end of radius are common and present a special problem of reconstruction after tumour excision. Several reconstructive procedures like vascularized and non-vascularized fibular graft, osteo-articular allograft,centralization of ulna, ceramic prosthesis and megaprosthesis are in use for substitution of the defect in the distal radius following resection. We here present our experience with wide resection and non-vascularised autogenous fibula grafting for 2 cases of GCT of distal radius.

Mean follow up period was 10 month. Case 2 shows consolidation at the fibuloradial junction and case 1 shows signs of union. Mean grip strength of involved side was 75% . The average range of movements were 72° forearm supination, 65° forearm pronation, 60° of wrist palmerflexion and 65° of wrist dorsiflexion with combined movements of 162°. Revised musculoskeletal tumor society (MSTS) score averaged 91.38% with excellent results in both the cases. There were no graft related complications, deep infections or wrist subluxation and still no tumor recurrence.

Although non union or recurrence is high, the procedure for reconstruction and limb salvage after wide resection of GCT of distal radius with the free non vascularised fibular graft(with fibular head) is an ideal substitute.This technique provided encouraging functional results, assuring patients' return to their usual activities.

CASE REPORT

Case-1:

This is a 20 years old housewife who presented with sudden onset of pain and swelling over right wrist. She relates her symptom to a trivial injury to the wrist while working. Her symptoms became increasingly worse over the past 3 weeks prior to admission. Examination revealed a tender swelling over right wrist. The overlying skin was normal. Range of movement for the right wrist was limited due to pain.

A plain radiograph of the wrist revealed an expanded, eccentric osteolytic lesion at the distal right radius. The lesion occupied both the epiphyseal and metaphyseal areas. The bone cortex was thinned and ballooned and there was an area of cortical breakthrough over the volar aspect of the distal radius (figure 1).

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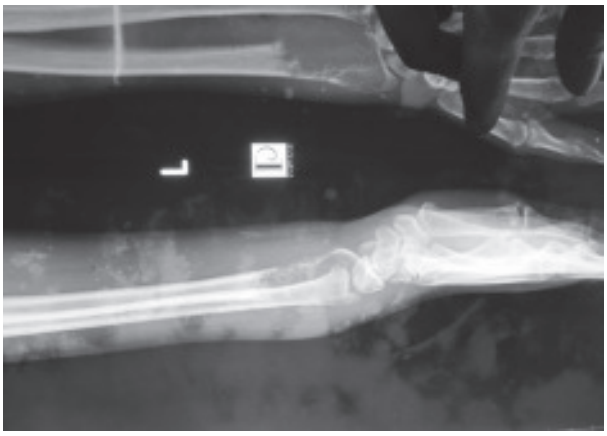


Fig.-1: *Anteroposterior and lateral view of right distal radius showing a balloned out cortex. the lesion extends from the metaphysis extends to epiphysis and skipping joint surface*

A radiological diagnosis of giant cell tumor Campanacci grade 3 was made and a needle biopsy was performed. The biopsy confirmed the diagnosis of Giant cell tumour of the distal radius. She subsequently underwent a wide excision of distal right radius. Autologous fibular graft was taken from the ipsilateral side and was fixed at the recipient site with DCP & screw and K wire with reconstruction of radial collateral ligament.

Follow up was done at 3 wks, 6 wks, 3, 6 and 8 months.

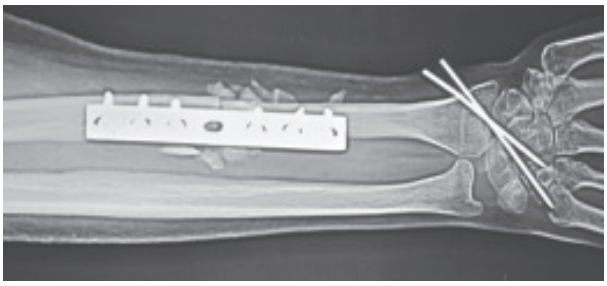


Fig.-2: *At 3 wks follow up. Fixation of ipsilateral autologous fibular graft with DCP, screw & K wire with autogenous cancellous bone graft at graft-host junction after taking from iliac crest.*

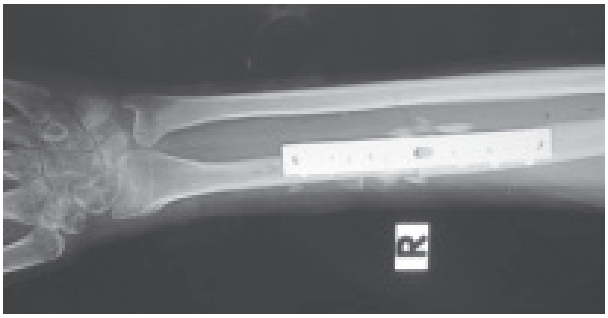


Fig.-3: *At 3 months follow up after removal of K-wire.*



Fig.-4: A*t 6 months of follow up.*

The range of motion of the involved wrist was 60° dorsiflexion, 60° palmar flexion, 15° radial deviation, 22° ulnar deviation, 70° supination and 60° pronation. They retained 80% of contralateral range of wrist motion. Grip strength compared to the contralateral hand was found to be 70% .

CASE-2

This is a 28 year old gentleman who works at a departmental store presented with pain and swelling over left wrist. He had same problem one year back and was diagnosed as a case of Giant cell tumour involving distal radius. He was operated by an Orthopaedic surgeon. Curettage of tumour tissue with filling of cavity with autogenous cancellous bone graft and bone cement was done. Then from about two months prior to admission, he again felt pain at the same site with gradual appearance of swelling. His symptoms became increasingly worse over the past 2 weeks prior to admission. Examination revealed a tender swelling over left wrist. The overlying skin was normal. Range of movement for the left wrist was limited due to pain.

A plain radiograph of the wrist revealed an expanded cavity at the distal left radius filled with bone graft and bone cement. The lesion occupied both the epiphyseal and metaphyseal areas. The thinned and ballooned out cortex showed breakthrough over the volar aspect of the distal radius (figure 1).

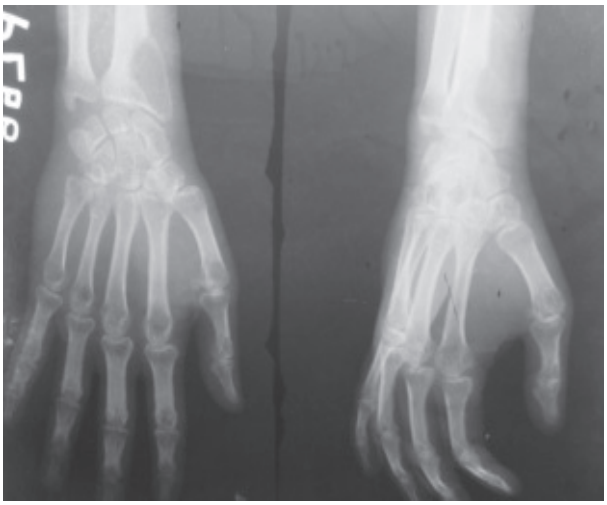


Fig.-1: *Anteroposterior and lateral view of right distal radius showing a ballooned out eccentric, expansile, thinning out) cortex. The lesion extends from the metaphysis upto epiphysis and joint surface not involved.*

A radiological diagnosis of recurrent giant cell tumor was made and a needle biopsy was performed. The biopsy confirmed the diagnosis of Giant cell tumour of the distal radius. He subsequently underwent a wide excision of distal left radius and autologous fibular grafting.



Fig-2: *Curettage and filling of cavity with bone graft and bone cement elsewhere.*



Fig-4: *Wide excision of radius with tumour mass and reconstruction with non vascularized ipsilateral fibular graft, holding the part with Dynamic compression plate & screw and K- wire with reconstruction of radial collateral ligament.*



Fig-5: *At 3months follow up showing good range of movement.*

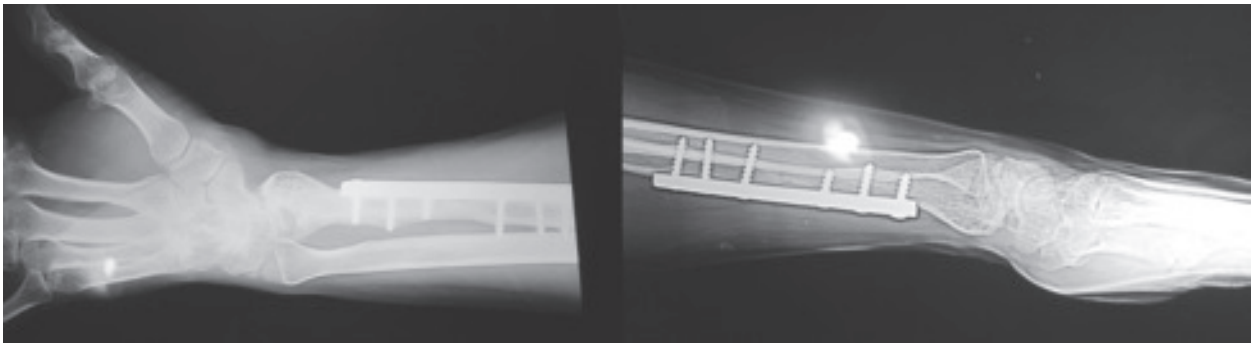


Fig-6: At 9 month showing consolidation at graft-host junction.

Fig-7: At 12 months

The range of motion of the involved wrist was 65° dorsiflexion, 60° palmar flexion, 15° radial deviation, 25° ulnar deviation, 75° supination and 65° pronation. They retained 85% of contralateral range of wrist motion. Grip strength compared to the contralateral hand was found to be 80% .

Follow up was done at 3 wks, 6 wks, 3, 6, 9 and 12 months.

DISCUSSION

Giant cell tumor is a challenge for the surgeons both for cure and rehabilitation. Most patients with GCT are young with normal life expectancy. The aim of treatment is to remove the tumor, reduce the chances of recurrence and preserve the joint functioná.

Giant cell tumor of bone may present with pain over the joint, effusion and swelling. About 10-15 % patient will present with pathological fracture. This tumour is locally aggressive and has a high incidence of recurrence. It can also metastasize to the lung (less than 2 %)á´².

Ten percent of the giant cell tumor of bone involved the distal radius.

In these patients, one is recurrent and the other is grade 3 tumour. A variety of treatment have been advocated for giant-cell tumour of bone, including curettage, curettage and bone grafting, cryotherapy of the cavity after curettage, application of phenol after curettage, insertion of methylmethacrylate cement in the cavity after curettage and resection followed by allograft, autograft or prosthetic reconstructiont . Historically, simple curettage of giant-cell tumor is associated with a 40 to 50% rate of local recurrence. Adjuvant treatment of bone bed with liquid nitrogen or phenol after removal of the tumor has been advocated to decrease the risk of local recurrenceu . Liquid nitrogen results in effective osteonecrosis to a depth of 1 to 2 centimeters. The extend of the osteonecrosis induced by liquid nitrogen is difficult to control, thus it may weaken the bone and lead to a fracture. Phenol has been advocated as a safer agent than liquid nitrogen for adjuvant therapy. Phenol causes protein coagulation, damages DNA, and causes necrosisu ´v ´w . Preventing leakage of Phenol in the extensive cortical disruption while at the same time allowing adequate saturation of the bone with the chemical is difficult and the leakage can potentially be harmful. Phenol is toxic to the nervous system, the heart, kidney, and the liver. It is readily absorbed through skin, mucosa and open wounds³´w .

The technique of intralesional curettage followed by packing of the defect with methylmethacrylate has become popular. The free radicals and the thermal effects of the polymerization reaction can cause necrosis as much as 2 or 3 mms in the cancellous bone. Additional advantages of the use of cement include low cost, easy to use, lack of donor-site morbidity, and elimination of the risk of transmission of disease associated with the use of allograft bone, immediate structural stability and potential for earlier detection of local recurrenceu ´x .

After the resection of a lesion that is not amenable to curettage, techniques of arthroplasty have been employed in an attempt to preserve motion at the wrist joint. A lower rate of recurrence has been noted after resection of the distal part of the radius compared with curettage, especially when the tumor has broken the cortex or when there has been rapid enlargement of the lesion or a local recurrence. After resection, the defect has been reconstructed as an arthroplasty or an arthrodesis involving use of either vascularised or non vascularised bone grafts from the tibia, the proximal part of the fibula, the iliac crest, or the distal part of ulna. Other procedures that have been used to fill the defect have included use of an osteoarticular allograft, custom made prosthesis and transposition of the carpus onto the distal part of the ulna to create a one bone forearmy ´áp .

Although there are advantages to the use of vascularised bone grafts, non vascularised bone graft were successfully employed in the few series. The advantages of vascularised graft may be less important in the distal radius, due to its relatively short length of resection and graft. Also operating time for vascularized fibular graft often reaches 12-14 hours and requires sacrifice of two major vessels. Dissection to obtain the fibula and its vascular pedicle and the isolation of its recipient vessels requires meticulous attention. Sophisticated infrastructure, skill and prolonged operating time have made its use limitedy .

Resection with wrist reconstruction using autogenous fibular grafting enables the patient to achieve some function at the wrist as compared to fusion. Most patients can return to useful employment despite their functional limitationsáp .

Wide resection with fibular grafting also caries the risk of complications related to the graft such as non union, graft fracture, residual subluxation of the carpus, degenerative oeteoarthrosis, limited wrist movement and pain. There can also be donor site complications such as chronic leg pain, lateral ligament laxity, leg dysesthesia and foot dropx ´áp .

CONCLUSION

Resection of distal radius and reconstruction with proximal fibular transplant is useful to preserve the functional movement and stability with normal appearance of the wrist. Further, this procedure eliminates the need for microvascular surgery. Our results showing satisfactory range of movements and sufficient grip strength with good functional results justify this procedure of reconstruction arthroplasty in case of Giant cell tumors of distal radius.

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