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Original Article

Open Reduction and Internal Fixation of Displaced Middle Third Clavicle Fracture by Reconstruction Plate

Purnendu Biswas[1], Abdur Rahman[2], Dibakar Sarkar[3], Uttam Kumar Roy[4], Tofael Hossain[5]

Abstract:

Clavicle fracture is one of the common bony injuries in young active individual. It has been traditionally treated conservatively. This study was undertaken to evaluate the role of surgical treatment in the displaced clavicle fracture in the middle position. Fifteen adult patients (Male-11, Female-4) average age is 26.5 years, with fresh clavicle fracture treated surgically with Open Reduction and Internal Fixation by reconstruction plate and screw and followed up. The study conducted between January -2014 to December -2018. Among fifteen patients thirteen were united at the end of 6 weeks and one united at 9 and other united at 12 weeks. The study showed rigid fixation with plate and screw in displaced and comminuted fracture clavicle gives immediate pain relief, prevent shoulder stiffness, can avoid non-union and gives good functional outcome.

Keywords: ORIF, Fracture middle third clavicle, Reconstruction plate

INTRODUCTION:

Surgical treatment of mid-shaft clavicle fracture is a topic of controversy. Traditional treatment of fracture clavicle is non-operative method in both children and adult[1-6]. Literature has inversely questioned the patient oriented outcome in recent years. Many reports points out higher rates of complications such as shortening, non-union , deformity , and unsatisfactory patient -derived outcome in case of adult displaced mid-shaft clavicle fracture[7-14]

Two recent randomized control studies have demonstrated superior results in favor of operative treatment in cases of completely displaced clavicle fracture in adult population[15-16].

Recent studies shows initial shortening of 2cm was associated with greater risk of non-union, poor clinical outcome and decrease shoulder strength and endurance[10,17].

Various method have been described for operative fixation of clavicle fracture by Reconstruction plate , Semi tubular plate, Dynamic Compression Plate, LCDCP, Locking plate, External fixation, Intramedullary Fixation with K-wire, Knowle's pin, Haige Pins, and Titanium nail etc.

Intramedullary fixation of fracture clavicle , though more cosmetic is technically more demanding owing to lack of clear cut medullary canal and higher complication rate up to 75%[18]. Plate fixation provide immediate rigid stabilization, pain relief, facilitates early mobilization and return to pre injury activities [10,19.20]. Superior placement of plate is biomechanically more stable especially in presence inferior cortical communition[21]. So ORIF with superior reconstruction plate is preferred in adults with middle third displaced clavicle fracture. The aim of this study is to evaluate the radiological union, functional outcome of midshaft clavicle fracture in adult managed with superior surface plating.

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Deformity after 3 months

Nonunion after 3years

MATERIALS AND METHODS:

Fifteen patients with displaced middle third clavicle fracture who underwent ORIF with Reconstruction plate in different private hospitals in Dhaka city between January-2014 to December-2018, were prospectively followed up. Demographic variables were mode of injury, injury -surgery interval, hospital stay, time required for union. Fracture was classified according to Edinburgh Classification[22].

Surgical Procedure:

All operation were performed under Sclene nerve block with deep sedation in supine position. A relatively curved incision over superior aspect of clavicle. Supraclavicular nerve was preserved. Periostium was preserved as much as possible. Reduction was done and fracture was stabilized by reconstruction plate placing superiorly and fixed with 3.5mm cortical screw (at least 4 cotical purchases on each side) . Interfragmentry screw was required some cases. The wound was closed in two layers keeping a drain; the limb was supported with shoulder-arm brace.

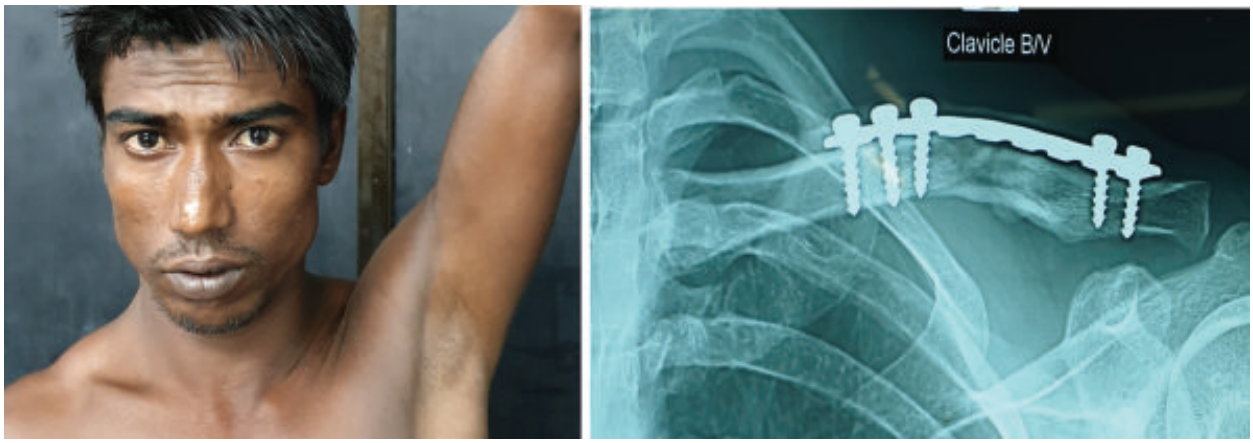
The drain was removed on first POD and patient was discharged. X-Ray was taken before discharge. The wound was inspected on 3rd POD and all stitches were removed on 10th POD. Patient was advised gentle pendulous exercise after removal of stitches. Next follow up done after 6 weeks. Repeat X-Ray was taken and full range of motion started. Subsequent follow up after 3months, 6 months and 1 year.

RESULT:

There were 15 patients to follow up, 11 were male and 4 were female the mean age 26.5 years (18-55years). Nine fractures were in the right side and 6 were in the left. Eight fracture were resulting from RTA, 3 due all from height, 2 due to sports and 2 from physical assault. According to Edinburgh system 5 were 2A2, 7 were 2B1, and 3 were 2B2. Five fractures were tending skin and two was open. Four patients had associated injury, three patients had rib and one patient had fracture tibia and one had metacarpal fracture. Associated injury was managed in the same operative setting. Reconstruction plates of 6 to 9 hole were used in all patients. Interfragmentry screws were used in 6 patients. Average hospital stays were 2 days. All patients were operated in the day of admission except 3 cases one had rib fracture and other had closed tibia fracture with soft tissue injury. These patients were operated within two weeks of injury. None of these patients had early wound infection, one patient had wound infection after 3 weeks. The implant was removed and



Faruk Miah 30yrs, 3 days Fracture Lt Clavicle,



After 3 months Follow up

curettage was done after 6 weeks. However the fracture was united.

All fracture had united in near anatomical position on 6 weeks follow up. Implant was removed in 5 patients after one and half of a year. All patients were satisfied with the procedure .None of the patients had implant loosening, non-union or implant failure or any functional impairment.

DISCUSSION:

Fractures of clavicle are common accounting 2.6% of all fractures, more than 75% located in the middle shaft[12].

Many conservative treatment methods have been described, but simple arm sling or figure of 8 bandages have been widely used[13]. Neither technique reduces the fracture, the outcome was identical but arm sling demonstrated better patient satisfaction[14]. More over the figure of eight bandage was associated with higher complication like axillary pressure sore, neurovascular compression[14]. Past studies shown high level of patient satisfaction after non-operative treatment of these fractures and more operative treatment had higher rates of non-union[4,15,17]. However recent studies have demonstrated higher rates of non-union and poor functional outcomes after non-operative treatment, while the results of primary operative treatment have improved considerably[8,18,19]. The deforming force of starnoclidomastoid is very strong and cannot be overcome by external supports provided by arm sling or figure of eight bandage[20].

Neer's nonunion rate is 1% is misleading as more recent studies shows higher rates of nonunion in displaced mid-shaft clavicle fracture treated conservatively[15]. It was 4.5 to 9.5 % in Robinson's series, 15% in Hill's series and 13% in White et al study, when such fracture managed conservatively[1,7,21]. Moreover shortening more than 2 cm and overlapping leads to greater risk of nonunion, more pain, poor cosmetic and function result[7,8,22]. A metanalysis of recent studies reduced the risk of nonunion by 86% in the operative group compared to non operative group[9]. Drawbacks of conservative treatment can be effectively overcome by surgically treating these fracture achieving near normal anatomic, cosmetic and functional profile[8,18].

Plate fixation provides immediate rigid stabilization, pain relief, facilities early mobilization and return to pre injury activities[2,7,10]. Superior placement of plate is biomechanically more stable especially in presence of inferior cortical communition but associated with greater risk of injury to underlying neurovascular structure and subsequent prominence of plate may necessitate its removal[11]. Low complication rate was associated with inferior implantation of plate, although superior placement provided biomechanically more secured fixation[11]. In our series also stability was preferred over cosmetic and fracture was fixed with superior implantation of reconstruction plate countering it as necessary. Neer and Rowe's higher rate of nonunion after operative fixation can be overcome by using 3.5 mm reconstruction plate with at least 6 cortical purchase on eighter side and delaying institution of physiotherapy programme[4,12]. A recent multicentre trail comparing non operative treatment with primary plate fixation for displaced fractures in 138 patients demonstrated better functional outcomes, lower rates of malunion and nonunion , and a shorter time to union in the latter group[18]. In our series also, there was no malunion or non union, excellent function with average constant score of 97 and all fractures united in less than 8 weeks. Clinical and radiographic signs of non union included moblity or pain on stressing of the fractures and an absence for bridging of callus on radiographs[3]. In our

series we use 6 interfragmentry screws carefully and no comunition occurred.

Although complication rate of 34% and re-operation rate of 18 % (implant removal) are reported in operative group (18). In our series we encountered complication in one case. The complications related to fixation are infection, plate failure, hypertrophic or dystrophic scars, implant loosening, nonunion and rarely intraoperative vascular injury[5,24,25]. In our series we encountered one deep infection requiring early implant removal . No complication occurred after implant removal, though it is important to preserve supraclavicular nerve during operation, none of our patients had any complication even if it was sacrificed during operation.

CONCLUSION:

The traditional method of managing middle third clavicular fracture conservatively gives poor result. Intramedullary fixation is not favored for its higher complication rate though better cosmoses. Reconstruction plates can be contoured according to need and gives better anatomical alignment and functional outcome.

REFERENCES:

1. Langenberg R. Therapy of Clavicular fractures and injuries of adjacent joints: when is a surgical, when is a conservative procedure indicated? Beitr Orthop Traumatol. 1987;34:124-31. [PubMed]
2. McKee MD, Schemitsch EH, Waddell JP, Yoo D. A prospective, randomized clinical trial comparing tibial nailing using fracture table traction versus manual traction. J Orthop Trauma. 199;13:463-9. [PubMed]
3. Paffen PJ, Jansen EW. Surgical treatment of clavicular fractures with Kirschner wires: a comparative study. Arch Chir Neerl. 1978;30:43-53. [PubMed]
4. Rowe CR. An atlas of antomy and treatment of midclavicular fractures. Clin Orthop Relat Res. 1968;58:29-42. [PubMed]
5. Schmit-Neuerburg KP, Weiss H. Conservative therapy and treatment results in calvicular fractures. Hefte Unfallheilkd. 1982;160:55-75. [PubMed]
6. Stanley D, Trowbridge EA, Norris SH. The mechanism of clavicular fracture. A clinical and biomechanical analysis. J Bone Joint Surg Br. 1988;70:461-4. [PubMed]
7. Echtermeyer V, Zwipp H, Qestern HJ. Errors and dangers in the treatment of fractures and pseudarthroses of the clavicle. Langenbecks Arch Chir. 1984;364:351-1. [PubMed]
8. Effenberger T. Clavicle fractures: treatment, follow-up studies. Shirurg. 1981;52:121-4. [PubMed]
9. Eskola A, Vainionpaa s, Myllynen P, et al. Outcome of clavicular fracture in 89 patients. Arch Orthop Trauma Surg. 1986;105:337-8. [PubMed]
10. Hill JM, McGuire MH, Crosby LA. Closed treatment of displaced middle-third fractures of the clavicle gives poor results. J Bone Joint Surg Br 1997;79:537-9.
11. Jupiter JB, Leffert RD. Non-union of the clavicle. Associated complications and surgical management. J. Bone Joint Surg Am. 1987;69:753-60. [PubMed]
12. Nordqvist A, Petersson CJ, Redlund-Johnell I. Mid-clavicle fractures in adults: end result study after conservative treatment. J Orhop Trauma. 1998;12:572-6. [PubMed]
13. Nowak J, Holgersson M, Larsson S. Sequelac from clavicle fractures are common: a prospective study of 222 patients . Acta Orthop. 2005;76:496-502. [PubMed]
14. Robinson CM, Carins DA. Primary nonoperative treatment of displaced lateral fracutures of the clavicle. J Bone Joint Surg Am. 2004;86:778-82. [PubMed]
15. Nonoperative treatment compared with plate fixation of displaced midshaft clavicular fractures. A multicenter, randomized clinical trial. J Bone Joint Surg Am. 2007;89:1-10. [PubMed]
16. Smekal V, Irenberger A, Struve P, et al. Elastic stable intramedullary nailing versus nonoperative treatment of displaced midshaft clavicular fractures-a randomized, controlled, clinical trial. J Othop Trauma. 2009;23:106-12. [PubMed]
17. Mckee MD, Pedersen EM, Jones C, Stephen DJ, Kreder HJ, Schemitsch EH, Wild LM, Potter J. Deficits following nonoperative treatment of displaced midshaft clavicular fractures. J Bone Joint Surg Am 2006;88:35-40.
18. Zlowodzki M, Zelle BA, Cole PA, Jeray K, Mckee MD; Evidence-Based Orthopaedic Trauma Working group. Treatment of midshaft clavicle fractures: systematic review of 2144 fractures: on behalf of Evidence-Based Orthopaedic Trauma Working group. J Orthop Trauma 2005;19:504-7.
19. Neer CS 2nd. Fractures of the distal third of the clavicle. Clin Orthop Relat Res 1986;58:43-50.
20. Mullaji AB, Jupiter JB. Low-contact dynamic compression plating of the clavicle. Injury 1994;25:41-5.
21. Iannotti MR, Crosby LA, Stafford P, Grayson G, Goulet R. Effectis of plate location and selection on the stability of midshaftclavicle osteotomies: a biomechanical study. J Shoulder Elbow Surg 2002;11:457-62.

22. Robinson CM. Fractures of the clavicle in the adult. Epidemiology and Classification. J Bone Joint Sura Br 1998;80:476-84.

23. Crenshaw AH. Fracture of the shoulder girdle arm and forearm .In: Crenshaw AH , editor. Campbell's operative orthopaedics . 8th ed. St.Louis: Mosby Year Book; 1992.p 989-1053.

24. Lester CW. The treatment of fracture of clavicle . *Ann Surg* 1929;89:600-6.

25. Anderson K, Jensen PO, Lauritzen J. Treatment of clavicle fracture . Figure of eight bandage versus simple sling. *Acta Orthop Scand* 1987;105:337-8.

26. Neer CS 2nd. Nonunion of the clavicle. JAM Med Assoc 1960;172:1006-11.

27. Mckee MD, Pedersen EM, Jones C, Stephen DJ, Kreder HJ, Schemitsch EH, Wild LM, Potter J. Deficits following nonoperative treatment of displaced midshaft calvicular fractures. J Bone Joint Surg Am 2006;88:35-40.

28. Canadian Orhopaedic Trauma Society. Nonoperative treatment compared with plate fixation of displaced midshaft clavicular fractures. A multicenter, randomized clinical trial. J Bone Joint Surg Am 2007;89:1-10.

29. Wun-Jer Shen, Tsung-Jen Liu, Young-Shung Shen. Plate fixation of fresh displaced midshaft clavicle fractures. Inury 1992;23(4):237-41.

30. White PR ,Anson PS, Adult Clavicle fracture :relationship between mechanism of injury and healin . Orthop Trans 1989;13:514-5.

31. Bostman O, Manninen M, Pihlajmaki H, Complication of plate fixation in fresh displaced midclavicular fracture J trauma 1997;43:778-83.

Original Article

Management of Complex Diabetic Foot Ulcer by External Fixation: Our Experience in BIRDEM General Hospital

Jonaed Hakim[1], Afrina Jahan[2], Md. Zawad[3], MKI Quayyum Choudhury[4]

Abstract:

Twenty Percent of all diabetic patients' admissions to a hospital are caused by foot problems or ulceration at certain point in their lifetime. Traditionally, the treatment for complex lower extremity wounds and major soft tissue defects has been amputation of the affected limb. Complex wound caused by infection, vascular insufficiency, compromised immune status and unstable skeletal framework require multiple operations by different specialties and prolonged healing period to salvage the limb with no guarantee that the result yields a functional limb. Amputations are a rapid solution for such complex wounds, which enable the patient to be ambulated in a short duration, though imposing the risks of increased expenditure, decreased life expectancy and increased risk of contralateral limb amputation. Application of external fixator is a novel technique of stabilizing those wound thereby accelerating wound healing, closure of the wound and preventing amputation. Our aim was to study the efficacy of external fixation in healing large, deep and unstable diabetic foot ulcers / wounds. External fixator was applied in nine patients. Three were female and six were male. All ulcers were located on or around ankle joint and graded 2 under Wagner Classification. After primary debridement of ulcer, the L-shaped uniaxial locally made external fixator was applied either medially or laterally according to need and kept for 10-12 weeks. Stability of joint was checked both clinically and radiologically. Daily dressing with advance dressing materials or VAC applied according to the patients' ability. Ulcers were then covered either by skin graft or flap accordingly keeping the external fixator till complete healing. Fixation of theankle made it stable such that patients became ambulatory with support that resulted in an improvement in patients' quality of life. In two patients, there was pin tract infection resulting in loosening of hardware in one.After removal of external fixator our patients could walk normally. In our study, time for wound healing with skin grafting / flap coverage and time of ambulation with bipedal weight bearing were early. High level of patient satisfaction was found in all patients as they were back to their normal life after the procedure, avoiding the psychological and social stigma of amputation. External fixation provides limb off-loading, immobilization, skeletal fixation, wound care, preservation of vascular structures and simultaneously allow sift tissue healing in complex diabetic ulcer.

Key words: Diabetic foot ulcer, external fixator, amputation, skin grafting, Wagner Classification, VAC (Vacuum Assisted Closure)

INTRODUCTION:

Ulceration, infection, gangrene and amputation, associated with chronic complications of diabetes are a major source of morbidity and a leading cause of hospital admission for people with diabetes.[1] The pathophysiology of diabetic foot ulceration is multifactorial, but peripheral neuropathy is thought to be responsible for most cases. Foot ulcers are a common, serious and costly complication of diabetes, preceding 84% of lower extremity amputations in diabetic patients and increasing the risk of death by 2.4 fold over

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diabetic patients without ulcers.[2,3] Despite advances in knowledge and treatments, as many as 12-25% of people with diabetes will develop foot ulceration at some stage of their disease, many of whom will require amputation.[4,5] Application of external fixator is a novel technique of stabilizing those wound thereby accelerating wound healing, closure of the wound and preventing amputation. External fixation is a device which provides a rigid immobilization through external fixation in or through bone. Treatment of diabetes foot ulcer patients is wound closure and finally a stable foot, which is determined by severity, vascularity and infection.[6]

BIRDEM General hospital is one of the largest dedicated hospitals for diabetic patients not only in Bangladesh but also around the world. So, the number of patients having complex diabetic foot ulcers are huge and so is their complications leading to amputation of lower limb. In our study, we tried to evaluate the adjunctive role of external fixation in soft tissue reconstruction to ensure healing in patients requiring reliable off-loading or immobilization of joints and its role in limb salvage in a complex diabetic ulcer.

MATERIALS & METHODS:

A prospective, continuous study was performed on nine elderly diabetic patients admitted in BIRDEM General Hospital between year 2019 to 2020. Among them, three were female and six were male. Age of the patients ranged from 55 years to 70 years (mean age: 60.5 years). All patients had one or more complications of diabetes like chronic renal failure, ischaemic heart disease, hypertension and cerebrovascular disease. All patients had ulcer on or around ankle joint making the overlying tendons of foot and joint capsule exposed to exterior. Only one patient had ulcer on medial side and rest had on lateral side of ankle. Wagner classification for diabetic foot ulcer was used and all nine patients were under grade two associated with systemic toxicity / septicemia, so ulcers were assigned as complex one. The investigations were done according to our hospital protocol for all diabetic patients. They included random blood sugar, fasting and post-prandial blood sugar, glycosylated haemoglobin, routine uranalysis, renal function test, liver function tests, serum electrolytes, chest X-ray, ECG, echocardiogram and fundus examination. Aerobic and anaerobic culture and antibiotic sensitivity, complete blood count with ESR were done in each case. Probe to bone test was done in these cases to characterize the ulcer and for evidence of bone involvement. X-ray of the ankle and foot was done in all patients. Patients ability to safely use assistive walking devices was evaluated and optimized perioperatively, preferably before any elective reconstructive surgery. The first determinant for limb salvage in a diabetic patient is determination of inflow. In all our patients, along with other thorough clinical examination, we performed duplex scan of lower limb before application of external fixator to determine the vascularity of the distal part.

Surgical Procedure:

Locally made uniaxial external fixator was applied after thorough debridement and removal of infected tissue. Joint capsule of ankle joint was not opened, otherwise it would let the joint unstable and vulnerable for septic arthritic leading to destruction of articular surfaces. (Fig:) Two pins are introduced into the shaft of the tibia, two smaller pins near the head of the 1st (medial side ulcer) or 5th (lateral side ulcer) metatarsal, one pin in the calcaneum through and through. Then the pins are connected by two rods one upon another to give firm support and rigid stability of the external fixator. It produced a very stable construct with minimum instrumentation at minimal cost to patients. In five patients VAC (Vacuum Assisted Closure) was applied one day after the 1st debridement. Change of VAC and regular dressing was done until ulcers became healthy for skin grafting or flap coverage and it took maximum 5 weeks for such. During this period, all patients were made ambulatory with help of walking sticks or axillary crutches. At the end of 10-12 weeks all the external fixators were

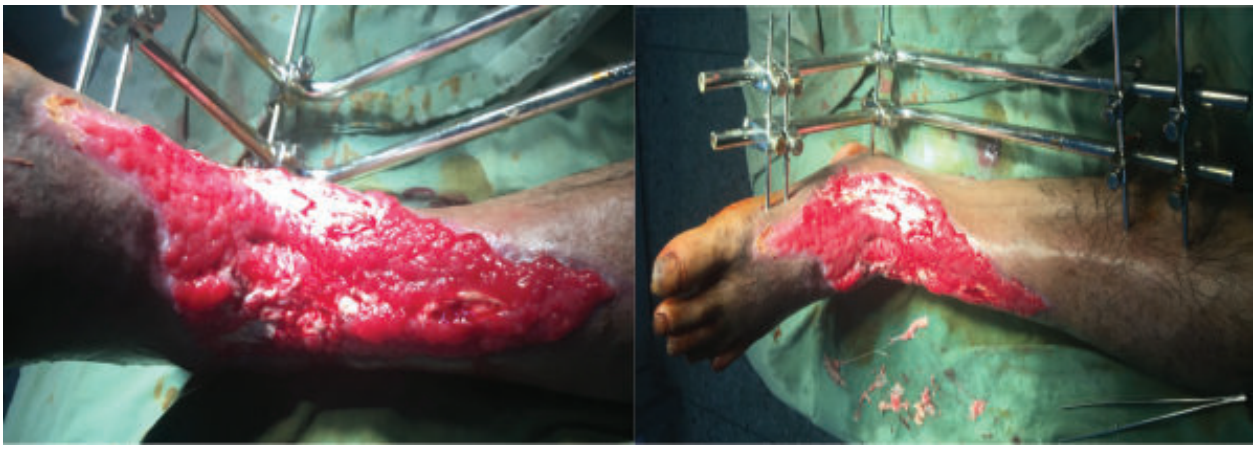


Fig-1: *Healing Ulcer over ankle with External Fixator*

removed as all ulcer beds were found healthy. After removal of external fixator, patients were advised to walk without walking aids, but custom braces and orthoses such as the Charcot restraint orthotic walker (CROW) was advised to use for at least subsequent 4-6 months.



Fig-2: *Ulcer Coverage with Skin Grafting with External Fixator*

RESULTS:

In our series, we applied external fixator in nine patients after wound debridement. Fixation of the ankle made it stable such that the patient became ambulatory with support. Thus, there was an improvement in the patients' quality of life. With regular dressing and application of VAC (vacuum assisted closure), ulcers gradually converted into a healthy granulating ulcer and was ready for skin grafting or flap coverage, all of which completed within 10-12 weeks of time. In our study, time for wound healing, time for skin grafting or flap coverage and time of ambulation with bipedal weight bearing were early. In our series we witnessed a high level of patient satisfaction as they were back to their near normal life after the procedure, avoiding the psychological and social stigma of amputation. Potential documented complications of external fixation in patients with diabetes included pin tract infection, hardware failure, iatrogenic ulcerations on the contralateral leg due to injury by external fixator, scarring, sepsis, fractures, muscular atrophy and deep vein thrombosis. In our patient group, two patients developed pin tract infection, one resulted in loosening of fixator though at the end, it was managed successfully. Most of these complications were minor and could be avoided with proper pin insertion, biomechanically sound constructs, decreased duration in frame, pin care and general care of the patient including bladder, bowel and skin care. When used for a short period of time, pin tract infections are negligible when compared to the advantages provided by external fixator. Muscular atrophy during the period of immobilization was minor, which improved with physical therapy.

DISCUSSION:

Twenty percent of all diabetic patients' admissions to the hospital are caused by a foot problem or ulceration at a certain point in their lifetime.[7] Traditionally, the treatment for complex lower extremity wounds and major soft tissue defects has been amputation of the affected limb.[8] Uncontrollable wounds caused by infection, size, vascular insufficiency, compromise immune status and unstable skeletal framework require multiple operations. A number of surgical techniques can maximize the success of wound healing. The most important is aggressive debridement of all infected tissue and bone, while sparing the healthy tissue for closure. If the wound is grossly infected at the initial debridement, serial surgical debridement is necessary until the wound respond responds and starts to heal. Leaving large wounds to heal by granulation and secondary intention may take several months or years for complete closure.[9,10] External fixator may be used in complex diabetic foot wounds, which is usually difficult to salvage using conservative method. External fixator has an established role in treatment of trauma and osteomyelitis.[11,12]In these clinical applications, the external fixator allows salvage of severely infected or traumatised bone or joints that required major amputation in the past.[9] The fixator maintains bone and joint alignment through rigid external fixation despite significant bone resectionfor osteomyelitis or skeletal realignment. It does thatwithout having to resort to internal fixation withplates and screws that are contraindicated in infectedwounds. Motion along a joint where there is soft tissuereconstructionoften leads to dehiscence or breakdown.Immobilisation with a cast makes it difficult to follow thewound and could place pressure on the reconstruction.Placing external fixators across a given joint immobilisesthat joint while allowing excellent wound care. Thefixator can then be removed upon wound healing.Premature weight bearing on a reconstructed site alsoleads to breakdown. If the reconstruction involves thesole of the foot,off loading for 6 weeks is often necessaryto ensure healing.External fixation stabilizes the joint by decreasing the mobility at the site of joint and helps in approximating the wound margin which is closed by skin graft or flap.In one study, demonstrated that application of external fixator in exposed joint decreases the wounds sizes more effectively in 52 days as compared to the wound managed by posterior slab support 59 days, ulcer preventing complications and hence promising a better outcome.[13] Another study on 32

patients with complex diabetic foot wound who underwent external fixation as a limb salvage procedure were studied postoperatively and found satisfactory result.[7] In our study, though the number of patients were less, but all of them had a satisfactory result with an improved quality of life. Poor compliance with the external fixator was a common complaint for all patients but when we considered quick recovery of ulcer as well as partial weight bearing since the time from surgery, this can be ignored. But the number of patients should have been more and it should have been compared with other modalities of joint stabilizing methods like casting or Ilizarov ring fixator.

CONCLUSION:

The advantage of this treatment is to decrease mobility at wound site, approximation of wound margins, better joint stability and alignment, less hospital stay, cost effective, limb salvage and better quality of life.

REFERENCES:

1. Frykberg RG, Zgonis T, Armstrong DG, Driver VR, Giurini JM, Kravitz SR, et al. Diabetic Foot disorders. A clinical guideline. J Foot Ankle Surg. 2006; 45 (5 Suppl): S1-66
2. Boulton AJ, Vileikyte L, Ragnarson-Tennvall G, Apelqvist J. The global burden of diabetic foot disease. Lancet. 2005;366(9498): 1719-24
3. Reiber GE, Pecoraro RE, Koepsel TD. Risk factors for amputation in patients with diabetes mellitus. A case-control study. Ann Intern Med. 1992;117:97-105
4. Lipsky BA, Berendt AR, Embil J, De Lalla F. Diagnosing and treating diabetic foot infection. Diabetes Metab Res Rev. 2004;20 (Suppl 1):S56-S64
5. Sing N, Armstrong DG, Lipsky BA. Preventing foot ulcers in patients with diabetes. JAMA. 2005;293:217-28
6. Holden CE. The role of blood supply to soft tissue in the healing of diaphyseal fractures: an experimental study. J Bone Joint Surg Am. 1972; 54:993-1000
7. Nayak B, Mahapatra KC, Das RR. Mnagement of complex diabetic foot wound by external fixation: An effective way for limb salvage. Journal of Health Specialties; 2016, vol 4, issue 2:128-132
8. Ikonen TS, Sund R, Venersmo M, Winell K. Fewer major amputations among individuals with diabetes in Finland in 1997-2007: A population-based study. Diabetes Care 2010;33:2598-603
9. Roukis TS, Zgonis T. skin grafting techniques for soft tissue coverage of diabetic foot and ankle wounds. J Wound Care 2005;14:173-6
10. Pinzur MS, Sage R, Stuck R, Osterman H. Amputations in the diabetic foot and ankle. Clin Orthop Relat Res 1993; 77:835-46
11. Dendrinos GK, Kontos S, Lyritsis E. Use of the Ilizarov technique for treatment of non-union of the tibia associated with infection. J Bone Joint Surg Am 1995;77:835-46
12. Ghoneem HF, Wright JG, Cole WG, Rang M. The Ilizarov method for correction of complex deformities: Psychological and functional outcomes. J Bone Joint Surg Am 1996;78:1480-5
13. Patro B, Surana P, Mahapatra KC. A study of the efficacy of external fixation in healing large, deep and unstable diabetic foot wounds. International Surgery Journal 2019; Vol 6;issue 3:660- 74

Original Article

Evaluation of surgical bipolar release of Sternocleidomastoid muscle in patients with congenital muscular torticollis

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Abstract:

The congenital muscular torticollis (CMT) is a neck deformity which occurred shortly after birth due to unilateral shortening of sternocleidomastoid muscle (SCM). Generally, female with right side deformity rate is higher. Although there are various options of operation, bipolar release technique is most suitable having less risk of recurrence than other available techniques with good cosmetic outcome when conservative treatment fails.This prospective interventional study was conducted in the department of Orthopaedic Surgery, Bangabandhu Sheikh Mujib Medical University, Shahbag, Dhaka, Bangladesh from Jan 2015 to Dec 2017. Twenty patients of congenital muscular torticollis was selected and intervention was done by bipolar release of sternocleidomastoid muscle. This study had potential risk, so signed informed written consent was taken from the authorized legal guardian with written statement. The objective of this study was to evaluate the functional and cosmetic outcomes of bipolar release of sternocleidomastoid muscle in congenital muscular torticollis. Out of 20 patients, 8 were male (40%) and 12 were female (60%), Right side involvement were 15 cases (75%) and left side 05 cases (25%). The mean cervical rotation was improved from 45.3^0 to 78.5^0, tilt was reduced from 14.8^0 to 2.3^0 and lateral flexion was reduced from 24.5^0 to 4.1^0 comparing pre-operative state to final follow up at 6 months. The mean modified Lee's score was improved from 4.4 (24.2%) to 16.3 (90.3%) from pre operative condition to the final follow-up at 6 months postoperatively. Therefore, the overall modified Lee's score was improved 66.1% by the bipolar release operation, as well as the functional and cosmetic outcome was also significantly improved.

Key words: Congenital torticollis, bipolar release, neck deformity

INTRODUCTION:

Congenital muscular torticollis (CMT) is the third most common congenital musculoskeletal anomaly after dislocation of the hip and clubfoot with a reported incidence of 0.3-1.9 percent and there seems to be slight male predominance with a relative ratio of approximately 3:2[1]. The right side is most frequently affected[2]. Although various theories have been proposed to explain its aetiology, such as birth trauma, intrauterine malposition, infectious myositis and venous occlusion, difficult delivery, hereditary and compartment syndrome, the actual cause of CMT has not been identified[3].The basic pathology of CMT is endomysial fibrosis with deposition of collagen and aggregation of fibroblast around individual muscle fibres, which then undergo atrophy[4].

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Prompt diagnosis and early treatment with concise physical therapy causes over 95 percent patients to achieve acceptable passive cervical rotation, but when physical therapy is not successful after the age of one year, some authors advocate surgical correction to improve cervical motion and cosmetic deformity[3] .Surgery is also recommended in patients with residual head tilt, passive rotation deficit or lateral bending deficit of more than 15 degree[5].The timing of surgery is controvertial. Some authors have advocated that an earlier operation improves head tilt and prevents craniofacial asymmetry, which appears to result from restricted growth on the affected side[6], others have reported that waiting until one year of age has the advantages of allowing the growth of neck structures and simplifying surgery. Some have concluded that the optimal age of surgery is between one and four years[7].

But complete restoration of facial asymmetry is difficult in patients older than four years[8] .Chen and Ko,2000 also described excellent results in patients over six years of age, and latter suggested that the degree of correction was affected by adequate surgical release and postoperative rehabilitation rather than age. Coventry and Harris, 1959 reported that operation upto 12 years of age produced good results and indicates good modified Lee's scores[9].

Although there are various surgical procedures for CMT, unipolar and bipolar release technique are the most popular[10]. But with open unipolar tenotomy of sternocleidomastoid muscle could be followed by tethering of scar to the deep structures, loss of contour of the muscle, failure to correct the tilt of the head, or failure of facial asymmetry to correct and recurrence rates are high (7percent). But surgical correction with bipolar release and Z-plasty of sternal end of sternocleidomastoid or attachment of clavicuiar head to sternal head lessens the sunken or hollow appearance of the distal end of sternocleidomastoid and giving the patient a better cosmetic result as well as markedly reduce the recurrence rate[8].It is clear that surgery in late cases improves neck motion and corrects head tilt, and therefore improves quality of life. Bipolar release is an adequate and complication free method and must be considered in neglected cases[11].

Recently, to hide incision scars an endoscopic technique through an incision placed within the hair bearing scalp at the level of superior helical rim or anterior axillary line was introduced1[12](Sasaki et al., 2000). However the retroauricular endoscopic approach places spinal accessory and greater auricular nerve at risk. Furthermore this method involves expensile equipment and incurease additional costs due to the requirement for a dispensable endoscopic ports[13].

A retrospective study of 11 patients, age was 4-18 yrs were operated by bipolar release and Z-lengthening of sternocleidomastoid with an average follow up of 4.4 years (2-8.6 years) shown significant improvement of neck motion, head tilt, chin deviation and cosmesis with excellent results in 8 patients 72.7 percent and good in 3 patients 27.2 percent. Results were evaluated by the scoring system of Lee et al. There were no recurrence and no surgery related complications [14].

In our study we will find out the functional and cosmetic outcome of bipolar release of sternocleidomastoid and Z-lengthening in congenital muscular torticollis.

MATERIALS AND METHODS:

Twinty patients (8 males & 12 females) mean age 5±3.75 years who have undergone bipolar release and Z-plasty of sternal head of sternocleidomastoid muscle for congenital muscular torticollis in the Hand and Reconstructive Surgery Wing, Department of Orthopaedic Surgery, Bangabandhu Sheikh Mujib Medical University, Shahbag, Dhaka, Bangladesh from Jan 2015 to Dec 2017. The patient had been scheduled for surgery on the basis of clinical and radiological finding including cervical rotation, tilt, lateral flexion. Other than congenital muscular torticollis was excluded from this prospective interventional study. Postoperatively intensive physical therapy included cervical traction for 3-6 weeks, application of soft neck collar with neck mobilization exercises were ensured for 3-6 months. Finally results were evaluated at 6 months with modified Lee's scoring score. The results were compared using student or ANOVA's t-test as appropriate. All statistical analyses were performed using SPSS statistics. P value of less than 0.05 was considered as statistically significant.

A-Sternocleidomastoid muscle, B-release of clavicular head near its attachment site, and cut the sterna head 2-3 cm away from its attachment and mastoid head 1 cm away from its attachment C- suturing the clavicular head wi the sterna head.D- course of Spinal accessory nerve.

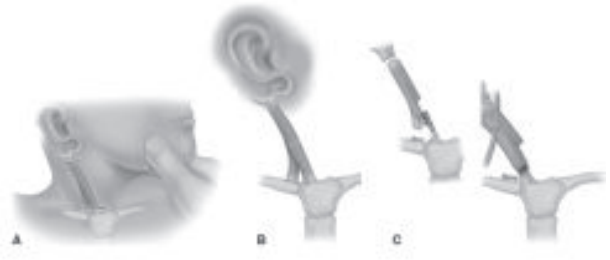


Fig.-1. *Bipolar Z-plasty operation of Torticollis (Source: Campble 12 ed.)*

RESULTS:

This prospective interventional study was carried out at Bangabandhu Sheikh Mujib Medical University (BSMMU), Shahbag, and Dhaka from January 2015 to December 2017 to assess the outcome of the open bipolar release of SCM in CMT.

20 cases of congenital muscular torticollis were included in this study. After proper evaluation of patient's intervention was done by open surgical bipolar release of sternocleidomastoid with lengthening of sterna head. Follow up were taken every 03 weekly for 03 months then 06 weekly upto at least 06 months.

Maximum 9(45%) patients were in age group 3-6 followed by 6 (30%) and 5(25%) patients were in age group of 6-9 years and 9-12 years respectively. Mean (SD) age was 5.0 (±3.75) with the rage of 1-12 years. Male female ratio was 2:3. 15 (75%) patients were in the right side and rest 5(25%) patients were CMT in the left side. 16(80%) patients had the history of normal vaginal delivery (NVD) and 4(20%) had caesarean section delivery.

Pre operatively thirteen (65%) patients had moderate facial asymmetry, 5(25%) patients had slight facial asymmetry and 2 (10%) patients had severe facial asymmetry, on the other hand lateral flexion deficit was found 53.3% and 54.8% with the lateral rotation deficit was 85.0% and 82.9% on the left and right CMT patients respectively. 11 (55%) patients had moderate head tilt and 9(45%) patients had severe head tilt.

At 6 months follow up seventeen (85%) patients had none of facial asymmetry and 3 (15%) patients had the mild facial asymmetry. The lateral flexion deficit was found 8.0% and 9.0% with the lateral rotation deficit was 2.5% and 2.1% on the left and right CMT patients respectively. 11(55%) patients had none of head tilt, 8(40%) patients had mild head tilt and 1 (5%) patients had moderate head tilt. Regarding post-operative complications one (5%) patient had the superficial wound infection 19(95%) and two(10%) patients had the disfiguring scar. The loss of Sternocleidomastoid muscle contour (SMC) was found in 1(5%) patient.

Table-I

Patients Clinical Information's

Case	Name	Age(Yrs)	Sex	Side	Surgical Procedure	Duration of F/U, Months	Results
1	Samia	0 7	F	R	Bipolar R	24	Excellent
2	Sarimrahman	11	M	R	Bipolar R	22	Good
3	Akbar hossain	3.5	M	R	Bipolar R	21	Excellent
4	Abir	04	M	R	Bipolar R	18	Excellent
5	Shifa	3.5	F	R	Bipolar R	18	Excellent
6	Shohana	07	F	R	Bipolar R	16	Good
7	Sumayia	08	F	R	Bipolar R	15	Good
8	Parul	05	F	L	Bipolar R	15	Excellent
9	Aman	07	M	R	Bipolar R	12	Excellent
10	Munni	12	F	R	Bipolar R	12	Fair
11	Asif	05	M	R	Bipolar R	11	Excellent
12	Nilima	6.5	F	L	Bipolar R	11	Excellent
13	Rajib	04	M	R	Bipolar R	10	Excellent
14	Farhana	09	F	L	Bipolar R	10	Excellent
15	Momin	5.5	M	R	Bipolar R	09	Excellent
16	Ruma	05	F	R	Bipolar R	09	Excellent
17	Umme Hani	12	F	R	Bipolar R	08	Good
18	Fahim	11	M	R	Bipolar R	07	Excellent
19	Nusrat	11.5	F	L	Bipolar R	06	Good
20	Anu	5.5	F	R	Bipolar R	06	Excellent

Table II

Comparisons of pre and post operative modified Lee's score (n=20)[3]

Value	Rotational deficit		Side flexion deficit		Craniofacial asymmetry		Residual band		Head tilt		Cosmetic and Functional	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post
Minimum	0.000	2.000	0.000	2.000	0.000	2.000	0.000	2.000	0.000	1.000	0.000	1.000
Maximum	1.000	3.000	1.000	3.000	1.000	3.000	2.000	3.000	1.000	3.000	1.000	3.000
Mean	0.900	2.900	0.900	2.900	0.900	2.850	0.750	2.700	0.550	2.500	0.400	2.300
Std. deviation	0.308	0.308	0.308	0.308	0.308	0.366	0.550	0.470	0.510	0.607	0.503	0.657
p-value	0.0001*		0.0001*		0.0001*		0.0001*		0.0001*		0.0001*	

Table –II, Statistical analysis was conducted using student t-distribution with 95% confidence interval where a p-value <0.05 indicates the statistically significant. The student t-distribution was considered between the pre and post operative modified Lee's scores where the theoretical mean value was set for statistical analysis (3). In case of rotational deficit, side flexion deficit, craniofacial asymmetry, residual band, head tilt and cosmetic function the statistically significant difference (p-value <0.0001) was observed in between the pre-operative and post operative modified Lee's score at 6 months follow up. (Table XI).

Table III

Distribution of patients by final outcome (n=20)

Final outcome	Frequency	Percentage
Satisfactory (Excellent+Good)	19	95%
Unsatisfactory (Fair+poor)	01	05%
Total	20	100%

Table III was shown the final outcome assessment by the modified Lee's scores. Nineteen patients (95%) were found the satisfactory, on the other hand only one patient (5%) was found unsatisfactory result due to post operative complications.



Fig-2: *Pre operative*

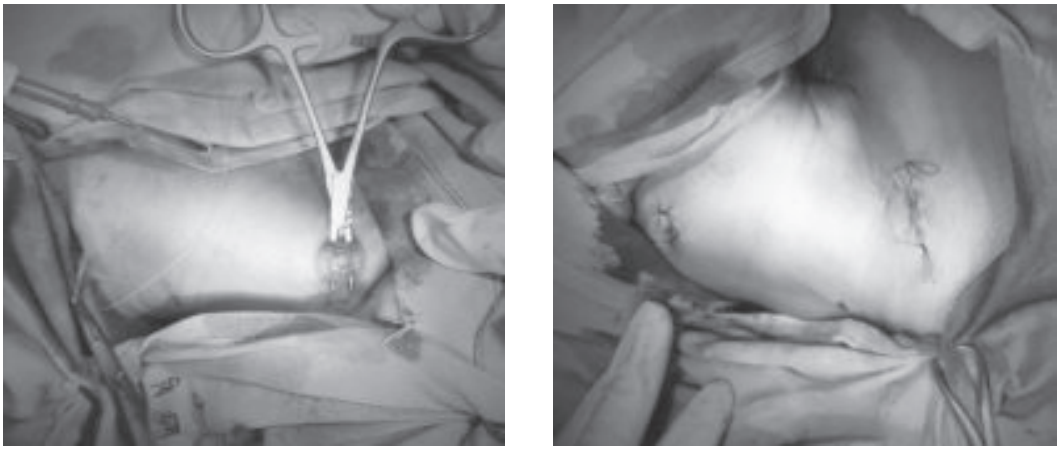


Fig-3: *Per operative*



Fig-4:*Post operative halter traction*



Fig-5: *X-ray of Cervical Spineat Final Followup to measure the recidual head tilt*



Fig-6: *Lateral Rotation at Final Follow-up*



Fig-6: *Lateral Rotation at Final Follow-up*



Fig-7: *Final Follow-up at 6 months*



Fig-8: *Pre operative photograph*

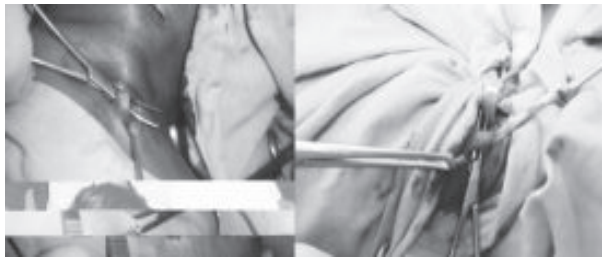


Fig-9: *Per operative photograph*



Fig-10:*Post operative halter traction*



Fig-11: Final Follow-up at 6 months

DISCUSSION

In our study 14 patient (70%) had the excellent result with modified Lee's scores[3] from 16 to 18, 5(25%) patients had the modified Lee's score was 12 to 15 that was coincide with good result and 1(5%) patient had the fair modified Lee's score. Our one patient developed superficial wound infection, later unsightly disfiguring scar and subsequently loss of SCM contour and had got fair outcome and another one patient develop slightly disfiguring scar but modified lee's score was good and outcome was satisfactory. In Ferkel[8] et al.1983 original series with the described operation showed 92% excellent to good outcome with one fair due to unsightly scar. Kashani[15] et al 2008 showed 86% excellent to good results by bipolar release in skeletally mature patient with CMT.Sudesh[1] et al. 2010 operated 14 patients with patients age more than 10 years showed 71% excellent to good results. Patwardhan[16] et al 2011 reported 67% excellent to good results in a study with patient age ranging from 17-31 by modified Ferkel's method. Seyhan[11] et al 2012 showed marked improvement of head tilt and neck movement by the same technique with patient age between 06 to 23 years. In another study by Bhuyan 2014 of 11 patients showed excellent result in 08 patients (72%) and good in 3(27.2%) cases with patients age between 4-18 years, who followed similar operative technique, post operative rehabilitation and scoring system, which is almost similar to our study[14]. In our study, the lateral flexion deficit were found 54.8% in right side and 53.3% in left side with the lateral rotation deficit was 82.90% and 85.00% respectively in preoperative group but the lateral flexion deficit were found 8.0% and 9.0% with the lateral rotation deficit 2.5% and 2.1 on the right and left CMT patients in post operative group at final follow up. In a study on 12 adult patient by patwardhan et al. 2011 used the similar operative technique and scoring system. Regarding distribution of patients by gender female were predominant by male. Male female ratio was 2:3 and male was 40% and female was 60%. In a similar study by S.Patwardhan et al., out of 12 patients 9 (75%) cases were female and 03(25%) cases were male, which is similar to our study. In a study by Bhuyan[14] 2014 on 11 patients female patient was 7(63%) and male 4(37%) which is similar to our study. Regarding patients by common pre-operative symptoms of facial asymmetry. Thirteen (65%) patients had moderate facial asymmetry, 5(25%) patients had slight facial asymmetry and 2(10%) patients had the severe facial asymmetry. On the other hand 11(55%) patients had moderate head tilt and 9(45%) patients had severe head tilt, in preoperative group. On post-operatively 17(85%) patients had none of facial asymmetry and 3(15%) patients had the mild facial asymmetry and eleven (55%) patients had none of head tilt, 8(40%) patients had mild head tilt and 1 (5%) patients had moderate head tilt at final follow up. Another study done by Lim et al 42 neglected torticollis case where the mean preoperative cervico mandibular angle was 17.8^0 (range,$5.1^0 – 37.1^0$) which was postoperatively reduced to 6.58^0 (range$0.2^0 – 32.9^0$). In study by Bhuyan 2014, 7(63.5%) had none and 3(27.4%) had slight and 01(9.1%) had moderate facial asymmetry, which is almost similar to our study[14].Regarding post-operative complications 1(5%) patients had superficial wound Infection and 2(10%) patients had disfiguring scar. On the other hand, 18(90%) patients had none of disfiguring scar. Sternocleidomastoid Muscle contour (SMC) was lost in 1(5%) patients and contour was maintained in 19(95%) patients. No significant complication in our study which is almost similar to other study conducted by Lim[17] et al. 2014 and Patwardhan[16] et al.2011.

CONCLUSION

We found that CMT with bipolar release and sternal head lengthening achieved almost full range of cervical motion and good cosmetic outcome. It also restored the V shape configuration of the base of the neck which also ensures the cosmesis of the patient.

REFERENCES:

1. Sudesh, P., Bali, K., Mootha, A. K. &Dhillon, M. S., (2010).Results of bipolar release of congenital muscular torticollis in patients older than 10 years of age.*J Child Orthop*, *4*, 227-234.
2. Do, TT., (2006). Congenital muscular torticollis: current concepts and review of treatment. *Current Opinion in Pediatrics*, *18*(1), 26-29.
3. Lee, I. J, Lim, S. Y, Song, H. S, Park, M. C., (2010). Complete tight fibrous band release and resection in congenital muscular torticollis. *J PlastReconstrAesthetSurg*, *63*(6), 947-953.
4. Tang, S., Liu, Z., Quan, X., Qin, J., & Zhang, D., (1998). Sternocleidomastoid Pseudotumor of Infants and Congenital Muscular Torticollis: Fine-Structure Research. *Journal of Pediatric Orthopaedics*, *8*(2), 214-218.
5. Chung I. H., Park, B. M., Chang, S. C., (1968). Congenital Muscular Torticollis:Analysis of 17 Cases. *Yonsei Medical Journal*, *9* (2), 116-120.
6. Wolfort, F. G., Kanter, M. A., & Miller, L. B., (1989).Torticollis.*PlastReconstrSurg*, *84*, 682-692.
7. Shim, J. S. & Jang, H. P., (2008).Operative treatment of congenital torticollis.*J Bone & Joint surgery Br*, *90*, 934-939.

8. Ferkel, R. D., Westin, G. W., Dawson, E. G., & Oppenheim, W. L., (1983).Muscular torticollis.A modified surgical approach.*Journal of Bone & Joint Surgery Am*,*65*(7), 894-900.

9. Chen, C. E., &Ko, J. Y., (2000). Surgical treatment of muscular torticollis for patients above 6 years of age.*Arch Orthop Trauma Surg*,*120*,149–151.

10. Wirth, C. J., Hagena, F. W., Wuelker, N., & Siebert, W. E., (1992).Biterminaltenotomy for the treatment of congenital muscular torticollis: long term results. *J Bone & Joint surgery Am*, *74*(3), 427-434.

11. Seyhan, N., Jasharllari, L., Keskin, M., &Savac, N., (2012).Efiicacy of Bipolar release in neglected congenital muscular torticollis patients.*Musculoskeletal Surgery*, *96*(1), 55-57.

12. Sasaki, S,,Shionoya, A., Ishida, M., Gambello, M. J., Yingling, J., Wynshaw-Boris, A., Hirotsune, S., (2000). A LIS1/NUDEL/cytoplasmic dynein heavy chain complex in the developing and adult nervous system.*Neuron*, *28*(3), 681-696.

13. Swain, B., (2007). Endoscopic release of restricting bands in congenital muscular torticollis-a novel technique.*J PlastReconstrAesthetSurg*, *60*, 95-98.

14. Bhyuan, B. K., (2014). Outcome of the bipolar release of the sternocleidomastoid in neglected congenital muscular torticollis.*Medical Journal of Dr. D.Y. Patil University*, *7*, 584-588.

15. Kashani FO, Hasankhani EG, Sharifi R and Mazlumi M. Bmc Musculoskeletal Disorders 2008 9:158. https:// doi.org/10.1186/1471-2474-9-158.

16. Patwardhan S, Shyam AK, Sancheti P, Arora P, Nagda T and Naik. Adult presentation of congenital muscular torticolis: a series of 12 patients treated with a bipolar release of Sternocleidomastoid and Z –lengthening, J Bone Joint Surg Br.2011. https:// doi.org/10.1302/0301-620X.93B6.26232.

17. Lim KS, Shim JS, and Lee YS. 2014 Apr;472(4):1271-1278. Is Sternocleidomastoid Muscle Release Effective in Adults with Neglected Congenital Muscular Torticollis?Clinical Orthopaedics and Related Research.https://www.ncbi.nlm.nih.gov.

Original Article

Correlation between MRI and Arthroscopic Findings in ACL Injuries

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Abstract

ACL is the commonest ligament to be involved in knee joint injuries. Despite the superiority of diagnostic arthroscopy in ACL injuries, it has considerable complications and economic drawbacks. Thus, Magnetic Resonance Imaging (MRI) appears as a noninvasive alternative to this diagnostic modality. Therefore, this study aimed at evaluating the accuracy and usefulness of MRI in diagnosis of ACL tears using arthroscopy as gold standard. A cross sectional study between January 2017 and December 2018 was carried out at NITOR and BSMMU, including 80 patients by purposive sampling. Each case was evaluated clinically, with MRI and by arthroscopic methods; sensitivity, specificity, accuracy; PPV & NPV of MRI were measured. The mean age of patients was 25.9±7.72 years with a male: female ratio of 19:1. Principal cause of ACL tear was sports injury (42.5%) and 35 patients (43.75%) had associated medial meniscal injury. Positive MRI was found in 66 (82.5%) patients. Among them 63 were positive and 3 were found negative by arthroscopy. Conversely, negative MRI was found in 14 (17.5%) patients, 2 of them were positive and 12 were negative evaluated by arthroscopy. The sensitivity, specificity, accuracy, PPV and NPV of MRI in respect to arthroscopy were 96.92%, 80%, 93.75%, 95.45% and 85.71% respectively. The study concludes that MRI is a useful non-invasive modality having high diagnostic sensitivity and accuracy for ACL injury. Thus, it is a very reliable test for diagnosing internal derangements of the knee joint, especially when there is uncertainty about necessity for arthroscopy.

Keywords: ACL injury, MRI, arthroscopy

INTRODUCTION

Due to increased road traffic accidents and professional sports activities, knee joint is commonly injured joint now a days[1]. Complex ligamentous structure within the knee joint makes it susceptible to injury[2]. The anterior cruciate ligaments play a pivotal role in supporting normal biomechanics of knee joints.However, the anatomical location and course of the ACL block its visualization and thus restrain from adequate evaluation of ACL pathologies[3].

There are several options to assess the anterior cruciate ligament (ACL) injury, whereproper history and physical examination are the important steps[4]. Imaging and arthroscopy are two most common modalities. Of these, magnetic resonance imaging (MRI) is suitable for quick evaluation and assessment for treatment planning in acute knee injuries[5]. By contrast, diagnostic arthroscopy has a diagnostic accuracy of about 95%. But, itsinvasiveness leads the patient vulnerable to infection, hemarthrosis, as well as complications related to anesthesia, while MRI is a completely noninvasive method and there is no radiation hazard[6].

Furthermore, another noticeable drawback of arthroscopy is it cannot visualize the extra capsular ligaments. On the other hand, MRI is an appropriate tool for"composite diagnosis" (the overall assessment of the entire joint)[7]. However, identification of meniscal tears can be difficult to interpret and can be observer dependent as well as dependent upon the sensitivity of the scanner[8]. Moreover, MRI sometimes fail to differentiate between complete and partial tear of ACL. As a result, arthroscopy is considered

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as gold standard to assess intra articular lesions in knee joint[9].

Although magnetic resonance imaging (MRI) scans are often considered to give the ultimate diagnostic certainty, but when confronted with the reality, its efficacy varies largely[6].

The aim of this study is to determine the efficacy of MRI keeping arthroscopy as gold standard in detecting the anterior cruciate ligament injuries in our set up.

MATERIALS AND METHODS

This was a cross sectional study held at the National Institute of Traumatology and Orthopaedic Rehabilitation (NITOR), Dhaka and Bangabandhu Sheikh Mujib Medical University (BSMMU), Dhaka from January 2017 to December 2018. Nonrandomized purposive sampling was done according to the availability of patients, which included 80 patients with ACL injury. Patients with previous knee arthroscopy, surgery or knee fractures were excluded from the study.

Patients were diagnosed on the basis of presenting complaints and clinical examinations. After selection of the subject, verbal consent was taken. Thorough clinical examinations were performed according to the pre-designed study proforma. Informed consent was taken prior to arthroscopic evaluation and the modalities of treatment was under taken. All the findings were recorded according to the design study proforma. Post-operatively the patients were taken care by joint immobilization, antibiotic prophylaxis and a standard rehabilitation programme.

Statistical analyses were carried out by using the Statistical Package for Social Sciences version 23.0 for Windows (SPSS Inc., Chicago, Illinois, USA). The mean values were calculated for continuous variables. The quantitative observations were indicated by frequencies and percentages. The summarized data were presented in the form of tables and charts. Institutional approval was taken from the Institutional Review Board (IRB) of NITOR to conduct the study.

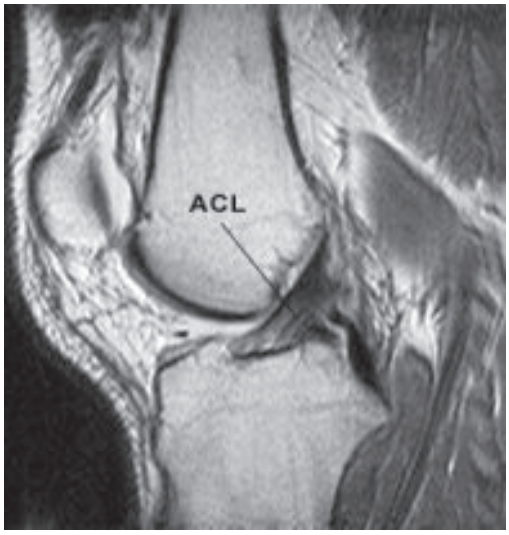


Fig.-1: *MRI of normal ACL*

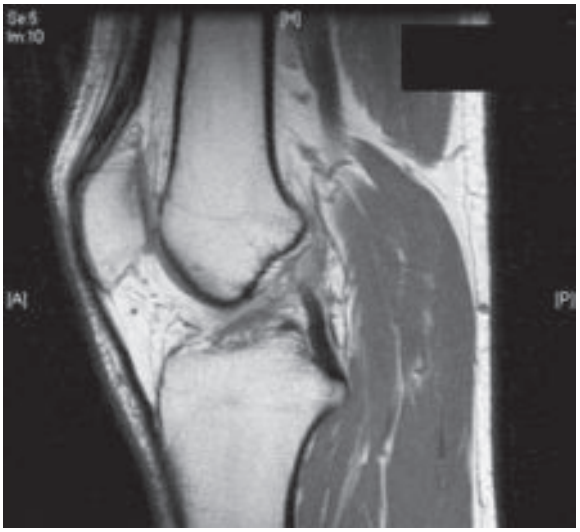


Figure 2: *MRI of torn ACL*

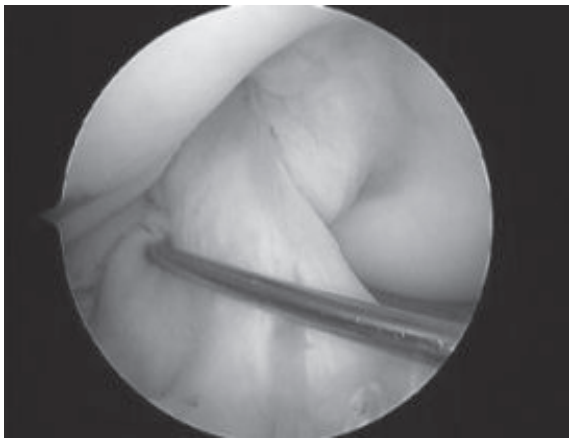


Fig.-3: *Arthroscopic view of normal ACL*

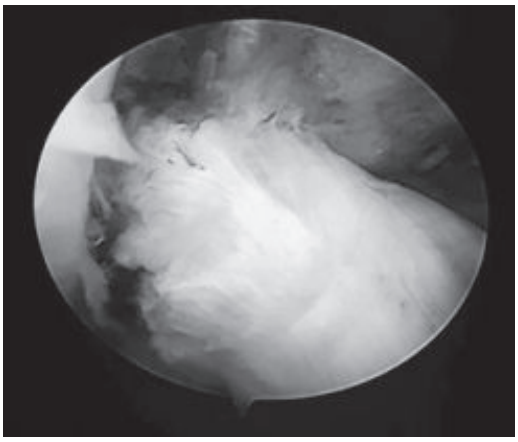


Fig.-4: *Arthroscopic view of torn ACL*

RESULTS

Age of the patients ranged from 16-45 years. Among them majority of subjects (57.50%) were from 16-25 years age group. The mean age were found 25.98±7.71 years. 76 (95%) of all patients were male and rest were female and the ratio was 19:1.

Clinically, 35 patients (43.75%) had an associated medial meniscal injury followed by 19 patients (23.75%), who had lateral meniscal injury (Table I). While, MRI of the cases showed that, 66 (82.5%) patients had anterior cruciate ligament injury, 38(47.5%)out of 80 patients had associated medial meniscus injury and 20 (25%) had additional lateral meniscus injury (Table II).

Inarthroscopic assessment, 65 (81.25%) patients were found with injured ACL and 15 (18.75%) had no ACL injury. Out of 65 arthroscopic positive cases, 13 (16.25%) cases had tibial attachment tear/avulsion, 17 (21.25%) cases had femoral attachment tear and 35 (43.75%) had mid-substance tear.

Table -I

Distribution of the cases by clinical diagnosis (n=80)

Clinical diagnosis	Frequency	Percentage
Anterior cruciate ligament injury	80	100.00%
Posterior cruciate ligament injury	1	1.25%
Medial collateral ligament injury	1	1.25%
Lateral collateral ligament injury	2	2.50%
Medial meniscus injury	35	43.75%
Lateral meniscus injury	19	23.75%

*Multiple entries

Table II

Distribution of the study by MRI diagnosis (n=80)

MRI diagnosis	Frequency	Percentage
Anterior cruciate ligament injury	66	82.50%
Posterior cruciate ligament injury	3	3.75%
Medial collateral ligament injury	3	3.75%
Lateral collateral ligament injury	2	2.50%
Medial meniscus injury	38	47.50%
Lateral meniscus injury	20	25.00%

*Multiple entries

Table III

Correlation between MRI and arthroscopy diagnosis evaluation for ACL injury

MRI	Arthroscopy		Total
	Positive	Negative	
Positive	63(True positive)	3(False positive)	66
Negative	2(False negative)	12(True negative)	14
Total	65	15	80

Positive MRI was found in 66 (82.5%) patients. Among them 63 were positive and 3 were negative evaluated by arthroscopy. Negative MRI was found in 14 (17.5%) patients. Among them 2 were positive and 12 were negative evaluated by arthroscopydiagnosis evaluation for anterior cruciate ligament injury (Table III). The sensitivity, specificity and accuracy of MRI with respect to arthroscopy were 96.92%, 80% and 93.75%, respectively (fair correlation with arthroscopy in diagnosing ACL tears). The PPV was 95.45% and the NPV of MRI was 85.71% (Table IV).

Table IV

Sensitivity, specificity, accuracy, positive and negative predictive value of MRI in diagnosing anterior cruciate ligament injury

Test of validity	Percentage
Sensitivity	96.92%
Specificity	80.00%
Accuracy	93.75%
Positive predictive value	95.45%
Negative predictive value	85.71%

DISCUSSION

In this study majority 46 (57.5%) patients belonged to age 16-25 years. Twenty two (27.5%) cases belonged to age group 26-35 years and 12 (15%) cases belonged to 36 to 45 years. The mean age were found 25.98±7.71 years among the 16 to 45 years group. Khandelwal, et al. (2018) observed maximum patients (47.14%) between 21 and 30 years(10), which was almost similar to the study done by Ishani, et al.[8]

Men suffered most of the knee injuries as that of the study by Khandelwal, et al.(10)because they tend to do more outdoor activities and sports. Moreover, in concordance with the study of Avcu et al.[11], our study had almost three fifth of patients with right sided ACL injury.

Among 80 cases, in 34 (42.5%) patients the cause of injury was sport injury, 34 (42.5%) was motor vehicle accident and 12 (15%) was fall from height. Similar observation was found in Ahmed, et al. (2017) where they showed 50.81% patients were road traffic accidents, 45.95% were sports injuries and 3.24% were miscellaneous injury[4].

According to inclusion criteria, all 80 (100.0%) patients have anterior cruciate ligament injury clinically. According to clinical diagnosis, associated other injuries includes, medial meniscus injury in 35 (43.75%) cases, lateral meniscus injury in 19 (23.75%) cases, lateral collateral ligament injury in 2(2.5%) cases, medial collateral ligament injury in 1(1.25%) case and posterior cruciate ligament injury in 1(1.25%) case.Jah, et al. (2005) diagnosed clinically 21 anterior cruciate ligament injuries, 9 posterior cruciate ligament injuries, 24 medial meniscal injuries and 13 lateral meniscal injuries in 56 patients[12].

This study showed that, out of 80 clinically diagnosed ACL injuries, 66 (82.5%) patients found ACL injury on MRI. Other injuries found on MRI includes 38(47.5%) medial meniscus injury, 20 (25%) lateral meniscus injury, 3(3.75%) medial collateral ligament injury, 3 (3.75%) posterior cruciate ligament injury and 2 (2.5%) lateral collateral ligament injury. Gupta et al. (2014) found out of 40 patients, 23 (57.5%) were anterior cruciate ligament tears, 20 (50.0%) medial meniscus tears, 16 (40.0%) medial collateral ligament injury and 16 (40%) patients lateral meniscus tears on MRI[13]. Rayan, et al. (2009) observed that out of 26 cases where ACL was found damaged on MRI scan, 22 cases had arthroscopic evidence of ACL injury (84.6%). These results are quite similar to the present study[14].

In this study, it was observed that in arthroscopic procedure, 65 (81.25%) patients were found injured ACL and 15 (18.75%) had no ACL injury. Gupta, et al. (2014) showed all the patients underwent arthroscopy where MM tear 21(52.5%), LM tear 18(45%), ACL tear 23(57.5%) and PCL tear 14(35%) cases(13). Jah, et al. (2005) showed 20 anterior cruciate ligament injuries through arthroscopy, 9 posterior cruciate ligament injuries, 26 medial meniscal and 16 lateral meniscal injuries[12].

Regarding location of ACL injury revealed by arthroscopy, the study showed that, 13 (16.25%) cases had tibial attachment tear/avulsion, 17 (21.25%) cases had femoral attachment tear and 35 (43.75%) had mid-substance tear in arthroscopic positive cases.

Positive MRI for ACL injury was found in 66 (82.5%) patients. Among them 63 were positive and 3 were negative evaluated by arthroscopy. Negative MRI was found in 14 (17.5%) patients. Among them 2 were positive and 12 were negative evaluated by arthroscopydiagnosis evaluation for anterior cruciate ligament injury which was nearly similar to that of Khandelwal, et al. study(10). Rayan, et al. (2009) observed that out of 64 cases there were 45(70.3%) cases where both MRI and arthroscopy were positive. Arthroscopy was positive 49 cases (76.5%)(14). From a total of 79 cases where MRI scan showed torn medial meniscus, 45 cases confirmed with positive arthroscopic evidence (56.9%).

The sensitivity, specificity and accuracy of MRI with respect to arthroscopy were 96.92%, 80% and 93.75%, respectively (fair correlation with arthroscopy in diagnosing ACL tears). The PPV was 95.45% and the NPV of MRI was 85.71%. Khandelwal, et al. (2018) observed that the sensitivity, specificity and accuracy of MRI in reference to arthroscopy for ACL tear were 97.46%, 90.38% and 95.71% respectively. Khan, et al. (2015)concluded that MRI had 100% sensitivity and NPV of 70% in diagnosing ACL tears[15]. In the series of Gupta, et al. (2013), theyfound that MRI had a sensitivity of 74.42%, specificity of 93.10%, accuracy of 84.21%, and a negative predictive value of 88.04%[13]. Khalil, et al. (2015) found that in comparison to knee arthroscopy, magnetic resonance imaging revealed an overall of 93.9% sensitivity and 66.6% specificity[4]. Murmu, et al. (2017)also found that the sensitivity of MRI for diagnosis of ACL was 87.5%, specificity was 66.67%, positive predictive value -87.5%, negative predictive value -66.6% and accuracy of 81.82%[16].

Lastly, from the present study, it can be suggested that, MRI is a reliable diagnostic tool with a higher sensitivity, accuracy and positive predictive value. Furthermore, it has a higher specificity and negative predictive value which indicate that MRI also have a better ability to exclude negative cases.

CONCLUSION

This study concludes that MRI is a useful non-invasive modality having high diagnostic sensitivity and accuracy for ACL injury. Thus, it is a reliable screening test for diagnosing ligamentous injuries of the knee joint. It also helps avoiding invasive diagnostic procedures having higher sensitivity and specificity. Moreover, it is superior to arthroscopic procedures for extra articular knee pathologies and limiting arthroscopy-related complications.

Hence performing an MRI prior to arthroscopy is worthy in overall evaluation of derangements of the knee joint.

REFERENCES

1. Kulkarni OP, Pundkar GN, Sonar SB. A comparative study of MRI versus arthroscopic findings in ACL and meniscal injuries of the knee. 2018;4(2):198–202.
2. Bone J, Surg J. Ligamentous restraints to anterior-posterior drawer in the human knee . A biomechanical study. 1980;62(April).
3. Hung W, Ng A, Francis J, Hiu E, Hun Y, Paunipagar B, et al. Imaging of the anterior cruciate ligament. 2011;2(8):75–84.
4. Ahmed A, Razzaque MA, Kaleem M, Zaman AU, Akram R. Diagnostic accuracy of magnetic resonance imaging in detecting anterior cruciate ligament injuries. 2017;26(3):218–23.
5. Sandhu P. Clinico-radiological correlation in the diagnosis of ligament and meniscus injuries at knee joint/ : A prospective study. 2013;13(1):22–6.
6. Correlation A, Cruciate A, Injuries L. MRI and Arthroscopic Correlation in Anterior Cruciate Ligament Injuries of Knee. 2017;05(05):22013–25.
7. Kostov H, Stojmenski S, Kostova E. Reliability Assessment of Arthroscopic Findings Versus MRI in ACL Injuries of the Knee. 2014;22(2):111–4.
8. Ishani P, Vijay C, Supreeth N, Ravishankar R. Clinical , Magnetic Resonance Imaging , and Arthroscopic Correlation in Anterior Cruciate Ligament and Meniscal Injuries of the Knee. J Orthop Trauma Rehabil [Internet]. 2018;24(October 2017):52–6.
9. Muhle C, Ahn JM, Dieke C. Diagnosis of ACL and meniscal injuries/ : MR imaging of knee flexion versus extension compared to arthroscopy. 2013;1–10.
10. Khandelwal K, Chaturvedi VC, Mishra V, Khandelwal G. The Egyptian Journal of Radiology and Nuclear Medicine Diagnostic accuracy of MRI knee in reference to arthroscopy in meniscal and anterior cruciate ligament injuries. Egypt J Radiol Nucl Med [Internet]. 2018;49(1):138–45.
11. Avcu S, Altun E, Akpinar I, Bulut MD, Eresov K, Biren T. Knee joint examinations by magnetic resonance imaging/ : The correlation of pathology , age , and sex. 2010;2(4):11–4.
12. Accuracy of MRI in comparison with clinical and arthroscopic findings in ligamentous and meniscal injuries of the knee. 2005;71:189–96.
13. Mk G, Rk R, Nk K, Pl S, Dhungel K, Ahmad K. MRI Evaluation of Knee Injury with Arthroscopic Correlation. 2014;12(1):63–7.
14. Rayan F, Bhonsle S, Shukla DD. Clinical , MRI , and arthroscopic correlation in meniscal and anterior cruciate ligament injuries. 2009;129–32.
15. Khan HA, Ahad H, Sharma P, Bajaj P, Hassan N. Correlation Between Magnetic Resonance Imaging and Arthroscopic Findings in the Knee Joint. 2015;20(1):1–4.
16. Murmu C, Tiwari PK, Sircar S, Agrawal VK. Accuracy of magnetic resonance imaging in diagnosis of knee injuries. 2017;3(1):85–8.

Original Article

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

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Abstract

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

Key words: Total knee, Replacement, Advanced OA.

INTRODUCTION

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

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

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

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

MATERIALS AND METHODS

- **Study design**: Prospective interventional study.
- **Place of study:** This study was carried out in the Department of Orthopaedic Surgery at Bangabandhu Sheik Mujib Medical University (BSMMU), Dhaka.
- **Study period: F**rom January 2014 to December 2015.
- **Study population:** Patients with advance osteoarthritis of knee joint diagnosed on the basis of presenting complains, clinical examination and investigations who was admitted in the above mentioned hospital during the study period was selected for the study population.
- **Ethical issue:** This protocol was primarily selected by the academic committee of the department of orthopaedics, BSMMU and approved by IRB (Institutional review board), BSMMU.
- **Sample Size:**
  A total number of 20 patients with advance osteoarthritis of knee were included in this study due to time and financial constraints as well as unavailability of the patients (according to inclusion and exclusion criteria).

Inclusion criteria:

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

Exclusion criteria:

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

DISCUSSION

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

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

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

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

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

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

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

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

CONCLUSION

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

REFERENCES

1. Bhan, S, Malhotra, R & Ahmed, A 2002, 'Results of total knee arthroplasty with different prosthesis designs', *Indian J Orthop*, vol. 36, pp. 4.
2. Bisschop, R, Reinoud W. Brouwer, Jos, JAM & Raay, V December 2010, 'Total Knee Arthroplasty in Younger Patients: A 13-year Follow-up Study', *Clin Orthop Relat Res*, Vol. 33, PP. 12-18.
3. Callahan, CM, Drake, BG & Heck, DA 1995, 'Patient outcome following unicompartmental or bicompartmental knee arthroplasty: a meta analysis', *J Arthroplasty,* vol. 10, pp. 141-8.
4. Debette, C 2014, *Orthopaedics & Traumatology: Surgery & Research* 100 (2014), pp. 531–534.
5. Fitch, DA 2014 oct, 'a meta analysis to determine clinical outcomes for a medial pivot total knee replacement', *bone joint re*, vol. 3, no.10, pp. 297-304.
6. Merle-Vincent, F, Couris, CM & Schott, AM, 2010, 'Cross-sectional study of pain and disability at knee replacement surgery for osteoarthritis in 299 patients', *Joint Bone Spine*, vol. 74, pp. 612–6.
7. Mizner, RL, Petterson, SC & Snyder-Mackler, L 2010, 'Measuring Functional Improvement After Total Knee Arthroplasty Requires Both Performance- Based and Patient-Report Assessments', *J Orthop Sports Phys Ther*, vol. 01, pp. 01-5.
8. Núñez, M, Lozano, L & Núñez, E, 2009, 'Total knee replacement and health-related quality of life: factors influencing long-term outcomes', *Arthritis Rheum*, vol. 61, pp. 1062–9.
9. Rand, J & IIstrup, DM 1991, 'Surviorship analysis of total knee arthoplasty', *JBJS*, vol. 73-A, pp. 397.
10. Reddy, PK, Prakashappa, TH, Chandrashekar, HS & Reddy, MR 2015, ' A Prospective study of functional outcome after posterior cruciate retained total knee', *International Journal of Scientific and Research Publications*, Vol. 5, pp. 2250-3153.
11. Richard, DS 2006, 'Total knee arthroplasty', *J Arthroplasty*, vol. 21, no. 2, pp. 167-71.
12. Thambiah, MD, Sahaya, N, Branden, ZX, Shen, L & Krishna, L 2015, 'Patient satisfaction after total knee arthroplasty: an Asian perspective', *Singapore Med J*, vol. 56, no. 5, pp. 259–263.
13. Yuan, A, Cai, D & Wang, K 2007, 'Analysis of factors relating to clinical outcomes after total knee replacement', *Zhongguo Xiu Fu Chong Jian Wai Ke Za Zhi*, vol. 21, pp. 235–9.

Original Article

A comparative study between arthroscopic assisted reconstruction of ACL by BPTB technique and quadruple semi tendinosus graft

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Abstract

Rupture of ACL is a common sports injury, which often markedly reduces athletic activity and the quality of life. Bone Patellar Tendon Bone (BPTB) and Quadruple semitendinosus (QST) grafts are the two most commonly used graft for reconstruction. To compare the outcome following arthroscopically assisted ACL reconstruction by bone patellar tendon bone (BPTB) graft and quadruple semitendinosus tendon (QST) graft. This prospective interventional study was conducted in the Department of Orthopedic, BSMMU, Dhaka from January 2011 to December 2012. Twenty male patients with chronic ACL injury, aged between 20 to 30 years were selected for the study. Each group consists of 10 patients and they were selected according to their wish after proper counseling regarding advantages and disadvantages of the methods. All patients were operated in similar surgical set up, rehabilitated by similar rehabilitation protocol and followed for six months. Post operative thigh atrophy (22.6 mm) was almost similar to the mean pre-operative thigh atrophy (22.5 mm) in BPTB group and in QST group the mean post-operative thigh atrophy (22.2 mm) was higher than the mean pre-operative thigh atrophy (20.6 mm). Loss of sensation (focal) was found in 30% cases in QST group but in BPTB group that was only 10%. Irritation at the site was present in 20% cases of QST group. Kneeling pain was predominant in BPTB group. Osteoarthritic changes of knee develop in 40% patients of BPTB and a bit higher 70% in QST group. 10% tunnel widening was seen in BPTB group but 50% patient developed tunnel widening in QST group. Both group had significant improvement of Lysholm score after operation. Both BPTB and QST grafts provided good subjective and objective stability. Statistically no significant differences were noted in terms of final outcome between study groups.

Keywords: Anterior cruciate ligament (ACL), Bone patellar tendon bone graft (BPTB), Quadruple semi tendinosus graft (QST).

INTRODUCTION

The anterior cruciate ligament (ACL) is the primary structure to prevent anterior tibial displacement.[1] The bony structure of the knee joint is inherently unstable.[2] The ligaments along with menisci of the knee function maintain the kinematics of the knee joint throughout the range of motion.[3] Rupture of the anterior cruciate ligament (ACL) is a common injury. The management of such injuries has been much debated and surgical reconstruction with an autograft is a popular option.

The ACL is the primary stabilizer against anterior translation of the tibia on the femur and is important in counteracting rotation and valgus stress. ACL deficiency leads to knee instability.[4] This results in recurrent injuries and increased risk of intra- articular damage, especially the meniscus.[5,6] The goals of ACL reconstruction are to

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restore stability to the knee; allow the patient to return to normal activities, including sports; and to delay the onset of osteoarthritis with associated recurrent injuries to the articular cartilage and loss of meniscal functions.[7-9] During the past decade arthroscopically assisted techniques have been an accepted method of reconstructing the ACL.[9-11]

Bone–patellar tendon–bone (BPTB) autograft is called the gold standard for ACL reconstruction (ACLR) because of its low level of laxity, high durability, and appropriate size.[12,13] But there is a little difference between BPTB graft and QST grafts in terms of functional outcome after ACL reconstruction, despite greater laxity measurements in the hamstring tendon group patients.[11]

The purpose of this study was to perform a comparison between BPTB autografts and QST allografts for ACLR with regard to patient satisfaction, graft rupture rate, return to preinjury activity level, and postoperative functional outcomes.

METHOD:

This prospective interventional study was carried out in the Department of Orthopedics, Bangabandhu Sheikh Mujib Medical University, Dhaka over a period of 2 years from January 2011 to December 2012. Twenty male patients with chronic ACL injury, aged between 20 to 30 years were selected for the study. Patients who were previously operated for ACL insufficiency, osteoarthritis of knee and ACL injury associated with intra articular fracture of knee were excluded from this study. Patients were divided into two groups. Each group consists of 10 patients and they were selected according to their wish after proper counseling regarding advantages and disadvantages of the methods (BPTB group and QST group). ACL reconstruction were performed by quadruple semitendinosus graft using endo-button and tibial AO fixation post for group QST and bone patellar tendon bone graft was fixed with interference screw for group BPTB. All patients were operated in similar surgical set up, rehabilitated by similar rehabilitation protocol and followed for six months. Data were collected by using a pre designed structured data collection form containing the variables of interest. All collected data were processed and analyzed using computer aided statistical package (SPSS 12.0). Initially data were explored for normality and descriptive statistics were generated. Quantitative Baseline parameters were compared with Mann Whitney U test. Association was sought in categorical parameters through chi-square test. Paired comparison of pre and Post- operative assessment was done with non parametric Wilcoxon test. All the level of significance were considered at p value <0.05.

RESULTS:

Table-I

Demographic profile of both groups (n=20)

Variable	BPTB (n=10) Mean±SD	QST (n=10) Mean±SD	p-value
Age (years)	23.6±2.1	24.5±2.4	0.939 ns
Duration of symptoms (months)	14.5±5.3	12.4±5.5	0.344 ns

Mean age of the patients of BPTB group was 23.6 ±2.1 years and QST group was 24.5±2.4 years. Mean duration of symptoms were 14.5 ±5.3 months and 12.4 ±5.5 months of BPTB and QST group respectively. Statistically no differences were found regarding age and duration of symptoms between two methods.

Table -II

Subjective symptoms comparison (Post operative) (n=20)

Variable	BPTB (n=10) n (%)	QST (n=10) n (%)	p-value
Pain	4 (40.0)	3 (30.0)	0.418 ns
Swelling	6 (60.0)	4 (40.0)	0.637 ns
Stiffness	4 (40.0)	6 (60.0)	0.496 ns

The patients of both BPTB and QST group had post-operative pain, swelling and stiffness but no statistically significant differences were noted between the groups. (p>0.05)

Table - III

Donner site symptoms comparison (n=20)

Variable	BPTB (n=10)	QST (n=10)	p value
Tenderness	4(40.0%)	2(20.0%)	0.314 ns
Irritation	6(60.0%)	6(60.0%)	0.675 ns
Numbness	2(20.0%)	5(50.0%)	0.174 ns

In both groups donor site symptoms were present at rest but no statistically significant differences were noted regarding tenderness, Irritation and numbness (p> 0.05).

Table -IV

Status of thigh atrophy of both groups (n=20)

Group	Thigh atrophy		p value
	Pre operative	Post operative	
BPTB	22.5±4.9	22.6±6.3	1.000
QST	20.6±4.3	22.2±3.9	0.259
p value		0.866	

There was no significant change in post-operative thigh atrophy comparing to pre-operative thigh atrophy in both groups. The difference in post-operative thigh atrophy between two groups was not statistically significant (p >0.05).

Table V

Difference of radiological changes of both groups (Post operative)(n=20)

	BPTB (n=10)	QST (n=10)	p value
Joint space reduction	1(10.0%)	3(30.0%)	0.291 ns
Osteoarthritic change	4(40.0%)	7(70.0%)	0.184ns
Tunnel widening	1(10.0%)	5(50.0%)	0.071 ns

In both the study groups joint space reduction, osteoarthritic and tunnel widening changes were statistically insignificant (p>0.05).

Table VI

Comparison between pre and post operative Lysholm score and post operative Lysholm score of both groups (n=20)

Group	Lysholm Scale		p value
	Pre operative	Post operative	
BPTB	67.4±2.2	87.4±2.9	0.005
QST	66.8±1.4	88.0±3.3	0.005
p value		0.670	

In both groups, post operative Lysholm scores were significantly higher than the pre-operative Lysholm score. But no significant difference was noted in post-operative score between two groups (p>0.05).

Table VII

Distribution of the study patients according to complication (n=20)

Complication	BPTB (n=10) n (%)	QST (n=10) n (%)	p-value
Complication	4 (40.0)	5 (50.0)	0.500ns
Kneeling pain	3 (30.0)	0 (0.0)	
Loss of sensation (Focal)	1 (10.0)	3 30.0)	
Irritation at the site	0 (0.0)	2 (20.0)	

ns=not significant

Kneeling pain was found 3(30.0%) in BPTB group. Loss of sensation (focal) was found 1(10.0%) in BPTB and 1(10.0%) in QST. Irritation at the site was 2(20.0%) in QST but not found in BPTB group. The difference was not statistically significant (p>0.05) between two groups.

Table - VIII

Final outcome (Tegner-Lysholm score) Comparison (n=20)

Final Outcome (Score)	BPTB (n=10)	QST (n=10)	P value
Excellent (>90)	2 (20.0%)	2 (20.0%)	0.586 ns
Good (84-90)	8 (80.0%)	7 (70.0%)	
Fair (65-83)	0 (0.0%)	1 (10.0%)	

BPTB groups showed 20.0% excellent, 80.0% good outcome and QST group 20.0% patients had excellent, 70.0% had good and 10.0% had fair out come on the basis of Tegner-Lysholm scoring scale. The difference was not statistically significant (p>0.05) between two groups.

DISCUSSION

In the present study mean age of the patients of BPTB group was 23.6 ±2.1 years and QST group was 24.5 ± 2.4 years. Mean age was 25.7 ± 3.9 years in the study of Eriksson et al.[14] which is consistent with present study.

Mean duration of symptoms was 14.5 ±5.3 months and 12.4±5.5 months in BPTB and QST group respectively. The study of Boonriong & Kietsiriroje[15] showed the duration between injury and operation was significantly shorter in hamstring group. This study also showed the duration of suffering is less in quadruple hamstring group.

Regarding subjective symptom of pain (40%) and swelling (60%) is more common in BPTB group but quadruple semitendinosus group was more affected by stiffness (60%). BPTB had almost similar (40%) in intensity in stiffness and no patient of any group had suffered from giving way during their daily activity. Study of Pinczewski et al.[16] revels insignificant difference between the two groups for any time period and our study also shows insignificant differences between study groups ($p>0.05$).

Donor site symptoms at rest were present in both groups, among them tenderness had very small dissimilarity and irritation had no dissimilarity but numbness was higher (50%) in hamstring group which is not significant difference ($p>0.05$). Symptoms at graft site were significantly more in BPTB group ($p=0.01$) which was the observation of Roe et al.[17]. Injury after 7 years was inconsistent with present study.

After six months mean post operative thigh atrophy (22.6 mm) was almost similar to the mean pre-operative thigh atrophy (22.5 mm) in BPTB group and in QST group the mean post-operative thigh atrophy (22.2 mm) was higher than the mean pre-operative thigh atrophy (20.6 mm). So, none of the operation showed to achieve significant improvement of thigh atrophy within six months. Observation of Pinczewski et al. [16] demonstrate 81% of BPTB and 75% of hamstring group having thigh atrophy below 10 mm after 2 years and after 5 years these figure were 65% of BPTB and 64% of hamstring group that indicates with the passes of time thigh atrophy improves. Shaieb et al.[18] observed 78% of BPTB and 81% of hamstring group having thigh atrophy below 10 mm and remaining 22% of BPTB and 19% of hamstring group having thigh atrophy between 10 mm to 20 mm and no significant difference were noted between the groups after two years. Present study also showed insignificant difference of post-operative thigh atrophy of both groups.

Radiological changes demonstrate joint space reduction was 10% patients in BPTB and 30% patients in quadruple semitendinosusgroup of this study. Roe et al.[17]observed abnormal radiological findings in 45% patients of BPTB and 14% of hamstring tendon group which are dissimilar with this study. Osteoarthritic changes present in 40% patients of BPTB and a bit higher 70% in hamstring group. Pinczewski et al. [16] observed early osteoarthritic change in 2 (4%) patients of the hamstring tendon group and 11 (18%) patients of BPTB group which was inconsistent with this study. 50% patient of quadruple semitendinosus group developed tunnel widening but was insignificant ($p=0.701$) but 10% cases tunnel widening was seen in BPTB group. Feller & Webster[11] also published similar observation that the radiological evidence of tunnel widening was also greater in hamstring tendon group.

BPTB group showed that mean post-operative Lysholm score was 87.5 which is higher than the mean pre-operative Lysholm score 67.5 in QST group and mean post operative Lysholm score was 88.0 which was also higher than the mean pre-operative Lysholm score 66.8. So, this study revealed significant improvement of Lysholm score post operatively ($p= 0.005$) in both group but post-operative difference between two groups was insignificant ($p=0.670$). Significant difference was observed by Boonriong & Kietsiriroje[15] between each group pre and post operatively but Post- operative comparison had insignificant difference. A five year comparative study of Pinczewski et al. [16] demonstrated similar observation between two groups at any time period.

Loss of sensation (focal) was found 30.0% in QST group which was only 10% in BPTB group. Irritation at tibial AO fixation site was present in 20% cases of QST group. Jansson et al.[19] published in their paper that nearly all patients experienced numbness lateral to the tibial incision scar. In hamstring tendon group tibial AO fixation post was removed 2 years after operation in 32 cases out of 46 patients, who had discomfort at the fixation site. In the present study kneeling pain was higher (30.0%) in BPTB group without significant difference.

Feller & Webster[11] also observed pain in kneeling was greater in BPTB group. Biau et al.[20] shown the patients of QST group reported fewer anterior knee symptoms than BPTB group. 50% patients of QST group had at least one complication but no complication was found in 60.0% of patient of BPTB group of present study at six months.

BPTB groups had 20% excellent and 80% good outcome and poor result was absent. In QST group 20% patients had excellent, 70% had good and 10% had fair outcome but no patient showed poor result. The difference was not statistically significant ($p>0.05$).

CONCLUSION

Observation of this study showed insignificant differences regarding subjective symptoms, knee stability, radiological changes, patient satisfaction and knee function. Both the operation showed significant improvement of post operative Lysholm score with insignificant difference of final outcome between study groups.

REFERENCES:

1. Miller III, RH &A zar, FM 2008. Knee injuries. In: Canale ST., Daugherty K. & Jones L. eds. *Campbell's Operative Orthopedics,* 11th ed. St. Louis: Mosby Year Book, pp. 2396 - 2575.

2. Solomon L. 2001. Warwick DJ & Nayagum S *Apley's System of Orthopaedics and Fractures*: "*Injuries of the knee and Leg"*. 8th ed. London: Arnold.

3. Arnoczky SP Bullough PG. 2001. Healing of Knee ligaments and meniscus. In: Insall JN, & Scott WN, eds. *Surgery of the Knee*. 3rded. New York: Churchill Livingstone, p. 457.

4. Levy IM, Torzilli PA, Warren RF. The effect of medial meniscectomy on anterior-posterior motion of the knee. JBJS. 1982 Jul 1;64(6):883-8.

5. Jomha NM, Pinczewski LA, Clingeleffer A, Otto DD. Arthroscopic reconstruction of the anterior cruciate ligament with patellar-tendon autograft and interference screw fixation: the results at seven years. The Journal of bone and joint surgery. British volume. 1999 Sep;81(5):775-9.

6. Barrack RL, Bruckner JD, Kneisl J, Inman WS, Alexander AH. The outcome of nonoperatively treated complete tears of the anterior cruciate ligament in active young adults. Clinical orthopaedics and related research. 1990 Oct(259):192-9.

7. Dye SF, Wojtys EM, Fu FH, Fithian DC, Gillquist J. Factors contributing to function of the knee joint after injury or reconstruction of the anterior cruciate ligament. Instructional Course Lecture - American Academy of Orthopaedic Surgery. 1999;48:185-98.

8. Jorgensen UF, Sonne-Holm ST, Lauridsen FL, Rosenklint AR. Long-term follow-up of meniscectomy in athletes. A prospective longitudinal study. The Journal of bone and joint surgery. British volume. 1987 Jan;69(1):80-3.

9. Rangger C, Klestil T, Gloetzer W, Kemmler G, Benedetto KP. Osteoarthritis after arthroscopic partial meniscectomy. The American journal of sports medicine. 1995 Mar;23(2):240-4.

10. Sajovic M, Vengust V, Komadina R, Tavcar R, Skaza K. A prospective, randomized comparison of semitendinosus and gracilis tendon versus patellar tendon autografts for anterior cruciate ligament reconstruction: five-year follow-up. The American journal of sports medicine. 2006 Dec;34(12):1933-40.

11. Feller JA, Webster KE. A randomized comparison of patellar tendon and hamstring tendon anterior cruciate ligament reconstruction. The American journal of sports medicine. 2003 Jul;31(4):564-73.

12. Carmichael JR, Cross MJ. Why bone-patella tendon-bone grafts should still be considered the gold standard for anterior cruciate reconstruction. British journal of sports medicine. 2009;43(5):323-325

13. Chang SK, Egami DK, Shaieb MD, Kan DM, Richardson AB. Anterior cruciate ligament reconstruction: allograft versus autograft. Arthroscopy: The journal of Arthroscopic & Related Surgery. 2003 May 1;19(5):453-62.

14. Eriksson K, Anderberg P, Hamberg P, Löfgren AC, Bredenberg M, Westman I, Wredmark T. A comparison of quadruple semitendinosus and patellar tendon grafts in reconstruction of the anterior cruciate ligament. The Journal of bone and joint surgery. British volume. 2001 Apr;83(3):348-54.

15. Boonriong T, Kietsiriroje N. Arthroscopically assisted anterior cruciate ligament reconstruction: comparison of bone-patellar tendon-bone versus hamstring tendon autograft. *Journal of Medical association. Thai*. 2004 Sep 1;87(9):1100-7.

16. Pinczewski LA, Deehan DJ, Salmon LJ, Russell VJ, Clingeleffer A. A five-year comparison of patellar tendon versus four-strand hamstring tendon autograft for arthroscopic reconstruction of the anterior cruciate ligament. The American journal of sports medicine. 2002 Jul;30(4):523-36.

17. Roe J, Pinczewski LA, Russell VJ, Salmon LJ, Kawamata T, Chew M. A 7-year follow-up of patellar tendon and hamstring tendon grafts for arthroscopic anterior cruciate ligament reconstruction: differences and similarities. The American journal of sports medicine. 2005 Sep;33(9):1337-45.

18. Shaieb MD, Kan DM, Chang SK, Marumoto JM, Richardson AB. A prospective randomized comparison of patellar tendon versus semitendinosus and gracilis tendon autografts for anterior cruciate ligament reconstruction. The American journal of sports medicine. 2002 Mar;30(2):214-20.

19. Jansson KA, Linko E, Sandelin J, Harilainen A. A prospective randomized study of patellar versus hamstring tendon autografts for anterior cruciate ligament reconstruction. The American journal of sports medicine. 2003 Jan;31(1):12-8.

20. Biau DJ, Tournoux C, Katsahian S, Schranz PJ, Nizard RS. Bone-patellar tendon-bone autografts versus hamstring autografts for reconstruction of anterior cruciate ligament: meta-analysis. Bmj. 2006 Apr 27;332(7548):995-1001.

Original Article

The Evaluation of Results of Anterior Cervical Discectomy with Fusion and Stabilization in Cervical Disc Prolapse

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Abstract:

The cervical disc prolapse is the common neck disorder. The cervical disc prolapse is a very small, usually no longer then a Pea. However this small protruding tissue causes enormous pressure more commonly on the nerve root or on the spinal cord producing rediculopathy or myelopathy respectively. Purpose of the study to the evaluation of the results of anterior cervical discectomy with fusion and stabilization in cervical disc prolapse. This is a prospective study carried out on 30 patients with cervical disc prolapse with rediculopathy or mylopathy from July 2012 to June 2013 in the spine unit, department of Orthopaedic surgery, Bangabandhu Sheikh Mujib Medical University & private hospital in Dhaka. All the patient had adequate conservative treatment out side the hospital unless there was no progressive neurological deficit. Result was evaluated by modified Macnab criteria. Among the 30 cases, 24 cases (80%) were male and 6 cases (20%) female. The age range was from 31-55 years. Affected cases were equal between manual and sedentary worker. Most common level of disc prolapse were $C_{5/6}$, 20 level (44.44%). 15 cases (50%) presented with single level and also 15 cases (50%) presented with multiple level of disc prolapse. Among the 30 patients, 24 cases (80%) were presented by rediculopathy and other 6 cases were presented by myelopathy and myelorediculopathy in equal number (3 cases) respectively. We performed anterior discectomy and fusion by tricortical bone graft followed by stabilization by plate and screws in all cases. Fewer complication were occurred among the patients, per operative haemorrhage occurred in 3 cases (10%), temporary dysphagia in 9 cases (30%) and disc space infection in 1 case (3.33%). Preoperatively patients mean neck pain was 7.93 ± 1.0 and redicular pain was 7.16 ± 1.0. After 3 months of operation mean neck pain was reduced to 1.97 ± 0.5 and redicular pain was to 1.47 ± 0.5 and 6 months of operation mean neck pain was reduced to 1.77 ± 0.5 and redicular pain was to 1.39 ± 0.5. Regarding the modified Macnab criteria of the study patient, we obtained satisfactory outcome (excellent and good) were 27 cases (90%) and unsatisfactory (fair & poor) result in 3 cases (10%). The results of the study demonstrates that operative treatment of cervical disc prolapse by anterior cervical discectomy and fusion by tricortical bone graft followed by stabilization with plate & screw is an effective procedure.

Key words: Anterior cervical discectomy, Fusion, cervical disc prolapse

INTRODUCTION:

The common orthopaedic cause of neck disorder is degeneration of cervical intervertebral disc. This may lead to protrusion of a part of disc content (cervical disc prolapse) or more often it may give rise to secondary osteoarthritic changes in the intervertebral joints (cervical spondylosis). As the degenerative cascade progresses, it has an irritative and compressive effects on the neural elements producing features of either discogenic neck pain, radiculopathy or myelopathy.

In addition dynamic cord compression as well as compromised vascular supply of the spinal cord contribute

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to worsening of symptoms of myelopathy[1]. With age as degeneration progresses, the peripheral part of the disc becomes weak and there occurs tearing of its circumferential and radial fibers allowing herniation of nucleous pulposus, the soft central part of disc[2]. The cervical disc herniation is very small, usually no larger than a pea. However this small protruding tissue causes enormous pressure more commonly on the nerve root or on the spinal cord producing rediculopathy or myelopathy respectively. Rediculopathy, myelopathy or myeloradiculopathy due to cervical disc herniation create great suffering to the patients, there families and also for society[3].

With the developing of imaging technique like Magnetic resonance imaging (MRI) lead to the accurate diagnosis of disc prolapse and its compressive effects on the nerve root and spinal cord. Successive development of medical technology has allowed better understanding of pathophysiology of disc degeneration and the most common level for the development of disc herniation. The most frequent involved levels are the more mobile segments $C_{5/6, 6/7}$ and $C_{4/5}$ [4]. So Indication for surgery in cervical rediculopathy include failure trial of non-operative treatment to relieve redicular arm pain and progressive neurological deficit. Patient with progressive neurological deficit and patient with myelopathy require operative treatment as soon as possible[5]. Unlike as in rediculopathy, natural history of cervical spondylotic myelopathy is of a gradual progressive loss of spinal cord function and role of non operative treatment is very limited[6].

Intervertebral disc removal with anterior interbody fusion is a accepted surgical treatment for degenerated and protruded disc of cervical spine[7]. During the last three decades the anterior approach to the cervical spine has been increasingly preferred in the operative treatment of herniated cervical disc. This approach is less traumatic than that of the posterior technique described by Scoville et al.[14] Among the commonly used technique for anterior cervical spine fusion Smith- Robinson configuration is the strongest in compressive loading as the graft could all bear load of 2.5 to 5 times the body weight. The strongest configuration of the Smith-Robinson arthodesis is the result of leaving intact cortical shell of the vertebral body. Even this technique is associated with variety complications. Collapse or setting of grafted bone into the vertebral end plates with resulting kyphotic deformity of the cervical spine commonly described complication of anterior discectomy and fusion[8]. Moreover, with this technique when used without anterior plating there is also chance of graft extrusion. Micromotion increased between vertebral bodies which hampered fusion between them lead to pseudoarthosis[10]. But the complication rate for plated fusion is extremely low[11]. Higher level fusion rate of 97.5% is obtained for multi level ACDF with rigid plating [12].

In the cervical spine when a rigid plate is placed anteriorly, its prevent graft extrusion and provide construct that resists a variety of potential disrotational forces including flexion and extension as well as rotational and laterally applied forces. In addition beneath the plate is held in contact under load, the plate becomes part of load bearing cross sectional area which adding to the stability. Anterior cervical plating can make good influence on the result of anterior cervical discectomy and fusion[13].

The goal of anterior cervical plating in addition to fusion with bone graft are to improve the fusion success rate by reducing micromotion and by enhancing sound bone graft incorporation to decrease the incidence of graft extrution and collapse of adjacent vertebral body to maintain proper spinal alignment (cervical lordotic curve) and to decrease or eliminate the need for external orthotic immobilization postoperatively. So in addition to an improve fusion rate is most instance patient feel more comfortable leaving the hospital and earlier return to their routine of daily living without cervical collar. So anterior cervical discectomy fusion and stabilization using Smith-Robinson technique associated with anterior cervical plating has some definite advantages area of the techniques.

Although more sophisticated procedure like endoscopic discectomy use of carbon fiber case instead of autogenous bone graft are invented in the meantime. But these high technically demanding procedures are not well acquainted to us and they are also out of our financial reach in the present socioeconomic situation. Moreover they are not also without complication. Now anterior cervical plate is widely used in countries of the world to augment fusion and stabilization of cervical spine. We also treating now, many patient of cervical disc prolapse by ACDF and stabilization with plating. In the meantime a number of study have been carried out in different countries to evaluate the efficacy of ACDF and stabilization with plating for fusion enhancement and results are also gratifying.

Prevention, treatment and production enough skilled trained personnel are most important aspect to be addressed with to priority to combat this problem. The current trend to treat this patients either conservatively or operatively. Though operative treatment is good option. We have limited resources as well as very few skilled personnel to handle the problem. So large number of patient

go to abroad to take operative treatment, it causes loss of time and money. Therefore this issue to be explored in over population. If operative treatment is proved to be effective option in this disease in our country, it could be possible to bring health benefit for our country with save of national currency. With this background present study have been designed to evaluate the result of anterior cervical discectomy with fusion and stabilization in cervical disc prolapse.

MATERIALS AND METHOD :

This is a prospective interventional study conducted from July 2012 to June 2013 in Department of Orthopaedic surgery, Bangabandhu Sheikh Mujib Medical University & Private Hospital, Dhaka. Patients of both sex with cervical disc prolapse admitted in the spinal unit under the Department of Orthopaedic Surgery and total 30 patients were selected by purposive sampling technique as per inclusion and exclusion criteria.

Intervention:

Anterior cervical discectomy and fusion by tricortical bone graft followed by stabilization with plate and screws was done in all cases and the specific level of operation was identified by c-arm.

Follow up evaluation:

Follow-up ranged from 3 months to 6 months. The detailed follow up evaluations were scheduled to be conducted monthly for first 3 months, then at 6th month after surgery. The evaluation included clinical and radiological. The clinical evaluation included pain status, range of neck movement, neurological improvement and working status. Plain X-ray cervical spine (A/P and lateral view) was done to see plate loosening and progress of interbody fusion.

Research instruments:

A questionnaire was prepared by the researcher considering key variables like age, sex, occupation of the patient, presenting complaints with the duration, clinical findings, associated medical conditions, investigations, per-operative findings, per-operative complications and outcome of the surgery and it was verified by the guide and the data were collected by the researcher himself.

Data were collected by taking history, clinical examination and investigations. Per-operative findings, per-operative complications and post operative follow up were recorded.

Outcome Criteria:

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

Good: Occasional nonradicular pain, 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 postoperative follow-up.

For valid statistical analysis outcome categories were re-grouped. Excellent and good categories were considered as satisfactory; fair and poor categories were considered as unsatisfactory.

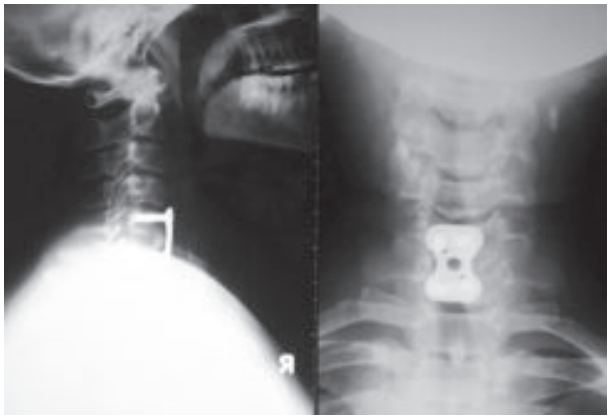


Figure-1: Distribution of multiple level operations.

RESULTS:

The study of 30 cases was done at Spinal Unit of the Department of Orthopaedic Surgery, Bangabandhu Sheikh Mujib Medical University and private hospital in Dhaka. The operations were done between July 2012 to June 2013. All patients were followed up routinely at outpatient department for 3-6 months.

The age ranged between 31 to 55 years. The highest number of cases 15 (50%) were in the 4th decade in this study, age of the youngest patient was 31 years and the age of the oldest patient was 55 years. The mean age was 41.5 ± 17.253 years.

There were 24 (80%) males and 06 (20%) females. The ratios being 4:1. By occupation 15 (50%) were manual workers, 12 (40%) were sedentary workers and 03 (10%) were housewife.

Table-I

Duration of symptoms on admission (n = 30).

Duration of symptoms in months	Frequency	Percentage
6-9	12	40%
10-12	15	50%
> 13	03	10%
Total	30	100%

Table-II

Distribution of interspaces involved (n=30).

Interspaces Involved	Frequency	Percentage
C_{3-4}	1	2.22%
C_{4-5}	10	22.22%
C_{5-6}	20	44.44%
C_{6-7}	14	31.11%
Total	45	100%

Table-III

Distribution of type of involved (n = 30).

Interspaces Involved	Frequency	Percentage
Rediculopathy	24	80%
Myelopathy	3	10%
Myeloradiculopathy	3	10%
Total	30	100%

Duration of symptoms before operation ranged from 6 months to 15 months. The mean duration of symptoms was 8.7 ± 3.8 months. Among the 30 cases the highest frequency 20 (44.44%) of interspaces involved was C_{5-6}. Then the frequency of $C_{6-7,}$ $C_{4-5,}$ C_{3-4}, were 14 (31.11), 10 (22,22%) and 1 (2.22%) respectively.

Among the 30 cases 24 (80%) were rediculopathy, 3 (10%) were myelopathy and 3 (10%) were myeloradiculopathy. Almost 66.66% were right sided and 33.33% were left sided rediculopathy.

Total 15 (50%) patients were operated upon at single level and 15 (50%) patients were operated upon at multiple level.

Among multiple levels, $C_{5/6}$, $C_{6/7}$ were common; 8 (53.33%) cases. Others were $C_{4/5}$, $C_{5/6}$ in 6 (39.96%) cases and $C_{3/4}$, $C_{4/5}$ in 1 (6.66%) case. At operation, compressive elements were found to be soft disc in 20 (44.44%) level and both hard and soft discs in 25 (55.55%) level.

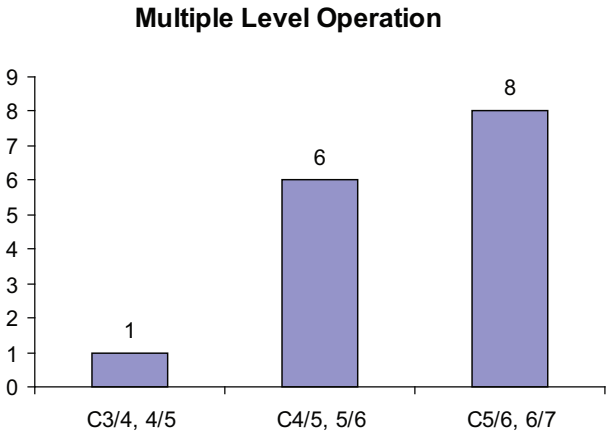


Figure-1: Distribution of multiple level operations.

Table-IV

Complications of operation (n=30).

Operative finding	Frequency	Percentage
Per / Post-operative hemorrhage	3	10%
Transient dysphagia	9	30%
Donor site pain	17	56.66%
Disc space infection	1	3.33%
Total	30	100%

There were some complications of operations. Per-operative hemorrhage was encountered in 3 (10%) cases but there was no post-operative hemorrhagic complication. 9 (30%) patients developed temporary dysphagia lasting for 4 to 5 days post-operatively; all of them were operated at multiple levels. All patients complained of donor site pain at the right anterior iliac crest, out of them 17 (56.66%) complained significant pain but they got recovered of the problem within 3 to 6 months of follow up period. 01 case (3.33%) was developed disc space infection which was recovered within 3 months.

Table-V

Clinical outcome of the study (n=30)

Pain category		Pre operative	3 months	6 months
Neck pain	VAS	7.93 ± 1.0	1.97 ± 0.5	1.47 ± 0.5
Redicular pain		7.16 ± 1.0	1.77 ± 0.5	1.39 ± 0.5
Sensory	Clinical test	30 (100%)	11(36.66%)	5(16.66%)
Motor		6 (20%)	4(13.33%)	3(10%)
Reflex		18 (60%)	6(20%)	6(20%)

At the 6 months postoperative follow up period all patients were ask to score their satisfactions with the surgical result using a VAS scale. Preoperatively patients Neck pain between 6-10 and Redicular pain 5-9. Mean neck pain was 7.93 ± 1.0 and redicular pain was 7.16 ± 1.0.

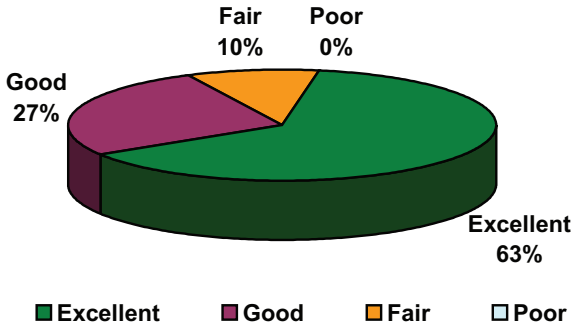


Figure-2: Functional outcome of the study (n = 30).

All the 30 patients underwent anterior discectomy followed by fusion and stabilization with plating were followed up 3 to 6 months at the outpatient department. All were assessed using modified Macnab criteria[32]. Results were found excellent in 19 (63.33%), good in 8 (26.66%) and fair in 3 (10%) cases. No poor result was observed in this series.

Excellent and good results were considered as satisfactory, whereas, fair and poor results were considered as unsatisfactory. Thus 27 (90%) cases showed satisfactory and 3 (10%) cases showed unsatisfactory outcome.

DISCUSSION:

In the management of cervical disc prolapsed anterior cervical discectomy and interbody fusion has gained widespread acceptance. In this operation varying rates of success to eliminate the patient symptoms but has been accompanied by incidence of major complications like extrusion of graft or collapse thereby increases the rate of nonunion. So postoperative morbidity occurs in good number of patient and reoperation is required in previous operated level. So anterior cervical plating technique has been developed for stabilization after discectomy and fusion. This technique enhances the rate of arthodesis and prevents the above mentioned complications.

The study has been carried out on 30 patients of cervical disc prolapse treated with the anterior cervical plating technique. In our observation, MRI is the investigation of choice for proper diagnosis of cervical disc prolapse as it gives a details idea about the level of compression, site of compression, change in the nerve root and in the spinal cord, associated any pathology in the vicinity of nerve root or spinal cord. In this study, the highest number of patient 15 (50%) was in the 4th decade. It may be due to dynamic life style associated with age related degeneration of intervertebral disc is this part of life. In this study less number of female possible due to male dominant social structure and negligence of treatment for the female members of family in our country. In our study 15 patients were manual workers, 15 patients were sedentary workers. So we did not find any definite relation of cervical disc prolapse with occupation.

In this series the highest percentage of interspace involved is seen in $C_{5/6}$ (44.44%). But in the series of smith & Robinsion $C_{5/6}$ was the commonest level (50%)[14]. In Gore and Sepic series commonest level of involvement was also $C_{5/6}$ (51%). $C_{5/6}$ is the commonest level of involvement because it is the mobile area of cervical spine[7].

In this study, 11 patients did not get complete relief of symptoms in spite of fusion at the end of 3 months postoperatively. After review the data sheet we have been seen that duration of symptoms were more (>10 months) in that 11 patients. In the Gore and Sepic series, It was also seen that existence of symptoms for a prolonged period of time were associated with poor outcome after surgery. So the existence of symptoms for prolonged period of time before surgery, the prognosis was relative bad. So that final results recommend that patients with surgically correctable problems should have surgery as soon as possible[15].

Outcome of the procedure for the treatment of cervical disc prolapse was categorized according to internationally accepted modified Macnab criteria as excellent, good, fair and poor. For statistical analysis excellent and good categories were regrouped as satisfactory, fair and poor categories were regrouped as unsatisfactory. Subjective outcome (e.g. extent of relief of symptoms and patients satisfaction by VAS), objective outcome (e.g. finding of clinical examination, x-ray cervical spine), functional outcome (e.g. ability to return to previous work) during discharge of the patient from hospital and subsequent follow-up period at the outpatient department were recorded.

In the study of smith and Robinson, outcome obtained as excellent in 64.2%, good in 14.2%, fair in 14.2% and poor in 7.1%. As a whole satisfactory outcome was 78.4% and unsatisfactory outcome 21.3%. In this series 50% cases required reoperation for non-union[14]. Depalma and cook (1968) showed result excellent in 15.6%, good in 44.9%,

fair in 29.1% and poor in 10.4%. Overall satisfactory result was 60.5% and unsatisfactory result 30.5%[16]. Rosenorn and Hansen (1983) showed the outcome was excellent in 41.3%, good in 27.5%, fair in 6.2% and poor in 24.1% cases. Overall satisfactory result was 68.8% and unsatisfactory result was 33.3%[8]. But in this series outcome obtained as excellent in 63.33% cases, good in 26.66% cases, fair in 10% cases. No poor outcome was obtained in this study. No case of nonunion was occurred here. Overall satisfactory result was 90% and unsatisfactory was 10% only. So this procedure is definitely better than that of the procedure of fusion without anterior plating.

Irrespective of procedure of choice there are some complications such as per-operative: Haemorrhage, recurrent laryngeal nerve injury, Horner's syndrome, injury to oesophagous, injury to the vertebral artery, dural tear, nerve root injury, spinal cord injury, post operative: Wound infection, disc space infection, CSF leakage, Meningitis, graft extrusion, graft collapse, nonunion, donor site pain. Likely in our series there was no major complication occurred but per-operative hemorrhage occurred in 3 cases which were managed instantly and there was no post operative hemorrhage. 9 patients were developed dysphagia temporarily in case of multiple level operated patient possibly due to prolonged use of retractor. All the patients complained of donor site pain but 17 of them complained significantly which was relieved this problem within 3 to 6 months follow-up period. There was no case of collapse or graft extrusion were observed in this series. All cases obtained interbody fusion at the end of 3 months was seen in follow up X-ray cervical spine lateral view. Only 1 case developed disc space infection which was recovered by conservative treatment within 3 months.

CONCLUSION:

To obtain desired result the good understanding of the pathophysiology of the disease, made appropriate clinical diagnosis, appropriate investigations, logical patient selection should be done. There is no alternative to knowledge, experience, sincerity and operative skill to obtain better outcome of surgery.

There were some limitations of the study like smaller sample size, study and follow up period is short in comparable to other series and data were collected from two station.

In this study it is revealed that in the operative treatment of cervical disc prolapse by anterior cervical discectomy and fusion by tricortical bone graft and stabilization with plate and screw produce better outcome. It is safe and effective procedure if it is done by experienced and skilled surgeon.

REFERENCES:

1. Bernhardt M, Hynes RA, Blume HW, White AA. current concepts review: cervical spondylotic myelopathy J Bone Joint Am 1993 : 75:119-28.
2. Rothman R, Rashbaum R, Pathogensis of signs and symptoms of cervical disc degeneration. Instr course lect 1978
3. Hukuda S, Wilson CB. Experimental cerivcal myelopathy. Effects of compression and ischaemia on the canine cervical cord J neurosurg 1972 : 37: 631-52.
4. Clarke E, Robinson PK. Cervical myelopathy: A complication of cevical spondylosis Brain 1956: 79: 483-510.
5. Nurick S. The pathogenesis of the spinal cord disorder associated with cervical spondylosis. 1972; 95: 87-100.
6. Lees F. Turner JwA. Natural history and prognosis of cervical spondylosis . BMJ 1963: 2:1607-10.
7. Gore, DR , Sepic, SB. (1984) "Anterior cervical fusion for degenerated or protruded disc" Spine, Vol. 9, No. 7, P 667.
8. Rosenorn, j Hansen, EB. and Rosenon M (1983) Anterior cevical discectomy with and without fusion, J neurosurgery , vol 59 August PP-252-55.
9. Anderson, DG, & Albert TJ (2002) "Bone grafting implants and plating option for anterior cervical fusion" orthop clin North Am, Vol 2, No-2, April pp. 317-28,
10. White, AA south Wick, Wo panjabi, MM (1976) "Clinical instability in the lower cervical spine" spineVol-1 No.1, March pp-15-27.
11. Williams, KD. & Park, Al. (2003) "Lower back pain and disorder of intervertebral disc". In canale S.T. (ed) campbells operative orthopaedics 10th edn, Mosby, Inc., Pennsylvania.
12. Turck, SL. (1989), The cervical spine, in: pederson, DD. (ed), orthopaedics principles and their application, 4th edn, J.B. Lippincott company, pennsylvania.
13. Hu, SS. tribus, CB. Tay, BKB. carison, GD. (2003), Disorders, diseases and injuries of the spine, in; Skinner ,HB. (ed), current diagnosis and treatment in othopaedics, 3rd edn, Mcgraw Hill, USA.
14. Smith GW, Robinson RA. The treatment of certain cervical disorders by anterior removal of the intervertebal disc and interbody fusion. J Bone Joint surg Am 1958 : 40:607-24.
15. Cloward RB. the anterior approach for removal of ruptured cervical disc. J neurosurgery 1958:15:602-17.
16. Depalma, AF., & Cooke, A.J (2001), "Results of anterior interbody fusion of the cervical Spine", Clin orthop, vol.60, September- October, pp.69-85.

Original Article

Correlation between clinical features and magnetic resonance imaging findings in lumbar disc prolapse : A study of 60 cases

Md. Akshad Al Masur[1], Md. Masudur Rahman[2], Abu Taleb[3], Md. Mahbub Ali[4], Mst. Fatema Khatun[5]

Abstract :

Lumbar disc prolapse is one of the common causes of low back pain seen in the working population. There are contradictorty reports regarding the clinical significance of various magnetic resonance imaging (MRI) findings observed in these patients. The study was conducted to correlate the abnormalities observed on MRI and clinical features of lumbar disc prolapse. 60 clinically diagnosed patients with lumbar disc prolapse were included in the study. Clinical evaluation included pain distribution, neurological symptoms and signs. MR evaluation included grades of disc degeneration, type of herniation, neural foramen compromise, nerve root compression, and miscellaneous findings. The MRI findings were then correlated with clinical symptoms and the level of disc prolapse as well as neurological signs and symptoms. The presence of centrolateral protrusion or extrusion with gross foramen compromise correlates with clinical signs and symptoms very well, while central bulges and disc protrusions correlate poorly with clinical signs and symptoms. The presence of neural foramen compromise is more important in determining the clinical signs and symptoms while type of disc herniation (bulge, protrusion, or extrusion) correlates poorly with clinical signs and symptoms.

Keywords: Lumbar disc prolapse, magnetic resonance imaging, clinical correlation

INTRODUCTION:

Lumbar disc prolapse is one of the common causes of low back pain seen in the working population. There are contradictorty reports regarding the clinical significance of various magnetic resonance imaging (MRI) findings observed in these patients. The study was conducted to correlate the abnormalities observed on MRI and clinical features of lumbar disc prolapse. Clinical evaluation included pain distribution, neurological symptoms and signs. MR evaluation included grades of disc degeneration, type of herniation, neural foramen compromise, nerve root compression, and miscellaneous findings.

The MRI findings were then correlated with clinical symptoms and the level of disc prolapse as well as neurological signs and symptoms. All patients underwent MRI evaluation with a 1.5 tesla scanning machine. Disc degeneration was graded from 1 to 5 as per Pfirrmann et al. Grade 1–3 were considered insignificant and normal. Grade 4 and 5 were considered as abnormal. Disc herniation was classified as follows: a) Normal : No disc extension beyond the interspace. b) Disc bulge: Circumferential symmetrical disc extension beyond the interspace. c) Disc protrusion: Focal or asymmetrical disc extension beyond the interspace with base against the parent disc broader than any other diameter of the protrusion.d) Disc extrusion: Focal obvious disc extension beyond the interspace with base against the parent disc, narrower than the diameter of the extruding ,material itself or no connection to parent disc.

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Neural foramen compromise was graded as : Thecal sac compression, Neural foramen compromise, Nerve root contact, Nerve root compression. Borenstein and others clearly opined that MRI findings were not predictive of the development or duration of low back pain and that clinical correlation is essential. Beattie et al. found that the presence of disc extrusion and severe nerve root compression at one or multiple sites is strongly associated with distal leg pain. Rankine et al. in their study opined that pain drawing is not a good predictor of nerve compression on magnetic resonance imaging with poor correlation

MATERIALS AND METHODS

- The present study was conducted to determine the association between abnormalities visible in MRI and patients' clinical features including pain distribution, neurological signs, and symptoms in lumbar disc prolapse.
- ***Study Type : :*** Observational Study
- ***Duration : :*** January 2015 to January 2021
- ***Place of Study : :*** PMCH & Private Hospitals.
- ***Total Patients:*** 60

Is MRI really essential in all patients with lumbar disc prolapse? If MRI is done, which of MRI findings will be clinically significant, and which of these findings are important from the management point of view? So we decided to study the correlation between clinical features and MRI findings in lumbar disc prolapse and to know about its significance in decision making for treatment.

Selection criteria:

A. Inclution Criteria:

- Patients presenting with clinical features of lower limb radiculopathy to the outpatient department of orthopedics were screened for inclusion in the study.
- The patients with clinical diagnosis of lumbar disc prolapse were included in the study.
- The clinical criteria used are:
  a) low backache with radiation to the lower limb
  b) radicular pain along a specific dermatome
  c) nerve root tension signs like straight leg raising test (SLRT)
  d) presence of neurological symptoms and signs.
- Patients with two positive criteria, when other causes were ruled out and MRI showed disc prolapse, were also included in the study

B. Exclusion Criteria:

- Patients who presented with acute onset of symptoms and were having radicular symptoms for the first time were treated with simple bed rest and analgesics for 3 weeks.
- Patients who had completely recovered were excluded from the study.

RESULT:

The pain distribution was classified as per the dermatomal level. L5 and S1 dermatomes were involved in 44 and 16 patients. All 60 patients had Neurological and Sensory Deficits.

Disc degeneration : 30 (50%) patients had disc degeneration of grade 4 and above at two or more levels.

Disc herniation : Disc bulges were noticed in 83 levels in 60 patients. Disc protrusion was noticed in 60 levels (60 patients).

Neural foramen compromise and nerve root compression : There was evidence of neural foramen compromise at 60 levels out of 60 patients.

While correlating clinical and MRI levels of lesion, if multiple level disc prolapses were present, the nerve root compression visible in MRI was used as the MRI level.

We used the conventional wisdom that L4–5 level produces L5 dermatomal level symptoms and L5–S1 level produces S1 dermatomal level symptoms was used.

In My Series, clinical findings correlates with MRI level.The Kappa value for the statistical significance between the clinical level and the MRI level was 0.8.

Table-I

Level of disc herniation

Level	Number	Percentage
L4/5	48	80%
L5/S	12	20%

Table shows level of herniation. Most common site of disc prolapse was at the level of L4/5(80%)

Table-II

Side of disc herniation

Side of disc herniation	Number	Percentage
Right	18	30%
Left	38	63.33%
Bilateral(central)	04	6.67%

Table shows side of disc herniation. More involvement was at the left side (63.33%)

CONCLUSION:

We evaluated the correlation between clinical and MRI findings. In most cases, pain distribution could be correlated with a particular level making it easy to compare the clinical and MRI levels. While the level of disc prolapse correlates well with the clinical level and MRI may not be essential for clinical diagnosis, MRI is definitely essential when surgery is planned. In our study, out of 83 levels of disc lesions only 30 patients. From our study we can see that a centrolateral disc protrusion with neural foramen compromise are more likely to cause symptoms in that order while central disc protrusions as well as disc bulges without foramen compromise are less likely to produce symptoms. This study has some limitations such as Sample size is small, Statistically not very significant, Biased study. Clinical findings correlate well with MRI findings, but all MRI abnormalities need not have a clinical significance. The presence of centrolateral disc protrusion and extrusions with gross neural foramen compromise is invariably associated with clinical signs and symptoms. The presence of neural foramen compromise is more important in determining the clinical signs and symptoms while the type of disc herniation (bulge, protrusion, or extrusion) correlates poorly with clinical signs and symptoms.

REFERENCES:

1. Olmarker K, Rydevik B. Pathophysiology of sciatica. Orthop Clin North Am. 1991;22:223–34.
2. Frymoyer JW, Pope MH, Clements JH, Wilder DG, MacPherson B, Ashikaga T. Risk factors in low-back pain. An epidemiological survey. J Bone Joint Surg Am. 1983;65:213–8.
3. Modic MT, Ross JS. Magnetic resonance imaging in the evaluation of low back pain. Orthop Clin North Am. 1991;22:283–301.
4. Andersson GB, Deyo RA. History and physical examination in patients with herniated lumbar discs. Spine (Phila Pa 1976) 1996;21(24 Suppl):10–18S.
5. Cranshaw C, Kean DM. The use of unclear MR in diagnoses of lateral canal extra percent. J Bone Joint Surg Am. 1984;66B:711–4.
6. Rothman RH. A study of computer-assisted tomography. Spine (Phila Pa 1976) 1984;9:548.
7. Buirski G, Silberstein M. The symptomatic lumbar disc in patients with low-back pain. Magnetic resonance imaging appearances in both a symptomatic and control population. Spine (Phila Pa 1976) 1993;18:1808–11.
8. Vroomen PC, de Krom MC, Knottnerus JA. Consistency of history taking and physical examination in patients with suspected lumbar nerve root involvement. Spine (Phila Pa 1976) 2000;25:91–6.
9. Beattie PF, Meyers SP, Stratford P, Millard RW, Hollenberg GM. Association between patients report of symptoms and anatomic impairment visible on lumbar magnetic resonance imaging. Spine (Phila Pa 1976) 2000;25:819–28.
10. Brant MN, Jensen MC, Obuchowski N. Intraobserver and interobserver variability in interpretation of lumbar disc abnormalities: A comparison of two nomenclatures. Spine (Phila Pa 1976) 1995;20:1257–64.
11. Horal J. The clinical appearance of low back disorders in the city of Gothenburg, Sweden. Comparison of incapacitated probands with matched controls. Acta Orthop Scand Suppl. 1969;118:1–109.
12. Suk KS, Lee HM, Moon SH, Kim NH. Lumbosacral scoliotic list by lumbar disc herniation. Spine (Phila Pa 1976) 2001;26:667–71.
13. Takahashi H, Suguro T, Okazima Y, Motegi M, Okada Y, Kakiuchi T. Inflammatory Cytokines in the Herniated Disc of the Lumbar Spine. Spine (Phila Pa 1976) 1996;21:218–24.
14. Jensen MC, Brant-Zawadzki MN, Obuchowski N, Modic MT, Malkasian D, Ross JS. Magnetic resonance imaging of the lumbar spine in people without back pain. N Engl J Med. 1994;331:69–73.
15. Damkot DK, Pope MH, Lord J, Frymoyer JW. The relationship between work history, work environment and low-back pain in men. Spine (Phila Pa 1976) 1984;9: 395–9.

Original Article

Comparison of outcome on early and late initiation of operative treatment in children with lateral condyle fracture of Humerus

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Abstract

Lateral condyle fracture of Humerus in children is the second most common fracture around elbow occurs less commonly than supracondylar fracture in the range of 15% to 20% that must be treated by operation. Previously late and neglected cases were left alone in worldwide but recent trends are to treat by operation. To find out the demographic variations, causes, functional movements and complications of late cases of lateral condyle fracture of Humerus in children treated by open reduction and internal fixation and also comparison with early cases. This prospective interventional study was carried out in the Department of Orthopaedic Surgery, Bangabandhu Sheikh Mujib Medical University and Chattogram Medical College Hospital for the duration of 03 years and 06 months. Total 24 patients of fracture lateral condyle of Humerus in children age ranges from 02 to 14 years were selected but due to loss of follow up, 20 children were taken in account for the study. Purposive type of non-probability sampling technique was used as per inclusion and exclusion criteria. Total patients were divided into two groups- group I: early (up to 4 weeks) and group II: late (5 to 12 weeks) according to time interval from injury to operative treatment. Outcome was evaluated by Modified Aggarwal et al. criteria where satisfactory result was considered as excellent and good groups. In this study, Out of 20 patients, male (85%) were more than female (15%), left side involvement was 60% and right side was 40%. Among causes of injury, 55% was due to sports injury, 30% was fall from height and 15% from RTA. 35% initially treated by plaster cast, 60% by traditionally bone setter. 55% were misdiagnosed; complications were 10% in group I and 30% in group II. Outcome was satisfactory with 100% in group I and 70% in group II. Outcome was better in early cases by operative treatment but late cases up to 12 weeks should be treated by operation.

Key words: Late case, Lateral condyle, Milch type, K wire.

INTRODUCTION

Fracture of the lateral condyle of Humerus is quite common and occurs at approximately age of 06 years and constitutes around 13% - 18% of the elbow injuries[1,2]. The management of the fresh displaced fractures of less than 3 weeks duration is not controversial as it is generally agreed that it should be treated by osteosynthetic procedures[3,4]. Observers have variedly defined the 'delayed', 'neglected' or 'late presentation' of lateral condylar fractures (>3-6 weeks) in children[5] . But recent studies have defined the late presentation as >4 weeks post injury in their series[6,7]. Although there could be some difference of opinion regarding the approach, fixation method but the consensus remain in favor of operative intervention[8-10].

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The problem arises when the patient presents late due to socioeconomic reasons, lack of awareness, missed diagnosis or improper initial treatment. It has been observed that nonunion of the fractures of the lateral condylar epiphysis of Humerus are more commonly result from minimally displaced fractures than from severely displaced and rotated fractures simply because more adequate treatment is administered to the more severe fracture usually[11,12] .

Late presentation of this fracture is difficult and challenging problems. The fractured surfaces become sclerosed and filled with fibrous tissue; furthermore the muscular attachments become shortened and contracted thus making derotation and anatomical reduction may lead to avascular necrosis of the fragment. Complications such as non union, premature physeal closure, lateral condyler overgrowth, stiffness, cubitus valgus/varus, avascular necrosis and tardy ulnar nerve palsy may arise after surgical or conservative treatment[13,14]. Fracture of the lateral condyle of Humerus is unstable and tends to become displaced even when immobilized because of pull of forearm extensors. This fracture also prone to nonunion since the fracture is intra articular and is bathed in synovial fluid[2,15,16].

Previously late cases were left alone because of bad result in surgery. Jakob et al. reported that results of open reduction more than three weeks after the fracture are no better than those of no treatment at all and may kill the lateral condylar fragment by damaging its blood supply. But in recent study they considered that delaying greater than 3 weeks still allow anatomical reduction without damaging bony fragment and soft tissue[8,17,18].

The aim of present study was to find out the outcome of operative treatment in late cases of fractures lateral Humeral condyle in children as late cases are left alone previously with lot of complications in our country and also to compare with early cases.

METHODS

This prospective interventional study was carried out in the Department of Orthopaedic Surgery, Bangabandhu Sheikh Mujib Medical University and Chattogram Medical College Hospital from March 2013 to August 2016 for the duration of 03 years and 06 months. Total 24 patients of fracture lateral condyle of Humerus in children were selected but due to loss of follow up, 20 children were taken in account for the study. Purposive type of non-probability sampling technique was used as according to availability of the patients and strictly considering the inclusion and exclusion criteria. Total patients were divided into two groups- group I: early (up to 4 weeks) and group II: late (5 to 12 weeks) according to time interval from injury to operative treatment. Outcome was evaluated by Modified Aggarwal et al. criteria where satisfactory result was considered as excellent and good groups(19). The protocol was approved by the Institutional Review Board of BSMMU, Dhaka, Bangladesh**.** Regarding inclusion criteria we considered age 2-14 years with both gender and displaced fracture. We excluded open and pathological fractures, multiple fractures/poly trauma, and fracture with neurovascular injury, metabolic bone disease and skeletal dysplasia.

Table-I: *Modified Aggarwal et al. Criteria(19).*

S.no	Result	Description
1.	Excellent	Union in perfect alignment, full range of elbow movement, no alteration in carrying angle, no premature fusion of physis, no avascular necrosis of epiphysis, no lateral prominence, and X-ray showing anatomical reduction.
2.	Good	Union with minimum displacement, limitation of terminal range of movements of not more than 15°, no alteration in carrying angle, no pre-mature fusion of physis, no avascular necrosis of epiphysis, no deformity at local site, and X-ray showing step/gap of not more than 2 mm.
3.	Fair	Union with minimum displacement, limitation of terminal range of movements of up to 25°, alteration in carrying angle of up to 10°, premature fusion of the physis, no avascular necrosis of epiphy-sis, mild deformity at local site, and X-ray showing a step/gap of between 2-5 mm.
4.	Poor	Nonunion at fracture site, gross limitations of elbow movements (with limitation more than 30°), change in carrying angle of more than 10°, premature fusion of the physis, avascular necrosis of the fragment, visible deformity at local site, and X-ray showing a step/ gap of more than 5 mm.

Data were processed and analyzed using computer software program SPSS version 24. Final outcome were evaluated by Modified Aggarwal et al. criteria(19). For all analyses level of significance was set at 0.05 and p-value <0.05 was considered significant.

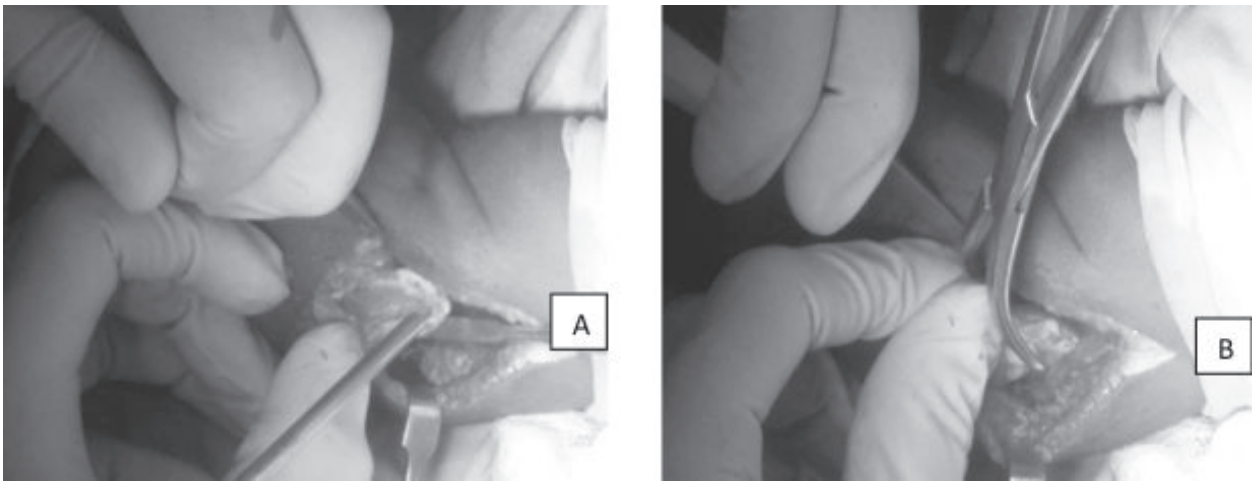


Figure 2: *Per-operative Kocher lateral J approach to elbow joint. A. Capsized fracture fragment of lateral condyle of Humerus. B. Reduced fracture fragment of lateral condyle of Humerus by towel clip.*

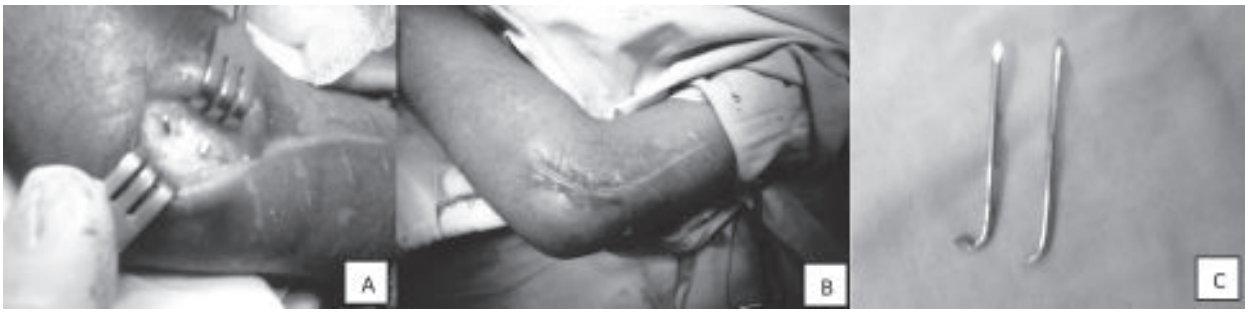


Fig.-3: *Postoperative implant removal. A. Implant in situ. B. Closing the skin wound. C. Two 1.5 mm implant.*

RESULTS

From table 2 we found that maximum age incidence was found in 05-07 years age group. The mean age was 7.04 ± 2.63 in group-I and 7.22 ± 2.51 in group-II. Both groups had similar mean age distribution and male with left sided predominance. Regarding causes of injury, sports activities was the prime cause 11(55.0%) in both groups with 13 (65%) were Milch-II fracture type. Most of the children 12(60%) were initially treated by traditional bone setter and misdiagnosis 11(55%) was a major problem.

Table II

Demographic outcomes

		Demographic outcomes			
		Group-I (n=10), %	Group-II (n=10), %	Total	*p* value
Age (years)	02-04	01(10%)	01(10%)	02(10%)	0.700
	05-07	06(60%)	05(50%)	11(55%)	
	08-10	01(10%)	03(30%)	04(20%)	
	11-14	02(20%)	01(10%)	03(15%)	
Gender	Male	08(80%)	09(90%)	17(85%)	
	Female	02(20%)	01(10%)	03(15%)	0.531
Side	Right	05(50%)	07(70%)	12(60%)	0.361
	Left	05(50%)	03(30%)	08(40%)	
Causes of injury	Sports	05(50%)	06(60%)	11(55%)	0.231
	Fall from height	03(30%)	03(30%)	06(30%)	
	RTA	02(20%)	01(10%)	15(15%)	

Table II (Cont'd)

		Demographic outcomes			
		Group-I (n=10), %	Group-II (n=10), %	Total	*p* value
Fracture type distribution	Milch-I	04(40%)	03(30%)	07(35%)	0.639
	Milch-II	06(60%)	07(70%)	13(65%)	
History of initial treatments	Plaster cast	06(60%)	01(10%)	07(35%)	0.022
	Traditional bone setter	03(30%)	09(90%)	12(60%)	
	Both	01(10%)	00(00%)	01(05%)	
	Initial Diagnosis				
	Misdiagnosed	03(30%)	08(80%)	11(55%)	0.025
	Proper Diagnosis	07(70%)	02(20%)	09(45%)	
Time interval between incidence and operation (Weeks)					
	01-02	03(30%)	00(00%)	03(15%)	0.0004
	03-04	07(70%)	00(00%)	07(35%)	
	05-07	00(00%)	02(20%)	02(10%)	
	08-10	00(00%)	05(50%)	05(25%)	
	11-12	00(00%)	03(30%)	03(15%)	

Regarding postoperative outcome from table 3, in group-I, only 01(10%) patient suffered with stich point infection and in group-II, 02 (20%) patients got pin tract infection and 01(10%) had got alteration of carrying angle less than 10^0. At fracture union in group-I, 07 (70%) and in group-II 01(10%) fracture were perfectly united. At the end of 01 year in both groups, full range of motion in 08 (40%) patients, 08 (40%) had less than 15° limitation, 04 (20%) had less than 25° limitation and with only 03 (15%) had got deformity in group-II.

Table III

Postoperative outcomes.

Postoperative outcomes	Group-I (n=10),%	Group-II (n=10),%	Total	*p* value
Postoperative hospital stay (Days)				
01-06	06(60%)	05(50%)	11(55%)	0.524
07-10	03(30%)	02(20%)	05(25%)	
11-14	01(10%)	03(30%)	04(20%)	
Postoperative complications				
No complications	09(90%)	07(70%)	16(80%)	
Stitch point infection	01(10%)	00(00%)	01(05%)	0.236
Pin tract infection	00(00%)	02(20%)	02(10%)	
Carrying angle $<10^0$	00(00%)	01(10%)	01(05%)	
Union at fracture site (radiological)				
In perfect alignment and anatomical reduction	07(70%)	01(10%)	08(40%)	0.014
Minimum displacement and step/gap not more than 2mm.	03(30%)	06(60%)	09(45%)	
Minimum displacement and step/gap of between 2-5mm.	00(00%)	03(30%)	03(15%)	
Limitation of terminal range of motion at the elbow joint				
Full range of motion	07(70%)	01(10%)	08(40%)	0.011
Not more than 15°.	03(30%)	05(50%)	08(40%)	
Not more than 25°	00(00%)	04(40%)	04(20%)	
Deformity at fracture site				
Deformed	00(00%)	03(30%)	03(15%)	0.060
Not deformed	10(100%)	07(70%)	17(85%)	
Functional outcome				
Excellent	07(70%)	01(10%)	08(40%)	0.014
Good	03(30%)	06(60%)	09(45%)	
Fair	00(00%)	03(30%)	03(15%)	
Poor	00(00%)	00(00%)	05(25%)	

DISCUSSION

In 1883, Stimson first described the fracture patterns in lateral condyle fracture in his book *'Treatise on Fractures'.* In 1955, Milch recognized the significance of these fracture patterns as they related to elbow stability. Thus the fracture patterns of the lateral condyle bear his name and are classified as either Milch I or Milch II fracture[20].

6.5 to 8 years old children suffered more in this type of fracture with boys (66.66-83.3%) were more victimized than girls. It was interesting that injury was predominantly left sided (60%) although most of the children were right handed predominant that matched with other studies 56-59%[6,19,21,22]. Sports injury (55%) was main cause for this fracture in Bangladesh while in one study by Pant et al. showed that most common cause was fall from height (55%) rather than sports injury (27.7%)[13].

Most of the children (60%) in our country were maltreated and misdiagnosed (55%) before definitive treatment which were 32-61.11% and 27.27% respectively in other developing country too. So proper diagnosis and treatment by attending doctor have a great value in fracture lateral condyle in Humerus in children. The time interval from incidence to definite treatment, number became progressively increased as time passed by in this subcontinent. Perfect union at fracture site (radiological) was more in early cases (70%) which also common in other studies[6,19,21,22]. Although full range of motion was more in early cases but acceptable range of motion (limitation of motion not more than 15°) was found in late cases too (50%) where Sial showed that in 5-12 weeks full range of motion were 4.54%, not more than 15° were 13.63%[22].

In this study after one year of final follow up with Modified Aggarwal et al.[19] criteria, outcome was satisfactory with 100% in group I and 70% in group II that matched with other study[2].

Conclusion

Outcome was better in early cases by operative treatment but late cases up to 12 weeks should be treated by operation to prevent complications.

Limitation of the study

- The follow up period was short in comparable to other series. So we could not evaluate very late post-operative complications.
- Small sample size.
- Sample size not representing whole country scenario.
- Some patients could not come for follow up timely.

Recommendations

- Specialized training programs for general practitioner at rural areas for early diagnosis, initial management and referral system for better and complications free treatment.
- Adequate counseling of the guardian about operative treatment protocol.
- Good anatomical and radiological knowledge around children elbow.
- Need to improved facilities and expertise for both early and late cases.
- Long term follow up.

Conflict of interest: none.

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REFERENCES:

1. Canale ST, Beaty JH. Campbell's operative orthopaedics e-book. In: Canale ST, editor. Campbell's operative orthopaedics. 12th ed. Pennsylvania: Elsevier Health Sciences; 2012. p. 1394–401.
2. Saraf S, Khare G. Late presentation of fractures of the lateral condyle of the humerus in children. Indian J Orthop [Internet]. 2011 [cited 2019 Aug 19];45(1):39. Available from: http://www.ijoonline.com/text.asp?2011/45/1/39/67119
3. Hardacre JA, Nahigian SH, Froimson AI, Brown JE. Fractures of the lateral condyle of the humerus in children. J Bone Joint Surg Am [Internet]. 1971 Sep [cited 2019 Aug 19];53(6):1083–95. Available from: http://www.ncbi.nlm.nih.gov/pubmed/5092798
4. Solomon L, Warwick D, Nayagam S. Apley's System of Orthopaedics and Fractures. In: Jamieson G, editor. Apley's System of Orthopaedics and Fractures. 9th ed. 338 Euston Road, London NW1 3BH: Hodder Arnold; 2010. p. 761–3.

5. Jakob R, Fowles J V., Rang M, Kassab MT. Observations concerning fractures of the lateral humeral condyle in children. J Bone Joint Surg Br [Internet]. 1975 Nov 1 [cited 2019 Aug 21];57-B(4):430–6. Available from: http://online.boneandjoint.org.uk/doi/10.1302/0301-620X.57B4.430

6. Saraf SK, Khare GN. Late presentation of fractures of the lateral condyle of the humerus in children. Indian J Orthop [Internet]. 2011 Jan [cited 2019 Aug 19];45(1):39–44. Available from: http://www.ncbi.nlm.nih.gov/pubmed/21221222

7. Hanif M, Arshad RM, Abbas MA, Syed MK, Rana RE, Saeed KM. Outcome of open osteosynthesis in neglected fracture of lateral humeral condyle in children. Pakistan J Med Heal Sci. 2012 Oct 1;6:1024–7.

8. Soon Song K, Cheor Bae K, Hyung Kang C, Woo Min B, Hyun Cho C, Sa-Kong H. Surgical Treatment of Late Presented Displaced Lateral Condylar Fracture of the Humerus in Children [Internet]. Vol. 43, J Korean Orthop Assoc. 2008 [cited 2019 Aug 19]. Available from: https://synapse.koreamed.org/Synapse/Data/PDFData/0043JKOA/jkoa-43-24.pdf

9. Byanjankar S, Amatya S, Shrestha R, Jr S, Chhetri S. Screw fixation for Lateral Condylar Fracture of Humerus in Children. 2018 [cited 2019 Aug 19]; Available from: https://crimsonpublishers.com/ooij/pdf/OOIJ.000513.pdf

10. Malik Shaikh A, Zaib Tunio M, Iqbal Tebani K. Outcome of Displaced Lateral Condyle Humerus Fractures in Children's Treated with K-wire Fixation [Internet]. 2011 [cited 2019 Aug 19]. Available from: http://jpoa.org.pk/issues/2015/2732015/JPOA-N-8.pdf

11. Flynn JC, Richards JF, Saltzman RI. Prevention and treatment of non-union of slightly displaced fractures of the lateral humeral condyle in children. An end-result study. J Bone Joint Surg Am [Internet]. 1975 Dec [cited 2019 Aug 19];57(8):1087–92. Available from: http://www.ncbi.nlm.nih.gov/pubmed/1201992

12. Shabir AD, Tahir AD, Sharief AW, Imtiyaz HD, Shahid H, Reyaz AD. Delayed Operative Management of Fractures of the Lateral Condyle of the Humerus in Children. [cited 2019 Aug 19]; Available from: http://dx.doi.org/10.5704/MOJ.1503.010

13. Pant A, Huda N, Julfiqar J, Jameel T, Tripathi S, Kumar S, et al. Late open reduction and internal fixation for fractures of lateral condyle of humerus in children: a clinical study. J Evol Med Dent Sci [Internet]. 2013 Oct 8 [cited 2019 Aug 19];2(41):7809–15. Available from: http://jemds.com/data_pdf/2_Ajay Pant.pdf

14. Kumar N, Meena S, Mehtani A, Yadav C, Raj R, Barwar N. Delayed presentation of fracture of lateral condyle of humerus in pediatric age group treated by ORIF and ulnar peg grafting: A case series. J Orthop Allied Sci [Internet]. 2015 [cited 2019 Aug 19];3(1):12. Available from: http://www.joas.in/text.asp?2015/3/1/12/155911

15. Pirker ME, Weinberg AM, H??llwarth ME, Haberlik A. Subsequent Displacement of Initially Nondisplaced and Minimally Displaced Fractures of the Lateral Humeral Condyle in Children. J Trauma Inj Infect Crit Care [Internet]. 2005 Jun [cited 2019 Aug 21];58(6):1202–7. Available from: https://insights.ovid.com/crossref?an=00005373-200506000-00018

16. Jenyo M, Mirdad T. Fractures Of The Lateral Condyle Of The Humerus In Children [Internet]. Vol. 78, East African Medical Journal. 2001 [cited 2019 Aug 21]. Available from: http://journals.uonbi.ac.ke/files/journals/1/articles/784/submission/original/784-2948-1-SM.pdf

17. Ngoc Hung N. Kirschner Wire Fixation of Neglected Lateral Condylar Fracture of the Humerus in Children. Journal [Internet]. 2017 [cited 2019 Aug 19];4:3330. Available from: http://dx.doi.org/10.4236/oalib.1103330http://creativecommons.org/licenses/by/4.0/

18. Kumar Ghosh D, Mondal D, Ray D, Sinha D, Ghosh D, Adhikary D. "Outcome of Open Reduction and Internal Fixation in Late Presentation of Fracture Lateral Condyle of Humerus in Paediatric Age Group" IOSR J Dent Med Sci e-ISSN [Internet]. 2018 [cited 2019 Aug 19];17:12–25. Available from: www.iosrjournals.org

19. Khalid Mahmood, Faaiz Ali Shah, Ghulam Atiq, Shahab-ud-din, Wali Mohammad Mehsud A, Rehman Qureshi I ullah B. Outcome of open reduction and internal fixation of fracture lateral condyle of humerus in children presented late. Pak J surg . 2014 ;30(3):263–7.

20. Mahan ST. Lateral Humeral Condyle Fracture. Oper Tech Pediatr Orthop Surg. 2011;55–64.

21. Ali Z, Tahir A, Ali N. Treatment of Old Fracture of the lateral Condyle of Humerus in Children. Pak paed J. 2012;36(3):152–7.

22. SIAL NA, IQBAL MJ, SHAUKAT MK. No Title. Prof Med J. 2011;18(03):501–9.