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Original Article

Evaluation of Functional Outcome of Total Knee Replacement

Md. Tofayel Hossain[1], Md. Syedur Rahaman[2], Arun Kumar Sarker[3], A.S.M Nurul Alam Siddique[4], B.M Rahgir Mahmud[5], Md. Hasan Jamil Hedyatullah[6]

ABSTRACT

Introduction:Total knee replacement (TKR) surgery is one of the most common and successful surgical interventions, providing substantial relief from pain and improvement in functional disability in patients with knee arthritis. The surgery involves the replacement of both the medial and lateral tibio-femoral and patello-femoral joint. Although total knee replacement is an effective treatment, postoperative complications may include blood clots, infection, and loosening or malalignment of the prosthetic component.

Methods: This is a prospective observational study and was conducted in the National Institute of Traumatology and Orthopedic Rehabilitation, (NITOR) Dhaka, Bangladesh during the period from January 2020 to December 2021. This study was conducted through a detailed interview of 60 patients, of which, 45 patients went through a separate second stage interview one year after their knee replacement surgery. This particular study was concluded by focusing only on patients with severe knee pain and stiffness.

Results: Total of 45 patients most of the patients found male 20(44.45%) and 25 (55.55%) female patients. Among them 8 (17.78%) of them were aged under 50, 27 (60 %) are aged between 51 to 60, and the remaining 10 (22.22%) are aged 61-70 years (Figure-2). Post-operativecomplications noted in 14 study population are residual pain 11 (24.44%), infection 2 (4.44) and fracture 1(2.22) (Table-1). After one year of surgery 67% regarded their lifestyle as excellent, and 16% regarded it as satisfactory and 17% responded that their lifestyle was not satisfactory.

Conclusions : Total knee arthroplasty is a generally effective procedure, Patients who have marked functional limitation, severe pain, low mental health score, and other comorbid conditions before total knee arthroplasty are more likely to have a worse outcome at one year.

Keywords: TKR, Arthroplasty, Knee replacement, Surgical.

INTRODUCTION

Total knee replacement (TKR) surgery is one of the most common and successful surgical interventions, providing substantial relief from pain and improvement in functional disability in patients with knee arthritis.[1] The surgery involves the replacement of both the medial and lateral tibio-femoral and patello-femoral joint. Although total knee replacement is an effective treatment, postoperative complications may include blood clots, infection, and loosening or malalignment of the prosthetic component.[1,2] Total knee arthroplasty (TKA) results in a high degree of patient satisfaction, as it provides patients with considerable medium- and long-term benefits in terms of quality of life, pain relief, and function. Nevertheless, the literature reports that up to 29% of patients are dissatisfied. This dissatisfaction is directly related to the patients' quality of life, which they deem insufficient [3]. In this case, patient satisfaction is greatly influenced by many outside factors, like their lifestyle pre-surgery, the environment, lack of post-operative exercise, obesity, and many others. Just as likely, some surgical factors can also play a part in their satisfaction after surgery, for example, phantom pain, a mishap while surgery, second-grade replacement parts, wearing of replacement parts, post-operative infection, blood clot, and others. This study is aimed to determine the evaluation of functional outcome of total knee replacement.

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OBJECTIVES

a. General objective

Determination of functional outcome of total knee replacement.

b. Specific Objectives

i. Determine the percentage of patients with difficulty after TKR.

ii. Determine the factors causes unsatisfactory lifestyle in post-operative period.

METHODOLOGY

This was a prospective observational study and was conducted in the National Institute of Traumatology and Orthopedic Rehabilitation, (NITOR) Dhaka, Bangladesh during the period from January 2020 to December 2021. This study was conducted through a detailed interview of 60 patients, of which, 45 patients went through a separate second stage interview one year after their knee replacement surgery. So the sample size for this study will be 45 only. A large number of patients are admitted daily to this institute, mostly with bone fractures and bone-related issues. This particular study was concluded by focusing only on patients with severe knee pain and stiffness.

Inclusion Criteria

- Patients with severe knee pain
- Both male and female

Exclusion Criteria

- Patients with severe co morbidity
- Patients who didn't give consent

For this study, total of 75 patients with severe knee pain were approached. From them 15 patients refused to participate in the study. The remaining 60 patients faced a basic interview describing their daily lifestyle, their pain severity and any prior medical history. After this step, 15 patients were excluded because their knee pain was managed by medication. Remaining 45 patients make up the core of this study and they went through a detailed second interview 1 year after their surgery to see whether they face any complications or changes in their daily lifestyle or not. The data analysis of this case study was done by Microsoft excel.

RESULT

A Total of 45 patients most of the patients found male 20(44.45%) and 25 (55.55%) female patients with total knee replacement (Figure-1). Also, 8 (17.78%) of them were aged under 50, 27 (60 %) are aged between 51 to 60, and the remaining 10 (22.22%) are aged 61-70 years (Figure-2). From the range of collected data we found 55.55% of the sample size is female and 44.45% are male. Most of the sample patients consist of older males and females, with the youngest being in their 40's. People between the age of 50-70 consist of the largest demographic between the sample patients. Post operative complications noted in 14 study population are residual pain 11 (24.44%), infection 2 (4.44) and fracture 1(2.22) (Table-1). After one year of surgery 67% regarded their lifestyle as excellent, and 16% regarded it as satisfactory and 17% responded that their lifestyle was not satisfactory (Figure-3).

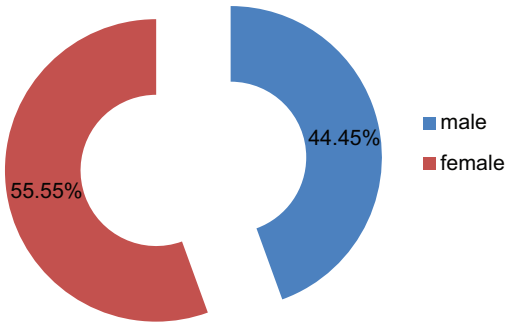


Figure-1: *Distribution of study population according to gender, n=45*

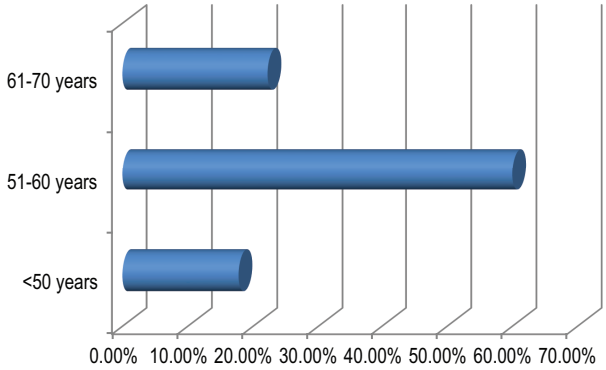


Figure-2 *Distribution of study population according to age, n=45*

Table-I

Post operative complications n=14

Complication	Number	Percentage
Residual pain	11	24.44%
Infection	2	4.44%
Fracture	1	2.22%

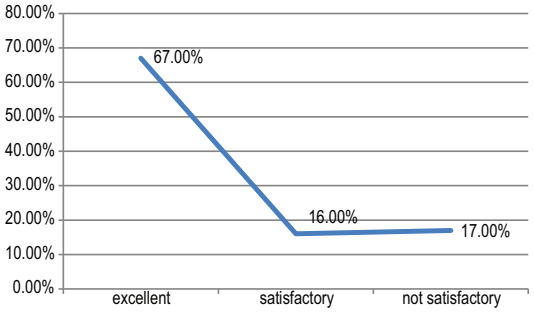


Figure-3 *Distribution of study population according to Post operative follow up.*



Fig.4 *Pre & Post Operative Picture of TKR.*

DISCUSSION

From the collected data and the created analysis of them, we can see that the ratio of female patients to male patients is higher by 10%. One possible reason for this outcome can be the calcium and Vit -D deficiency. Patients under the age of 50 years have required low chance of knee replacement than patients between the age group of 51 to 70 years. After surgery patients who properly taken care of for a certain time responded positively among them 67% regarded their lifestyle as excellent, and 16% regarded it as satisfactory. 17% responded that their lifestyle post-surgery was not satisfactory. On each follow-up examination, every patient received an original questionnaire with 24 questions concerning the course of their post-operative period (between the discharge from the hospital and the planned follow-up). The patients assessed the degree of satisfaction with surgery outcomes on a scale ranging from "fully satisfied" to "dissatisfied" and expressed their overall satisfaction in percent.[5] It can be surmised that follow-up treatments, both surgical and non-surgical in nature can affect a patient's lifestyle and satisfaction regarding surgery long after the surgery is over. Recent studies shown that on average 10% to 30% of the patients TKR outcome has not met their expectations.[5] While running a separate research study to see the rate of improvements between patients with moderate to severe knee pain, a greater scale of improvement could be seen in the patients undergoing surgery, compared to patients relying on only non-surgical methods the dissatisfaction patients showed is directly related to their quality of life, which they deem insufficient. This can depend on many physical, behavioral, social, and psychological factors that are not taken into account by functional outcome scores.[6] It has been decided that mainly three parameters affect patient satisfaction the most, functional outcomes, level of residual pain, and any prior expectations the patient might have had pre-operation.[6] A detailed analysis of the patient-reported functions and pain management has shown that after TKR, the pain outcomes have begun to worsen gradually over time. This time trend may be influenced by patient activity after TKR, their job, and lifestyle, and other environmental factors.[7] It has also been observed that patients' psychological state has a valid effect on patients' satisfaction toward the surgery, as patients with depressions voted the surgery unsatisfactory even though they received the exact surgery as the other patients.[8] Although small, there was a risk of having knee infection from the surgery, which also influenced the decision making of the patients. Nevertheless, patients concluded their TKR as successful, despite facing continuous pain, as they made varying reasons and rationalizations for the remaining pain.[4] The study, cross-referenced with another implies that the age or obesity of the patient does not negatively impactthe patient-related outcomes.[9] It is apparent that TKR can only elevate the pain and not erase it, but the biggest factor in deciding the satisfaction of a patient was the existing pain after surgery. As this study was conducted over a short pool of samples and a short time frame, further analysis is needed to determine whether the outcome improves or deteriorates over a longer period. It has been observed that patients who tend to move a lot, need to climb stairs, and are unable to use elevators, patients in an occupation that require standing or sitting in the same place for a long time, are more likely to feel unsatisfied with the surgery, as these activities are very distressing and still play a part in the patients daily life.[10] Overall

evaluation of the current data leads us to believe that women are more likely to need TKR than men, after a successful TKR/TKA, patients are mostly satisfied with the surgery, excluding a few cases. The patient's satisfaction or dissatisfaction is generally influenced by their pre-operation and post-operation lifestyle, occupation, and expectations. But having a small data pool, we cannot yet reach any further analysis as these statements might change after moire time passes, and there is a need to continue the research via more check-ups and interviews with the current sample size intermittently over a long period, preferably a yearly review going up to 6-7 years.

LIMITATIONS OF THE STUDY

Our study wasn't blinded so patient bias was present along with observer bias in subjective. Other potential predictive variables were not collected for this study, such as co-morbidities, type and extent of joint damage and operative factors.

CONCLUSION

Total knee arthroplasty is a generally effective procedure, Patients who have marked functional limitation, severe pain, low mental health score, and other comorbid conditions before total knee arthroplasty are more likely to have a worse outcome at one year. The impact of patient expectations on satisfaction is profound. Obviously, it would be wise for orthopaedic surgeons and patients to discuss expectations before TKA surgery to assure that these are realistic.

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Original Article

Comparison of PHILOS Plate and Percutaneous K-Wire Fixation for Proximal Humerus Fracture in Respect of Functional Outcome: A Prospective Study

Mohammad Awlad Hossain[1], Sumon Mallik[2], M. M. Ekramul Haque[3], Rafique Ahmed[4], Mohsin Hasan Samrat[5]

Abstract:

Background: The fracture of the proximal humerus is the second most often occurring fracture in the upper extremities. The advancement of internal fixation methods has led to an expansion of surgical indications. Objective: The objective of this study was to conduct a comparative analysis of the outcomes associated with PHILOS plating and percutaneous K-Wire fixation as treatment options for proximal humerus fractures. Methodology: This was prospective study. Conducted on the adult population at NITOR, from June 2021 to May 2022. Results: The majority of the patients were left-handed, and the average age was 54.19 years old; the youngest patient was 22 years old, and the oldest patient was 75 years old. Among the 52 patients (number of patient divided into two equivalent group, 26 patient in each group), 46.16 percent were female, while 53.84% were male, indicating that females predominated. The most frequent cause of injury was a fall (60%) followed by a car accident (40%) as the second most common cause. In 42% of patients, the right side was affected, whereas the left side was affected in 58% of instances. Conclusion: The results of this study indicate that older individuals with 4-part proximal humeral fractures are better candidates for ORIF with PHILOS.

Keywords: PHILOS Plate, K-Wire Fixation, Proximal Humerus Fracture

INTRODUCTION:

A proximal humerus fracture (PHF) is a frequent and potentially life-threatening injury.[1] According to the findings of various studies on a wide range of populations, their incidence ranges between 4% to 10% of all fractures.[2] Around 85% of cases manifest in those over 50 years, with the highest rates observed in those between the ages of 60 and 90 years, with a 70:30 gender distribution.[3] A research done in Finland in 2006 found that the number of proximal humerus fractures caused by falling has tripled since 1970.[4] This common injury is often treated in a contentious and challenging manner. Most patients just need non-surgical care, although surgery may be necessary for complicated fractures. Recent surveys conducted among surgeons show that shoulder arthroplasty and surgical fixation are the preferred treatments for many types of fractures in elderly patients, especially among shoulder and elbow specialists.[5,6]

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The pattern of the fracture, the health of the bone, the patient's needs, and the surgeon's familiarity with the procedures all influence the choice of treatment. Treatment options for proximal humerus fractures include both non-surgical and surgical methods. Surgery options for proximal humeral fractures include open reduction and internal fixation (ORIF), reverse shoulder arthroplasty (RSA), and hemiarthroplasty (HA).[7] Apart from all these treatments, there are two popular surgical treatments: PHILOS plates and percutaneous K-wire fixation.

An expansion of the original Bohler's approach, which was made in 1962 to treat epiphyseal fractures of the proximal humerus, has led to the creation of a unique method of biological fixation that uses closed reduction and percutaneous fixation.[8] The treatment options are also heavily influenced by the patient's age, physical activity level, and overall health. One of the available treatment options is closed reduction and percutaneous Kwire fixation.[9] It reduces the risk of blood loss, neurovascular problems, and glenohumeral joint motion obstruction.[10,11] However, the disadvantages of protracted immobilization that contribute to shoulder joint stiffness and anatomical reduction are typically not realized. Open reduction and internal fixation (ORIF) with plating is another way to get a stable, secure, and anatomically correct reduction with immediate movement. The proximal humerus interlocking system has biologically shaped surfaces and threaded screw heads that fit into threaded plate holes. This keeps the screws from flipping, sliding, or pulling out, and it also keeps the joints stable. Due to the low profile of these plates, the risk of postoperative soft tissue impingement syndrome is minimal.

Objectives: The objective of this study was to assess and evaluate the efficacy and results of PHILOS plating and percutaneous K-Wire fixation in the treatment of proximal humerus fractures.

Methodology:

Type of study: This research was done as a prospective study.

Study Duration: This study was conducted between June 2021 to May 2022.

Study Location: This study was conducted at The National Institute of Traumatology & Orthopaedic Rehabilitation (NITOR).

Study Population and sampling methods: This investigation includes 52 cases of proximal humerus fractures admitted to NITOR. The proximal humerus internal locking system (PHILOS) was used on 26 patients (Group A) and percutaneous K-wire fixation was used on 26 patients (Group B) in a prospective series of displaced proximal humerus fractures.

Follow up duration: All of these 52 patients were followed for an equivalent of 11 months over the course of this study.

Inclusion criteria:

- Patients who have fractures of the proximal humerus.
- Patient must be 18 years of age or older and above.
- Post-traumatic fractures with no neurovascular impairment
- Willing to sign the consent form and commit to the required follow-up.
- Patients whose test results were within the normal range and who were hemodynamically stable.

Surgical Procedures:

Group A- Proximal Humerus Internal Locking System (PHILOS): In Group A, surgery was done with a deltopectoral (anterior) approach, under general anesthesia, while the patient was sitting in a beach chair, and all aseptic precautions were taken [12,13]. Avulsions and injuries of the rotator cuff, capsule, and subscapularis muscles were repaired. When tuberosities were found to be fractured, they were repaired with nonabsorbable sutures. However, 48 hours after surgery, full-range elbow, wrist, and finger movements were incorporated into pendulum exercises. Actively assisted forward elevation and external and internal shoulder rotation were encouraged beginning on the seventh day. The stitches were removed on the 12th day, and the patient began using a step ladder after 3 weeks.

Group B- percutaneous K wire fixation: After inducing general anesthesia and positioning the patient in the beach chair position while taking all necessary precautions, we used the techniques described by Millet et al. [14] and Rowles & McGrory [15] to determine the appropriate insertion point for the proximal lateral pins and the appropriate removal point for the greater tuberosity pins in Group B.

The beginning point for the proximal lateral pin was twice the distance between the top and bottom of the humeral head, and the ending point for the greater tuberosity pin was more than two centimeters below the bottom of the humeral head.

After this, a fluoroscopic picture was used to verify that the 2.0 mm K-wire had been successfully positioned at the desired site in the case of two-part fractures. K-wire was drilled up into the humeral head while the reduction was being held, and the drilling continued until the tip of the K-wire was just beneath the articular surface. It was decided to drill a second K-wire parallel to the first one in order to achieve a distance in the humeral head of between

1.5 and 2.0 cm between the two K-wires. At long last, a third K-wire was inserted into the humeral head from the front in the direction of the anterior head of between 1.5 and 2.0 cm between the two K-wires. At long last, a third K-wire was inserted into the humeral head from the front in the direction of the anterior. In the event that it turned out to be essential, a fourth K-wire was placed from the front in the direction of providing extra stability.

Statistical data analysis: Parametric analyses were used to evaluate the outcomes. The unpaired t-test was used to compare the PHILOS group to the K-wire group, while Fisher's exact test was utilized for categorical data.

RESULTS:

The mean age of the patients was 54.19 years; the earliest was 22 years old, and the oldest was 75 years old; the majority of the patients were left-handed. Females predominated among the 52 patients, as indicated by the fact that 53.84 percent were male and 46.16 percent were female (Table-I).

Most of the patients were around 52 years old, which shows that osteoporosis plays a role in how these small injuries can lead to fractures. Moreover, 28% of patients were wounded in road traffic accidents. Falling to the ground was the most prevalent mechanism of injury among patients. The duration of the follow-up was, on average, eleven months.

The primary cause of injury seen in the study was falls, accounting for 60% of reported incidents, while automobile accidents were the second most prevalent cause, including 40% of the total cases. In 42% of patients, the right side was affected, whereas the left side was affected in 58% of instances. The average length of hospital stay for plating patients was 12 days, whereas K-wiring patients spent an average of 4 days there. The K-wiring procedure took an average of 30.7 minutes longer than the plating procedure, which took 84 minutes overall. Blood loss during plating was an average of 92 milliliters, while blood loss during K-wiring was 21 milliliters (Table-II).

Table-I

Distribution of age and gender among participants. (N=52)

Variables			Group A (PHILOS Plating) (N=26)	Group B (K wiring) (N=26)	P value
Age (in years)		56.15±12.10 Yrs	52.23±16.01 Yrs	0.58	
Age range		18-27 Years	2.4%	2.2%	N/A
		28-37 Years	4.4%	5.2%	
		38-47 Years	15.25%	14.72%	
		48-57 Years	30.95%	38.25%	
		58+ Years	47%	39.63%	
Gender	Male	53.84%	69.23%	65.38%	0.77
	Female	46.16%	30.77%	34.62%	

TableII

Distribution of causes of injuries and the surgery among the two groups.

Variables		%	Group A (PHILOS Plating) (N=26)	Group B (K wiring) (N=26)	P value
Mode of injury (%)	Fall	60%	16	15	0.85
	RTA	40%	13	8	
Laterality (%)	Left	58%	14	16	0.48
	Right	42%	12	10	
Neer classification (%)	1 part	19.23%	2	8	0.11
	2 parts	21.11%	4	7	
	3 parts	40.38%	15	6	
	4 parts	19.38%	6	4	
Duration of hospital stay (in days)		12 ± 1.22	4 ± 0.51	0.005*	
Duration of surgery (in minutes)		84.0 ± 12.10	30.7 ± 8.64	0.005*	
Blood loss (in ml)		91.0 ± 16.25	21.0 ± 8.22	0.005*	

Table-III

Comparison of surgical outcome of different fracture patterns between groups.

Outcome	1 Part		2 Parts		3 Parts		4 Parts	
	Group A (PHILOS Plating)	Group B (K wiring)	Group A (PHILOS Plating)	Group B (K wiring)	Group A (PHILOS Plating)	Group B (K wiring)	Group A (PHILOS Plating)	Group B (K wiring)
Favorable								
Excellent	2	3	2	2	8	3	3	2
Satisfactory	—	2	1	3	4	2	1	1
Unfavorable								
Unsatisfactory	—	2	—	1	1	1	1	—
Poor	—	1	1	1	2	—	1	1
Total	2	8	4	7	15	6	6	4
P value	***p>0.05***		***P>0.05***		***P<0.05****		***P< 0.05****	

In patients with 4-part fractures, the difference between the categories was statistically significant, whereas it was insignificant for patients with 1-, 2-, and 3-part fractures. Thus, patients with 4-part fractures in Group A had better outcomes than those in Group B (Table-3).

Table-IV

Distribution of complication among the patients.

Complications	No. of patient	
	Group A (PHILOS Plating)	Group B (K wiring)
Infection	1	2
Pain in shoulder	1	4
Screw perforation	1	—
Malunion	2	3
Restricted ROM (stiff shoulder)	2	6
Subacromial impingement	1	—
K-wire migration (loosening)	—	4

ROM: Range of motion, PHILOS: Proximal humerus internal locking system

DISCUSSIONS:

Most proximal humeral fractures that have not moved can be treated without surgery if the breaks are not too far apart. Even so, surgical treatment is necessary for displaced fractures in order to get better results. The therapy aimed to develop a shoulder that was pain-free and had a full range of motion (ROM). There are many different ways to fix these difficult fractures, such as nonabsorbable bone sutures, tension bands, K-wires, T-plates, intramedullary devices, and hemiarthroplasty. Still, each of the procedures has a chance of failing mechanically and could increase the number of complications.[16] According to the results of our research, the average age of the patients was 54.19 years old, with a range that went all the way up to 75 years old. This demonstrates the significance of senile osteoporosis in the development of these fractures, as other authors have reported.[17] Due to the cancellous nature of bone, fracture union has never been a problem in the management of proximal humeral fractures, as has been mentioned in many studies. The only exception to this is when the anatomical neck or articular part of the humerus is involved, which compromises the bone's blood supply.[18-20] ORIF with PHILOS gives better anatomical reduction and stronger fixation into the metaphyseal bone. As a result, it enables earlier mobility, which in turn reduces postoperative stiffness. One other benefit of utilizing this method is that it makes it possible to achieve a satisfactory decrease of the larger tuberosity. As a consequence of this, we had much more positive results with the patients in Group A as opposed to the patients in Group B. Fractures of the proximal humerus pose diverse challenges, with treatment outcomes contingent upon their classification. In the case of two- and three-part fractures, both PHILOS and K-wires exhibit effective healing. However, for four-part fractures, PHILOS surpasses K-wires due to its provision of a more rigid structure and stable fixation of tuberosities using non-absorbable sutures. Dolfi et al.'s[19] study, involving Type II, Type III, and Type IV proximal

humerus fractures, utilized various pins but found none effective for Neer's Type IV fractures, with three patients developing avascular necrosis (AVN). Percutaneous fixation, with terminally threaded pins and the avoidance of smooth K-wires, achieves stable fixation for Type II and Type III fractures but is not recommended for Type IV fractures. Shiva et al.'s investigation unveiled age-dependent variations in functional outcomes and fixation methods. Patients below 60 years old, receiving K-wire fixation, exhibited a functional outcome of 81.6, contrasting with a lower outcome of 66.8 in those above 60. Plating, as an alternative fixation method, demonstrated a functional outcome of 85.3 in patients younger than 60, while those older than 60 had a slightly lower outcome of 72.8.[21]

In Group A, seven out of the eight problems happened because the plates were put in the wrong place and the greater tuberosity was cut down too much. Before putting on the plate, impingement could have been avoided by cutting the greater tuberosity and other pieces into smaller pieces. For better results, intraoperative image control should be used to make sure that the fracture pieces have been properly reduced and that the plate and screws have been perforated. Nevertheless, the outcomes of K-wires in our research were comparatively less positive than those reported by Smejkal et al.[22] and Jaberg et al.[23] This discrepancy can be attributed to the higher mean age of 51 years among the participants in our study, indicating a greater proportion of elderly patients. The advanced age of these individuals correlated with poorer bone quality and increased comminution at the fracture site, contributing to a heightened risk of reduction loss and K-wire migration.

In this study, the average duration of follow-up was 11 months. Complications, such as secondary osteoarthritis and osteonecrosis of the proximal humerus, are more common the longer patients are followed following surgical treatments. The present study lacks the extensive follow-up of previous studies, which may have an impact on the reported incidence of complications.[17,24]

CONCLUSION

The results of this study indicate that older individuals with 4-part proximal humeral fractures are better candidates for ORIF with PHILOS. Stable fixation using PHILOS, which gives a more solid build with an anatomical decrease of tuberosities, can help get patients started on physical therapy sooner, increasing their chances of a successful outcome.

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Original Article

Evaluation of the Outcome of Arthroscopic Anterior Cruciate Ligament Reconstruction by Quadrupled Semitendinosus-Gracilis

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Abstract

Introduction: The anterior cruciate ligament (ACL) is one of the most commonly injured ligaments in the knee joint, especially in young individuals involved in sports requiring rapid changes in direction and jumping. Arthroscopic ACL reconstruction using the quadrupled semitendinosus-gracilis technique has become a popular surgical approach due to its minimal invasiveness, low morbidity, and high success rate. This study aimed to evaluate the outcomes of arthroscopic ACL reconstruction using the quadrupled semitendinosus-gracilis technique in 30 patients.

Methods: This prospective observational study was conducted with a total of 30 cases of ACL tear between the 25 months from May 2017 to August 2019, who had undergone ACL reconstruction through Quadrupled Semitendinosus-Gracilis method and were followed up for 24 weeks post-operatively.

Result: In the sample population, 56.67% were aged 16-25, with 33.33% in the 26-35 age group and only 10% aged 36-45. The population was predominantly male (96.67%), with 33.33% completing higher secondary education, 40% being students and 80% experiencing sports-related injuries. Pre-operative tests indicated ligamentous instability for all 30 patients. Post-operative tests showed no instability and a majority (80%) of patients had an excellent Lysholm knee score. One patient experienced pain as a post-operative complication, while none had infections or other complications.

Conclusion: The study observed the outcomes and complications of ACL reconstruction through Quadrupled Semitendinosus-Gracilis method in 30 patients. Young males were found to have a higher incidence of ACL injuries due to their participation in physical activities and sports. The primary cause of ACL injuries in the sample population was sports-related, with football being the most common cause. The ACL reconstruction surgery using quadrupled semitendinosus-gracilis was found to be safe and effective, resulting in positive outcomes and quality-of-life improvements for patients.

Keywords: Tear, Reconstruction, Ligament, Anterior, Arthroscopic

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INTRODUCTION

Anterior cruciate ligament (ACL) injuries are one of the most common knee injuries worldwide, with a prevalence rate of 68.6 cases per 100,000 individuals per year[1]. ACL injuries can occur in individuals of all ages, but young adults and athletes are particularly susceptible due to their involvement in high-impact sports and activities.[2,3] It is estimated that over 200,000 ACL injuries occur annually in the United States alone, with the majority of cases affecting individuals aged 15-45 years old.[4,5] The ACL is a crucial stabilizing ligament in the knee joint that helps maintain proper alignment and movement of the knee.[6] An injury to this ligament can lead to significant pain, instability,

and reduced knee joint function. The effects of an ACL injury can be debilitating, with many patients experiencing difficulty performing routine activities such as walking, running, and jumping. The management of ACL injuries depends on a variety of factors, including the severity of the injury, age of the patient, and the patient's level of physical activity.[7-10] Conservative management such as physiotherapy and bracing may be appropriate for individuals with minor ACL injuries or those who do not participate in high-impact activities.[11,12] However, surgical intervention may be necessary for more severe injuries or individuals who wish to return to high-impact activities.[12] One of the most common surgical techniques for ACL reconstruction is using a quadrupled semitendinosus-gracilis autograft. This technique involves harvesting a portion of the patient's own hamstring tendons and using them to create a new ACL.[13-15] The advantages of this technique include lower rates of donor site morbidity compared to other grafting techniques, good patient satisfaction, and high rates of return to pre-injury activity levels. (13)The use of quadrupled semitendinosus-gracilis autografts for ACL reconstruction has been extensively studied in recent years. Several studies have reported favorable outcomes with this technique, including high graft survival rates and low rates of complications such as knee instability and re-injury.[16,17] Furthermore, studies have demonstrated good functional outcomes with high rates of return to pre-injury activity levels. However, despite the success of this technique, there are some concerns regarding the long-term consequences of ACL reconstruction with quadrupled semitendinosus-gracilis autografts. For example, some studies have reported an increased risk of developing knee osteoarthritis in patients who undergo ACL reconstruction using this technique.[18] Additionally, there are concerns regarding the potential for the graft to stretch or elongate over time, leading to knee instability and reduced function. The present study was conducted to better understand ACL reconstruction's benefits using the quadrupled semitendinosus-gracilis method, by observing post-operative outcome and complications at a 24-week follow-up.

METHODS

This prospective observational cross-sectional study was conducted at the National Institute of Traumatology & Orthopaedic, Dhaka, Bangladesh. The study duration was 2 years and 3 months, from May 2017 to August 2019, during which 30 participants were selected for the present study. For inclusion of the participants, any patients visiting the outdoor department of the study place and diagnosed as a case isolated ACL tear were initially included in the study, while patients <18 years of age and >49 years of age, patients with presence of fracture around the knee, multiple ligament injuries, associated meniscus injury, previous open surgery for knee injuries, loss of knee motion and knee osteoarthritis, etc. were excluded from the study. Patients were selected through consecutive sampling methods from those undergoing arthroscopic ACL reconstruction by quadrupled semitendinosus-gracilis. The purpose and procedure of the study were discussed with the patients. The patients were then admitted after counseling for surgery. Pre-operative data were collected including Lachman test, ADT and Lysholm knee score in all the patients. Then, the patients were investigated for pre-anesthetic check-up and prepared for the operation. Informed written consent was taken from all patients. After a proper pre-operative check-up and discussing the technique with the surgical team, operation was performed methodically. Each patient followed up for 24 weeks post-operatively. Post-operative data were collected including Lachman test, ADT, and Lysholm knee score in all the patients and recorded for final outcome evaluation. The data were collected in a structured data collection form with a pre-tested structured questionnaire containing all the variables of interest by interview, observation, clinical examinations, and imaging findings. Collected data was analyzed using the SPSS V.25 software.

RESULTS

Table-I

Distribution of participants by socio-demographic characteristics (n=30)

Variables	n	%
Age		
16-25	17	56.67%
26-35	10	33.33%
36-45	3	10.00%
Mean±SD	26.8±7.4	
Gender		
Male	29	96.67%
Female	1	3.33%
Education		
Primary	3	10.00%
Secondary	9	30.00%
Higher Secondary	10	33.33%
Graduate	8	26.67%
Occupation		
Student	12	40.00%
Service holder	14	46.67%
Businessman	2	6.67%
Others	2	6.67%

The majority of the participants (56.67%) were aged between 16 to 25 years, with 33.33% falling into the age group of 26 to 35 years and only 10% were aged between 36 to 45 years. The mean age of the sample population was 26.8 years with a standard deviation of 7.4. Gender distribution indicates that the sample population consisted of 96.67% males and only 3.33% females. In terms of education, the highest proportion (33.33%) had completed higher secondary education, followed by 26.67% with a graduate degree, 30% with secondary education, and only 10% with primary education. Regarding occupation, 40% were students, 46.67% were service holders, 6.67% were businessmen, and 6.67% fell into the "others" category.

Table II

Distribution of participants by injury-related characteristics (n=30)

Variables	n	%
Affected Knee		
Right	20	66.67%
Left	10	33.33%
Causes of the injury		
Sports	24	80.00%
Road Traffic Accident	4	13.33%
Other	2	6.67%
Mechanism of the injury		
Football	23	76.67%
Cricket	2	6.67%
Other	5	16.67%

66.67% of the injuries occurred in the right knee and 33.33% in the left knee. In terms of the causes of injury, 80.00% were related to sports, 13.33% were due to road traffic accidents, and the remaining 6.67% had other reasons. The mechanism of injury in the sample population was primarily associated with football (76.67%), followed by other sports like cricket (6.67%) and other unspecified causes (16.67%).

Table III

Distribution of participants by pre-operative clinical characteristics (n=30)

Pre-Operative Clinical Findings	n	%
Lachman Test		
Positive	30	100.00%
Negative	0	0.00%
Anterior Drawer Test		
Positive	30	100.00%
Negative	0	0.00%
Lysholm knee score		
Poor	21	70.00%
Fair	9	30.00%
Good	0	0.00%
Excellent	0	0.00%

In terms of pre-operative tests, all 30 patients who underwent the Lachman and anterior drawer tests had positive results, indicating that they had ligamentous instability in the knee joint. Regarding the Lysholm knee score, 70% of the patients had a poor score, while 30% had a fair score. No patients had a good or excellent score.

Table IV

Mean duration of post-operative hospital stay among the participants (n=30)

Post-operative Hospital Stay (in days)	Mean	SD
	3.5	0.86

The mean post-operative hospital stay was 3.5 days, with a standard deviation of 0.86 days.

Table V

Distribution of participants by 24thpostoperative week clinical characteristics (n=30)

Post-Operative Clinical Findings	n	%
Lachman Test		
Positive	0	0.00%
Negative	30	100.00%
Anterior Drawer Test		
Positive	0	0.00%
Negative	30	100.00%
Lysholm knee score		
Poor	0	0.00%
Fair	0	0.00%
Good	6	20.00%
Excellent	24	80.00%

At post-operative functionality tests, all 30 patients had negative results on the Lachman and anterior drawer tests, indicating that there was no ligamentous instability in the knee joint after the surgery. Regarding the Lysholm knee score, none of the patients had poor or fair scores. Instead, 80% of the patients had an excellent score, and the remaining 20% had a good score.

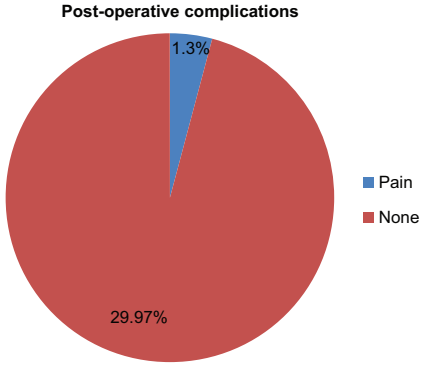


Figure 1: Distribution of participants by post-operative complications (n=30)

The results indicate that out of 30 patients, only one patient (3.33%) experienced pain as a post-operative complication, while none of the patients had infections or other complications. Most patients (96.67%) did not experience any post-operative complications.

DISCUSSION

The present observational study was conducted to observe the post-operative outcome and complications of patients with ACL tears who had undergone reconstruction through Quadrupled Semitendinosus-Gracilis method. The study included 30 patients who underwent ACL reconstruction by quadrupled semitendinosus-gracilis. The demographic characteristics of the sample population were analyzed, and it was found that the majority of the participants were young males, with a mean age of 26.8 years. This finding was consistent with previous studies that have reported a higher incidence of ACL injuries in young male athletes.[19,20] This is primarily due to the increased participation of young people in physical activities and sports that involve running, jumping, and cutting. Young people are more active and often engage in sports that put significant stress on their knees, such as soccer, basketball, and football. Additionally, the knee joint anatomy in young individuals may play a role in the higher incidence of ACL injuries. The bones, ligaments, and muscles in young people are not fully developed, which can make the knee joint less stable and more susceptible to injury. Most of the participants in the present study had completed higher secondary education and were either students or service holders. This finding may be attributed to most participants being young adults pursuing higher education or being employed. This was quite understandable due to the age distribution of the present study's participants. The results of the present study suggest that the primary cause of ACL injuries in the sample population was sports-related, with football being the most common cause. This finding is consistent with previous studies that have reported a higher incidence of ACL injuries in athletes participating in contact sports such as football.[2,21] The results of the pre-operative tests indicate that all patients had ligamentous instability in the knee joint, as indicated by positive results on the Lachman and anterior drawer tests. This finding is expected, as these tests are commonly used to diagnose ACL injuries. The mean duration of hospital stay was 3.5 days among the participants, which was slightly longer compared to another study.[22] The results of the post-operative functionality tests indicate that all patients had negative results on the Lachman and anterior drawer tests, indicating that there was no ligamentous instability in the knee joint after the surgery. This finding suggests that the ACL reconstruction surgery was successfully restored knee stability in all patients. In addition, none of the patients had any post-operative infections or complications, except for one patient who experienced pain. This outcome was significantly better than other studies, as no treatment failures were observed in the present study.[23] However, the small sample size of the present study, as well as the medical advancements over the decades had a significant impact on this low complication rate. In terms of the Lysholm knee score, the results of the present study indicate that the majority of the patients had excellent scores, and none of the patients had poor or fair scores after the surgery. This finding suggests that the ACL reconstruction surgery had a positive impact on the patient's quality of life and functional abilities. The results of the present study were consistent with previous studies that have reported good to excellent outcomes for ACL reconstruction surgery using quadrupled semitendinosus-gracilis.[24,25] These finding indicates that the quadrupled semitendinosus-gracilis technique is a safe and effective treatment option for ACL injuries.

LIMITATIONS OF THE STUDY

The study was conducted in a single hospital with a small sample size. So, the results may only represent part of the community.

CONCLUSION

This observational study examined 30 patients who underwent ACL reconstruction through the Quadrupled Semitendinosus-Gracilis method and found that most participants were young males who sustained their injuries during sports activities. Pre-operative tests showed that all patients had ligamentous instability, but post-operative tests indicated that surgery successfully restored knee stability, with no post-operative infections or complications, except for one patient who experienced pain. The study suggests that the quadrupled semitendinosus-gracilis technique is a safe and effective treatment option for ACL injuries.

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Ethical approval: The study was approved by the Institutional Ethics Committee.

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Original Article

Evaluation of Surgical Outcome of Cemented Total Hip Replacement in Elderly Patients

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Abstract

Introduction: Orthopedic surgeons replace the damaged hip joint surfaces with artificial joint prostheses. Sir John Charnley, a British orthopaedic surgeon, developed the fundamental principles of the artificial hip and is credited as the father of THR. Charnley's low friction Replacement, acrylic cement became standard for femoral component fixation. Charnley systematically promoted THR, based on the concept of low friction Replacement by: (a) fixation with bone cement; (b) adoption of a 22-mm femoral head; (c) adoption of ultrahigh molecular weight polyethylene (UHMWPE); and (d) preparation of a manual of the surgical procedure. The main component of a cemented hip replacement is Polymethyl- methacrylate, more commonly known as (PMMA). This study focused on the surgical outcome of a successful cemented THR surgery and its possible complications in elderly patients.

Methods: This was retrospective observational study and was conducted in the Department of Orthopaedic Surgery of National Institute of Traumatology and Orthopedic Rehabilitation (NITOR), Dhaka, Bangladesh from September 2019 to August 2021, over a period of two years. Records of patients with cemented hip replacements were collected over the two- year period, by giving them a questionnaire at their follow up inspection, which happened 5-10 years after the surgery. The questionnaire was given to 60 different patients, all with cemented hip arthroplasty done before, including a wide range of demographics. Of the 60 initial prospects, 3 patients did not wish to disclose their personal information, bringing the sample number to 57 willing to participate in this study. The collected data was then cross-referenced with similar existing case studies to reach an outcome.

Results: Total of 57 samples were selected for collecting valid data. Male female ratio was 2:1 (n=38:19). A total of 38.60% (n=22) patients were under the age of 50 at the time of surgery, 35.09% (n=20) were between the age group of 51 to 60. 21.05% (n=12) patients were from the age group of 61 to 70 years and the rest 5.26% (n=3) were above 70 years at the time of their arthroplasty. At the time of the follow-up, only 96.50% (n=55) were alive, and the remaining 3.50% (n=2) were found to have passed away. One n=1 (1.75%) of them died due to surgical complication. The follow-up year after their initial surgery was divided into 5 groups, starting at 5 years after their surgery having a 10.53% (n=6) patients coming for secondary revision, 8.77% (n=5) patients coming after 7 years of surgery, 12.28% (n=7) having followed up 8 years after the surgery, 26.32% (n=15) having followed up 9 years after the THA and the majority having done the follow up 10 years after successful surgery, at 38.60% (n=22). Follow-up can be divided into 3 primary groups, having the majority of patients getting follow up for resurfacing pain, at 52.63% (n=30), 5.26% (n= 3) for sepsis, and 10.53% (n=6) coming in for dislocation.

Conclusions: Cemented femoral stems have excellent long-term outcomes and a continued role, particularly in elderly patients. Contrary to historical concerns, recent studies have not shown an increased risk of death with cemented femoral fixation.

Keywords: THR, Arthroplasty, Hip replacement, Cemented, THA.

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INTRODUCTION

Many patients suffering from chronic joint pain due to arthritis now-a-days. Majority of them requires joint replacement surgery, the orthopedic surgeon will replace the existing joint surfaces with artificial joint prostheses. Sir John Charnley, a British orthopaedic surgeon, developed the fundamental principles of the artificial hip and is credited as the father of THR.[3] Charnley's low friction Replacement, acrylic cement became standard for femoral component fixation. Charnley systematically promoted THR, based on the concept of low friction Replacement by: (a) fixation with bone cement; (b)

adoption of a 22-mm femoral head; (c) adoption of ultrahigh molecular weight polyethylene (UHMWPE); and (d) preparation of a manual of the surgical procedure. These prosthetic components must adhere to the patient's natural bone. This adhesion can be achieved in two ways.[3] A cemented joint prosthesis uses fast-drying bone cement to help affix it to the bone. This article is focused on surgical outcome of a cemented hip replacement and changes after surgery. The main component of a cemented hip replacement is Polymethyl-methacrylate, more commonly known as (PMMA). Various types of additives have been trialed to figure out problems with modern bone cements, like loosening of the prosthesis, high post-operative infection rates, and inflammatory reduction in interface integrity.[1] Proximal femur undergoes physical changes to carry the weight of the body. Thus, any affection to the hip joint severely affects locomotion.[2] This study focused on the surgical outcome of a successful cemented THR surgery and its possible complications. It also showed the male to female ratio in cases of hip replacements, based on our current socio-economic status, and the average age of a patient going in for a cemented hip replacement. This study focused mainly on the outcome of a THR and evaluated them to reach proper conclusions. It has also examined the possible complications regarding these types of surgery, specifically the postoperative complications, to see if cemented total hip arthroplasty is a viable option for patients with severe pain in the coxa region. The study has also concluded the primary reasons for a follow up after a successful hip replacement, which weighed in on the types of possible complications faced in these types of major surgery.

Objectives

General objective: To evaluate the surgical outcome of Cemented Hip Replacements.

Specific Objectives: To discuss the surgical outcome after a successful THR, to observe the positive or negative influence in a patient's life after a cemented hip replacement

MATERIALS & METHODS

This was an observational study and was conducted in the Department of Orthopaedic Surgery of National Institute of Traumatology and Orthopedic Rehabilitation (NITOR), Dhaka, Bangladesh from September 2019 to August 2021, over a period of two years. Records of patients with cemented hip replacements were collected over the two-year period, by giving them a questionnaire at their follow up inspection, which happened 5-10 years after the surgery. The questionnaire was given to 60 different patients, all with cemented hip arthroplasty done before, including a wide range of demographics. Of the 60 initial prospects, 3 patients did not wish to disclosed their personal information, bringing the sample number to 57 willing to participate in this study. The collected data was then cross-referenced with similar existing case studies to reach an outcome.

RESULTS

In this study, a total of 57 samples were selected for collecting valid data, with a wide range of demographics, including age groups, gender, and reason for secondary revision. The male: female ratio was 2:1 (n=38:19).The sample age group was divided into 4 groups based on when the surgery was done, starting from patients who were under 50 at the time of arthroplasty. A total of 38.60% (n=22) patients were under the age of 50 at the time of surgery, 35.09% (n=20) were between the age group of 51 to 60. 21.05% (n=12) patients were from the age group of 61 to 70 years and the rest 5.26% (n=3) were above 70years at the time of their arthroplasty. It is to be noted that this data was heavily influenced by the average mortality rate of Bangladesh as average life expectancy is 72 years here. At the time of the follow-up, only 96.50% (n=55) were alive, and the remaining 3.50% (n=2) were found to have passed away.One n=1 (1.75%) of them died due to surgical complication. The follow-up year after their initial surgery was divided into 5 groups, starting at 5 years after their surgery having a 10.53% (n=6) patients coming for secondary revision, 8.77% (n=5) patients coming after 7 years of surgery, 12.28% (n=7) having followed up 8 years after the surgery, 26.32% (n=15) having followed up 9 years after the THA and the majority having done the follow up 10 years after successful surgery, at 38.60% (n=22). Follow-up can be divided into 3 primary groups, having the majority of patients getting follow up for resurfacing pain, at 52.63% (n=30), 5.26% (n= 3) for sepsis, and 10.53% (n=6) coming in for dislocation.

Table-I

Sex distribution

Sex	n	Percentage %
Male	38	66.67%
Female	19	33.33%
Total	57	100.0

Table-II

Complications After Surgery

Complications	n	Percentage %
Alive at follow up	55	96.50%
Died due to natural causes	1	1.75%
Died due to surgical complications	1	1.75%
Total	57	100%

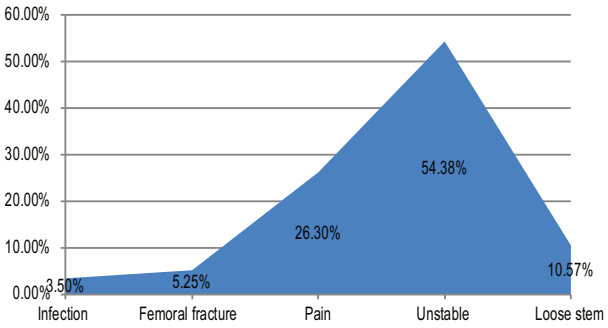


Fig.- 1 *Cause of Surgery of study patients*

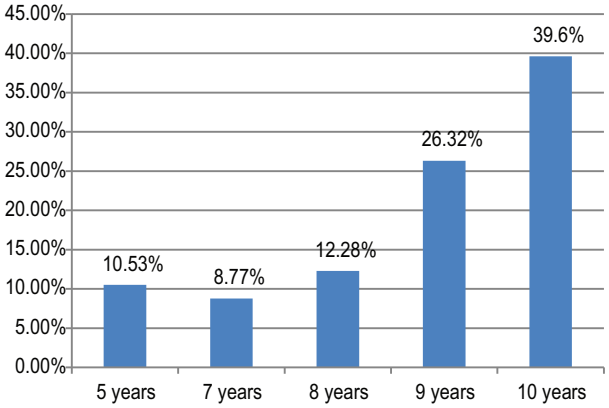


Fig.-2 *Follow up duration of study population*

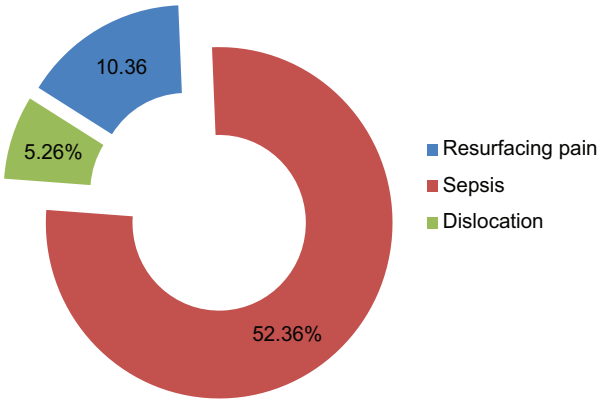


Fig.-3 *Reasons for follow up cemented THR*

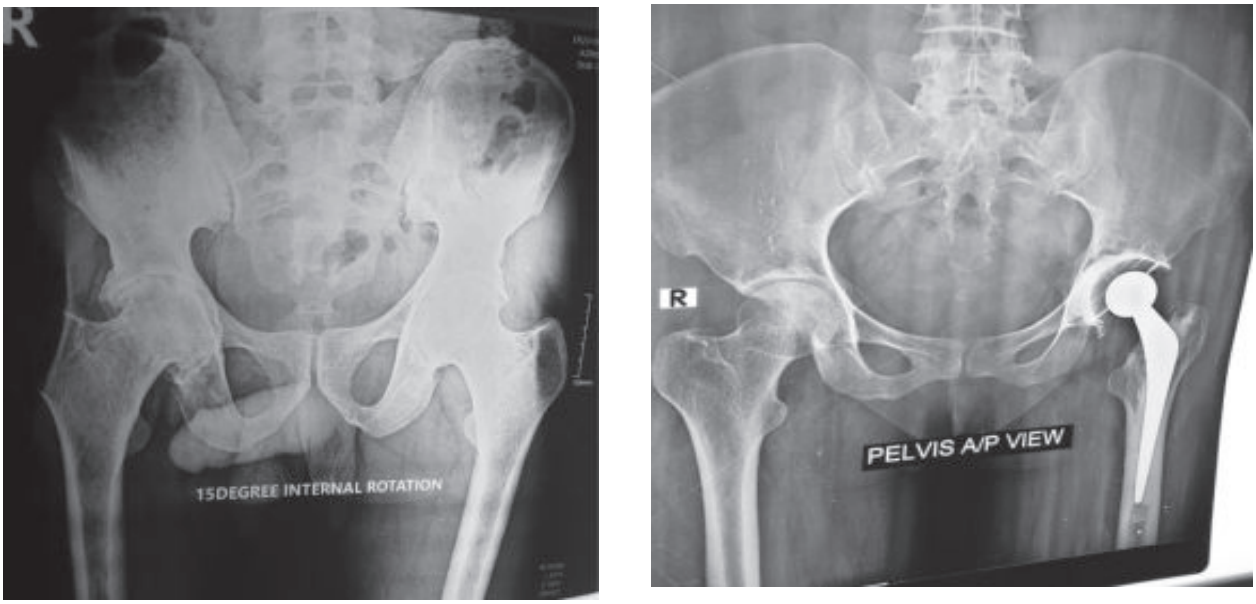


Figure 4 - *Cemented THR (Pre and Post Operative)*

DISCUSSION

Due to chronic joint pain as consequence of arthritis, a patient generally choice for hip replacement surgery. This surgery can largely be categorized into two processes, Cemented hip replacement and Cementless hip replacement. This study was focused on cemented hip replacement and the evaluation of surgical outcomes regarding that Cemented THA generally uses polymethyl-methacrylate (PMMA) to function as a grout, producing an interlocking fit between cancellous bone and prosthesis.[3] In the case of Cemented Hip Arthroplasty, initial stability is a must for permanent fixation of acetabular cups. Biological reactions tolocalized bone resorption can often lead to implant failure. Modern fixation techniques and implants using cement have resulted in a better outcome than older cemented and historical uncemented series.[4] Cemented stems fall into two main categories: "force-closed" and "shape-closed." Otherwise known as taper-slip and composite beam respectively. Taper-slip stems, such as the Exeter stem, are collarless and have a highly polished surface finish. They achieve stability through micromotion at the prosthesis-cement interface promoting slight subsidence of the stem within the cement mantle, the generation of radial stresses, and ultimately compression at the bone-cement and prosthesis-cement interfaces. Composite beam stems, such as the later versions of the Charnley Stem, aim to achieve stability through a solid bond between stem, cement, and bone, maintaining the position of the stem within the mantle. Design features including rough surface finish and the presence of a collar are intended to improve stability at the prosthesis-cement interface.[5] Another study focused on the reasons for dislocation and loss of stems has found that the majority of the reasons are of fracture in the secondary to lysis below the tip of the stem[7] This study focused only on one type of cemented hip replacements, specifically the matt finished femoral stems and the mode of their loosening. It has been generally observed that the ratio of male to female coming in for hip replacements is 2 to 1. Here, when cross-referencing with other studies performed in developed countries, it can be seen that Osteoarthritis (OA) is a leading cause of disabilityis more prevalent in women compared to men. Total joint arthroplasty is an effective treatment option for end-stage OA.[8] But further analysis into those studies lead us to believe that among patients potentially at risk for the procedure, men and women within the VA system have the identical likelihood of undergoing hip arthroplasty.[9] The explanation for this disparity in countries such as ours can be explained by another study, performed via questionnaires, which shows that there's an underuse of arthroplasty for severe arthritis in both sexes, but the degree of underuse is quite 3 times as great in women as in men.[10]

As our study was concluded with a limited sample size and in a country with an average life expectancy of 72 years, most of the complications, found resurfscing painin our study 52.36%. The remaining 5.26% of the total sample size had a complication after surgery in the form of sepsis from a fracture in the acetabulum region. This ratio of sepsis after Cemented THR can be confirmed by another study performed by M J Spangehl.[11] When compared to the complications from cemented hip arthroplasty, the ratio of complications in cementless hip replacement can be seen as much higher, at a shockingly 9:1 ratio, with 9 being the cementless THR complications.[12]

The primary analysis of the patients through the questionnaire has shown that prior to the surgery, the most prominent reason for patients to operate for a cemented THR was unstable hip joints, with almost 54.38% of patients having done surgery for this reason. 26.30% operated for THR because of pain in the coxa region, and the least reviewed reason for getting THA was a femoral fracture 5.25% and 3.50% infection in the coxa region. This may be influenced by the socio-economic condition of the patients, as a hip replacement can be very costly and many try to rely on medication instead of surgery for moderate to severe pain. Some of the more prominent reasons for hip arthroplasty are loose stem 10.57%. The main reason for a follow up can be seen as resurfacing pain 52.36%. Among other reasons, sepsis and dislocation. It is observed any complications from the surgery were very limited and not severe. When cross-referencing with another study, it can be surmised that both resurfacing pain and dislocation are common after a while has passed after THR, and can happen mainly because of two reasons, both in cemented cases and cementless cases. Though further analysis has shown that cemented cases are much less likely to face these problems compared to cementless cases.[13]

At the time of the surgery, more than 38.60% of the patients were under the age of 50, a very few within age of 61-70 years, specifically only 3 patients operated for THR. This can also be explained by the life expectancy as the hope of survival decreases and the possible complications grow exponentially over-time after a certain age. Many after the age of 70 do not wish to take any unnecessary risk via surgery for a few more years in life. Another outlook can be that people under the age of 50 are more likely to get

any major surgery done as they have a higher life expectancy and if the risks are also low compared to people over the age of 70.

LIMITATIONS OF THE STUDY

This study faced some limitations, mostly in the case of average life expectancy. The average life expectancy in this country is 72 years, which made it hard for patients going in for surgery to have proper follow-ups, especially those who were near the age of 70 at the time of their operation. Socioeconomic condition was bid issue for THR, in both cemented and cementless cases, as the surgery itself was too expensive for most patients. Another limitation of the study was the poor data as patients went abroad, didn't come for proper follow-ups, or had refused to share their data.

CONCLUSION AND RECOMMENDATIONS

Cemented femoral stems have excellent long-term outcomes and a continued role, particularly in elderly patients. Contrary to historical concerns, recent studies have not shown an increased risk of death with cemented femoral fixation. Further research is needed to directly examine the impact for surgeons to decision-making.

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Original Article

Outcome of Paediatric Dynamic Hip Screw (DHS) Fixation for the Treatment of Proximal Femoral Fracture in the Age Group of 6-16 Years

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ABSTRACT

Background: Pediatric proximal femoral fractures continue to be a topic of great interest because of their rarity, lack of consensus for best treatment, associated complications and morbidity, and need for prospective, randomized evidence to evaluate treatment methods. Recently, paediatric Dynamic Hip Screw (DHS) has got popularity by the orthopaedic surgeon which is biomechanically more stable construct with fewer complication rates. So, this study has attempted to evaluate the functional outcome of paediatric dynamic hip screw (DHS) fixation for the management of proximal femoral fractures in the age group of 6 to 16 years.

Material & Method: A prospective observational study was conducted at NITOR from January 2020 to December 2021. Paediatric patients in above age group with Delbet type III, IV and subtrochanteric fractures meeting the selection criteria were study population. Total 18 patients were included in the study. Cases were evaluated by clinical findings, imaging by X-ray and HHS. Twenty-four weeks follow up was done with clinical, functional and radiological assessment.

Results: The mean age was 10.1±3 years with a male predominance (72.2%). Motor vehicle accident was the most common cause of injury (66.7%). The mean duration of injury to surgery and follow up was 9.2±1.9 days and 28.7±3.8 weeks respectively. In 14 cases of Delbet type III and IV fracture closed reduction could be done but in 4 cases of subtrochanteric fracture open reduction was needed. Wound infection was found in 1 (5.6%) cases and screw cutout was found in 1 (5.6%) cases. All cases have united within the follow up period and the mean radiological union time was 12.8±2.7 weeks. The mean flexion of hip at last follow up was 119.170±10.470. Again, the mean abduction and adduction was 31.10±40 and 31.70±3.80 respectively. Internal rotation and external rotation at last follow up was 300±4.20 and 29.170±3.50 respectively. The mean HHS was 89.9±12.1 at last follow up. Finally, out of 18 cases, 10 (55.56%) were excellent, 5 (27.8%) were good, 2 (11.1%) were fair and the rest 1 (5.6%) was poor.

Conclusion: Delbet type III and IV fracture and subtrochanteric fracture can be effectively treated with paediatric DHS in paediatric age group with a good safety profile.

Key words: Proximal femoral fracture, Dynamic Hip Screw.

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INTRODUCTION

Proximal femoral fractures in the paediatric patient are rare, accounting for less than one percent of all paediatric fractures.[1] Despite the low incidence, pediatric proximal femoral fractures continue to be a topic of great interest because of their rarity, lack of consensus for best treatment, associated complications and morbidity, and need for prospective, randomized evidence to evaluate treatment methods.[2] These fractures are however associated with high rate of complications such as coxa vara, delayed union, nonunion, avascular necrosis of femoral head, premature physeal closure and limb length discrepancy etc.[3]This fact was best summarized by Canale stating that "hip fractures in children are of interest because of the frequency of complications rather than the frequency of fractures".[3]

Proximal femoral fractures pose a great challenge to the orthopaedic surgeons due to variation in osseous & vascular anatomy in different age group as well as distinct biomechanics in the neck, trochanter and subtrochanteric region. Regarding biomechanics of proximal femur, AO considered that torsional and shear forces at the fracture site are the main stress factors that impair the healing of fractures, while axial compressive stress is beneficial.[4]The ideal fixation device must stand to weight bearing loads and provide stability across the fracture site to reduce complication rates during healing process. In addition to this, most devastating complication like AVN should be kept in mind before choosing an implant.

These fractures can be managed by hip spica, cannulated screw, dynamic hip screw (DHS), proximal femur anatomical plate or angled blade plate, intramedullary nails. While hip spica cast is appropriate in younger children, angled blade plate lacks compression effects and cannulated screws lack buttressing effect, more emphasis has been implicated on paediatric DHS due to its biomechanical superiority. It can resist bending and shearing forces and can maintain neck shaft angle and provides better rotational stability at the fracture site. Now-a-days, it is widely performed technique because of its better outcome in relation to available implants in our country.

MATERIAL & METHOD:

A prospective observational study was conducted at NITOR from January 2020 to December 2021. Paediatric patients of 6 to 16 years old with Delbet type III, IV and subtrochanteric fractures meeting the selection criteria were study population. Total 18 patients were included in the study. Cases were evaluated by clinical findings, imaging by X-ray and HHS. Twenty-four weeks follow up was done with clinical, functional and radiological assessment.

Results: The mean age was 10.1±3 years with a male predominance (72.2%). Motor vehicle accident was the most common cause of injury (66.7%). The mean duration of injury to surgery and follow up was 9.2±1.9 days and 28.7±3.8 weeks respectively. In 14 cases of Delbet type III and IV fracture closed reduction could be done but in 4 cases of subtrochanteric fracture open reduction was needed. Wound infection was found in 1 (5.6%) cases and screw cutout was found in 1 (5.6%) cases. All cases have united within the follow up period and the mean radiological union time was 12.8±2.7 weeks. The mean flexion of hip at last follow up was 119.17^0±10.47^0. Again, the mean abduction and adduction was 31.1^0±4^0 and 31.7^0±3.8^0 respectively. Internal rotation and external rotation at last follow up was 30^0±4.2^0 and 29.17^0±3.5^0 respectively.

The mean HHS was 89.9±12.1 at last follow up. Finally, out of 18 cases, 10 (55.56%) were excellent, 5 (27.8%) were good, 2 (11.1%) were fair and the rest 1 (5.6%) was poor.

Table I

Distribution of cases according to age (N=18)

Age (years)	Frequency	Percentage
6-9	8	44.4%
9-12	5	27.8%
12-16	5	27.8%
Total	18	100.0%
Mean±SD	10.1±3	

In this study, the highest number of patients 8 (44.4 %) were 6 to 9 year age group followed by 5 (27.8%) cases in 9 to 12 year age group and in 12 to 16 year age group each. The mean age was 10.1±3 years with range from 6 to 16 years.

Among the 18 cases, 8 (44.4%) had a Delbet type III fracture, 6 (33.3%) had Delbet type IV fracture and the remaining 4 (22.2%) had subtrochanteric fracture.

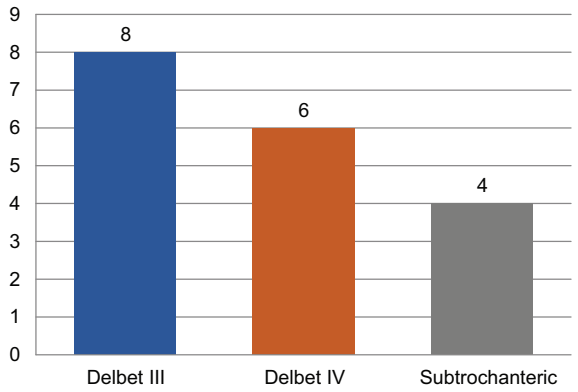


Fig.- 1: *Distribution of cases according to type of fracture (N=18)*

Table II

Duration of radiological union in weeks (N=18)

Type of Fracture	Mean ± SD	p value
Delbet III or IV	13.9 ± 1.8	<0.001
Subtrochanteric	9.0 ± 1.2	
Total	12.8 ± 2.7	

p value was calculated with unpaired t test

The mean radiological union time was 12.8 ± 2.7 weeks, ranging from 8 weeks to 18 weeks. Mean radiological union time in Delbet type III and IV was 13.9 ± 1.8 weeks while in subtrochanteric fracture, it was significantly shorter to 9 ± 1.2 weeks (p value <.05).

Table III: Distribution of cases by to functional ability at last follow up (N=18)

Function		Frequency	Percentage
Limp	None	10	55.6%
	Slight	7	38.9%
	Moderate	1	5.6%
Support	None	10	55.6%
	Cane for long walks	5	27.8%
	Cane for most of time	3	16.7%
Distance	Unlimited Six	10	55.6%
walked	blocks	8	44.4%
Sitting	Comfortable in ordinary chair for 1 hour	16	88.9%
	Comfortable on a high chair for 30 minutes	2	11.1%
Use of public	Yes	11	61.1%
transport Stairs	No	7	38.9%
	Normal	9	50.0%
	Use railing	9	50.0%
Put on shoes or socks	Easily	13	72.2%
	With difficult	5	27.8%

The functional ability of the cases was measured according to Harris hip score (Harris, 1969). Regarding limping, 10 (55.6%) cases did not limp, 7 (38.9%) cases slightly limped and 1 (5.6%) case limped moderately. 10 (55.6%) cases walked without support, 5 (27.8%) case needed cane for long walk and 3 (16.7%) needed cane most of the time. 10 (55.6%) patients could walk unlimited distance and 8 (44.4%) patients could walk six blocks. 16 (88.9%) patients could comfortably sit on ordinary chair for at least 1 hour but 2 (11.1%) patients could sit in high chair for 30 minutes. 11 (61.1%) could use public transport. No help was needed to climb stairs in 9 (50%) patients, aid of railing was needed for 9 (50%) cases. 13 (72.2%) patients could put on socks/ shoes easily whereas 5 (27.8%) patients could do it with difficulties.

Table IV

Distribution of cases according to HHS at different follow up (N=18)

HHS at different follow up	Mean ± SD	p value
HHS at 6 weeks	44.7 ± 11.9	
HHS at 12 weeks	76.1 ± 12.2	<0.001
HHS at Last follow up	89.9 ± 12.1	0.0014

The mean HHS at 6 weeks was 44.7±11.9. At 12 weeks, it has increased significantly to 76.1±12.2 (p value <.05). Again, at last follow up, the mean has increased significantly to 89.9±12.1 (p value <.05).

Table V

Final outcome according to HHS (N=18)

Final outcome	Frequency	Percentage
Excellent	10	55.56%
Good	5	27.78%
Fair	2	11.11%
Poor	1	5.56%
Total	18	100.00%

After last follow up, the final outcome was assessed with HHS tool. Out of 18 cases, 10 (55.56%) were excellent, 5 (27.8%) were good, 2 (11.1%) were fair and the rest 1 (5.6%) was poor.

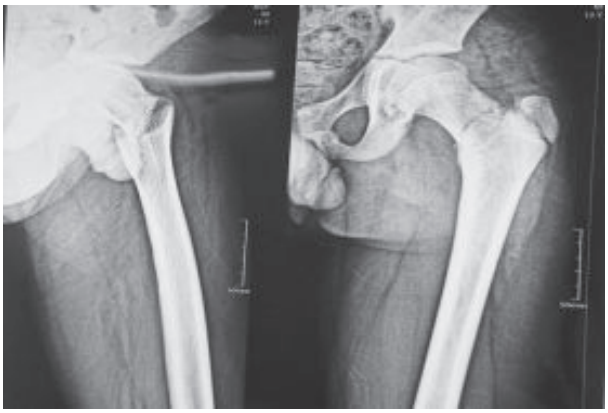


Figure 2: *Preoperative X-ray.*



Fig.-3: *Fluroscopic image of closed reduction with positioning of patient.*

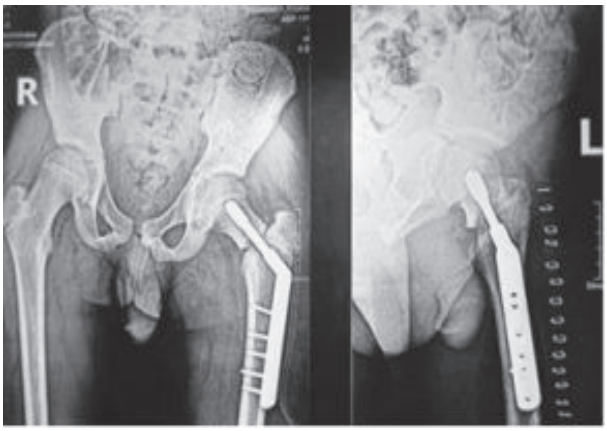


Fig.-4: *Immediate postoperative X-ray.*



Fig.-5: *X-ray at 24 weeks.*



Figure 6: *Functional status at last follow up showing flexion of hip & knee and full weight bearing status.*

DISCUSSION

Paediatric proximal femoral fracture is a rarity. During the span of the study, 18 cases were included with mean age of 10.1±3 years ranging from 6 to 16 years. There was 13 (72.2%) male and 5 (27.8%) female with a male-female ratio of 2.6:1. Paediatric proximal femur fractures are exceedingly rare owing to the dense bone surrounded by a strong periosteum.[5]So, a high energy force is needed for these types of fractures to be happened unless there is any pathology in that region. This fact is reflected in the present study. In 66.7% (n=12) cases, fractures were due to motor vehicle accident while in the remaining 33.3% (n=6) cases it was due to fall from height.

Among the 18 cases, 8 (44.4%) had a Delbet type III fracture, 6 (33.3%) had Delbet type IV fracture and the remaining 4 (22.2%) had subtrochanteric fracture. In a previous study, the incidence of Delbet type III fracture was the highest among these three types of fracture which is 35%.[6] This finding has correlated with the present study. Out of 18 cases, in 10 (55.6%) cases, duration of injury to surgery was between 6 to 9 days and in 8 (44.4%) cases, duration was 10 to 13 days.

The mean duration of injury to surgery was 9.2±1.9 days, ranging from 6 days to 13 days. In three cases, presentation was late, may be due to poor referral system, dependency on traditional bone setter, transport difficulties due to COVID pandemic etc. Theoretically, early reduction

"unkinks" the vessels and reduces ischemic time and necrosis.[7]However, other series in the paediatric literature did not demonstrate a difference between early and delayed reduction.[8] Authors who found no differences with development of AVN and early anatomic reduction relied on the theory that the initial injury determines the development of AVN irrespective of how the injury is managed.[9]

In 14 cases of Delbet type III and IV fracture, we performed closed reduction whereas we performed open reduction in rest 4 cases of subtrochanteric fracture. It is assumed that orthopaedic surgeons avoid open reduction of paediatric neck fracture due to fear of disrupting the blood supply which may increase the risk of AVN.[9] Debate still exists between open or closed treatment; however, obtaining an anatomic reduction is more important whether it is performed open or closed.[10,11]

The mean radiological union time was 12.8±2.7 weeks, ranging from 8 weeks to 18 weeks. Out of 18 cases, 1patient developed superficial wound infection which was managed by regular dressing and antibiotic according to culture and sensitivity, 1 patient developed lag screw cutout which was managed by non-weight bearing for 18 weeks. Despite these, there was no instance of nonunion, malunion or coxa vera deformity. In the review study, it was stated that the prevention of a femoral neck nonunion can be achieved by stable internal fixation at the time of initial surgery.[7] The DHS has been shown to be biomechanically superior to three parallel screws.[12]

Regarding AVN of femoral head, in the literatures, this is the most common complication of proximal femoral fracture[13]. In Delbet type III and type IV fractures, risk of AVN is 20% and 5% respectively[6] and in subtrochanteric fracture, it is not described. AVN becomes radiologically evident in X-ray within 1 year[14]. But, none of the patient during the follow up period has showed any sign of AVN either clinically or radiologically within follow up period. Occurrence of AVN could not be evaluated in the present study.

The functional ability of the cases was measured according to Harris Hip Score[15].At last follow up, only in 3 (16.7%) cases, at least one out of four deformities, defined by Harris (1969), was present[15]. The mean flexion of hip at last follow up was $119.17^0 \pm 10.47^0$. Again, the mean abduction and adduction were $31.11^0 \pm 4.04^0$ and $31.67^0 \pm 3.83^0$ respectively. Internal rotation and external rotation at last follow up was $30^0 \pm 4.2^0$ and $29.17^0 \pm 3.54^0$ respectively. The mean HHS at 6 weeks was 44.7±11.9. At 12 weeks, it has increased significantly to 76.1±12.2 (p value <.05). Again, at last follow up, the mean has increased significantly to 89.9±12.1 (p value <.05). After last follow up, out of 18 cases, 10 (55.56%) were excellent, 5 (27.8%) were good, 2 (11.1%) were fair and the rest 1 (5.6%) was poor. In a previous series, the mean Harris Hip Score was 94.16 (range 11 to 100)[16]. This mean is slightly higher than the present study because of their longer follow up (50 months).

CONCLUSION

On the basis of results in the present study, it can be concluded that treatment of Delbet type III and IV fracture and subtrochanteric fracture can be effectively treated with paediatric DHS in paediatric age group with a good safety profile. We have found satisfactory outcome of paediatric DHS fixation in subtrochenteric fracture management, though literature recommendation in this regard is very much scanty.

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Original Article

Outcomes of Total Knee Arthroplasty in the 50 To 70 Years Age Group

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Abstract

Background: Total knee arthroplasty (TKA) has become the preferred surgical treatment for end-stage osteoarthritis (OA) of the knee as well as for certain other knee joint pathologies. Although radiographic evidence for OA present in a significant percent of women beginning in the early 40's, most people do not develop symptoms until significant joint damage has occurred, commonly after age 50 to 60 years. However, limited evidence was found regarding the outcome of TKA in the age group 50-70 years in Bangladesh context.

Objective: The current study was planned to assess the outcome of the total Knee Arthroplasty patients in 50 to 70 years age group.

Methods: This prospective interventional study was carried out at the National Institute of Traumatology and Orthopaedic Rehabilitation, Dhaka. All patients admitted for total knee replacement were included in this study. A predesigned questionnaire was used during data collection and record. The clinical and functional outcome was assessed with knee society scoring (KSS) system pre-operatively, at 2 weeks, 4 weeks, 12 weeks and final follow up at 24 weeks after operation.

Results: Among 40 patients, mean age was 61.0 ± 5.69 years with male-female ratio-1: 2.1. Significnat improvement was noted regarding pain, stability, range of motion, distance of walking and climbing stairs (In all cases, p<.001). Significant decreasment was noted regarding flexion contracture and need for support (all cases, p value <.001). At final follow up, 82.5% of cases were either excellent or good and only 7.5% were either fair or poor outcome according to KSS scoring system. Among the cases, only 3 (7.5%) developed complications.

Conclusion: Based on the present study, it can be concluded that in 50 to 70 years age group, the clinical and functional outcome of knee following TKA was excellent in majority of the cases. Only 7.5% cases had either fair or poor outcome.

Keywords:

INTRODUCTION

Total knee arthroplasty (TKA) is an operation that has become the preferred surgical treatment for end-stage osteoarthritis (OA) of the knee as well as for certain other knee joint pathology.[1, 2,3] Global statistics revealed over 100 million people worldwide suffer from OA and Bangladesh is demonstrating the high incidence of this disease also. So TKA is catching more attention than before in Bangladesh as well as in the other countries[4].

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TKA reliably reduces pain and improves function in patients with knee OA and 90 % of patients report reduced pain, improved functional ability and greater health related quality of life after surgery.[5] With the increase of the elderly population, an understanding of how these patients respond to surgery is important as the elderly account for a greater proportion of these cases. Although TKA is a safe and highly effective procedure, it is a major surgical procedure with variable risks of adverse outcomes including mortality, morbidity, and complications. In the literature, the elderly have comparable knee scores to those of younger patients in the initial postoperative years but with a lack of long term follow-up, it is difficult to determine how these patients progress.[6,7,8]

The outcomes of TKA have been reported in a multitude of studies using various tools. Common to most reports is

a classification of success or failure based on clinical and radiographic criteria of the involved knee and the physician's perception of the patient's ability to perform basic functions of walking and stairclimbing. Given the increasingly successful results with modern arthroplasty techniques, implant survival in TKA patients is becoming a less critical issue in the elderly patient. There is now a global emphasis on expanding evaluation of outcomes to include self-reported measures of functional assessment, including pain and mobility.[9]However, the number of studies focusing on the functional outcome using Knee Society Clinical Rating System (KSS) score in 50 to 70 years age group of TKA is quite limited in our country.

So this study is aimed to evaluate the outcome of total knee arthroplasty in 50-70 years age group.

METHODOLOGY

This was a prospective observational study carried out at National Institute of Traumatology and Orthopaedic Rehabilitation (NITOR), Dhaka and Lab Aid Specialized Hospital, Dhaka from May 2017 to August 2019. Nonrandomized purposive sampling was done according to availability of patients, which included 40 patients within 50 to 70 years of age with primary and secondary osteoarthritis requiring TKA and capable to carry out post-operative rehabilitation protocol. Patients with extensor mechanism dysfunction and presence of systemic and local infection were excluded from the study.

After selection of the patients, patients were evaluated preoperatively and KSS score was measured. Patients were followed up at 2 week, 1 month, 3 month and 6 month after surgery. Knee clinical and functional scores were measured in each follow up.

After collection of all the required data, analysis was carried out by using the SPSS version 25.0. Data were presented mean ± SD and/or medians for continuous variables and the frequencies of categorical variables were presented as percentage. Extended Chi square test with Yate's correction and paired t test was done to calculate p value. A p value < .05 was considered significant. Institutional approval was taken from the Institutional Review Board (IRB) of NITOR to conduct the study.

RESULTS

The mean age of the patients was 61.0 ± 5.69 years and 27 (67.5%) were female. Preoperatively, 37 (92.5%) were varus and 3 (7.5%) were valgus according to alignment of the knee. In 92.5% cases, TKR was done due to primary osteoarthritis. Other indications were sequel of TB knee (5%, n=2) and sequel of septic knee (2.5%, n=1).

Table I

Clinico-demographic profile of the study patients

Age (in years)	
Mean±SD	61±5.7
Gender, n (%)	
Male	13 (32.5)
Female	27 (67.5)
Occupation, n (%)	
Housewife	19 (47.5)
Service	15 (37.5)
Business	6 (15)
Alignment, n (%)	
Varus	37 (92.5)
Valgus	3 (7.5)
Indication of TKA, n (%)	
Osteoarthritis	37 (92.5)
Sequel of TB knee	2 (5)
Sequel of Septic knee	1 (2)

Regarding pre and post-operative pain during walking, 23 (57.5%) patients had severe pain before operation and 17 (42.5%) patients had moderate pain. After the operation, no pain was observed in 29 (72.5%) patients; however, 8 (20.0%) patients had mild pain and 3 (7.5%) patients had moderate pain. Post operatively there was significant improvement in pain status during walking. Similar results were observed regarding pre and post-operative pain at rest. 21 (52.5%) of the patients had moderate pain at rest before operation and 19 (47.5%) patients had severe pain at rest. After the operation, no pain was observed in 30 (75%) patients; however, 10 (25%) patients had mild pain. The pain status of the cases has improved post-operatively significantly (p<.001).

Table II

Pain status of the study patients

	Preoperative	At 6 months
Pain during walking, n (%)		
None	0 (0)	29 (72.5)
Present	40 (100)	11 (27.5)
Pain during rest, n (%)		
None	0 (0)	30 (75)
Present	40 (100)	10 (25)

The mean range of motion was 96.6±4.9degree before operation and 100±4.6 degree after operation. The result is statistically significant.

Eleven (27.5%) of the patients had antero-posterior instability of 5-10 mm and 4 (10.0%) had >10 mm before operation. After operation, no antero-posterior instability was observed among the patients (within 0-5mm). The antero-posterior stability improves significantly post-operatively (p value <.001).29 (72.5%) of the patients had medio-lateral instability of 6°-9° before operation. After operation, medio-lateral instability of <5° observed in 35 (87.5%) patients. The medio-lateral stability of the patients improved significantly following operation (p<0.001).

Regarding flexion contracture of the patients, 17 (42.5%) patients had 10^0-15^0 flexion contracture, 11(27.5%) patients had less than 5^0 and 7 (17.5%) patients had 16^0-20^0 flexion contracture before operation. After operation 33 (82.5%) of the patient had <5^0 flexion contracture, 5 (12.5%) patients had 5^0-10^0, 2 (5%) patients had 10^0-15^0. Flexion contracture has decreased significantly post-operatively (p value <.001). Regarding extension lag,pre-operatively 14 (35%) patients had <10^0 extension lag, 20 (50%) patients had no extension lag. After the operation 32 (80%) of the patients had no extension lag. Though extension lag has decreased post-operatively, this was not significant (p value >.05).

Thirty-one (77.5%) patients had 0^0-4^0 malalignment and 9(22.5%) patients had >11^0 malalignment pre-operatively. After the operation all had 5^0-10^0 alignment. Malalignment has corrected significantly post-operatively.

The distance of walking has increased significantly following operation (p value <.001). 50.0% of patients could walk for <5 blocks, and 37.5% patients could walk 5-10 blocks before operation. 10% were housebound and only 2.5% could walk more than 10 blocks. But after the operation 67.5% of patients could walk beyond 10 blocks, 30% patients had unlimited walking without pain and the remaining 5% could walk 5 to 10 blocks.

All patients (100%) had poor knee society clinical Score (<60) before operation with the average of 16.15±10.36 (out of 100). After operation the knee society clinical score significantly increased (p<0.001), average 87.9±12.34 (out of 100). Before operation all the cases (100%) had poor outcome. After the operation, 80% had excellent, 12.50% had good, 2.5% had fair and 5% had poor outcome.

Table III

Clinical outcome

Clinical Outcome	Preoperative, n (%)	At 6 months, n (%)
Poor	40 (100)	2 (5)
Fair	0 (0)	1 (2.5)
Good	0 (0)	5 (12.5)
Excellent	0 (0)	32 (80)
Total	40 (100)	40 (100)

87.5% of patients had poor knee society functional score before operation with the mean score of 35.75±15.71 (out of 100). After operation majority (82.5%) had excellent outcome, 10% had good, 2.5% had fair and 5% had poor outcome. The mean functional outcome score was 81.13±8.81 after operation (out of 100). Post-operatively, the functional outcome was significantly better (p value <.001).The clinical scores were significantly associated with functional score.

Table IV

Functional outcome

Functional Outcome	Preoperative, n (%)	At 6 months, n (%)
Poor	35 (87.5)	2 (5)
Fair	5 (12.5)	1 (2.5)
Good	0 (0)	4 (10)
Excellent	0 (0)	33 (82.5)
Total	40 (100)	40 (100)

Regarding complications, during the surgery preoperative complications were observed in 6 (15%) cases. Among them, 4 (10%) developed surgical site infection and 2 (5%) developed hematoma. The remaining 34 (85%) did not develop any complications.

DISCUSSION

Total knee arthroplasty (TKA) is a surgical procedure associated with good success worldwide. It has been widely implemented in recent years as a surgical treatment for osteoarthritis of the knee and favorable long-term outcomes have been reported.[10,11] Outcome research of total joint arthroplasty requires the use of a combination of measures. Joint-specific scoring systems such as the Knee Society Score combine measures of range of motion (ROM), stability, alignment, pain, and function as assessed by the clinician.[12] This prospective interventional study was done to evaluate the outcome of total knee arthroplasty in 50 to 70 years age group. A total of 40 patients were studied here.

In the present study the mean (±SD) age was found 61.0±5.69 years with ranging from 50 to 70 years and most of the patients were in 7th decade (60%). Most other studies also reported the mean age of patient in their studies in the seventh decade of life. Scott et al. found an average age of 66.9 years (range 22 to 85years) and Schurman et al. found an average age of 63.47 years.[13,14]Male female ratio was 1:2.1 which indicates that females are predominant in

this study. Schurman et al. (1985) and Dhilon et al. (1993) showed female patients 69.1% and 76.0% respectively, which shows similar result to the current study.[13, 15]

The pain status during walking and also during rest has improved significantly after operation.Masbah et al. (2011) reported in their study that pain, a significant component of the knee score, improved significantly after TKA. Preoperative pain was 9.92 ± 5.81 points while postoperative pain was rated at 46.91± 3.08 points, which is comparable with the current study, regarding the pain during walking.[16]

In this present series it was found that the mean range of motion was 96.63±4.87 degree with range from 0 to 110° before operation and post-operatively it was 100.00±4.58 degree. Though the ROM improvement was significant, but overall improvement was only less than 4^0. The ranges of post-operative motion (ROMs) reported by Ranawat et al. (1997) was 99° (range, 0°-120°).[17]Masbah et al. (2011) found the preoperative mean ROM was 97.58°± 22.47° and postoperative ROM mean was 99.77°±12.50°. These results were quite similar to the present study.In the series of Mutsuzaki et al. (2017), ROMs of knee after TKA were analyzed. They found that there was a significant reduction of extension lag from 8.7±9.6 degree pre-operatively to 1.5±3.5 degree at last follow up.[18]Again Masbah et al. (2011) also reported clinical improvement after operation, which was consistent present series.[16]

Malalignment status of the patients shows that, 31(77.5%) patients had 0-4 degree malalignment and 9(22.5%) patients had >11 degree malalignment pre-operatively. After the operation all had 5-10 degree alignment. Malalignment has corrected significantly post-operatively. Easley et al., (2000) also reported the average alignment of 5.3 degree which is technically similar to our study.[19]

After operation complications had experienced in 6 (15%) cases. Among them 4 (10%) developed surgical site infection and 2 (5%) developed hematoma. In the series of Gaine et al. (2000), they had studied prospectively the outcome of wound discharge in patients after arthroplasty and found that overall surgical site infection rate in TKA was 11.6% which was almost similar to the present study.[20]

All patients (100%) had poor knee society clinical Score (<60) before operation with the average of 16.15±10.36 (out of 100). After operation the knee society clinical score significantly increased (p<0.001), average 87.9±12.34 (out of 100). Before operation all of the cases (100%) had poor outcome. After the operation, 80% had excellent, 12.50% had good, 2.5% had fair and 5% had poor outcome.Radhakrishna et al. showed pre and post-operative mean knee clinical score was 24.9±8.5 and 89.9±6.2 respectively and 87% patients had excellent clinical outcome following TKA.[21] Rand et al., Zaki et al. and Sancheti et al. also suggested that total knee arthroplasty improves the post-operative knee clinical score which is correlated to our study.[22,23,24]

Regarding functional outcome, it was observed that before operation 87.5% patients had poor the knee society functional score before operation with the mean score of 35.75±15.71 (out of 100). After the operationthe majority (82.5%) had excellent outcome, 10% had good, 2.5% had fair and 5% had poor outcome. The mean functional outcome score was 81.13±8.81 after operation (out of 100). Post-operatively, the functional outcome was significantly better (p value <.001). Kadam et al. found that, the mean preoperative knee functional score (KFS) was 32.75±11.79 which was increased to a mean postoperative score of 84.43±9.59 at the end of 6 months which shows similarity to us.[25]

Overall, the knee clinical scores and functional scores significantly improved after TKA (p<0.001). For instance, the following reported good or excellent results: Scott et al. 98% (116 knees); Ranawat et al. 92% (103 knees); Ewald et al. 90% (111 knees); Diduch et al. reported 100% (103 knees) were good (15%) or excellent (83%) with a posterior substituting prosthesis.[14, 17, 26, 27] Those are correlated with our study.

The clinical scores were significantly associated with functional score. In the series of Kadam et al., they also found similar results. In their 32 patients who had excellent knee clinical scores, 26 patients (81.25%) had excellent knee functional scores, 6 patients (18.75%) had good knee functional scores.[25] Out of the 5 patients who had good knee clinical scores, 4 patients (80%) had good and 1 had fair (20%) knee functional score, 2 patients (100%) had fair knee clinical and functional scores. These results are similar to the present study.

The knee society score rating system is a logical outgrowth of the hospital for special surgery rating system. In our study, on clinical and functional evaluation of the patients assessed by the KSS score significant improvement was observed in both KCS and KFS score during follow up.

CONCLUSION

Based on the present study, it can be concluded that in 50 to 70 years age group, the clinical and functional outcome of knee following TKA was excellent in majority of the cases. Only 7.5% of cases had either fair or poor outcome.

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Original Article

Treatment of stage II AVN (Ficat & Arlet) of the Femoral Head by Core Decompression and Muscle Pedicle Bone Grafting with TFL versus Sartorius

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Abstract:

Avascular necrosis of the femoral head needs to be diagnosed early in its coursein order to prevent collapse of the head and subsequent osteoarthritis. Therefore, head preservation surgery with the objective of delaying or possibly averting further necrosis in young adults is preferable in the pre-collapse and pre-degenerative stages. To salvage the hip and prevent the need for total hip arthroplasty, a procedure was needed that would revascularize and initiate osteogenesis in the early stages of AVN. Muscle pedicle bone grafting (MPBG) with either Tensor fascia lata (TFL) or Sartorius has been described to be a standard procedure. In this study, we sorted out a total of 17 cases of grade II (Ficat & Arlet) AVN of the hip. Of these, 11 cases underwent TFL-based MPBG while six underwent Sartorius-based MPBG. After a follow-up period of six months, signs of clinical and radiological improvement in both groups were found to be the same (p>0.05). Therefore, we concluded that both of the procedures would provide satisfactory outcomes. We recommend further study with a large number of cases and prolonged follow-up.

Keywords: **AVN femoral head, Ficat & Arlet staging, TFL, Muscle pedicle bone grafting (MPBG)**

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INTRODUCTION:

Early detection and management are crucial for preventing collapse of the femoral head and subsequent osteoarthritis due to avascular necrosis. The condition affects younger persons (male predominance) and besides being idiopathic is commonly associated with steroid intake, alcohol consumption, and trauma.[1] Other risk factors found associated are genetic predilection, smoking, chronic disorders (renal diseases, hematological diseases, inflammatory bowel disease, hypertension, gout) and complications following organ transplantation.[2] As alcohol intake is not very common in Bangladesh, the inadvertent use of steroids is expected to be the foremost cause of AVN of the femoral head. The condition involves both hips in 61.6%.[3] The final outcome of femoral head necrosis is the collapse of the subchondral bone, leading to secondary hip arthritis that requires total hip replacement.[4] That is why a prompt diagnosis, timely reduction of intraosseous pressure, and vascular augmentation are recommended at early-stage avascular

necrosis for preservation of the hip joint. We used the Ficat & Arlet system[5], the most popular x-ray based system, for staging the femoral head AVN. In the earlier precollapse/predegenerative stages, core decompression with non-vascularized bone/vascularized fibular grafts or subchondral curettage of the necrotic bone with cancellous bone grafts were traditionally used. Later, different muscle pedicle bone grafting (MPBG) based on Quadratus Femoris[6], Tensor Fascia Lata[7] and Sartorius[8] has been utilized following core decompression for prevention of disease progression and subsequent collapse. However, a mean follow-up of fourteen years (range, 10.5 to 26.1 years) following vascularized bone-grafting in the precollapsed stage showed survivability in 60% of operated hips.[9] This result provided enough encouragement for performing MPBG as it would at least delay the disease progression to a collapsed head and subsequent arthroplasty. Therefore, we intended to compare the results of MPBG in the treatment of Ficat & Arlet stage II AVN of the femoral head by TFL and Sartorius. In this study, we presented 17 cases (in 17 hips) in which core decompression of the femoral head along with Sartorius or TFL pedicle bone grafting was done. The procedures involved creating a cortical window at the head-neck junction ('Light Bulb' technique), core decompression, removal of necrotic materials, impaction of harvested cancellous bone and anchorage of a bone block with muscle pedicle over the window by a partially threaded cancellous screw.

MATERIALS AND METHODS:

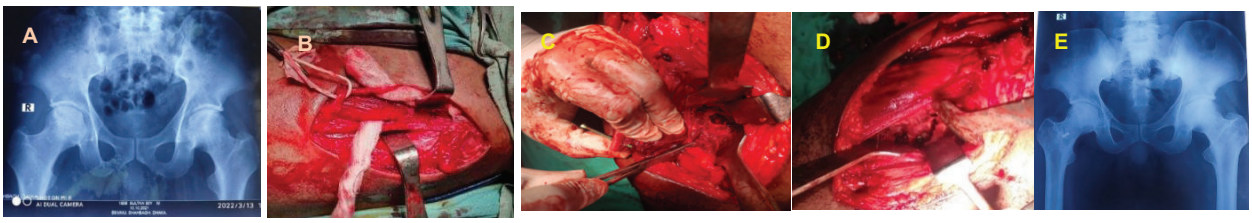
This prospectivelongitudinal observationalstudy was carried outintheDepartmentof Orthopaedics, BSMMU, from July 2020toJanuary 2022. 17 hips in 17 casesofage 18–50yearswithFicatandArlet StageII AVN of femoral heads wereincluded in thestudy. In the event of bilateral hip involvement, the hip with Stage II AVN was included in the study. Previously operated hips, hip pathology following trauma, hips with an implant, active infection, chronic disease, or coagulation disorders were excluded from the study.

Patient assessment:

After recording the detailed case history, we thoroughly examined the cases. In all cases X-ray pelvis with both hips AP, lateral X-ray of the affected hip and MRI pelvis including both hips were obtained. The Ficat & Arlet staging was recorded. We also performed Shimizu classification to know the extent of the lesion. The preoperative VAS and Harris Hip Score were noted. We performed the HHS by a manual completion of the score sheet. Laboratory investigations such as CBC with thick blood film, CRP, functional tests for liver and kidney, RBS and coagulation profile were done. Every case was selected for core decompression, curettage of necrotic material, and impaction of the void with cancellous bone grafting. But the decision of which muscle pedicle bone graft for which patient was chosen by lottery. And therefore, TFL MPBG was done in 11 patients while Sartorius MPBG was done on six patients.

Operative techniques: The patient was positioned supine on a regular radiolucent operating table. We used the Smith-Petersen approach to the hip with an extension along the iliac crest. [(10)]. Lateral femoral cutaneous nerve of the thigh was identified and protected. Dissection was done through the superficial intermuscular plane between the Tensor Fascia Lata muscle and Sartorius and deep plane between the Gluteus Medius and Rectus femoris. The hip joint was accessed by incising the capsule after retraction of the direct head of the Rectus femoris medially. A rectangular window (slightly smaller than the harvested bone graft) was created on the anterior cortex of the neck of the femur, at the head and neck junction (Light-bulb procedure). We used a C-arm to identify the involved area/s of the head and made multiple drill holes with a 4 mm drill bit through the window. Necrotic bone was curetted out with angled curette. For either of the procedures, we marked a block of 2 x 2 cm bone and inserted a 4.0 mm partially threaded cancellous screw in the center. For the Sartorius MPBG, the bone block was osteotomized from ASIS and the attached Sartorius muscle was carefully lifted and mobilized. The harvested Sartorius muscle pedicle with the block of ASIS was tunneled beneath the direct head of the rectus femoris into the window [(8)]. For the TFL-based graft, around the lower end of the incision, the muscle was first identified at the groove between Sartorius and TFL, the deep fascia thus incised along the medial border of TFL, raised and the TFL was traced up to the origin in the iliac crest.. We then marked a 2 x 2 cm bone block at the crest 2 cm behind the ASIS and inserted a 4.0 mm partially threaded cancellous screw in the center. The block was thus osteotomized, a 2cm wide band of TFLmuscle attached to the block was carefully dissected and retracted downward. This MPBG thus tunneled beneath the Sartorius and the direct head of Rectus Femoris onto the previously made cortical opening.

In both procedures, we stuffed the curetted area on the femoral head with cancellous bone harvested from the region of osteotomy, placed the bone block over the cortical window, applied gentle pressure and advanced the preplaced screw fully to anchor the block securely. The hip capsule was then repaired and the wound was closed in layers over a drain in place. A derotation bar was applied to the leg on the operated limb.



A. Pre-op xray with AVN of Rt femoral head. **B.** Isolation and protection of the LFCN. **C.** Cortical window and MPBG with preplaced screw on the bone block. **D.** Final position and anchorage of the MPBG. **E.** Post op Xray.

Post-operative complications: We encountered a transient injury to the lateral femoral cutaneous nerve in 2 patients and superficial surgical site infection in one. The transient LFCN injury recovered in one month. For the superficial SSI secondary closure following regular dressing was done.

Post-operative care and follow-up: An X-ray of the pelvis with both hips AP was obtained on 1st POD. The patient was discharged with relevant advice on the 5th POD. The sutures and derotation bar were removed on the 14th POD. Patient was kept non weight bearing up to 6 weeks, advised to toe-touch down non-weight bearing after 6 weeks and allowed gradual weight bearing with crutches for 12 weeks. After 12 weeks unprotected full weight bearing ensued. Serial X-rays were obtained at intervals of two weeks, four weeks, 12 weeks, and six months, and then every six months. We followed up with the patients for a minimum of six months. The post-operative HHS and VAS were recorded at every meeting. On every occasion, the post-op X-rays were compared with the preoperative X-ray and MRI, and signs (if any) of revascularization and preservation of femoral head sphericity were documented. Functional outcome was assessed with the comparison of the serial Harris Hip Scores (HSS). Outcome was evaluated by Harris Hip Score [11]: a score of 91-100 was categorized as excellent, 81-90 as good, 71-80 as fair, and less than 70 as poor. The diminution of the density of the necrotic portion of the femoral head was considered as a progression of the disease while the return to a normal density of pre-operative rarefied areas and restoration of normal trabecular pattern were considered as radiological improvement.[12,16,13] The excellent, good and fair HHS was considered as "satisfactory" while poor HHS was considered an unsatisfactory outcome. All the findings and variables were tabulated and results were derived by SPSS v.26.

RESULTS:

We identified 17 hips (n=17 patients) as being eligible for the study. The male-female ratio was 1.83.

Table 1

Population characteristics

Baseline characteristics of the study population (n=17)

Characteristics		Frequency	Percentage
Gender	Male	11	64.7
	Female	6	35.3
Mean Age(years)		31.65±6.873	
Etiological association			
Corticosteroid		9	52.9
Idiopathic		8	47.1
Side of Involved	Left	9	52.9
	Right	8	47.1

Table-II

Results

Involved Hip		Procedures		Total (%)	
		TFL MPBG	Sartorius MPBG		
Right		7	1	8 (47%)	
Left		4	5	9 (53%)	
Total		11	6	17	
Post-operative HHS category	Excellent (90-100)	6	3	9 (52.9%)	
	Good (80-89)	2	1	3 (17.6%)	
	Fair (70-79)	1	1	2 (11.8%)	
	Poor (<70)	2	1	3 (17.6%)	
Result categories	Satisfactory	9	5	14 (82.40%)	P=1.0
Unsatisfactory		2	1	3 (17.60%)	

All cases were in Ficat and Arlet stage II of AVN. We performed TFL based MPBG in 11 cases and Sartorius based in 6 cases. The average duration of surgery was 90 (range 70-120) minutes in Sartorius-basedprocedures and 70 minutes (range 50-90) in TFL-based procedures. Average preop and post-operative HHS were 70.94 and 86.88 respectively. The outcome of the study showed excellent in 9 (52.9%), good in 3 (17.6%), fair in 2 (11.8%), and poor in 3 (17.6%) and therefore satisfactory result was achieved in 14 cases (82.40%).The chi-square test after cross-tabulation with the outcome and MPBG procedure revealed P >0.05. There is no significant difference in the outcome of either of the procedures.

DISCUSSION:

Non-traumatic AVN of the femoral head has been established as a major musculoskeletal problem affecting the younger age group.[9] The disabling effect of the condition results from the progression into subchondral collapse and secondary hip arthritis. A total hip replacement is thus advised and poses a major economic burden. Again, longevity of the prosthesis in a young adult remains a major concern. As in numerous studies, the mean age in our study was 31.65 years.[7-9,12] We found corticosteroids in 53% of cases and idiopathic in 47% of cases as associated factors. Since alcoholism is not common in our society, the etiological factors in our study seem to differ from other studies where around 47% of cases showed an association with alcohol abuse.[1] All the cases in our study had Ficat & Arlet stage II and were in the precollapse stage. As core decompression alone could not provide satisfactory results in the long term[14], a combination of core decompression and various types of muscle pedicle bone grafting were described. Preoperative and post-operative Harris Hip scoring was done for both procedures in every case and the outcome was categorized as Excellent (score: 90-100), Good (score: 80-89), Fair (score: 70-79), and Poor (score: <70). A post-operative score of more than 70 and a difference of 20 between the pre-operative and post-operative HHS was considered a satisfactory outcome. The outcome of the study showed excellent in 9 (52.9%), good in 3 (17.6%), fair in 2 (11.8%), and poor in 3 (17.6%). Therefore satisfactory result was achieved in 14 cases (82.40%). Cross-tabulation of the scoring with the procedures revealed no significant difference in outcome. However, we encountered transient LFCN injury in 2 cases (11.7%) and superficial surgical site infection in 1 (5.8%) case. We did not find any effect of the complications on the study's final outcome.

CONCLUSION:

The surgical management for femoral-head AVN in the precollapse stage by core decompression followed by either Sartorius or TFL-based iliac bone grafting provided similar clinical results in achieving hip functions, relieving hip pain, preventing head collapse and possible revascularization of femoral heads.

Conflict of interest: None.

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Original Article

The Functional Outcomes of Arthroscopic Bankart Repair for Anterior Glenohumeral Instability

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Abstract

The gleno-humeral joint has been reported as the most commonly dislocated synovial joint because of its peculiar anatomical structure. Anterior dislocation of shoulder may occur during forced abduction with external rotation of the shoulder. Participation in athletics who perform overhead activities can place exceptional demands on healthy shoulders. Shoulder instability most commonly affects people who are in their late teens to mid-thirties. A major problem after a primary anterior dislocation of shoulder among young patients is the high risk of recurrence. The pathophysiology of recurrent instability extends from simple labral injury to with or without, osseous Bankart, Hill Sach's lesion, capsular laxity, SLAP tear and rotator interval dilatation, Treatment has to customize basing on the extent of injury from Bankart repair to with a without ramplassage, capsulorrhaphy or Laterjet procedure. This prospective study was done in CMH Dhaka & CMH Chattogram from 2015-2021 to evaluate the functional outcome of arthroscopic Bankart repair in patients with posttraumatic recurrent anterior gleno-humeral instability in 50 patients(50 male;meanage24.4;range 19 to 39 years).The mean age that first dislocation occurred was 22.3 years 16 to 36 years. Involvement was mostly on the right (dominant) side in 40 patients (80%) and on the left in 10 patients (20%). Recurrent dislocation having significant GBL (Glenoid Bone Loss), Hillsach,s lesion, SLAP tear and capsular laxity were excluded in this study. Preoperative and postoperative evaluations included detailed physical examination, Rowe and Constant scale for shoulder functions assessment, antero-posterior and axillary radiographs, CT scan and MRI. The mean follow up was 44.8 months (6 to 84 months).

According to Rowe score, the results were excellent in 34 patients(68%),good in 10 patients(20%),fairin 4 patients(8%) and poor in 2 patient (4%) with overall satisfactory result was observed in 44 (88%).The mean preoperative Rowe score was 20.1, postoperatively which increased to 89.1. Mean Constant scale preoperatively was 64.2 and postoperatively was 87.6. The mean active external rotation preoperatively was 45°, which decreased postoperatively to 40° ($p<0.05$).The patient with the poor result developed redislocation postoperatively at seventh month due to direct trauma. This study shows arthroscopic Bankart repair for recurrent shoulder dislocation is a useful and successful procedure.

INTRODUCTION

Comparing with the others joints, the shoulder has most wide range of motion, but also increased predisposition to dislocation (approximately 50% of all dislocations) due to its biomechanics and less bony stability. It usually occurs anteriorly (85-95%). Also its recurrence is more likely than the other joints. Recurrence is related with the closed reduction methods, immobilization time, severity of trauma, accompanied fracture and soft tissue damage.The most common form of the glenohumeral instability is traumatic anterior instability. Nearly all traumatic anterior instabilities consists of Bankart lesion. Avulsion of the labrum from the glenoid rim is known as Bankart lesion[1]. Sometimes Glenoid bone loss (GBL), Hill-Sachs lesion, capsular laxity, SLAP lesion and rotator interval dilatation (enlargement) also accompany to anterior instability.

Treatment of recurrent anterior glenohumeral instability is surgery. Until recently lot of techniques of surgery have

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been reported. [2-5] When treating shoulder instability, one should consider the ideal surgical technique. With open anterior capsule-labral reconstructions such as the open Bankart procedure satisfactory stabilization has been accomplished [4,6,7]. However, difficulty in achieving strength and in returning to daily activities as well as a decreased range of motion following open Bankart procedures has led to the development of arthroscopic stabilization techniques.

Shoulder arthroscopic stabilization techniques are gradually getting much more used. Arthroscopic methods offers some advantages such as recognising all pathologies causing instability and repairing lesions with less soft tissue damage. In the other hand, shoulder stability has varied widely after arthroscopic procedures, and technical complications and anatomical limitations have narrowed the indications for arthroscopic stabilization. Stabilization of recurrent shoulder instability depends on the nature of pathology, as in GBL if either or more than 25% then Laterjet procedure is indicated, if HS lesion is off tract then remplissage is also indicated along with other procedure.

This prospective study was purposed to assess the results of arthroscopic Bankart repair in recurrent anterior glenohumeral instability.

MATERIALS AND METHODS

From 2015 - 2022, 50 (50 male; mean age 24.4; range 19 to 39 years) patients underwent arthroscopic Bankart repair for recurrent anterior glenohumeral instability at CMH Dhaka & CMH Chattogram. Involvement was on the right (dominant) side in 40 patients (80%) and on the left in 10 (20%). The inclusion criteria included recurrent anterior subluxation or dislocation after the initial episode of traumatic anterior shoulder dislocation and a Bankart lesion confirmed by arthroscopic examination. Patients with acute shoulder dislocation, accompanied glenoid or tuberculum fracture (Bony Bankart), rotator cuff tear, capsular laxity, posterior instability and multidirectional instability and off tract HS lesion were excluded from the study.

Detailed medical histories and physical examination were obtained preoperatively. Symptoms, complaints, cause and type of instability, type of initial trauma, immobilization after initial dislocation, duration of time to surgery, number of dislocation and expectations from surgery were recorded. Range of motions were measured. Muscle strength were measured manually. To assess the type of laxity - sulcus sign, load and shift, apprehension and Jobe's apprehension relocation, tests were used. All patients were evaluated with antero-posterior and axillary radiographs, CT scan and MRI (Figure 1). Pre and postoperatively, all data were recorded to our shoulder form which included Rowe score and Constant scale.

All operations were performed with a standard technique by the same surgeon. After induction by general anaesthesia (G/A), the patient was placed in lateral decubitus position and again physical examination under

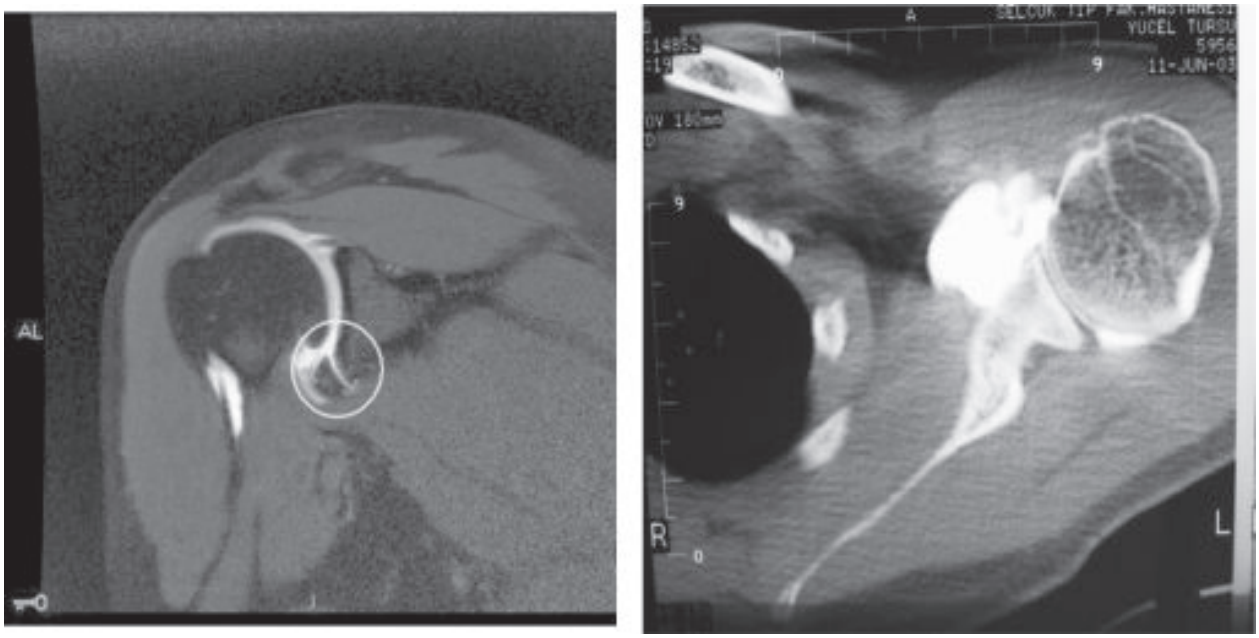


Figure 1. *CT and MRI view of Bankart Lesion.*

anesthesia was performed to assess the magnitude and direction of instability. Shoulders were evaluated for antero-posterior and inferior sliding preoperatively [8]. The shoulder was prepared and draped, and the bony landmarks were marked carefully. A standard posterior portal and two anterior portals were established using outside in technique with a spinal needle to establish the most appropriate placement of the cannulas. Prior diagnostic arthroscopy was performed and inner side of shoulder evaluated systematically. Diagnostic arthroscopy included glenoid labrum, capsule, rotator cuff, both articular surfaces, biceps tendon, and glenohumeral ligaments, eg superior, middle and inferior glenohumeral ligament and the irattachments to glenoid and humeral head and Hill sach's (HS) lesion were evaluated along with Bankart lesion. Drive through sign was searched[9].

After confirming antero-inferior instability caused by Bankart lesion, capsule-labral tissue was mobilized from the glenoid rim by using periosteal elevators. The goal was to mobilize the labrum such a way that it could be shifted superiorly and inwardly. The glenoid edge between 1 and 5 o'clock position in right shoulder (7 and 11 o'clock position in left) was abraded using a rasper or an arthroscopic burr. Anterior part of the glenoid labrum and the associated inferior glenohumeral ligament is advanced superiorly and the first anchor (no:2 nonabsorbable polyester ethibond loaded) was placed at the 5.00-5.30 o'clock position of glenoid edge. The second anchor is placed at the 3.00-3.30 o'clock, and thethirdoneisat1.30-2.00o'clock position in the same manner. (Figure 2) Additional suture was used if necessary according to examination and arthroscopic findings. During this procedure, arm was positioned in 10° external rotation and abduction in order to avoid external rotation restriction. After repairing labrum, arthroscopic thermal capsular shrinkage applied, and rotator interval was closed if capsular laxity was still going on. For this purpose, soft tissues over subscapularis tendon and anterior border of supraspinatus were stitched together.

The patients were placed in a gunsling (abduction arm sling) postoperatively for the first three weeks and they were only allowed hand, wrist and elbow motions. (Figure 3) In the second three weeks they used gunsling only in the night and pendular and passive assistive exercises were begun. From sixth to ninth weeks, range of motion increasing exercises were begun with the presence of physical therapist. After ninth weeks active external rotation exercises were started. They were allowed all activities except contact and upper extremity sports at the 16 weeks. After eighth months, upper extremity sports allowed.

Postoperative assessment included Rowe score and Constant scale for shoulder functions. Data analysis comparing the scores before and after surgery was performed using the t-test. A p-value of<0.05was taken as statistically significant. All the patients were followed up at intervals of three weeks, six weeks, three months and, every six months thereafter postoperatively. Recurrent dislocation, symptomatic subluxation or instability preventing return to full active duties or necessitating an additional surgical stabilization procedure were used as criteria for treatment failure.

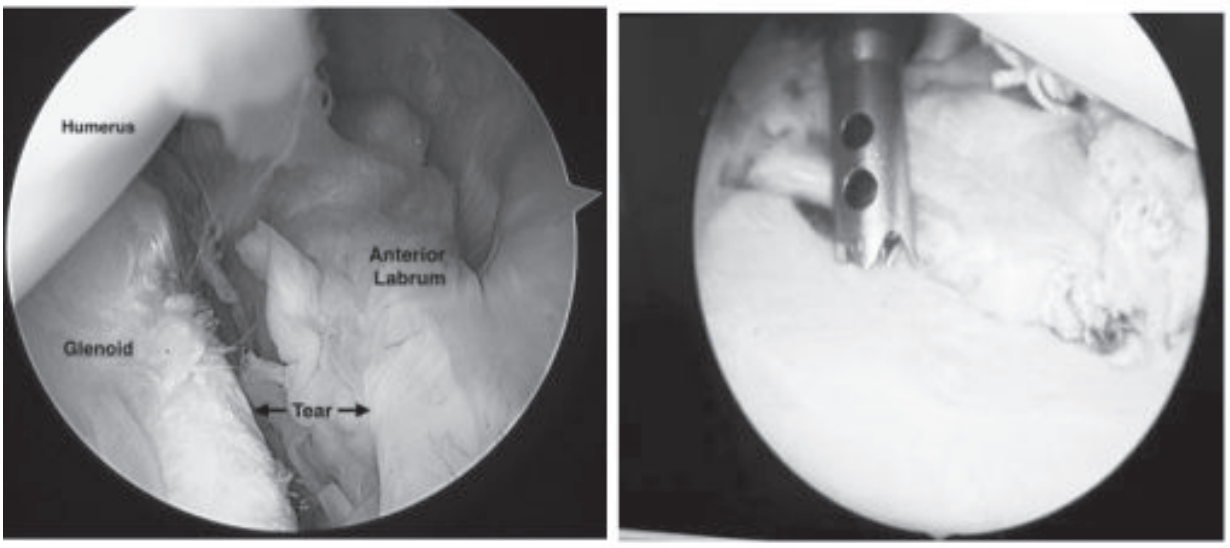


Figure 2. *Arthroscopic view of Bankart repair with knotless anchor*

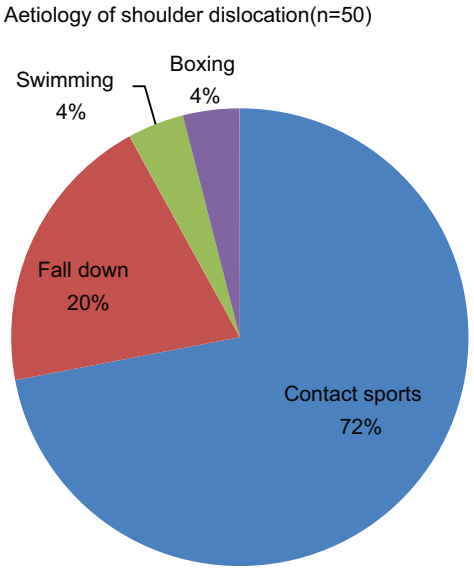
RESULTS

There were 50 patients (50 male 100 %) underwent arthroscopic Bankart repair. The mean age at the time of surgery was 24.4; range 17 to 35 years. Involvement was on the right (dominant) side in 40 (80%), on the left in 10 (20%). The mean age that first dislocation occured was 22.3 (16 to 36) years. After first dislocation, immobilization time in 4 (16%) patients was shorter than a week, 1 to 3 weeks in 16 (32%) patients, more than 3 weeks in 26 (52%) patients.

Table1

Number of patients	50
Male	50(100%)
Dominant side	40(80%)
Nondominant side	10(20%)
Mean age at injury+ SD,y	22.3+7.6
Mean age at surgery+ SD,y	24.4+9.8
Injury to surgery interval + SD, mo	25.6+15.7
Number of preoperative dislocations + SD	5.1+ 3.6

Aetiology of shoulder dislocation(n=50)



The etiology of traumatic dislocation was sports in 36 (72%), falling down in 10 (20%), swimming in 2 (4%), boxing in 2 (4%). The mean interval from the initial dislocation and surgery was 20 months; range 5 to 60 months. The mean number of dislocation before surgery was 5.1 times; range 2 to 10 times. No neurological deficiency was detected preoperatively. Apprehension test was positive in all patients and anterior translation in 30. 16 patients was existing stage 1 sulcus sign. The mean duration of surgery was 82 minutes. In one patient during surgery an anchor insufficiency developed and it removed. There were no postoperative complications related to the arthroscopic procedure like infection, compartment syndrome, or nerve injury.

Table II

Rowe score

Rowe score	Mean value	Standard deviation	P value
Pre op	20.1	7.9	
Post op 1 month	53.7	8.6	<0.001
Post op 3 month	69.6	7.1	<0.001
Post op 6 month	89.1	7.3	<0.001

The mean duration of follow up was 24 months; range 6 to 60 months. The mean postoperative shoulder scores were significantly improved at the time of the final follow-up. Mean preoperative Rowe score was 20.1 (15-25), which improved 89.1 (25-100) postoperatively ($p<0.05$). According to Rowe score, the results were excellent (perfect) in 34



Figure 3. *Shoulder position in abduction arm sling*

patients (68%), good in 10 patients (20%), fair in 4 patients (8%) and poor in 2 patients (4%). Preoperatively mean Constant scale was 64.2(46-72) and improved to 87.6(48-100) postoperatively ($p<0.05$). 44 (88%) patients were satisfied to the surgery. All patients demonstrated a good range of motion.

Preoperatively active external rotation was 45°(25°- 70°), which decreased to 40°(25°-60°) postoperatively. Related to the surgery mean external rotation limitation was 5°. Two of four fair cases had positive apprehension test in certain arm positions and discomfort and weakness during daily activities. The other patient had 25° external rotation limitation and little pain postoperatively.

DISCUSSION

The most common form of the glenohumeral instability is anterior instability [10,11]. Most of the recurrent anterior glenohumeral instability originates due to traumatic conditions. Rowe and Zarins reported a rate of 95.6% traumatic origin to anterior dislocation in their study that included 500 patients [12]. Similarly, all patients in our study had recurrent anterior glenohumeral instability because of initially traumatic anterior dislocation.

Anterior dislocations of the shoulder usually develops in the abduction with external rotation position due to decreasingjointstability[10,13].Inacadavericstudy Turkel et al. found that IGHL (inferior glenohumeral ligament) is the primer barrier to avoid dislocation of the shoulder in the 90° abduction with external rotation position [14].

Bankart lesion is traditionally the main reason responsible for anteroinferior shoulder instability, hence requires surgical treatment. Bankart lesion has been found in 90% of patients with traumatic anterior shoulder dislocations [15].Roweetal. reported as a rate of 85% and Gartsman et al reported 83% Bankart lesion in their series. We found a rate of 88% (44 patients) Bankart lesion and 12% (6 patients) ALPSA (anterior labroligamentous periosteal sleeve avulsion) lesion series.

The socket-deepening effect of the glenoid labrum has been proved to be important in maintaining shoulder stability[16,17]. Studies have shown that labrum contributes to 50% of total depth of the glenoid socket [18]. An avulsed or detached labrum known as Bankart lesion therefore causes significant instability because the bumper effect of the labrum is lost and the humeral head has the tendency to roll off the edge of the glenoid socket, resulting in subluxation or dislocation of the humeral head[19]. Re-attaching the labrum onto the articular surface restores its socket-deepening bumper effect. This is accomplished using sutures and suture anchors, which can be done either open or arthroscopically[17,20].

Capsular laxity is the other reason for glenohumeral instability. Lack of diagnosing and treating variable capsular laxity associated with Bankart lesions may cause repair failure [21,22]. All the facts causing instability must be understood and treated appropriately for a perfect shoulder instability repair result. The decrease of arthroscopic capsular volume can be possible by per- forming thermal capsulorrhaphy.

Recently, arthroscopic repair of capsulolabral tissues with appropriate tension using suture anchors is becoming the standard treatment in suitable anteroinferior shoulder instabilities. Arthroscopic Bankart repair has many advantages compared to the open technique. It offers a minimally invasive approach with less surgical trauma and blood loss. Postoperative recovery and rehabilitation is faster than open surgical techniques. Postoperative range of motion is also not sacrificed for the sake of stability. It also maintains cosmesis of the shoulder. Patients have a good range of motion functionally, especially external rotation which allows them to return to their sports or high demand jobs [23-26].

The high recurrence dislocation statistics in the early times of arthroscopic repairs have become comparatively as low as open techniques by newer surgical techniques and patient selection. According to Cole et al. in a retrospective study comparing arthroscopic and open methods relaxation rate was 24% in arthroscopic group and 18% in open group [27]. Gartsman et. al. performed arthroscopic Bankart repair, capsular plication, and if necessary thermal capsulorrhaphy in 53 patients with antero-inferior shoulder instability. After two years follow-up good and excellent results were 92%and 7.5% of them had recurrence [25]. Mishra and Fanton reported a failure rate of 7% with arthroscopic Bankart repair combined with the rmaltreatment[28]. Similarly, Ide et al reported a 7% failure rate after performing arthroscopic Bankart repair in a young, athletic group of patients [29]. After two years follow up Westerheide et al., stated 85 mean Rowe score and 7% redislocation rate in 71 shoulders of 67 patients, who underwent arthroscopic Bankartrepair[26]. Sedeeketal. reachedat a 92.5% successful rate after arthroscopic treatment of 40 shoulders [30]. On the other hand in a retrospective study comparing open versus arthroscopic treatment Lotzner et al found a tendency towards more frequently and earlier recurrence of instability [31]. Inourstudyall patients with anteroinferior shoulder instability underwent arthroscopic Bankart repair prior, if necessary rotator intervalclosure and thermal capsulorrhaphy then. At a mean follow-up for 24 months, 6 (18%) of 50 had recurrence in the form of subluxation – and difficulties in movement. The failure rate in our study was 18% which was little more than the other published studies. Thishigher unsatisfactoryrateofourstudymay be due to our initial arthroscopic cases, prolonged

postoperative immobilization or our nonaggressive rehabilitation programme.

Arthroscopic shoulder instability repair has lots of difficulties. Suture anchors must be put in appropriateangles and places. Also must be put in adequate number. Capsulolabral stabilization was performed with at least three anchor insertion by Karlsson [32], Kim [33],Fabriciani [34] and Ide [35]. During surgery we usually inserted three anchors, but sometimes two or four depending on the size of the Bankart lesion. Implant failure including migration, loosening and insufficiency (breaking) is not rareperopandpostoperatively[34].Likewise 03 anchors insufficiency developed in 03 patients during operation which was removed and reinserted instantly. On postop radiographs, CT or MRI no patients anchors were in wrong position.

All our patients are defense personnel, young, physically active persons who engage in high-demand jobs. The first episode of acute shoulder dislocation is invariably painful and traumatic. Subsequently, they sustain recurrent shoulder dislocation even during performing tasks of daily activities, i.e. reaching for overhead objects, stretching or even sleeping. The recurrence sustained varies from multiple subluxations to complete dislocations. Our patients expressed a high degree of satisfaction (88%) with arthroscopic Bankart repair. Functional Rowe scores were satisfactory perfect in 44 cases (88%), unsatisfactory was in 6 (12%) cases. In unsatisfactory group various complaints like positive apprehension test, weakness, discomfort, and external rotation limitation or even for two cases redislocation occurred after 06 months postoperatively.

Satisfactory range of motion, especially external rotation that allows proper functioning during activities of daily living, is considered more important than just stability alone. So range of motion must be protected while treating shoulder instability. Studies have shown a good range of motion achieved after arthroscopic repair than those achieved after open repair. In a prospective study by Karlsson et. al. comparing arthroscopic and open methods, after a mean duration of 28 months, external rotation was 80° in open group and 90° in arthroscopic group postoperatively [32]. Archiero et al. reported a decreasing external rotation rate of 3°, Gartsman et al. [25] reported 5° and Kim et al. [33] reported 4° in their series. Similarly meanexternalrotationlimitationwas5°inourpatients postoperatively.

CONCLUSION

Improvements in arthroscopic technique have led to better patient outcomes by improved understanding of the patho anatomy of instability. This study shows arthroscopic Bankart repair for recurrent anterior glenohumeral instability is a useful and successful procedure. Identification of patients with evident capsular laxity and or engaging Hill-Sachs lesion are addressed by thermal capsulorrhaphy to eliminate this laxity and or remplissage to fill up the engaging lesion in addition to Bankart operation and if arthroscopy reveals GBL (Glenoid Bone Loss) >25% then it is converted to Laterzet procedure which contribute to higher success rates. Wide arthroscopic studies with larger patients, it seems arthroscopic surgery techniques will gain its popularity more and more and becoming the procedure of choice for instability correction of shoulder.

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Original Article

Comparative Analysis of the Effects of Mini-Plate and K-Wire Fixation in Metacarpal Shaft Fractures: A Retrospective Study

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ABSTRACT:

Objective: The main objective of this study was to examine the clinical efficacy of using miniplate screw internal fixation with Kirschner wire (KW) in the management of metacarpal fractures.

Methods: This retrospective study was carried out at East West Medical College in Ashulia, Dhaka, Bangladesh, spanning from February 2020 to January 2022. The study enrolled sixty patients of both genders diagnosed with metacarpal shaft fractures, with ages ranging from 15 to 65 years. Radiographic examinations were conducted for all participants, who were then divided into two comparable categories. The study evaluated and compared clinical and radiological outcomes, surgical timing, and the incidence of complications between the two groups. The total participant pool consisted of 60 patients, with 30 assigned to receive micro plate treatment (Group A) and the remaining 30 assigned to undergo K-wire fixation (Group B). The assessment of functional results utilized the disabilities of the arm, shoulder and hand (DASH) scoring system.

Results: In Group A, the average age was 36.52 years, slightly higher than the average age of 36.43 years in Group B. The majority of patients in both groups were male, comprising 65.25% in Group A and 60.58% in Group B, while females accounted for 34.75% in Group A and 39.42% in Group B. Regarding fracture location, 40.30% of patients in Group A and 44.18% in Group B had fractures on the left side, while 59.70% in Group A and 55.82% in Group B displayed fractures on the right side.

Conclusions: Using mini-plate and screw fixation for metacarpal fractures has better results than KW fixation because it shortens the surgery and makes the patient less stressed. The utilization of this device can enhance patients' stability and facilitate early palm movement, thereby facilitating fracture healing and promoting the recovery of joint function. Additionally, it has the potential to decrease the occurrence of postoperative problems, thereby ensuring a certain level of safety. Furthermore, it has been shown that the implementation of certain measures can significantly decrease the likelihood of inadequate finger rotation. Additionally, both K-wire fixation and other methods have demonstrated effectiveness in the treatment of metacarpal shaft fractures.

Keywords: Mini-Plate, K-Wire Fixation, Metacarpal Shaft Fractures

INTRODUCTION:

Metacarpal fractures are relatively common among orthopaedic injuries. It's the most prevalent type of hand fracture, which can make up to 40% of all fractures, and so accounts for roughly 10% of all fractures overall.[1-3] The metacarpals are long, thin bones with a minor curve along the longitudinal axis and a concave gliding surface.

It is possible for therapeutic neglect, overtraining stiffness, maltreatment deformity and rigidity, and maltreatment deformity and rigidity to make metacarpal fractures worse.[4]

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Early diagnosis is crucial because when the metacarpus shortens by more than 3 mm, the externally handled muscles and the intrinsically handled muscles become out of balance. Other treatment goals include soft-tissue preservation, longitudinal arch preservation, transverse arch preservation, and metacarpal length maintenance.[5] Improvements in hand fracture care have resulted from a number of factors, including advances in our knowledge of the biomechanics of internal fixation, the development of more effective anesthetics, the simplification of surgery, and the development of more effective hand-physiotherapy techniques. The emergence of subspecialties within the field of hand surgery, as well as advancements in anesthetic techniques and instrumentation, have also contributed to this progress.[6-7]

In the past 25 years, there has been a significant expansion in the therapeutic options available for metacarpal fractures. It is possible to do closed reduction and splinting, which is a disadvantage due to the fact that it is difficult to maintain joint mobility in order to prevent stiffness.[8]

Objectives: The goal of this research was to examine the efficacy of using miniplate screws and Kirschner wire (KW) for fixing metacarpal fractures.

MATERIALS AND METHODS:

This retrospective study was conducted at East West medical college, Ashulia, Dhaka, Bangladesh, from February 2020 to January 2022. This study comprised a total of sixty patients, both male and female, who presented with shaft fractures of the metacarpal. This study protocol was approved by the ethics committee of our college. After receiving the patient's informed and written consent, the patient's complete demographic information was collected. This included the patient's age, gender, kind of fracture, and the affected side. Comminuted shaft and condylar fractures, metacarpal fractures in children younger than 18 years old, and patients with open fractures were not included in the study.

Complete radiological evaluations were carried out both before and after the operation. Patients were divided into two separate but comparable groups. Patients in group A who were treated with mini plates were compared to patients in group B who were treated with K-wire fixation (group B). The researchers looked into post-operative problems such as finger stiffness, delayed union, and superficial infections. The post-operative problems of both groups were investigated and compared with one another. The DASH scoring system was utilized so that functional outcomes could be evaluated. The 30-item DASH questionnaire measures upper extremity function. Each DASH task is evaluated from 1 (no difficulty) to 5 (unable to do), with higher scores indicating more impairment. Patients were observed for a year.

SPSS 24.0 was used to do the analysis on all of the data. In order to analyze the differences in functional outcomes and postoperative complications between the two groups, a Chi-square test was performed. A $p < 0.05$ was considered to be significant.

RESULTS:

The mean age for individuals in Group A was 36.52 years, slightly higher than the average age of 36.43 years for those in Group B. The gender distribution revealed a predominant male representation in both groups, with 65.25% in Group A and 60.58% in Group B. Conversely, female patients constituted 34.75% in Group A and 39.42% in Group B. Regarding fracture location, 40.30% of patients in Group A and 44.18% in Group B exhibited fractures on the left side, while 59.70% in Group A and 55.82% in Group B displayed fractures on the right side. Detailed information is available in Table I.

Table-I

Distribution of socio demographic status among the participants (N=60).

Variables	Group A	Group B
Age	36.52 ± 6.50	36.43 ± 6.28
Gender		
Male	65.25%	60.58%
Female	34.75%	39.42%
Fracture Side		
Left	40.30%	44.18%
Right	59.70%	55.82%

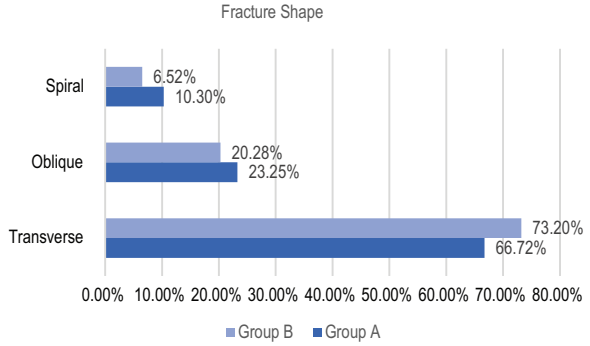


Fig.-1: *Bar chart distribution Fracture shape among the patients.*

Above figure 1 shows that, transverse, oblique, and spiral fractures were found in 66.72%, 23.25%, 10.3%, and 10.30% of patients in group A, respectively, while 73.20% of patients in group B had transverse fractures, 20.28% had oblique fractures, and 6.52% had spiral fractures.

The difference between the mean duration of union in group A (9.66 weeks) and group B (12.10weeks) was statistically significant ($p<0.05$). In group B, 14.01% of patients had nonunion of the bone, whereas in group B, none of the patients had nonunion (Table 2).

Table-II

Distribution of union time of bone and non-union (N=60).

Variable	Group A	Group B	P value
Union time (weeks)	9.66±2.36	12.10±2.20	0.02
Non-union	—	4.01%	N/S
Union of Bone	100%	97.20%	N/S

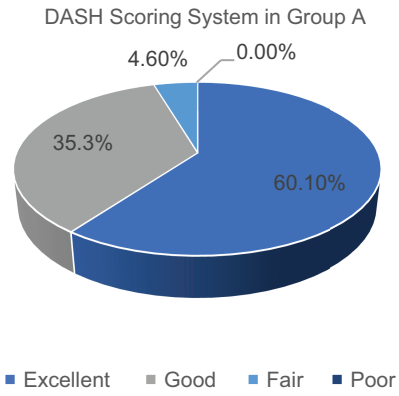


Fig.-2(a): *Pie chart distribution of DASH Scoring System among the Group A.*

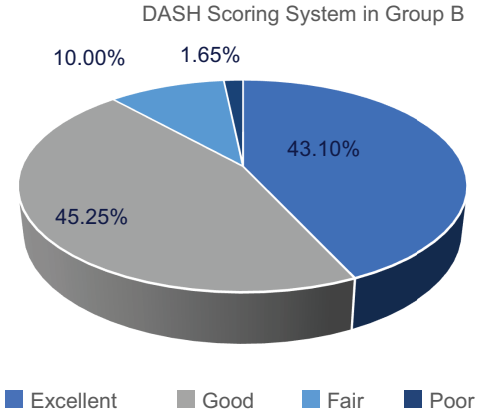


Fig.-2(b): *Pie chart distribution of DASH Scoring System*

The above-illustrated pie chart shows the level using the DASH scoring system among Group A. The pie chart shows that 60.10% of patients had an excellent score, 35.3% scored good, and 4.60% scored fair (Figure-2(a)).

Similarly, Figure 2(b) shows that 43.10% of patients in Group B scored excellent, 45.25% scored good, 10% scored fair, and 1.65% scored poor using the DASH Scoring System.

Within Group A, 9.75% of patients experienced superficial infections, 7.2% encountered finger stiffness, 3.86% faced implant loosening, and none reported delayed union. In Group B, corresponding figures were 13.10% for superficial infections, 11.25% for finger stiffness, 8.50% for implant loosening, and 2.20% for delayed union. Although Group B exhibited a higher incidence of postoperative complications compared to Group A, this disparity did not achieve statistical significance (p-value > 0.05) (Figure-3).



Fig.-3: *Fracture 2nd metacarpal*



Fig.-4: *Fracture fixed by K-wire*

Table-III

The distribution of This study aims to analyze and compare the occurrence of postoperative complications in two distinct groups.

Variable	Group A	Group B
Superficial infection	9.75%	13.10%
Finger stiffness	7.2%	11.25%
Implant Loosening	3.86%	8.50%
Delayed union	0.00%	2.20%



Fig.-5: *Fracture 3rd and 4th metacarpal*



Fig.-6: *Fracture fixed by mini plate*

DISCUSSIONS:

Fractures of the metacarpal shaft are frequently encountered in orthopaedic emergency and outpatient clinics. Although several surgical interventions exist for the treatment of these fractures, internal fixation with K-wire and mini-plate fixation are the most effective due to their low complication rates and high success rates.[9-10] Overall, 62.5% of patients were male across both groups, with just 37.5% being female. In our investigation, the mean age was 35.46 years. The average age of patients with a fractured shaft of a metacarpal was 30 years old, and the majority of those patients were male.[11,12]

A statistically significant difference (p-value<0.05) was observed in the mean union latencies between group B (K-wire fixation) and group A (mini-plate. Group B had a mean time of union of 12.10 weeks, compared to 9.66 weeks for group A. K-wire fixation was achieved in both groups. One individual in group B (4.01%) experienced nonunion, whereas none of the patients in group A developed nonunion.

In contrast with patients who underwent k-wire fixation, those who were fitted with micro plates had a shorter duration to union, according to a study by Agarwal et al. in 2019; nevertheless, the differences were not statistically significant.[12] Ahmad et al. 2020 found that compared to patients who underwent K-wire fixation, those who got mini-plates experienced faster bone union.[13]

In a separate investigation by Abdel-Hamid et al. in 2020, it was discovered that individuals undergoing treatment with mini-plates achieved an average union time of 6 weeks. In contrast, those treated with K-wires exhibited a comparatively longer average union time of 8 weeks.[14]

According to the findings of Khaled et al. 2018 patients who had mini-plates had functional outcomes that were 93.3% satisfactory, whereas patients who had K-wire fixation had functional outcomes that were 86.7% good.[15] K-wire fixation was associated with a higher rate of postoperative problems compared to than mini-plates fixation in our analysis, although the difference was not statistically significant ($p > 0.05$). In Group A (mini-plate), 9.75% of patients had superficial infection, 7.2% had stiffness, 3.86% had implant loosening, and 0% had delayed union. Besides, in Group B (k-wire fixation), there were 13.10% with superficial infection, 11.25% with finger stiffness, 28.50% with implant loosening, and 2.20% with delayed union. The results were consistent with several other studies showing a lower risk of problems with mini-plate fixation compared to k-wire fixation.

CONCLUSIONS:

In contrast to KW fixation, mini-plate and screw fixation exhibits superior efficacy in managing metacarpal fractures, thereby substantially reducing patient trauma and operating time. It facilitates early palm movement, promotes fracture healing and joint function recovery, and enhances patient stability; it also decreases the incidence of postoperative complications, which ensures patient safety. Moreover, it has the potential to significantly mitigate the likelihood of compromised finger rotation, and both K-wire fixation and metacarpal shaft fractures are effective.

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Original Article

Breaking Stereotype: Our Experience in Stabilizing Broken Beauty Bone

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Abstract:

Background & Objective: Clavicle fractures are common in all age groups. However, for years non-operative management of such fractures has been preferred worldwide. Non-union happens to be one of the commonest complications of conservative treatment along with prolonged periods of immobility and disability. In developed countries, there is already a paradigm shift towards operative management for such fractures for years. In our country, conservative treatment for clavicle fractures is an accepted and popular method.

Materials & Methods: Over the last two years (2021-2022), we treated clavicle fractures by open reduction and internal fixation (ORIF) using clavicular (anatomical) plates in various hospitals of Dhaka city only after meeting the criteria for surgery. In this retrospective study, we wanted to see the clinical outcome of those cases. Ten cases were included in this study. Clinical outcome was seen using Cologne Clavicle Score (CCS).

Result: Among ten cases, six were male, and four were female. The mean age was 45.5 (SD ± 9.39) years. AO classification was followed for classifying all fractures. The average time of union was 8 -12 weeks. Nine patients scored excellent, and one patient scored good. The plate was removed in one patient due to cosmetic reasons. Cerclage wire was used in one case to hold small, fractured pieces.

Conclusion: The outcome of this study ushered in an assurance to the treatment of clavicle fractures of certain types using clavicular (anatomical) plates.

Key words: Non-union, Clavicular Plate, Cologne Clavicle Score (CCS), ORIF, Clavicle Fracture

INTRODUCTION:

There has been a debate for more than a decade choosing the best treatment for clavicular fracture in between conservative over surgical. And the modern world, with the invention of implant design, the patient's desire for early mobilization and the advancement of anesthesia, has shifted towards surgical treatment for such fractures.[1] Clavicle fractures accounting for 4%-10% of all fractures.[2] Though there is a lot of published evidence in support of both surgical and conservative management, no definitive consensus on a single best approach has been reached.[2]

The clavicle is S-shaped, and forward-facing is convex medially and concave laterally. The cross-section is tubular in the middle and flat towards its lateral end. There are anatomical variations based on age, sex, and race, in the morphology of the clavicle and its medullary canal[3,4]. Considering these variations, a simple plating, either recon plate or locking combi-plate (LC-DCP) or even a small dynamic compression plate (DCP), was found unsuccessful while used to hold fracture fragments.[5] The inadequacy of the implant leads to complications including soft tissue irritation, non-union, implant loosening, and deep-seated infection.[6]

So, there has been an evolution in plate design with models including a combination of locking plates with combi holes

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and a lateral extension that allow the purchase of multiple screws at the lateral end of the clavicle providing a stable fixation of the fracture. This results in a plate design that is almost like the anatomical bone shape of a clavicle. Screws on both ends can be cortical or cancellous according to the need, though cancellous screws are preferred on the lateral side as it is cancellous. This study aims to report our results and outcomes following Open Reduction and Internal Fixation (ORIF) of Diaphyseal Clavicle Fractures using a Superior Anatomical Clavicle Locking Compression Plate (LCP).

MATERIALS &METHODS:

It is a retrospective observational study of surgical fixation for diaphyseal clavicle fractures in multiple institutions over two years between January 2021 to December 2022 using the Superior Anatomical Clavicle LCP. All the patients with clavicle fractures were first attended in the emergency department of various hospitals of Dhaka city. Some of them had other injuries such as soft tissue injury, bruise, and lacerations over multiple regions of body. After giving primary treatment with proper resuscitation, these patients were offered for surgery as a choice to treat clavicle fracture, considering active lifestyles and fracture configuration (displaced, shortened, or comminuted diaphyseal fracture). Ethical approval was not required, as data was collected for quality improvement and audit purposes and there was no direct involvement of human subjects.

Surgical Techniques:

General anesthesia in the supine position was the choice in all cases. The surgical site was infiltrated with local anesthetic and adrenaline as it helps to reduce per-operative blood loss and postoperative analgesia.[1] A curvilinear incision used to make 1 cm below the clavicle and extended to the lateral end of the clavicle. The platysma was incised along the line of the incision. Supraclavicular nerves were identified in younger patients (age < 45 years) and preserved. However, these were excised in older patients with loose skin and fascia. After excising the clavicopectoral fascia with no 12-blade, the fracture was exposed. The periosteum was elevated as per the need to align fracture fragments.

Hardly any fragments were detached from their soft-tissue attachments. Initially, butterfly fragments were held in place with a K-wire or AO 3.5 mm clamp. Later they were fixed with a lag screw and finally stabilized using a 3.5mm cortical screw, cerclage wires, or no 1 vicryl suture. The fracture was reduced and stabilized with a 3.5 mm Superior Anatomical Clavicle LCP in neutral mode, using both locking and cortical screws. 3.5mm cortical locking or non-locking screws with locking/ non-locking heads were used on the medial to the fracture site. Lateral to the fracture site, 3.5mm cancellous or cortical screws with locking and non-locking heads were used.

Postoperative Period:

After wound closure and pressure dressing, the arm was placed in an elbow bag. Patients were asked to do extension and flexion of the shoulder from the 1st postoperative day. Most patients found it painless and the from 2nd post-operative day, abduction and adduction of the shoulder were advised, though lifting the arm above the shoulder was always prohibited for up to 4 weeks. The elbow bag was removed 2 weeks later after removing all stitches. Partial weight bearing (< 2 kg) was advised after 2 weeks and full weight bearing after 6 weeks. Then all patients were reviewed at the 3rd and 6th months, with radiographs on each visit. In the 3rd and 6th months, Cologne Clavicle Score (CCS) was used to evaluate the outcome.

Statistics:

Statistical analysis was not performed.

RESULTS:

Among ten patients, eight were male and two were female. The age range of the patients was 28 years to 65 years with the median age being 45.5 years (SD ± 9.39). Indications of surgery were displaced midshaft clavicle fracture (A0 15-2, displaced ³ 2 cm and small / no contact of the main fragments), open fracture, neurovascular injury, fracture with skin impingement, cosmetic deformity, symptomatic non-union, and high-demand patients. Of those ten patients, two demanded surgeries for cosmetic purposes, one demanded surgery for old age, i.e., high-demand patients and the rest of the seven patients fulfilled the first criteria of displaced midshaft fracture. Demographic variables are presented in the following figures and the distribution of the fractures is presented in a pie chart. The time of surgery from the occurrence of the accident is also presented in the pie chart. The average time of union was 12 weeks (radiological union). In two cases fracture fragments were found very small to hold with AO 3.5 mm conventional screw, so 20 G cerclage wire was used. In one case mini plate (commonly used in maxio-facial surgery) was used to hold fragmented bone pieces as even cerclage wire was not giving stability. Then 3.5 mm clavicular plate was applied over it. In one patient, a

plate was found prominent under the skin as the patient had very little subcutaneous tissue underneath. So, it was removed after a year of surgery with complete union. Initially, drain was not applied in two cases, then on 3rd case, there was a serosanguinous collection underneath the skin, over the plate, it was managed by regular dressing and care of the wound. From the 4th case onward, a drain was applied in all cases and removed on the 3rd postoperative day. Cologne Clavicle Score (CCS) was done on the 3rd and 6th month. In the first follow-up on 3rd month, all the patients scored good. In the final follow-up in the 6th month, 8 patients had excellent results, 1 patient had good results and 1 patient had poor results.

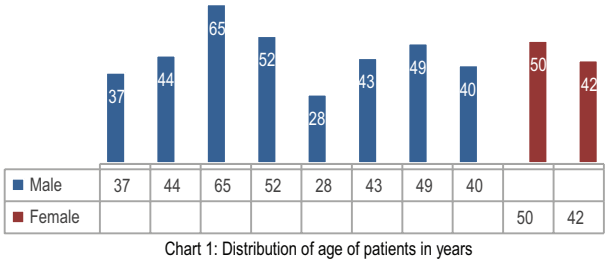


Chart 1: *Distribution of age of patients in years*

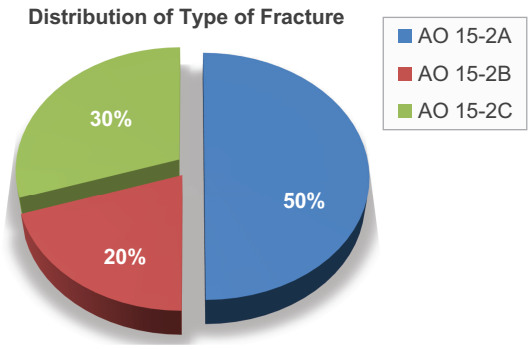


Chart 2: *Distribution of Type of Fractures*

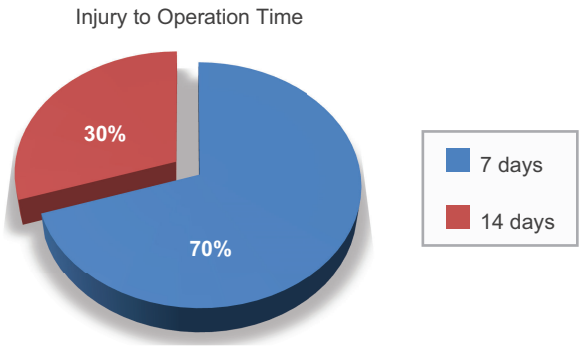


Chart 3: *Perioperative variable: Injury to operation Time*

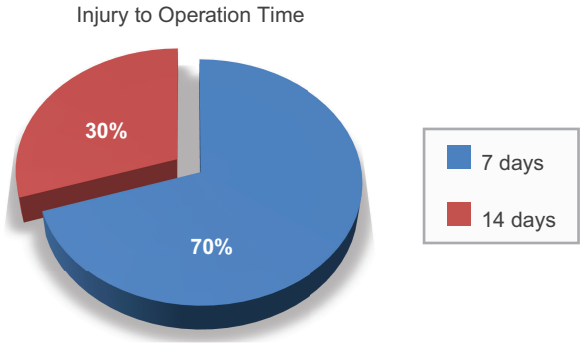


Chart 4: *Final Outcome- Cologne Clavicle Score*



Figure 1: *Plate fixation*



Figure 2: *X-ray Clavicle showing Fracture*



DISCUSSION:

In the classical papers by Neer7 and Rowe,8 most authors recommended that ORIF of displaced midshaft clavicle fracture should be avoided because of the high rate of union with non-operative treatment, high rate of failure with operative treatment, and the potential risk of

neurovascular complications due to the proximity of vital structures including the underlying subclavian artery, vein, brachial plexus, and pleura. Over 25 years ago, Jupiter & Leffert[9] noted that there is an association of non-union in their series of cases in fracture displacement of greater than 2 cm. This probably led to the shifting of displaced midshaft clavicle fractures towards surgery. Recent clinical studies demonstrate high rates of nonunion and symptomatic malunion with non-operative treatment. Even a few years back, our attitude towards clavicle fracture was to treat it conservatively which resulted in ono-union and complete dissatisfaction of patients. Then we changed our principle in treating clavicle fractures maintaining strict criteria to adopt surgical treatment and found satisfactory results.

In our series of 10 patients with midshaft and distal third fractures clavicle, we found a 100% union rate with no major complications. Skin paresthesia was one minor complication, especially in those cases where supraclavicular nerves were excised. We attribute our outcome to meticulous surgical technique including minimal devitalization of soft tissues providing blood supply to the bone, anatomic reductions whenever possible, and following established principles for internal fixation. Though the number of patients was very small, but we tried to assess them all using the Cologne Clavicle Score (CCS) and the result was excellent. This result is also like other articles published internationally[11]. One big difference may be the use of an anatomical clavicular plate that has locking and non-locking head screws with either cortical or cancellous screws. We didn't find any article on fixing small, comminuted pieces of bones either by cerclage wire or mini plate. We didn't violate the AO Trauma principle but, as we were concerned about the stability of the clavicle after fixing it with a mini plate, we were quite satisfied in the end. We planned to publish an article in the future discussing all about using mini plates. In our article, we skipped the discussion of demographic patterns of clavicle fracture as the number of cases was very small. In all our cases to minimize soft tissue bleeding, we infiltrate the skin along the incision line with 1% jasocaine with adrenaline. Most of the literature supported this.[12] The Cologne Clavicle Score was found excellent in almost all cases. Two cases failed to have an excellent result as they were old patients and had frozen shoulders on the same side, so had difficulty in moving their shoulders.

CONCLUSION:

In this retrospective study, Open Reduction and Internal Fixation (ORIF) of displaced clavicle fractures proved to be a reliable treatment with predictable outcomes when fundamentals of fracture fixation and soft tissue technique are followed. The outcome of this study ushered us an assurance to treat clavicle fractures of certain types by Open Reduction and Internal Fixation using a clavicular (anatomical) plate based on scientific ground.

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