



A STUDY ON FUNCTIONAL OUTCOME AFTER HIGH FIBULAR OSTEOTOMY IN MEDIAL COMPARTMENT OSTEOARTHRITIS KNEE.

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ABSTRACT

Background: Primary Osteoarthritis of the knee is more prevalent than that of the other joints. Treatment for knee osteoarthritis can be broken down into nonsurgical and surgical management. Initial treatment begins with nonsurgical modalities and moves to surgical treatment once the nonsurgical methods are no longer effective. Various treatment modalities available include intraarticular injections, physiotherapy, visco supplementation, arthroscopic debridement, high tibial osteotomy, and knee replacement with uni compartmental arthroplasty. All of it has its complications. Hence, there is a necessity for a modest technique, easily reproducible, provides decent functional outcomes and associated with a smaller recovery period, and develops the quality of life for the affected patients. In this scenario, this study is designed to know the functional outcomes, when an osteotomy of the fibula at proximal 3rd is performed in medial compartment osteoarthritis knee. **Methods:** The present study was conducted at the department of orthopaedics Andhra medical college/ king George hospital Visakhapatnam between 2019 and 2021. Thirty patients who fulfilled inclusion criteria were taken up for study n=30. **Statistical Analysis:** Statistical analysis was performed using SPSS version 19.0 statistical software for the window. Continuous variables were expressed as mean, \pm SD, and dichotomous variables were expressed as percentages. A two-tailed t-test was applied to analyze the postoperative weight-bearing ratio of knee joint space (medial/lateral compartment) data. In addition, the nonparametric test (Wilcoxon's signed-rank test) was applied to analyze the OKS, AKSS, and VAS scores. The chi-square test will analyze the Comparison of qualitative variable, and Comparison of the quantitative variable will be analyzed by independent samples unpaired T-test. A P-value less than 0.05 was considered to be significant. Data will be entered in Microsoft Excel, and data analysis was performed using windows MEDCALC software on a personal computer. **Results:** Sample size of the present study was 30 (n=30). Average age of the patients was 56 years. with males accounting to 56.66% and female's 43.33 percent. There were 17 males and 13 females among the 30 patients. The majority of the patients have grade 2 medial compartment osteoarthritis. Preoperatively, the mean medial/lateral joint space ratio was 0.26 \pm 0.12, which increased in the postoperative phase, reaching 0.67 \pm 0.29 after six months. **Conclusion:** Proximal fibular osteotomy effectively reduces the pain of medial compartment osteoarthritis. It also improves the mean pain score earliest postoperatively. We observed modest improvement in both oxford knee scores and American knee society score.

KEYWORDS : Osteotomy E04.555.580 Knee Joint A02.835.583.475 Arthritis C05.550.114

INTRODUCTION

In the knee joint, the load is distributed along the mechanical axis, which is generally medial to the knee's midpoint. However, the fibula soft tissue complex provides lateral support to the osteoporotic tibia causes bilateral plateau degradation and non-uniform settlement. As a result, the load from the usual distribution may move further medially to the medial plateau, causing knee varus and exacerbating the advancement of medial compartment O.A. in the knee joint. The tibial plateau slope arising from nonuniform settlement results in a transverse shearing force, with the femoral condyle shifting medially while walking and participating in sports. The fibula carries 16 percent of the body's weight. The loading via fibula to the lateral tibial condyle is preserved with age and contributes to the support of the lateral side of the proximal tibia, whereas the medial proximal tibia loses strength more quickly. The medial plateau bears nearly 100 percent of the weight in a varus deformity. To restore proper weight-bearing distribution over the knee's joint surface, Corrective osteotomies were performed around the knee joint.

The Justification Behind High Fibular Osteotomy

Many mechanisms appear to interplay after PFO. The nonuniform settlement concept. The term "settlement" refers to the gradual sinking of a structure after it has been built. The fibula has a higher bone density than the tibia's medial articular surface. The fibula supports the lateral tibial plateau in osteoporosis, preventing the lateral side from "settling" and creating varus deformity. This was referred to as a non-uniform settlement. The load borne by the fibula is 16% of body weight. With the age loading via fibula is preserved and contributes to support of lateral side of the proximal tibia, whereas loss of strength is more significant in the proximal tibia. The fibula's support is removed during PFO, causing the lateral side to "settle" down, and even loading distribution on the medial and lateral sides leads to correction of the deformity in a varus knee, alleviating symptoms and minimizing the deformity. The competition of muscles concept postulates a muscular competition between the peroneus and biceps femoris followed by PFO. After proximal fibular osteotomy, muscle activity increased in

the long head of the biceps femoris and reduced in the peroneus longus on the side that was operated on. This explains why, soon after proximal fibular osteotomy, the hip knee ankle (HKA) angle improved from a more varus to a more neutral alignment, which is noteworthy.

Aim And Objectives

1. To study the functional outcome of high fibular osteotomy in knee joint with medial compartment osteoarthritis.
2. To explore the effects of high fibular osteotomy as a new method for pain relief and medial/lateral joint space ratio improvement

MATERIAL AND METHODS

A Written Informed Consent was obtained from the Patient. A detailed history was taken. Patients were subjected to General Physical Examination, Systemic Examination, and the neurovascular status of the lower limbs was examined. X-ray knee the anteroposterior and lateral views were taken in standing position. The routine pre-anesthetic evaluation was done. Routine preop knee scoring was done. Patients fit for surgery and fall in the inclusion criteria for high fibular osteotomy taken for surgery. Preoperative Oxford knee score (OKS), function sub scores of the American Knee Society score (AKSS), and Visual Analogue Score (VAS) was noted along with Preoperative and postoperative weight-bearing ratio of knee joint space (medial/lateral compartment). Patients were followed up on immediate postop period, at suture removal after 14 days, three months, and at the final follow-up period, six months postop. The final follow-up scores were compared with preoperative scores. The primary outcome observed was the functional outcome of the patient. Functional status of the knee was evaluated with Oxford knee score (OKS), function sub scores of the American Knee Society score (AKSS) and Visual Analogue Score (VAS), and the postoperative weight-bearing ratio of knee joint space (medial/lateral compartment) after the procedure. The medial joint space was determined by one vertical line [A] between 2 horizontal lines (C and D) drawn from the lowest point of the medial condyle of femur and medial condylar plateau of the ipsilateral tibia. The lateral joint space was ascertained by one vertical line [B] between 2

horizontal lines [E and F], marked from the lowest point of the lateral condyle of femur and lateral condylar plateau of the ipsilateral tibia. The proportion of the joint space of knee (medial/lateral) can be ascertained by the division of [A]/[B]. (fig1).

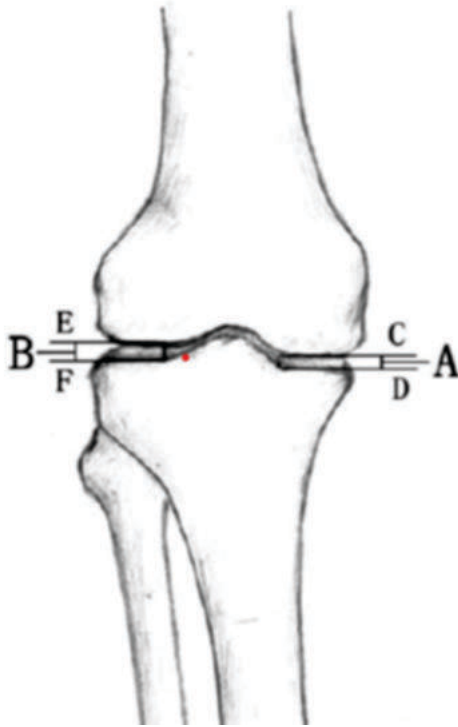


Fig-1 Medial/Lateral Joint Space Ratio

SURGICAL TECHNIQUE:

The surgery was performed under spinal or epidural anaesthesia without a tourniquet. The fibular head tip was marked with a skin marking pen, and the appropriate downward distance is measured. Skin and subcutaneous tissues were cut. The incision should be more than twice the length of the resected segment. The fibular periosteum was exposed by separating the peroneus and soleus. The periosteum was incised first in the line of skin incision and a 1.5 to 2 cm piece of fibula was resected with a narrow blade oscillating saw. The length of the fibular segment resected was 1.5 to 2cm, and the distance from the fibular head was 6 to 9 cm. The osteotomized fragment was removed and ends smoothed. The wound was washed, closed in layers, and given a light compression bandage. The patient was mobilized as soon as tolerated in most cases within 24 hours. The patients followed up immediately postoperatively and after 14 days for suture removal and then after three months and 6months postoperatively.

Inclusion Criteria

1. Age more than 40 years.
2. Osteoarthritis knee in medial compartment grade I to 3
3. Patients who had given consent.
4. Knee Varus less than 15°.
5. Fixed flexion deformity less than 15°.

Exclusion Criteria

1. Age less than 40 years.
2. Post traumatic arthritis, bi or tri compartmental osteoarthritis knee, inflammatory joint disease.
3. Knee Osteoarthritis grade 4.
4. Varus angle more than 15° and fixed flexion deformity more than 15°.
5. Associated tumors around the knee.
6. The patient is not fit for surgery.
7. Patients who denied consent.

RESULTS

Sample size of the present study was 30 (n=30). Average age of the patients was 56 years. with males accounting to 56.66% and female's 43.33 percent. There were 17 males and 13 females among the 30 patients. The majority of the patients have grade 2 medial compartment osteo arthritis. Preoperatively, the mean medial/lateral joint space ratio was 0.26+/-0.12, which increased in the postoperative phase, reaching

0.67+/-0.29 after six months. The radiological improvement was evident in all instances with an increase in medial/lateral joint space ratio during immediate postoperative period. Following six months of follow-up, the increase in medial/lateral joint space ratio was 41%. (Table-1)

Table-1 Medial/ Lateral Joint Space Ratio Pre And Post Operative Compared

Medial/lateral Joint Space Ratio	Pre operative	Post operative	t- value	p- value
	0.26+/-0.12	0.67+/-0.29	7.155	<0.001

The average VAS score before surgery was 7.23+/-1.02. After six months of postoperative follow-up, patients' mean VAS SCORE was 1.66, with a standard deviation of +/-0.74.

Most of the patients had an improvement pain score of 1 post operatively. Compared to the pre op VAS score, the z- value was -4.7821, and the p value was <0.001, which was significant implying a decrease in knee pain after surgery.

The average pre-op functional AKSS sub-score was 51.06+/-2.44, with a final score of 75.56+/-3.39 at six months with z-value of -4.7821 and p-value <0.001.

The average preoperative OXFORD score was 23.93+/-1.98, and the average postoperative OXFORD score was 34.46+/-2.76 with a z-value is -4.7821 and p-value <0.001.

The preop medial/lateral joint space ratio was 0.26+/-0.1, and the six-month postop follow-up M/L ratio was 0.67+/-0.29. Compared to the preop value, the t-value was 7.155, with a p-value <0.001 which was significant. The VAS score AKSS sub score and the OXFORD knee scores were tabulated in (Table-2).

Table-2 VAS And Knee Scores Summarized In Table Form

Parameter	Pre op	Post op	z- Value	p-Value
Oxford score	23.93+/-1.98	34.46+/-2.76	-4.7821	<0.001
AKSS score	51.06+/-2.44	75.56+/-3.39	-4.7821	<0.001
VAS score	7.23+/-1.02	1.66+/-0.74	-4.7821	<0.001

There were no serious complications other than immediate post procedure neuropraxia involving the superficial peroneal nerve in three patients, with one patient demonstrating full recovery at one month follow up and the remaining two patients recovering after three months.

All the parameters when compared at each instance of follow up showed serial improvement. The VAS score was decreased by day one itself and at final follow up it was further decreased. The M/L space ratio was increased after immediate postop; then, it was constant up to 3months, then it further increased at the final follow-up period. The AKSS and OXFORD scores increased immediately after postop; they remained constant until the final follow-up (Chart-1)

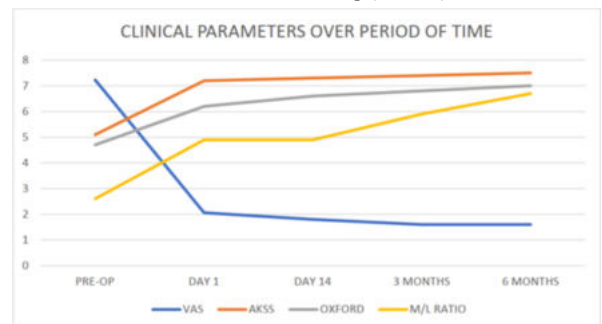


Chart-1 Trend Of All Clinical Parameters.

DISCUSSION

The mean VAS of pain improved significantly from 7.23 at preoperative to 1.66 at 6 months postoperative follow-up in the present study. There was a 55.7% improvement in VAS score in the present study. Wang et al showed 52.8% improvement in VAS score with a P value of 0.8055. L. Prakash et al showed 45% improvement in VAS score with a p-value of 0.2852. we found our results comparable to

Wang et al. and Prakash. L et al.32,53[1,2](Table-3).

Table-3 VAS Score Compared

VAS score	Present study	Wang et al	L Prakash study
Pre op	7.32+/-1.02	8.02+/-1.5	6.7
Post op	1.66+/-0.74	2.74+/-2.34	2.2
improvement	55.7%	52.8%	45%

The mean medial/lateral knee joint space ratio and the OXFORD score both improved significantly in the present study. This was better than Utomo. et al study.³⁵ This was due to the fact that Utomo et. Al., study included grade 4 osteo arthritis alone in their study. The medial/lateral joint space ratio was compared to Utomo. et al., which agrees with the results of the present study [3]. The functional AKSS sub-score was significantly improved in the present study. The findings matched those of Wang et al.³² Stretching out of the common peroneal nerve is a source of concern while doing a PFO during both of these studies [1]. The present study showed a lesser improvement when compared to Wang et al study owing to a lesser knee score before the study (Table-4).

Table -4. AKSS Sub Score And Oxford Scores Compared With Two Different Studies

AKSS score	Present study	Wang et al	OXFORD score	Present study	Utomo et al
Pre op	51.6+/-2.44	41.24+/-13.48	Pre op	23.93+/-1.98	25.66+/-4.18
Post op	75.56+/-3.39	69.02+/-11.12	Post op	34.46+/-2.76	36.80+/-3.00
Improvement	24.5%	27.78%	Improvement	21%	23%

On applying the chi-squared test, the p value was less than 0.05, implying the present study produced similar output as that of other studies in terms of pain relief medio lateral joint space ratio.

Huang et al.⁵⁴ postulated a muscular competition between the peroneus and biceps femoris followed by PFO. After proximal fibular osteotomy, Huang et al discovered that muscle activity rose in the long head of the biceps femoris and reduced in the peroneus longus on the side that was operated on. This explains why, soon after proximal fibular osteotomy, the hip knee ankle (HKA) angle improved from a more varus to a more neutral alignment, which is noteworthy. With the correction of the HKA angle, a rectified nonuniform settling would not be expected to be obvious immediately after a fibular resection, this explains the quick pain reduction following surgery [4]. The present study does not involve any muscular activity monitoring.

In a prospective analysis of 67 PFOs Qin et al.⁵⁵ discovered that the amount of the angle of inclination of the proximal tibiofibular joint and the amount of distalisation of the fibular osteotomy were linked to considerable clinical improvement following surgery. According to the authors, after PFO, the proximal fibula was no longer compressed by weight transmission forces from the distal fibula. The soleus and peroneus longus muscles linked to the proximal fibula, on the other hand, dragged the fibular head in a distal direction [5]. The ideal distance for the fibular osteotomy site proposed by Prakash. L et al was between 6 to 10 cm from the tip of the proximal fibula, depending upon the patient's height [2].

The same mechanism was applied in the present study by distalising the fibular osteotomy to 6 cm below the proximal tibio fibular articulation.

In 2018, Xie et al.⁵⁶ linked quick symptom relief following PFO to biomechanical alterations in ground response vector (GRV) action, primarily at the foot level. The hindfoot goes into valgus during the stance phase in patients with varus knees to relocate the origin of the GRV laterally and thus closer to the middle of the knee, minimizing the knee adduction moment (KAM). This compensating valgus is limited by an intact fibula. The lateral malleolus migrates proximally after PFO, forcing the calcaneus into more valgus through the calcaneofibular ligament, according to the authors. As a result, the GRV becomes more laterally oriented, alleviating pressure on the medial knee and providing immediate pain relief [6].

In a recent prospective investigation of 49 patients, Guo et al.⁵⁷ rejected the above notion. The lateral malleolus did not migrate proximally. Furthermore, they found no significant postoperative anatomical valgus alignment at the ankle following PFO [7].

Priya Ranjan, Rajeev Anand, Rakesh Choudhary in their study concluded that high fibular osteotomy was simple and affordable surgical option for medial compartment osteoarthritis of the knee and for medial joint space improvement[8].

Rakesh Kumar Misra and Ashish Vinod kumar Batra in their study from Rajasthan concluded that proximal fibular osteotomy is an option for countries that lack medical and financial resources[9]. Their study did not compare the effects with total knee arthroplasty. The present study did not take financial status of the patient in to account.

Jayanta K. Laik, Ravi Kaushal, Ritesh Kumar, Somit Sarkar, and Manish Garg in their study concluded that in their view high fibular osteotomy was an alternative to high tibial osteotomy, uni condylar knee arthroplasty and total knee arthroplasty as well in rural set up[10].

CONCLUSION

Proximal fibular osteotomy effectively reduces the pain of medial compartment osteoarthritis. It also improves the mean vas pain score earliest postoperatively. We observed modest improvement in both oxford knee scores and American knee society score.

ABBREVIATIONS USED

OA - osteoarthritis
 AP - anteroposterior
 GRV - ground reaction vector
 PFO -proximal fibular osteotomy
 VAS - visual analogue scale
 HTO -high tibial osteotomy
 FTA - femorotibial angle
 AKSS - American knee society score
 HKA -hip knee ankle angle
 OKS -oxford knee society score
 KAM -knee adduction moment
 CPN -common peroneal nerve
 SPN -superficial peroneal nerve
 DPN -deep peroneal nerve
 M/L - medial/lateral ratio
 SD -standard deviation

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