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Original Research Article

Proximal fibular osteotomy for pain relief and functional improvement in patients of osteoarthritis of knee

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ABSTRACT

Background: The aim of this study was to evaluate the effect of proximal fibular osteotomy in relieving pain and functional improvement in patients of osteoarthritis knee.
Methods: We selected 38 patients with KOA, out of which 30 patients gave written informed consent and underwent proximal fibular osteotomy. The median time of follow-up was 13.3 months. Preoperative and postoperative weight-bearing and whole lower extremity radiographs were obtained to analyse the alignment of the lower extremity (tibio-femoral angle) and ratio of the knee joint space (medial/lateral compartment). Assessment of knee pain was done using a visual analogue scale, and knee functional activities were evaluated using the American Knee Society score (KSS 1 and 2) preoperatively and postoperatively.
Results: Pain relief was observed in almost all patients after proximal fibular osteotomy. Weight-bearing lower extremity radiographs showed significant change in tibio-femoral angle an average increase in the postoperative medial knee joint space. Additionally, obvious change in alignment was observed in the whole lower extremity radiographs in 24 out of 30 patients. In three patients tibio-femoral angle showed progressive more varus alignment after proximal fibulectomy.
Conclusions: In short-term study, proximal fibular osteotomy provides pain relief and functional wellbeing to the patients of KOA.

Keywords: Knee osteoarthritis, Proximal fibular osteotomy, Pain relief

INTRODUCTION

Osteoarthritis of knee is a degenerative joint disease and one of the leading causes of disability in India with prevalence of about 28%.[1] It a chronic disorder having multifactorial etiology which ultimately leads to joint failure.[2,3] Most of the patients have idiopathic OA knee which leads to varus deformity of knee having reduced medial joint space and mechanical tibiofemoral axis of less than 180 degree on standing antero-posterior radiograph.[4] Currently there is no cure for OA. Total knee arthroplasty, unicompatmental knee arthroplasty and HTO are most common surgical procedures for advance OA. However, TKA is complex and expansive procedure but socioeconomic growth in developing countries has made it accessible to a large population of patients with arthritis in developing countries also. It is reported to relieve pain and improve mobility, in approximately 90% of patients.[1] However, there may be a need of second knee revision after the first surgery in about 6%-12% of patients.[5] HTO is an accepted method for treating medial OA with varus deformity of knee. However, the procedure is technically demanding and having complications of fixation failure, loss of correction, pseudoarthrosis, deep venous thrombosis, pulmonary embolism, and compartment syndrome.[6]

Proximal fibular osteotomy (PFO) is a procedure which aims to relieve pain and improves joint function in patients of medial knee osteoarthritis.[7] Compaired to HTO, proximal fibular osteotomt is simple and easily performed surgery and requires limited tissue damage and no internal fixation. Furthermore, proximal fibular osteotomy decreased the operation time, bleeding amount during operation and while shortened the full weight-bearing time; decreased the pain VAS and FTA and and decreased the incidence of complications.[8] This new surgery is more affordable in Indian cotext where there is still socioeconomic restrains. Pain relief after surgery occurs in almost all patients. PFO may delay or replace TKA in a subpopulation of patients with knee osteoarthritis. In the present study, we carefully evaluated the short-term efficacy of PFO in terms of pain relief and improvement of joint function in a cohort of patients from our hospital.

METHODS

After getting ethical clearance from ethics committee in IMS BHU Varanasi, between June 2016 and April 2018, a total of 38 patients were selected out of which 30 patients gave written informed consent and PFO performed on them in trauma centre BHU (average age of 52.26 years; age range, 40–63 years; 20 female, 10 male). Inclusion criteria included patients with moderate to severe symptomatic medial compartment OA of the knee, who had an indication for a surgical procedure, and who were able to give informed consent for the surgery. Exclusion criteria included patients with posttraumatic knee OA or inflammatory joint disease and patients having valgus deformity of knee. Patients in whom conservative management has failed and who have radiographic evidence of significant varus are good candidates for partial fibular osteotomy.

Figure 1: Pre-operative sterile painting and draping done and marking of resection site done at 8 cm from fibular head.

Figure 2: Plain of incision developed between peroneus muscle and soleus muscle.

Figure 3: Pre op x-ray scanogram having tibio femoral angle 177.52.

After administration of spinal anaesthesia, the patients were placed in the supine position with a sand bag placed under buttock of the side to be operated. Skin marking done centered over fibular head (Figure 1). An approximately 5-cm longitudinal incision was made 8 to 9 cm below fibular head and the fibula was exposed between the peroneus muscle and soleus muscle (Figure 2). PFO was performed by removing a 2- to 3-cm length of fibula at a site 6 to 10 cm from the caput fibulae with use of an oscillating saw. Following resection, the fibula ends were sealed with bone wax. The muscles, fascia, and

skin were sutured separately after the incision had been irrigated with a large volume of normal saline.an adhesive bandage is applied with cotton and compressive bandage. Postoperatively, the patients were ambulated as soon as they could tolerated the pain following surgery. One must remember location of common peroneal nerve while performing osteotomy. Full weight bearing and free mobilization were allowed postoperatively.

Figure 4: 3 month follow-up weight bearing X-ray scanogram.

Figure 5: Preoperative C-ARM image showing effect of proximal fibular osteotomy in decompressing medial joint space.

Preoperative and postoperative weight bearing whole lower extremity radiographs were obtained in all patients to analyse the alignment of the lower extremity and knee joint space (medial/ lateral compartment).The primary outcome measure was the difference in femoro-tibial angle (FTA) pre- vs postoperatively in weightbearing radiograps, Knee pain was measured using a visual analogue scale (VAS). Knee ambulation activities were recorded using the American Knee Society score (KSS) preoperatively and postoperatively. Data are shown as mean±SD. Paired and unpaired t tests were used to compare the differences in outcome scores between two groups. Differences were considered significant at $p<0.05$.

Figure 6: Postoperative C-ARM image showing effect of proximal fibular osteotomy in decompressing medial joint space.

Preoperative (Figure 5) and postoperative (Figure 6) C-ARM image showing effect of proximal fibular osteotomy in decompressing medial joint space.

RESULTS

One of 31 patients who underwent PFO, one lost to follow-up, leaving 30 patients who were followed for a minimum of 9 months. The mean duration of follow-up was 13.38 months (range, 30 months–9 months. medial pain relief was observed in all patients after PFO. The mean visual analogue scale scores decreased from 3.55±4.03 preoperatively to 2.450±1.06 postoperatively. Preoperatively, the mean knee and function subscores of the American Knee Society score were 62.13±11.90 and 55.16±4.15, respectively. Postoperatively, they significantly improved to 72.06±7.30 and 87.90±7.08, respectively (Figure 3). Radiographs of the weight-bearing lower extremity showed a significant improvement in FTA, from 181.21±3.20 preoperatively to 176.68±3.21 postoperatively. Medial joint space showed an insignificant increase from 2.35±0.53 mm to 2.35±0.83 mm.

Table 1: Sex distribution.

Sex	Frequency	Percentage
Male	10	33.3
Female	20	66.7
Total	30	100.0

Table 2: Preoperative and follow up values of different variables.

	Mean	Std. deviation	t	df	P value
KSS1	62.133	11.9069	-3.869	29	<0.05
Follow_KSS1	72.067	7.3949			
KSS2	55.167	4.1530	-20.098	29	<0.05
Follow_KSS2	87.900	7.0874			
FTA	181.2143	3.20890	5.383	29	<0.05
Follow_FTA	176.687	3.2114			
JCA	6.247	1.5596	-6.330	29	<.001
Followup_JCA	7.900	1.7685			
VAS	3.550	4.0372	1.375	29	>.05
Follow_VAS	2.450	1.0696			
MJS	2.393	.5382	.232	29	>.05
Followup_MJS	2.350	.8320			

KSS1 – Knee society score 1 (Clinical score); KSS2 – Knee society score 2 (Functional Score); FTA – FemoroTibial Angle; JCA – Joint Conversion Angle; VAS – Visual Analogue Scale; MJS – Medial Joint Space.

DISCUSSION

In older population knee osteoarthritis is most common form of arthritis and also a leading cause of disability.[9,10] Surgical methods for KOA include arthroscopic debridement, high tibial osteotomy (HTO), proximal fibular osteotomy and unicompartment or artificial total knee arthroplasty. Appropriate patient selection is key to successful HTO. Young patients with osteoarthritis of the medial compartment of the knee with varus deformity are the ideal candidate for HTO.[11] In elderly patients with severe osteoporosis there is risk of tibial plateau fracture and proximal necrosis with high tibial osteotomy so it is not a good surgery for older people.[12] 2PFO may be an alternative for patients of medial OA knee in developing countries like India because of their financial and healthcare delivery limitations. It may also constitute a promising alternative surgery for osteoarthritis of the medial compartment of the knee, especially for patients who cannot undergo TKA because of certain medical comorbidities. Furthermore, these patients can still undergo TKA in the future if it becomes necessary.

The mechanism of fibular osteotomy in relieving pain and correcting varus alignment is still unclear. In the load bearing joints like knee, there is some degree of settlement of bone mass with advancing age. Zhang et al in their work on knee non uniform settlement, pointed the role of fibula in providing lateral support to lateral condyle of tibia which leads to non-uniform settlement of tibial condyles which is more on medial side.[12] Based on this assumption, Yang et al hypothesised that the key factor which leads to non-uniform settlement of tibial platue and medial shift of mechanical axis is the lateral support of fibula to tibial plateau. Following osteotomy of proximal part of fibula, there is weakening of lateral fibular support that leads to correction of varus deformity and subsequently the loading force shifts more laterally which leads to pain relief and improvement in function.[13]

In our study, almost all patients following proximal fibular osteotomy experienced pain relief and improvement in KSS (knee society score) this leads to a step forward which establishes proximal fibular osteotomy as a simple, and safe procedure for treatment of medial compartment OA knee.

The key to successful fibular osteotomy was the level of resection of fibula and proper tissue dissection. 2 patients out of 30, experienced numbness on dorsum of foot with 1 having reversible weakness of EHL.

CONCLUSION

Proximal fibular osteotomy is a simple and safe procedure for patients having medial KOA with careful determination of level of resection and soft tissue handling.

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