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Prospective study of functional outcome of proximal fibular osteotomy in patients of knee osteoarthritis

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Abstract

Introduction: Knee osteoarthritis is a chronic, progressive degenerative disease with accompanying joint pain, stiffness and deformity. Knee osteoarthritis is a common joint disease, with an incidence of among 30 percent of population older than 60 years. Knee Varus deformities, characterized by a mechanical femoro-tibial axis of less than 180° on full leg standing antero-posterior radiograph and narrowed medial joint space are common in patient with knee osteoarthritis and affect 74 percent of patients with idiopathic osteoarthritis.

Objective: The study was intended to explore the effects of proximal fibular-osteotomy (PFO) as a new surgery for pain relief and improvement of medial joint space and function in patients with medial compartment knee osteoarthritis.

Methods: The study was carried out from Sept. 2017 to Dec. 2018 in B.R.D Medical College Gorakhpur in about 52 patients of age group 45 to 75 who underwent proximal fibular-osteotomy for medial compartment osteoarthritis was prospectively followed up. Preoperative and postoperative weight-bearing and whole lower extremity radiographs were obtained to analyze the alignment of the lower extremity and medial knee joint space. Knee pain was assessed using WOMAC (Western Ontario and McMaster Universities Osteoarthritis) score preoperative, post-operative and each follow up.

Results: There was a female preponderance seen in our study with the right knee being most commonly affected. Post surgery, 8 patients shows good, 10 patient shows fair and 34 patient shows unsatisfactory response as evaluated by WOMAC score at follow up. Weight bearing lower extremities radiographs shows significant increase in medial knee joint space in 20 percent patients.

Conclusion: From the inferences of the study we can concluded that it is simple, cost effective, and easy to perform procedure can improve both radiographic appearance and function of the affected knee joint and also achieve long term pain relief. It is associated with lesser complication and shorter recovery period as compared to High tibial osteotomy (HTO). This procedure may be an alternative treatment option for medial compartment osteoarthritis knee. A longer period of follow-up is necessary to evaluate whether the beneficial effects of Proximal fibular osteotomy is sustained over a period of time mainly in respect to improvement in medial joint space.

Keywords: Knee osteoarthritis, medial compartment, *PFO*, WOMAC score

Introduction

Knee osteoarthritis is a chronic, progressive degenerative disease with accompanying joint pain, stiffness and deformity [1]. Knee osteoarthritis is a common joint disease, with an incidence of 30% of population older than 60 years [2]. The initiation and progression of knee osteoarthritis involve mechanical, structural, genetic and environmental factors [3]. Knee varus deformities, characterized by a mechanical femorotibial axis of less than 180° on full leg standing antero-posterior radiograph and narrowed medial joint space are common in patient with knee osteoarthritis and affect 74 percent of patients with idiopathic osteoarthritis [4]. Factors associated with osteoarthritis of the knee are increasing age, obesity, sedentary lifestyle or changes in lifestyle and also work related activities. The conservative management for arthritis of the knee include analgesics, physiotherapy, visco- supplementation and intra-articular injections of steroid. Although it has been reported that even in healthy knee the medial compartment bear 60-80% of load [5], no one has precisely documented what contribute to this uneven load distribution. The current belief is that the load is distributed along the mechanical axis, which is generally medial to the center of knee.

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High tibial osteotomy (HTO) and total knee arthroplasty (TKA) are the two surgical methods used for treating knee osteoarthritis. High tibial osteotomy can be a technically demanding procedure and with its rare complication like neurovascular injury, iatrogenic fracture and non-union [6, 7]. Total knee arthroplasty can correct lower extremity alignment, relieve pain and improve knee joint function significantly. However for younger active patient or patients with moderate osteoarthritis it may not be the treatment of choice [8]. Based on previous clinical studies, it is believed that the lateral support provided to osteoporotic tibia by fibula-soft tissue complex may lead to the non-uniform settlement and degeneration of the tibial plateau bilaterally [9]. This may result in the load from normal distribution shifting farther medially to the medial plateau and consequently lead to knee pain, aggravating the progression of medial compartment osteoarthritis of the knee joint.

Using this logic, we have planned to perform proximal fibular osteotomy to relieve the increased loading force on the medial compartment for treatment of medial compartment osteoarthritis of knee joint. The goal of this prospective study was to evaluate the radiographic and clinical outcome of patients with medial compartment knee osteoarthritis treated by proximal fibular osteotomy with a mean follow up period of 12 months.

The management of elderly patients with tri-compartmental arthritis of the knee would ideally be a Total knee arthroplasty. While in younger patients with isolated medial compartment arthritis of the knee associated with a varus deformity, the surgical modalities available for management are limited to High tibial osteotomy and uni-condylar knee replacement. These procedures are associated with their own set of complications as well as being associated with a longer post-operative recovery period and also restriction of activities or weight bearing. Hence there is need for a procedure which is simple to perform, easily reproducible, gives good functional results and associated with a shorter recovery period and improves the quality of life for the affected patients. In this scenario, proximal fibular osteotomy is a relatively new and novel procedure which according to previously published and ongoing studies has been proven to be effective in the management of medial compartment arthritis of the knee. The aim of this study was to evaluate the role of proximal fibular osteotomy in the management of medial compartment knee osteoarthritis and to compare the results of this study with that of other authors as available in literature.

Methodology

The study was intended with 52 patients who belong to age group 45 to 75 year with medial compartment osteoarthritis who presented between September 2017 to December 2018 managed by proximal fibular osteotomy, included in our study. This study was approved by ethical committee of our institution. Inclusion criteria were both sex, age more than 45, medically fit patients, knee pain with difficulty in walking due to medial compartment osteoarthritis knee. While the exclusion criteria are Post traumatic knee osteoarthritis, inflammatory joint disease, refusal to provide informed consent. On admission all patients were evaluated clinically and radiological. Standard weight bearing radiograph of the affected knee were taken in antero-posterior and lateral views and the radiological parameters such as amount of medial joint space were evaluated and documented in the case records. The patients were then evaluated with the WOMAC

score, the preoperative values were documented in the patient case records. After obtaining informed consent and anesthetic fitness, the patients were taken up for the procedure. The surgery was performed with the patient in the supine position under spinal anesthesia with antibiotic cover. The fibular head was marked and the osteotomy site was determined to be 7 to 10 cm below from the head of fibula. A 5-8 cm lateral incision was made overlying the chosen site of osteotomy and dissection was carried out through the skin and subcutaneous tissues. The peroneus and soleus muscles were then separated to expose the periosteum of the fibula which was then incised and a 2 cm of fibula was then resected with the help of an oscillating saw. After ensuring haemostasis and giving wound wash, closure was done in layers and sterile dressing and compression bandage applied. All patients were encouraged to stand and walk on next day of surgery and were discharged within one week after the first wound inspection. Intravenous antibiotics were given for 2- 3 days followed by oral antibiotics for a period of 5 days. The sutures were removed on the 12th postoperative day. Postoperative weight bearing knee radiograph was taken and the radiological parameters were evaluated and documented. The patients were reviewed weekly for four weeks then at 3 months, 6 months and one year post operatively and at each visit he/ she will be assessed the medial knee joint space by radiograph and knee pain and function evaluation by WOMAC score.

Result

The present study reveals that 52 patients with medial compartment osteoarthritis of the knee who were registered in duration of September 2017 to December 2018 were managed with proximal fibular osteotomy and were followed up for a minimum period of one year. There was a female preponderance seen in our study with the right knee being more commonly affected. The age of the patients ranged from 45 to 75 years with the mean age being 60 years.

Table 1: Age wise Distribution

Age (Yr)	Male (%)	Female (%)	Total (%)
45-55	4 (25)	11 (30.50)	15 (28.50)
56-60	6 (37.5)	7 (19.40)	13 (25.00)
61-65	6 (37.5)	8 (22.20)	14 (27.00)
66-70	00 (0)	5 (13.80)	05 (9.60)
71-75	00 (0)	5 (13.80)	05 (9.60)
Total	16 (31)	36 (69.00)	52 (100%)

Table 2: Complications

Complication	No. of patients	Percentage
EHL weakness	0	-
Infection	0	-
Paresthesia over dorsum foot	4	7.6
Foot drop	0	-

Postoperatively 4 patients develop paraesthesia over the dorsum of the foot which eventually settled down within 3 weeks.

Table 3: Clinical Assessments (Evaluated by WOMAC Score)

Result (Range. of WOMAC score)	No. of patients	Percentage
Good (0-24)	8	15%
Fair (25-48)	10	20%
Poor (49-96)	34	65%

In our study postoperative 15% patients shows good, 20% fair and 65% poor (unsatisfactory) result in one-year follow-up as

evaluated by WOMAC score.

Table 4: Radiological Assessment

S. N	No. of patient	Percentage	Pre-Operative medial joint space (mean)	Post-Operative medial joint space(mean)
1	4	7.6	1.2±0.9	3.6±1.2
2	6	11.6	1.4±0.6	2.8±1.3
3	42	80.8	1.3±0.8	1.8±0.8



Fig 1: Preoperative X-Ray



Fig 2. Postoperative X-Ray (6 month)



Fig 3: Post-operative clinical photograph



Fig 4: Wound size after closure

Discussion

The surgical options available for the management of medial compartment osteoarthritis of the knee are limited to high tibial osteotomy and unicompartmental knee replacement. High tibial osteotomy correct the varus deformity associated with medial compartment osteoarthritis of the knee but it is associated with a longer recovery period and a prolonged period of non-weight bearing walking until union of the osteotomy site. There can be issues such as recurrence of varus deformity and

can also lead to revision to a Total knee arthroplasty due to persistent pain. Unicompartmental knee replacement is another procedure in the management of medial compartment osteoarthritis of the knee which produced mixed results according to various studies as found. This procedure could be associated with problems such as progression of arthritis or loosening of components. Certain studies have demonstrated a high rate of revision for unicompartmental knee replacement as compared to a total knee replacement.



Fig 5: Incision landmark 6-9 cm distal to head of fibula



Fig 6: Skin incision



Fig 7: Deep dissection

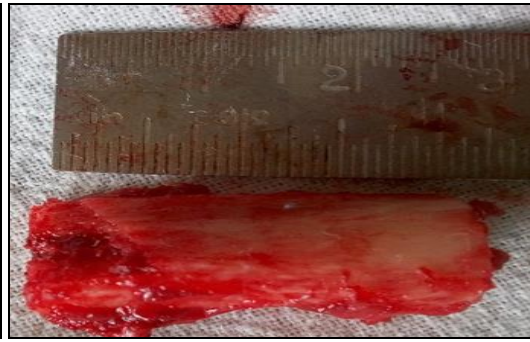


Fig 8: Length of osteotomised fibula

In this scenario, there is a need for a procedure which is simple to perform, easily reproducible, gives good functional results and associated with a shorter recovery period and improves the quality of life for the affected patients. The theory behind the development of medial compartment knee osteoarthritis suggests that there is an asymmetric load transmitted across both tibial plateaus with more stress being borne on the medial side which eventually leading to the development of a varus deformity and arthritic changes with degeneration of the articular cartilage. Proximal fibular osteotomy acts by weakening the support laterally, corrects the varus deformity and shifts the stress from the medial to the lateral compartment resulting in alleviation of pain and gives a good functional outcome. In a study by Yang *et al*, 150 patients with medial compartment arthritis were followed up for a period of more than 2 years. The preoperative KSS (Knee society score) was 45 ± 21.3 while postoperatively it was 92.3 ± 31.7 . The mean VAS (Visual analogue score) preoperatively was 7 which significantly decreased to 2 in the postoperative period. They stated that proximal fibular osteotomy dramatically improves the function of the knee and gives good pain relief. In a study by Bo Liu *et al*, they had 84 patients with 111 knees being affected by medial compartment arthritis. The average preoperative VAS score was 7.08 ± 1.41 . The average preoperative KSS and functional scores were 49.14 ± 10.95 and 44.97 ± 17.1 while postoperatively it was 67.77 ± 11.08 and 64.66 ± 13.12 respectively. 51 knees were associated with a satisfactory clinical outcome while 77 knees had a significant improvement. In our study, we have 52 patients who were managed by proximal fibular osteotomy and were followed up for a minimum period of 1 years. Following the surgery 8 patients reported good, 10 patient fair and 34 patient shows unsatisfactory response as evaluated by WOMAC score at final follow up. Weight bearing lower extremities radiographs showed significant increase in medial knee joint space in 20% patients.

The advantage of proximal fibular osteotomy over the other procedures is that it is a simple and safe procedure which is cost effective and easy to perform. It gives dramatic pain relief postoperatively and is associated with a shorter recovery time. All patients can be mobilized with weight bearing on the next day of surgery. If the procedure does not give good results in any situation then the field for performing a Total knee arthroplasty (TKA) at a later stage is not altered at all. The limitations of our study were a small sample of patients and relatively short follow up period. A longer period of follow up is necessary to evaluate whether the beneficial effects of Proximal fibular osteotomy are sustained over period of time.

Conclusion

The present study concludes that proximal fibular osteotomy is a promising alternative procedure in the management of medial compartment osteoarthritis of the knee. It is a simple, effective, and easy to perform procedure which is cost effective and gives pain relief postoperatively. It is associated with lesser complications and a shorter recovery period as compared to High tibial osteotomy and unicompartmental knee replacement. A longer period of follow up is necessary to evaluate whether the beneficial effects of PFO are sustained over a period of time.

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