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## The role of proximal fibular osteotomy in the management of medial compartment osteoarthritis of the knee

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### Abstract

**Background:** Young active patients with isolated medial compartment arthritis of the knee are not ideal candidates for Total knee arthroplasty. Hence there is a need for a procedure which would be ideally suited for the same. The aim of this study was to evaluate the role of Proximal fibular osteotomy (PFO) in the management of these patients and to compare the results with studies of other authors as available in literature.

**Methods:** 30 patients with medial compartment arthritis of the knee who presented between January 2015 to January 2016 were managed with PFO and were followed up for a minimum period of two years.

**Results:** There was a male preponderance seen in our study with the right knee being most commonly affected. Postsurgery, all our patients reported dramatic pain relief with the average preoperative Visual analogue score dropping from 6.9 to a value of 2.1 in the postoperative period. There was a significant increase in the modified oxford score from a preoperative score of 52.2 to 79 in the postoperative period.

**Conclusion:** Through this study we conclude that PFO is an excellent procedure in the management of younger patients with medial compartment arthritis of the knee provided the proper indications for surgery are met.

**Keywords:** Osteoarthritis, medial compartment, PFO, Oxford score

### Introduction

Osteoarthritis of the knee is a progressive disease of the joint associated with degeneration of the articular cartilage leading to pain, deformity, disability and decrease in the range of motion of the affected joint [1]. It is most commonly seen in males less than 45 years and in females older than 45 years. 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, viscosupplementation and also intra articular injections of steroid or platelet rich plasma [2, 3, 4, 5]. The management of elderly patients with tricompartmental 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 Unicompartmental knee replacement. These procedures are associated with their own set of complications as well as being associated with a longer postoperative recovery period and also restriction of activities or weight bearing. Hence 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. In this scenario, PFO is a relatively new and novel procedure which according to previously published and ongoing studies has been proven to be very effective in the management of medial compartment arthritis of the knee. The aim of this study was to evaluate the role of PFO in the management of this condition and to compare the results of this study with that of other authors as available in literature.

### Methods

30 patients with medial compartment arthritis who presented between January 2015 to January 2016 managed by PFO were included in our study.

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This study was approved by the ethical committee of our institution. The inclusion criteria were age more than 40 years, isolated medial compartment arthritis, at least 2 mm medial joint space present on weight bearing X rays, BMI less than 30 and varus less than  $10^{\circ}$  while the exclusion criteria were age less than 40 years, varus more than  $10^{\circ}$ , tricompartmental arthritis, morbid obesity and bone on bone appearance on weight bearing X rays. On admission, all patients were evaluated clinically and radiologically. Standard weight bearing X rays of the affected knee were taken in anteroposterior and lateral views and the radiological parameters such as tibiofemoral angle and amount of medial and lateral space were evaluated and documented in the case records. The patients were then evaluated with the Visual analogue score (VAS) and the modified oxford knee score and the preoperative values were documented in the patient case records. After obtaining informed consent and anaesthetic fitness, the patients were taken up for the procedure. The surgery was performed with the patient in the supine position under spinal anaesthesia with antibiotic cover. Tourniquet was not used routinely in our series. The fibular head was marked and the osteotomy site was determined to be 7 to 9 cm from the head of fibula. The rationale behind choosing this level of osteotomy is that an osteotomy at a higher level would be likely to cause an injury to the common peroneal nerve while if it was done any lower down that the effect of the osteotomy on the medial compartment arthritis would be lost. 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 1.5 to 2 cm of fibula was then resected with the help of an oscillating saw after placing a few drill holes at the osteotomy site. (Figure 1) Curved homann retractors were placed behind the fibula prior to osteotomy and care was taken not to stretch the soft tissues too much in order to protect the nerve from potential damage. Occasionally after the osteotomy some of the fibulae tend to bleed quite profusely and in that situation bone wax was used to seal the cut ends of the bone. 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 the same evening of surgery and were discharged on the third postoperative day after the first wound inspection. Intravenous antibiotics were given for 3 days followed by oral antibiotics for a period of 5 days. The sutures were removed on the 12<sup>th</sup> postoperative day. Postoperative weight bearing X rays were then taken and the radiological parameters were evaluated and documented. The patients were reviewed at 1, 3, 6 months and at the end of the first and second year where the VAS and the Oxford knee scores were evaluated and documented. The data collected was analyzed using IBM SPSS Version 22.0. Armonk, NY:IBM Corp. Chi square test was used in the comparison of categorical variables. A P value of less than 0.05 was considered to be statistically significant.



A: Preoperative standing radiograph of the knee showing decrease in the medial joint space. B: Marking a point 7-9 cm from the head of fibula. C: Line of incision marked. D: Dissection carried out through peroneus and soleus muscles. E: C-arm image prior to osteotomy. F: Fibular osteotomy done. G: Post osteotomy C-arm image showing an increase in the medial joint space. H: Wound closure

**Fig 1:** Illustrative case

## Results

30 patients with medial compartment arthritis of the knee who presented between January 2015 to January 2016 were managed with PFO and were followed up for a minimum period of two years. There was a male preponderance seen in our study with the right knee being more commonly affected. The age of the patients ranged from 42 to 54 years with the mean age being 48.4 years.

**Table 2:** Average Clinical scores

| S. No | Clinical score | Preoperative value | Postoperative value |
|-------|----------------|--------------------|---------------------|
| 1     | VAS            | 6.9                | 2.1                 |
| 2     | Oxford score   | 52.2               | 79                  |

The average preoperative tibio-femoral angle was  $182^{\circ} \pm 1.8^{\circ}$  while it was  $179^{\circ} \pm 1.9^{\circ}$  postoperatively. The average preoperative medial joint space was  $1.3 \pm 0.8$ mm while

**Table 1:** Age incidence

| S. No | Age(years) | Number of patients | Percentage |
|-------|------------|--------------------|------------|
| 1     | 41-50      | 17                 | 56.6       |
| 2     | 51-60      | 13                 | 43.4       |

The average preoperative VAS was 6.9 which improved to an average of 2.1 in the postoperative period. The average preoperative modified Oxford score was 52.2 which increased to 79 in the postoperative period.

postoperatively it was increased to  $4.2 \pm 2.7$ mm. The average lateral joint space preoperatively was  $7.6 \pm 1.2$ mm while postoperatively it was  $5.4 \pm 1.3$ mm.

**Table 3:** Radiological parameters

| S. No | Parameter           | Preoperative value    | Postoperative value   |
|-------|---------------------|-----------------------|-----------------------|
| 1     | Tibio-femoral angle | $182 \pm 1.8^{\circ}$ | $179 \pm 1.9^{\circ}$ |
| 2     | Medial joint space  | $1.3 \pm 0.8$ mm      | $4.2 \pm 2.7$ mm      |
| 3     | Lateral joint space | $7.6 \pm 1.2$ mm      | $5.4 \pm 1.3$ mm      |

Postoperatively 3 of our patients complained of paraesthesias over the dorsum of the foot which eventually settled down after a period of time. There were no complications such as superficial or deep infection or common peroneal nerve palsy encountered in our study. None of our patients were lost to follow up. All patients were happy with the outcome of the procedure in terms of good pain relief and improvement in knee function.

## Discussion

The surgical options available for the management of medial compartment arthritis of the knee are limited to High tibial osteotomy and Unicompartmental knee replacement. High tibial osteotomy corrects the varus deformity associated with medial compartment arthritis of the knee but it is associated with a longer recovery period and a prolonged period of nonweight 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 [6, 7, 8]. Unicompartmental knee replacement is another procedure in the management of medial compartment arthritis of the knee which has produced mixed results according to various studies as found in literature. This procedure could be associated with problems such as poly wear, progression of arthritis or loosening of components [9, 10]. Certain studies have demonstrated a high rate of revision for unicompartmental knee replacement as compared to a Total knee replacement [11, 12]. 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 suggests that there is an asymmetric load transmitted across both tibial plateaus with more stress being borne on the medial side which eventually becomes lower leading to the development of a varus deformity and arthritic changes occur with degeneration of the articular cartilage. PFO 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 score was  $45 \pm 21.3$  while postoperatively it was  $92.3 \pm 31.7$ . The mean VAS score preoperatively was 7 which significantly decreased to 2 in the postoperative period. They stated that PFO dramatically improves the function of the knee and gives good pain relief [13]. 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  $7.08 \pm 1.41$ . The average preoperative KSS and functional scores were  $49.14 \pm 10.95$  and  $44.97 \pm 17.1$  while postoperatively it was  $67.77 \pm 11.08$  and  $64.66 \pm 13.12$  respectively. 51 knees were associated with a satisfactory clinical outcome while 77 knees had a significant improvement [14]. In our study, we had 30 patients who were managed by PFO and were followed up for a minimum period of 2 years. Following the surgery all patients reported dramatic relief in pain with the VAS dropping significantly from 6.9 in the preoperative period to 2.1 postoperatively ( $P < 0.005$ ). The average preoperative Oxford score also showed a significant improvement from 52.2 preoperatively to 79 in the postoperative period ( $P < 0.005$ ). We also noted an increase in the medial joint space from  $1.3 \pm 0.8$ mm preoperatively to  $4.2 \pm 2.7$  in the postoperative period. The advantages of PFO 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 full weight bearing on the same day of surgery. If the procedure does not give good results in any situation then the field for performing a Total knee arthroplasty 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 PFO are sustained over a period of time.

## Conclusion

We thereby conclude by stating that PFO is a promising

alternative procedure in the management of medial compartment arthritis of the knee. It is a simple, effective, easy to perform procedure which is cost effective and gives excellent 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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