



PROXIMAL FIBULAR OSTEOTOMY-HOW FAR IS THE TOTAL KNEE REPLACEMENT?

Orthopaedics

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ABSTRACT

After removal of the proximal section of the fibula, patients with medial compartment knee OA showed greater improvement in alignment, knee range of motion and pain at an early stage. The goal of this study to assess clinical outcomes of patients with medial compartment osteoarthritis treated by proximal fibular osteotomy. A total of 40 patients were included in this study for follow-up of 12 months. At final follow-up, mean lateral joint space were and 6.2 ± 0.5 mm which were significantly lower than preoperatively. Mean KSS at final follow-up was 90.7 ± 29.5 , which was significantly larger than the preoperative score (43.0 ± 19.3). Mean VAS score at final follow-up was 1.7 ± 1.57 which was significantly lower than the preoperative data (7.73 ± 0.88). Four patients subsequently underwent total knee arthroplasty at a mean of 10.2 months (range, 8-12 months).

KEYWORDS

Proximal fibular osteotomy, Knee Osteoarthritis, Total knee replacement

INTRODUCTION

Knee osteoarthritis (OA) is a chronic, progressive degenerative disease with accompanying joint pain, stiffness, and deformity¹. Knee is a common joint which involved in osteoarthritis disease, affects about 50% of >60-year-old, especially women, associated with post-menopausal osteoporosis and significant bone mass reduction². The pathological characteristics of Knee Osteoarthritis include joint structure degradation and cartilage destruction and hyperplasia². A single arthroscopic debridement is one of the treatment method which can only alleviate symptoms of pain and is associated with high recurrence rates². Total knee arthroplasty is the main surgical intervention however is expensive and complex and sometimes it need a second knee revision surgery³. High tibial osteotomy is the first choice used for young patients which may result in complications like delayed time to full weight bearing, nonunion or delayed union, peroneal nerve paralysis, wound infection, iatrogenic fracture^{4,6}. Lateral support to the joint provided by the fibula-soft tissue complex may lead to the nonuniform settlement and degeneration of the tibial plateau bilaterally which result in shifting the load from the normal distribution to medially to the medial plateau and consequently lead to medial compartment osteoarthritis which lead to knee varus¹. Proximal fibular osteotomy is simple, safe and affordable procedure. Proximal fibular osteotomy is based on the 'theory of differential settlement', which initiates KOA and promotes its progression². After removal of the proximal section of the fibula, patients with medial compartment knee OA showed greater improvement in lower extremity alignment, knee range of motion (ROM), and local pain at an early stage¹. It may relieve the increased loading force on the medial compartment. The goal of this study to assess clinical outcomes of patients with medial compartment osteoarthritis treated by proximal fibular osteotomy and to assess any complication and need of Total Knee Replacement after procedure at the mean follow-up of 12 months.

METHODS

This was a prospective study conducted from January 2017 to December 2017 in tertiary care hospital at Udaipur. Patients who met with the inclusion criteria were included in the study after scrutinizing them for any exclusion criteria. We included patients with pain with difficulty while walking and patients who have only medial compartment osteoarthritis. We excluded any patients who have genu valgus deformity, patients with posttraumatic arthritis, patients have inflammatory joint disease, and patients have malignant tumours and patients have liver or renal dysfunction.

40 patients were included in this study and were followed up for up to 12 months postoperatively. All patients were operated by same orthopaedic surgeon. All patients provided informed consent prior to implementation of the study procedures.

Under spinal anesthesia, in supine position with a lower limb tourniquet inflated. A 3- to 5-cm lateral incision was made at fibula

posterolaterally. The fascia was then incised and the fibula was exposed between the peroneus and soleus muscles. A 2-cm section of the fibula was removed at 6 to 10 cm below the fibular head (Fig.1). After irrigation of the incision with a large volume of normal saline, the muscles, fascia, and skin were sutured separately. Full weight bearing and free mobilization were allowed postoperatively.

The primary outcome for pain and knee function was measured as the difference in Visual Analog Score (VAS) and American Knee Society Score (KSS) at preoperatively and at a mean of 12 months postoperatively.

Preoperative and postoperative whole lower extremity radiographs were obtained in all patients to analyses lateral and medial joint space and the ratio of knee joint space (medial/lateral compartment).



Figure 1. 2 cm section of fibula was removed at 6 to 10 cm below the fibular head

RESULT

A total of 40 patients, including 16 males and 24 females (30 right knees and 20 left knees), were included in this study for a mean follow-up of 12 months. These patients had an average age of 58.6 years (range, 47-69 years) at the time of surgery. All patients had complain of limited range of knee motion, varus deformity, and severe knee pain, which increased after weight bearing or athletic activities. Preoperative radiographs of the affected knees showed narrow joint space in the medial compartments. No patients had complain of numbness or weakness after proximal fibular osteotomy was performed. There were no superficial or deep infections. Four patients subsequently underwent total knee arthroplasty at a mean of 10.2 months (range, 8-12 months) after the osteotomy due to presence of pain and unsatisfactory knee function.

At final follow-up, 40 patients with an average age of 58.6 years (range, 47-69 years) were evaluated clinically and radiographically. Bone defects of the proximal fibula were observed on postoperative radiographs in all patients. Radiographic measurements were done preoperatively and at final follow-up. At final follow-up, mean lateral joint space were and 6.2 ± 0.5 mm which were significantly lower than the data measured preoperatively ($P < .001$). On preoperative radiographs the lateral joint space was wider and the medial joint space was narrower. Mean KSS at final follow-up was 90.7 ± 29.5 , which was significantly larger than the preoperative score (43.0 ± 19.3 ; $P < .001$). Mean VAS score at final follow-up was 1.7 ± 1.57 which was significantly lower than the preoperative data (7.73 ± 0.88 ; $P < .001$).



Figure 2. Preoperative and Postoperative Xray of patient show decrease in lateral joint space and increase in medial joint space

Table no. 1

Data	Pre-op	Post-op (12 months)	P value
KSS score	43.0±19.3	90.7±29.5	<0.001
VAS score	7.73±0.88	1.7±1.57	<0.001
Lateral joint space (mm)	12.1±0.70	6.2±0.5	<0.001

DISCUSSION

Knee osteoarthritis is one of the most common joint disorders, and it causes severe pain and immobility. Total knee arthroplasty (TKA) is very effectively relieves pain and improves knee function in patients with late-stage knee osteoarthritis. However, TKA is expensive and complex, and some patients need a second revision¹.

High tibial osteotomy (HTO) has been the surgical treatment of choice for young patients with osteoarthritis of the medial compartment of the knee, and it is aimed at correcting alignment and delaying the time until TKA is required³. Blaimont et al. found that the surgical effects of HTO are superior, but the excessively high osteotomy plane increases the risk of tibial plateau fracture and proximal necrosis^{2,7}. Hence, HTO is not recommended for the elderly or for patients with severe osteoporosis. Early complications of HTO include infection, deep vein thrombosis, insufficient correction, intra-articular fractures, peroneal nerve injury, osteofascial compartment syndrome and knee stiffness, whereas late complications of this procedure include delayed union or non-union, deformity recurrence and internal fixation failure.

Bone mass decreases as part of the normal aging process. In the proximal tibia, the lateral support of the fibula to the lateral tibial plateau routinely leads to nonuniform settlement, which is more severe in the medial plateau than in the lateral plateau. The slope of the tibial plateau arising from nonuniform settlement results in a transverse shearing force, with the femoral condyle shifting medially during walking and sport this resulting in degeneration and varus deformities of the knee joint.

In proximal fibula osteotomy, the fibular head is pulled to the distal end through the soleus muscle and peroneus longus to reduce the stress of medial plateau. Hence, the load of the knee joint is transferred from the medial plateau to the lateral plateau, and the distal femoral mechanical axis is rearranged to relieve the lateral soft tissue tension of the knee joint and remove knee osteoarthritis symptoms². This study showed

that performing fibular osteotomy in an area 4-7 cm away from the fibular head lowers the risk of peroneal nerve injury. A simple fibular osteotomy can relieve knee pain and correct varus deformity as effectively as high tibial osteotomy¹.

Proximal osteotomy of the fibula weakens the lateral fibular support and leads to a correction of the varus deformity which leads to decreased pain and a satisfactory functional recovery. This study showed that posterolateral approach via the space between the peroneus muscle and soleus muscle is used to lessen the risk of iatrogenic nerve injury at a level of 6 cm below the fibular head^{4,6}. The present study showed that proximal fibular osteotomy shortened the full weight-bearing time; decreased the pain VAS and increased the KSS score of the knee joint; and decreased the incidence of complications. These results suggest that the short-term and long-term surgical effects of proximal fibular osteotomy on varus knee osteoarthritis are superior to those of HTO, which has certain clinical promotion value.

CONCLUSION

Proximal fibular osteotomy is a simple, safe, fast and affordable surgery that does not require insertion of implants. As such, PFO is a preferable surgical option in most developing countries due to lack financial and medical resources. It may helpful surgery for osteoarthritis of the medial compartment of the knee, especially for those patients who cannot undergo TKA because of certain medical comorbidities. After surgery these patients can still undergo TKA in the future if it becomes necessary.

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