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A study of medial compartment osteoarthritis of knee after proximal fibular osteotomy

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Abstract

Background: Osteoarthritis of knee is a common and debilitating problem. It is associated with huge societal and economic burden. It has physical and psychological sequelae. Pain contributes to substantial socio-economic burden. Greater insight is needed into pain management in osteoarthritis to enable rational mechanism, based on different modalities. Hence it is imperative to look for newer, safer and simpler method of management of osteoarthritis.

Objective: To explore the effects of proximal fibular osteotomy as a new surgery for pain relief and improvement of medial joint space and function in patients with knee osteoarthritis.

Methods: From October 2018 to September 2020, a total of 60 patients, including 26 males and 34 females, with medial compartment OA were treated by proximal fibular osteotomy. Anteroposterior and lateral weight-bearing radiographs and the Knee Society Score (KSS) of the knee joint were evaluated and compared preoperatively and postoperatively.

Results: In our series of 60 patients, preoperative and postoperative KSS scores were compared. Majority of the patients were females and the mean age was 52.67 ± 6.32 years. Right side knee was most effected. At the final follow up, PFO had statistically very high significant difference between pre-op and post-op KSS scores ($P < 0.001$).

Most common complication was paraesthesia ($n=4$).

Conclusions: The present study demonstrates that proximal fibular osteotomy effectively relieves pain and improves joint function in patients with medial compartment osteoarthritis

Keywords: proximal fibular osteotomy, PFO, medial compartment osteoarthritis, varus Knee

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 joint¹. Factors associated with osteoarthritis of the knee are increasing age, obesity, sedentary lifestyle or changes in lifestyle and also work related activities^[1, 2, 3].

Osteoarthritis (OA) is one of the most common type of musculoskeletal illnesses internationally^[4]. It is predicted that 3.8% of the world's population is afflicted by symptomatic knee OA^[5, 6]. This equates to approximately 277 million human beings residing with knee OA worldwide. The prevalence of OA is comparable across the globe and it is anticipated to grow dramatically as the population ages, specifically in low and middle socio-economic countries. The prevalence of osteoarthritis of knee joint in rural and urban India is predicted to be 3.9% and 5.5%, respectively^[6, 7, 8]. It's estimated to be the fourth main reason for disability in elderly. Nearly 33% of all adults have radiological signs and symptoms of osteoarthritis^[9, 10].

There are many ways of managing osteoarthritis of knee depending upon the stage of disease. Traditionally clinicians used NSAIDs, several topical, oral, intra articular agents. Many non-pharmacological approaches are available, but underused. The use is limited by efficacy and safety profiles. The non-pharmacological interventions such as Orthotics, footwear, knee brace etc are used but most of them give partial relief^[11].

It would be a boon to such patients if any simple surgery could help alleviate their misery. Proximal fibular osteotomy is such a surgery being attempted at many places and is being evaluated for relief of symptoms^[12, 13].

So present study is undertaken to evaluate the results of a simple surgery like proximal fibular

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osteotomy in a patient with osteoarthritis of knee (medial compartment) which would be a great breakthrough in managing such disease, thus helping the individual in particular and the society in general [14].

Materials and Methods

This prospective interventional study was conducted between 1 October 2018 to 30 September 2020. A total of 60 patients of either sex above the age of 40 years were included in the study. Out of which 34 were females and 26 were males.

Out of 60 patients, 34 patients had right side knee osteoarthritis. The rest 26 patients had left knee osteoarthritis. Patients with medial compartment osteoarthritis of knee, who underwent Proximal Fibular Osteotomy, were studied with follow-up period of 6 months.

Pre-Operative Evaluation

All our patients were evaluated with detailed history and clinical examination. The preoperative medical evaluation was done for all to prevent complications.

In the clinical examination, patients were evaluated for varus, valgus and fixed flexion deformities. The extensor mechanism was assessed for any quadriceps contracture. They were also assessed for any ligamentous instability and laxity. Any limb length discrepancies were noted. The knee function was assessed preoperatively by using knee society score.

Routine preoperative laboratory evaluations including complete blood cell count, electrolytes, urine analysis, blood grouping, ECG, chest roentgenogram and coagulation studies were done.

Radiological Evaluation

Standard guidelines were utilised to get knee radiographs- weight bearing anteroposterior view, lateral view. The mechanical axis and the alignments of both lower limbs were studied by taking the X-rays including the hip, knee and ankle.

Angle between mechanical axis of femur and tibia determines the valgus or varus deformity. Any collateral ligament laxity, subluxation of tibia, presence of osteophytes, bone defects is assessed.

Surgical Procedure

- Procedure was performed under spinal anesthesia.
- Patient was placed supine on the radiolucent table with tourniquet.
- Under aseptic precautions part prepared and draped.
- All bony landmarks were identified and marked using sterile skin marker including the incision site.
- A 3- to 5-cm lateral incision was made at the proximal third of the fibula around 7 cms distal from the fibula head.
- The subcutaneous tissue was dissected and fascia was then incised parallel to the septum between the peroneus and soleus muscles.
- The muscles were separated and fibula was exposed.
- A 1-cm section of the fibula was removed 7 cms below the fibular head with an oscillating saw after stripping the periosteum and drilling multiple holes at the site.
- After irrigation of the incision with a large volume of normal saline, the muscles, fascia, and skin were sutured separately.

Fig 1: Supine position

Fig 2: Landmarks Marked

Fig 3: Incision

Fig 4: Multiple Holes Drilled

Fig 5: 1CM of Fibula Resected

Fig 6: Intra op Fluroscopic Image After PFO

Post Operative Protocol

The patients were initiated with quadriceps exercises immediately after anaesthesia action wore off and the patients were mobilized from post-op day 1.

Evaluation

Patients were evaluated at 6th week, 3rd month and 6th month using Knee Society Score.

Results

- The mean age of patients who underwent PFO was 52.67 ± 6.32 years, with the youngest being 43 year, and oldest aged 65 years.
- There was a female predominance in our study, which accounted for 56.7%.
- There were 56.7% of patients who had right side knee osteoarthritis. The rest 43.3% had left knee osteoarthritis.
- The BMI in our study ranged from 21.2 to 32.1 kg/m², with a mean of 26.43 ± 3.10 .
- 44 patients had a BMI greater than 25 kg/m².
- The maximum number of patients 30% were farmers by occupation, followed by 26.7% patients being labourer. 16.7% were employees. 13.3% were house maker and the other 13.3% were businessmen.
- The mean pre-op KSS was 61.13, with a std deviation of 6.69, which improved to a mean post-op KSS score of 78.07, with a std deviation of 9.96 ($P < 0.001$)
- KSS outcome was excellent in 32, good in 14 cases, fair

in 10 cases and poor in 4 cases at final follow up.

- Improvement in KSS scores was 16.94, with t-value 14.431.
- Paraesthesia of the lower leg was the most common complication in our study (n=4), followed by superficial infection (n=2). There were no other complications.

Table 1: Age wise distribution of patients

Age in years	Number of patients	Percentage
41-50	26	43.3
51-60	26	43.3
61-70	8	13.4
Total	60	100.0
Mean $\pm$ SD	52.67 ± 6.32	

Study shows that, each of the 26 (43.3%) patients belonged to the age group of 41-50 years and 51-60 years respectively and 8 (13.4%) patients belonged to the age group of 61-70 years. The mean age of patients was 52.67 ± 6.32 .

Table 2: Gender wise distribution of patients

Gender	Number of patients	Percentage
Male	26	43.3
Female	34	56.7
Total	60	100.0

Study shows that, Female patients were dominant (n=34) (56.7%) and male patients were 26 (43.3%).

Table 3: BMI wise distribution of patients

BMI in Kg/m ²	Number of patients	Percentage
< 18.5	0	0.0
18.6-24.9	16	26.7
25.0-29.9	30	50.0
≥ 30	14	23.3
Total	60	100.0
Mean $\pm$ SD	26.43 ± 3.10	

Study shows that, no patients were underweight, maximum number i.e., 30 (50.0%) patients were in the range of overweight BMI (25.0-29.9), 16 (26.7%) patients were in the

normal range of BMI (18.6-24.9) and 14 (23.3%) patients were obese, their BMI was ≥ 30 . The mean BMI of study sample was 26.43 ± 3.10 .

Table 4: Comparison of pre-operative and post-operative KSS score

Time period	KSS Score	Paired t-test	P-value and Significance
	Mean $\pm$ SD		
Pre-operative	61.13 ± 6.69	t = 14.431	P = 0.000, VHS
Post-operative	78.07 ± 9.96		

NS= not significant, S=significant, HS=highly significant, VHS=very highly significant

Study shows that, there was statistically very high significant difference of mean KSS score between pre-operative and post-operative score ($P < 0.001$). Post-operative mean KSS score was significantly high as compare to pre-operative KSS score.

Table 5: Distribution of patients according to study result

Study result	Number of patients	Percentage
Excellent	32	53.3
Good	14	23.3
Fair	10	16.7
Poor	4	6.7
Total	60	100.0

Study shows that, out of 60 study sample patients; 32 (53.3%) patient's study result was excellent, 14 (23.3%) patient's

result was good, 10 (16.7%) patient's result was fair and 4 (6.7%) patient's study result was poor.

Table 6: Complications wise distribution of patients

Complications	Number of patients	Percentage
None	54	90.0
Paraesthesia	4	6.7
Infection	2	3.3
Total	60	100.0

Study shows that, 54 (90.0%) patients didn't have any complications. 6 (10.0%) patients had complications, out of which 4 (6.7%) patients had paraesthesia and 2 (3.3%) patients had superficial infection.

CASE

Flexion at 6th month follow up

Squatting at 6th month follow up

Extension at 6th month follow up.

Pre op X-ray

Post op X-ray

Discussion

Knee osteoarthritis is one of the most common joint disorders, and it causes severe pain and immobility. 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 revision^[15, 16].

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 required^[16, 17]. However, HTO also has some disadvantages, including a delayed time to full weight bearing and risks of non-union or delayed union, peroneal nerve paralysis and wound infection^[18, 19].

PFO has emerged as a new surgery to relieve pain and improve joint function in patients with knee osteoarthritis as reported by Zhang *et al.*^[15] in 2015. The most striking findings in the present study included medial pain relief and an increase in the medial joint space. The majority of patients in our study had significant pain relief immediately after PFO. Interestingly, the pain relief continued to improve, and some patients even reported no pain at the last follow-up. Postoperative ambulation (i.e., walking) was also obviously improved when compared with the preoperative state.

Our Study reveals that, there was statistically very high significant difference of mean KSS score between pre-operative and post-operative score ($P < 0.001$). Post-operative mean KSS score was significantly high as compare to pre-operative KSS score. These findings were similar with studies conducted by Jayanta K Laik *et al.*^[20] and Xiaohu Wang^[14]

Although age is not a definitive criteria, the patients must be active enough to undergo rehabilitation and have good bone quality. Our Study observed that, each of 26 (43.3%) patients belonged to the age group of 41-50 years and 51-60 years respectively and 8 (13.4%) patients belonged to the age group of 61-70 years. The mean age of patients was 52.67 ± 6.32 . These findings were similar to Yang *et al.*^[21]

Stickles *et al.*^[22] demonstrated that obesity is an adverse factor in OA treatment. Weight gain in patients with knee varus will increase the pressure applied to the knee medial compartment. Therefore, the BMI was negatively correlated with improvement in the postoperative results. Body weight is definitely an independent risk factor for complications. Our Study observed that, maximum number i.e., 30 (50.0%) patients were in the range of overweight BMI (25.0-29.9), 16 (26.7%) patients were in the normal range of BMI (18.6-24.9) and 14 (23.3%) patients were obese, their BMI was ≥ 30 . The mean BMI of study sample was 26.43 ± 3.10 .

Compared with TKA or HTO, PFO is a simple, safe, fast and affordable surgery that does not require insertion of additional implants. As such, PFO is a suitable surgical option in most developing countries that lack financial and medical resources. This novel surgery can potentially become an alternative treatment method for osteoarthritis of the medial compartment of the knee, especially for patients who cannot undergo TKA because of medical comorbidities.

However, several limitations to this study must be noted. First, although the short-term results are encouraging, the follow-up time was relatively short, and whether these outcomes will remain unchanged at a longer follow-up time is unclear. Therefore, a longer follow-up study is warranted.

Finally, the absence of a control group is another main limitation; however, a placebo control is difficult to include when performing this surgery because of the inability to exclude a placebo effect.

Complications

- In our study none of the patients had any major complications.
- 4 patients developed paraesthesia over the lower leg, which resolved on its own.
- 2 patient had superficial skin infection, which was treated with IV antibiotics and regular dressings.
- The complications which are seen in this study could be prevented by proper pre operative planning and correct surgical technique. Infection control is also essential and proper postoperative care and rehabilitation is essential.

Conclusion

In conclusion, our preliminary data clearly demonstrate that PFO is a simple, safe, fast and affordable surgery to relieve pain and improve joint function and the medial joint space in knee osteoarthritis. PFO may be a promising alternative in most developing countries 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.

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