Proximal Fibular Osteotomy: Pain Relief of Medial Compartment Knee Osteoarthritis.

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ABSTRACT

Objective: This study was carried out to compare the mean pain score in patients of medial compartmental osteoarthritis of knee before and after proximal fibular osteotomy (PFO).

Methodology: This single group quasi experimental study of thirty patients was carried out in the Orthopaedic department. The patients of primary knee osteoarthritis involving only medial compartment for 3 months to 2 years with Kellgren and Lawrence grade 2-3 were included in the study. Visual analog scale was used for pain assessment before and after PFO on the day before the surgery and again after two months of surgery. Paired sample t-test was used to compare them.

Results: The patients mean age was 49.63±6.68 years (range 38 – 59 years). There were 19 (63.33%) female and 11 (36.67%) male patients. Mean pre-PFO pain score was 7.30±1.15 (range 5-10). Mean post-PFO pain score was 2.87±0.82 (range 1-4). There were 14 (46.67%) patients with right side involvement and 16 (53.33%) were with left side involvement. Diabetes was diagnosed in 07 (23.33%), hypertension was found in 09 (30.00%) patients. Eleven (36.67%) out of 30 patients were smokers. In age group of 38-50 years, mean pre-PFO pain score was 7.14±1.03 and post-PFO pain score was 2.71±0.73 ($p<0.001$). In patients having age 51-59 years, mean pre-PFO pain score was 7.44±1.26 and post-PFO pain score was 3.00±0.89 ($p<0.001$). In male patients, mean pre-PFO pain score was 7.36±1.21 and post-PFO pain score was 2.91±0.83 ($p<0.001$). In female patients, mean pre-PFO pain score was 7.26±1.15 and post-PFO pain score was 2.84±0.83 ($p<0.001$).

Conclusion: Proximal fibular osteotomy is an effective method for relief of pain with significant reduction in VAS score and thus functional regain with little or no complications in Kellgren and Lawrence grade 2-3 primary knee osteoarthritis.

Key words: Knee Osteoarthritis, Medial compartment knee arthritis, Osteoarthritis, Proximal fibular osteotomy (PFO).

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INTRODUCTION

Osteoarthritis is a common joint disease causing chronic pain and disability. Most commonly involved joint is knee i.e., 80%, and affects about 19% of adults with age 45 years and older[1].

Osteoarthritis increases in frequency with advancing age. Cartilage shows diminished cellularity, loss of elasticity, reduced proteoglycan concentration and a decrease in breaking strength with increasing age[2,3]. Increasing age, trauma, occupations (which produce repetitive stress to knee), joint dysplasia, obesity, female gender and family history are the major risk factors of osteoarthritis[4,5].

Pain is the usual presenting complaint specially on getting up from sitting position and on climbing stairs. There may be stiffness of involved joint characteristically occurring after periods of inactivity. In addition to that there may be swelling, local

tenderness, crepitus, limited movements, instability or total loss of function[6,7].

Proximal fibular osteotomy (PFO) is a novel surgical method for relief of pain along with the joint function improvement in patients having osteoarthritis of knee predominantly medial compartment osteoarthritis. It is considered an alternative remedy to high tibial osteotomy[8,9].

The rationale of Proximal Fibular Osteotomy can be explained on the concept of non-uniform settlement[8,10,11,12,13,14], the too many cortices theory[12], Slippage phenomenon[15], the concept of competition of muscles[11], dynamic fibular distalization theory[16], ground reaction vector readjustment theory[17].

The rationale of the study is that proximal fibular osteotomy may be an alternative in low and middle income countries with promising results because of their healthcare delivery and financial limitations specially for patients of medial compartment knee osteoarthritis. It may also help to delay a more complex procedures of the knee like high tibial wedge osteotomy or uni/total-compartmental knee replacements for these patients without causing any limitations for these procedures.

This study's objective was to compare mean pain score in patients of medial compartmental knee osteoarthritis before and after proximal fibular osteotomy (PFO).

MATERIALS AND METHOD

This single group Qausi experimental study was conducted in Orthopedic Department Unit-II, from 1st November 2020 to 30 March 2021. Thirty patients were included in the study. STAT 15.0 software was used to calculate sample size for two sample paired-means test. Mean VAS score 8.02±1.50 before PFO and 2.74±2.34 after PFO[8]. Power of the test 95% and level of significance 1.0%. Consecutive sampling (Non-Probability) technique was used.

Both male and female patients having duration of medial compartmental knee osteoarthritis of 3 months to 2 years with Kellgren and Lawrence grade 2-3 (Figure 1) were included. Patients with rheumatoid arthritis, post-traumatic arthritis or past history of septic arthritis and patients who received invasive treatment of osteoarthritis (including intra articular injections and arthroscopic lavage) before inclusion in this study were excluded from the study.

The approval was granted for this study by the Institutional Ethical Review Board. All patients fulfilling the above mentioned selection criteria were admitted through outpatient department, informed written consent was taken for participation from patient in the research project.

Baseline demographic information including age, gender, duration of illness, side involved, and pre-PFO pain score was noted. Diagnosis of medial compartmental knee osteoarthritis was made by clinical evaluation; such as swelling at knee, stiffness after inactivity, moderate/severe pain (VAS Score ≥4) that get worse during activity.

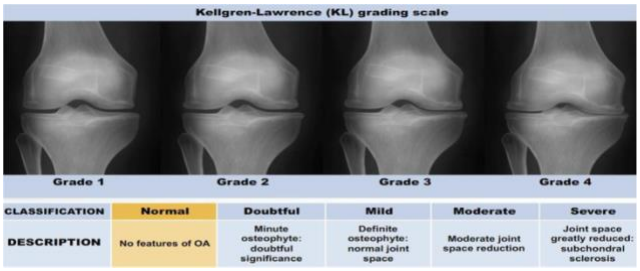

Figure 1: Kellgren and Lawrence grading system Criteria

Pain was evaluated on the day before surgery by Visual analog scale (VAS). After surgery pain score was measured again at 2 months of surgery.

We instructed the patient to point to the position on a line numbered from 1-10 between the two ends indicating 'No pain' and 'Worst pain ever'.

All patients underwent Proximal Fibular Osteotomy by senior orthopedic surgeon. We removed one cm segment of fibula about 7-8 cm distal to the head of the fibula through the inter-muscular space between the peroneus longus/peroneus brevis and extensor digitorum longus[11], under spinal anesthesia.

After the procedure, patient was discharged on the following day with advice of full weight bearing and maximum range of motion at the knee as pain allowed. Stitches were removed at 2 weeks. After that, the patient was followed after 2 months' interval and was assessed for pain according to visual analogue scale. Any complication like peroneal nerve injury or wound infection was also noted. Pre op and post op assessment was done by two senior orthopedic surgeons and a third more senior orthopedic surgeon was involved to resolve if and when there was any difference in assessment by these two.

All data was entered and analyzed using SPSS Version 25. Mean and standard deviation was computed for numeric values like age, duration of illness, pre-PFO pain score and post-PFO pain score. Frequency and percentage were used to describe the categorical variable like gender, side involved, diabetes, hypertension, and smoking.

Paired sample t-test was applied to compare pre-PFO and post-PFO pain score. Effect modifiers such as

age, gender, duration of arthritis, side involved, diabetes, smoking and hypertension were controlled through stratification. After stratification, independent sample t-test was applied to determine the association of these effect modifiers with pain score. P-value of less than 0.05 was taken as statistically significant.

RESULTS

Mean age of patients included in this study was 49.63±6.68 years (range 38 – 59 years). There were 19 (63.33%) female and 11 (36.67%) male patients. Mean duration of illness of patients was 10.97±6.63 months (range 4 – 24 months). Mean pre-PFO pain score was 7.30±1.15 (range 5-10). Mean post-PFO pain score was 2.87±0.82 (range 1-4). There were 14 (46.67%) patients with right side involvement and 16 (53.33%) were with left side involvement. Diabetes was diagnosed in 07 (23.33%), hypertension was found in 09 (30.00%) patients. Eleven (36.67%) out of 30 patients were smokers.

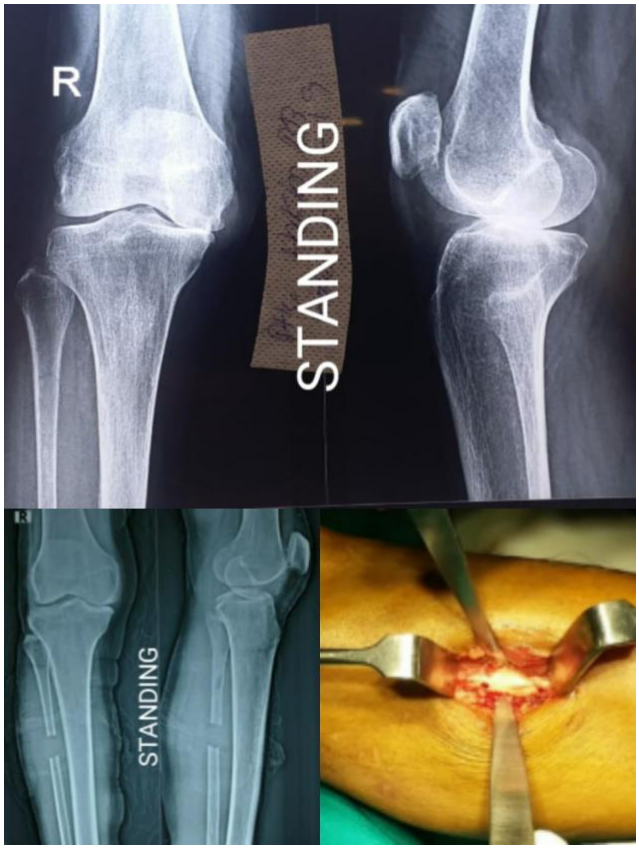

Figure 3: Pre-operative, per-operative & post-operative Proximal Fibular Osteotomy

In age group of 38-50 years, mean pre-PFO pain score was 7.14±1.03 and post-PFO pain score was 2.71±0.73 with p-value of <0.001. In patients having age 51-59 years, mean pre-PFO pain score was 7.44±1.26 and post-PFO pain score was 3.00±0.89. This difference was statistically significant (p= <0.001).

In male patients, mean pre-PFO pain score was 7.36±1.21 and post-PFO pain score was 2.91±0.83 with p-value of <0.001. In female patients, mean pre-PFO pain score was 7.26±1.15 and post-PFO pain score was 2.84±0.83. This difference was also statistically significant with p-value of <0.001.

Stratification was also performed on the basis of duration of illness, side involved, diabetes, smoking and hypertension. There was no significant association of these variables with pre-PFO and post-PFO pain score.

Figure 3 shows the pre-operative, per-operative and post-operative pictures of one of our case.

DISCUSSION

Osteoarthritis of knee is one of the most commonly occurring joint disorders, it presents with pain and difficulty in mobility. Total Knee Arthroplasty relieves pain effectively and improves knee mobility significantly in patients with advanced osteoarthritis knee. However, Total Knee Arthroplasty is a complex and expensive, and few patients may need to revise the procedure[18]. High Tibial Osteotomy has been the surgery of choice in young patients having medial compartment knee osteoarthritis. The objective of HTO is aimed to correct alignment and delay the time until total knee replacement is required[19]. However, HTO has few disadvantages like delay in full weight bearing with risk of delayed union or nonunion, palsy of peroneal nerve and risk of infection[20].

PFO has evolved as a novel surgical procedure for relief of pain and improvement in joint mobility in patients with medial compartmental knee osteoarthritis as reported by Zhang et al.[18]. The most impressive findings in his study were relief of pain on medial side of knee and an improvement in the joint space medially.

Most of the patients in this study as well had significant improvement in pain immediately after Proximal Fibular Osteotomy; however the actual mechanism was not clear with short follow-up. Interestingly, the improvement in relief of pain continued, even some patients had no pain at 2 months follow-up. There was obvious improvement in ambulation/walking postoperatively. The lower extremity axial alignment was also improved after PFO in some patients, specially in patients having severe genu varum preoperatively[21]. Compared with HTO or TKA or, PFO is a safe, simple, rapid and affordable

surgical procedure that does not need any implant. PFO is a valid surgical option in low and middle income countries that have limited medical and financial resources. This novel surgical procedure has the potential to become an alternative method of treatment for the medial compartment knee osteoarthritis, especially for patients who cannot avail the option of TKA because of medical comorbidities[22].

In the literature, there is still inconclusive and insufficient evidence on Proximal Fibular Osteotomy for medial compartmental knee Osteoarthritis. An accurately performed osteotomy of fibula (in terms of correct distance from the head of fibula, the length of the segment from fibula removed, and protection of peroneal nerve) is extremely important for a good outcome[23].

In our study, we found significant reduction in post-operative pain score after PFO, the mean pre-op VAS score was 7.30±1.15 and it reduced to 2.86±0.82 after PFO.

Wang et al.[8] reported short-term outcomes of Proximal Fibular Osteotomy in patients with medial compartment knee osteoarthritis. The authors reported significant reduction in pain after PFO. The mean VAS score before treatment was 8.02±1.50 and it reduced to 2.74±2.34 after PFO (p-value <0.001)[8].

A study carried out by Ahmed et al[24]. reported the mean pre-op VAS score as 7.90±0.79 before PFO and 2.32±0.792 after PFO. These are similar to our study results.

In a study by Wang et al.[8] Proximal Fibular Osteotomy for medial compartment relieved pain in all patients postoperatively; the mean Visual Analogue Score scores improved markedly from 8.02 ± 1.50 before PFO to 2.74 ± 2.34 after PFO.

Another study by Subash Y and Naidu GK[26], thirty patients were managed by PFO and the mean VAS showed improvement from 6.9 to 2.1 ($p < 0.005$). The mean pre-operative Oxford score revealed a significant improvement as well from 52.2 to 79 ($p < 0.005$). The medial space of joint also improved from 1.3 ± 0.8 mm to 4.2 ± 2.7 mm[26].

While a study by Rai et al[27]. reported no significant improvement in VAS score after the PFO, they reported VAS score preoperatively as 3.55±4.03 and postoperatively as 2.45±1.06 with insignificant p-value >0.05.

In brief, our data clearly shows that PFO is a safe, simple, less expensive surgery with quick recovery to manage pain and loss of joint function with some improvement in medial joint space in primary osteoarthritis knee. PFO potentially may be an alternate remedy/procedure in most underdeveloped and developing countries due to their financial restraints especially in patients who cannot undergo total knee replacement due to certain comorbidities. Furthermore, patients after PFO can still undergo TKA if it required in future.

The limitations of our present study were small sample size with no group as control, lack of long term follow up. Furthermore, we only used one scoring system during pain evaluation and have not assessed the improvement in quality of life like routine daily life and professional life that usually shows impairment due to knee pain.

We recommend further multi-center trial studies having larger sample size and long term follow up with the consideration of the above said limitations to establish guidelines for the management of medial compartmental osteoarthritis of knee.

CONCLUSION

Proximal fibular osteotomy is an effective method for relief of pain with significant reduction in VAS score and thus functional regain with little or no complications in Kellgren and Lawrence grade 2-3 primary knee osteoarthritis.

Conflict of Interest: None

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