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A mid-term analysis on treating medial compartment osteoarthritis of knee with proximal fibular osteotomy

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Abstract
Background: Patients with medial compartment OA knee who fall under early radiological grades of disease or are functionally active or have an isolated medial compartment OA knee are not considered for knee arthroplasty but still experience pain and face difficulty in day to day activities. Thus, comes the need for a procedure which can include these patients and treat their symptoms.
Aims and Objectives: Our aim is to analyse the functional outcome of proximal fibular osteotomy for treating symptomatic medial compartment osteoarthritis of knee.
Methods: From December 2018 to January 2020, 42 patients with medial compartment osteoarthritis were operated with proximal fibular osteotomy. Knee ambulation was evaluated using the American Knee Society score and the Knee pain was assessed using a visual analogue scale preoperatively and postoperatively on 1st, 3rd and 6th month.
Result: Immediate pain relief was noted in the patients undergoing proximal fibular osteotomy, which was seen as average decrease in the visual analogue score from 7.5 ± 0.9 preoperatively to 2.5 ± 0.9 at 6th month. Patients also experienced improved KSS functional score from 35.4 ± 15.1 pre-operatively to 79.9 ± 12.6 at 6th month and improved KSS clinical score from 54.6 ± 14.1 pre-operatively to 88.2 ± 6.9 at 6th month.
Conclusion: The present study demonstrates that proximal fibular osteotomy is an effective, low cost and simple surgery for reliving pain and for improving the joint function in patients with symptomatic medial compartment osteoarthritis.

Keywords: Proximal fibular osteotomy, osteoarthritis, medial compartment, american knee society score

Introduction
Osteoarthritis can be said to be "a degenerative disease which causes a progressive degeneration of the joint, joint cartilage and the bone forming the joint." Patients with OA knee commonly complain of severely pain leading to stiffness of joint and altered range of movement, dysfunction and disability. Osteoarthritis mostly affects the medial compartment of knee joint [1], with prevalence of 240/1,00,000 person-years [2]. OA knee is related to increasing age, predominantly affecting patients above 50 years of age, females more than males [2]. It is a multifactorial disorder which is genetically directed and influenced by the factors like age, sex, obesity, diet of patient, joint anatomy, bone density and loading patterns over the knee joint [1].
Patients with chronic disease and tri-compartmental OA of knee, surgical options like Total knee arthroplasty [TKA] is ideal treatment modality [3]. For acute disease, young patients and patients with uni-compartmental OA, HTO [high tibial osteotomy] and Uni-condylar arthroplasty are performed [3]. Arthroscopic debridement of knee joint is also used by some surgeons [4].
Chances of re-surgery or secondary corrective surgery increases with complex procedures like TKA and HTO [5, 6]. They also have a longer rehabilitation period and carry a procedural risk for the patients. Arthroscopy is reserved for patients with advanced age, above 60 years, but chances of symptomatic recurrence is high [4, 7]. All these procedures require high skill and good surgical setup which is usually not available to low-socioeconomic population.
Hence there is a need to introduce a novel procedure which is low-cost for patients, can be reproduced easily in a low end surgical setup, having a short rehabilitation period, but still giving a good outcome and pain relief. In this study, PFO [Proximal Fibular osteotomy], as new surgical modality, will be analysed and evaluated for the same concepts.

Materials and methods

From December 2018 to June 2020, patients with age group 50-70 years who were diagnosed with OA of knee joint, coming to our hospital, were selected by their willingness for surgery and participation. A prospective study was conducted on 42 patients with written and signed consent from the volunteers. 1] Age 50-70 years, 2] symptomatic medial compartment OA knee, 3] patients refractory to conservative treatment4] Varus deformity less than 15º were the inclusion criteria. The exclusion criteria were based on 1] Congenital deformity of lower limb,2] Secondary arthritis due to any cause,3] Varus deformity more than 15º. Age, Gender, medial joint space [8], VAS [9] and American knee society score [10, 11] were the study parameters. Pre-operatively patients were assessed radio graphically for KL grading and medial joint space, along with American Knee Society Score to assess joint function and VAS for pain assessment. Similar assessment was conducted post-operatively for medial joint space at 1st month via radiograph, American knee society score and VAS were assessed at 1st, 3rd and 6th month.

Surgical technique

Informed and written surgical consent was obtained from the patients after anaesthetic fitness before taking up for the procedure. Procedure was done under spinal anaesthesia with patient in supine position and antibiotic cover. Use of tourniquet was kept reserved for selected patients. Head of the fibula and the site for osteotomy which was between 7 – 9 cm distal to head of fibula was marked [12]. Proximal fibula was approached through plane of dissection between peroneus and soleus muscle via 5-8 cm skin incision. 1.5 – 2 cm segment of fibula was osteotomized using an oscillating saw after securing the segment with a schants pin. Special care was taken during dissection and retraction of tissue during the surgery to prevent any injury to common peroneal nerve. Bone wax was used only for patients showing profuse bleeding from osteotomy site. After achieving hemostasis and wound wash, the wound was closed in layers and sterile dressing was applied under compression. Patients were mobilized the next day and underwent 5 days of physiotherapy for quadriceps strengthening and knee mobilization exercises before discharging with primapore dressing. Sutures were removed on day 12 post-operatively on 1st follow-up.

Statistical analysis

All data were entered in Excel 2010 and statistical analysis was performed using the statistical software SPSS 25.0. Data were expressed as number [with percentages], mean values [with standard deviations] and median values [with IQR]. Differences between preop and postop data were analysed with Wilcoxon Signed Ranks Test for median values and Pearson's Chi-square test for proportions. Results were defined as statistically significant when the P value [2-sided] was less than 0.05.

Result

In the present study, 42 patients with a mean age of 59.4 years participated in the study. 20 patients [47.6 %] belonged to age group of 50 – 59 years and 22 patients [52.4 %] belonged to age group of 60 – 69 years. 22 patients [52.4 %] were males and 20 patients [47.6 %] were females. 17 patients [40.5 %] were affected on the left side and 25 patients [59.5 %] were affected on the right side. Patients with grade I and grade II according to Kellgren and Lawrence were selected for the study, of which 20 patients [47.6 %] were of grade I and 22 patients [52.4 %] were of grade II.

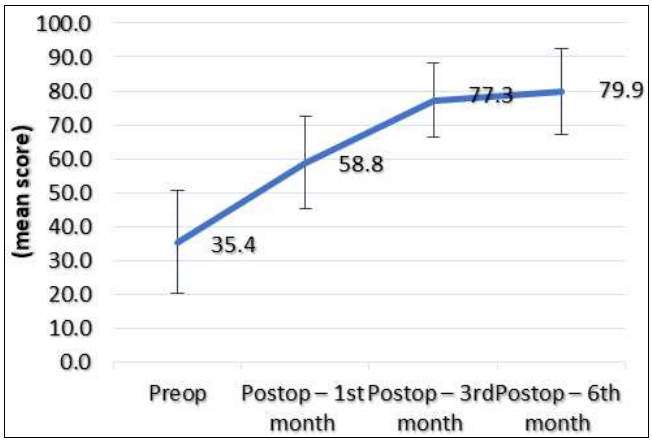

Fig 1: Distribution of functional KSS score

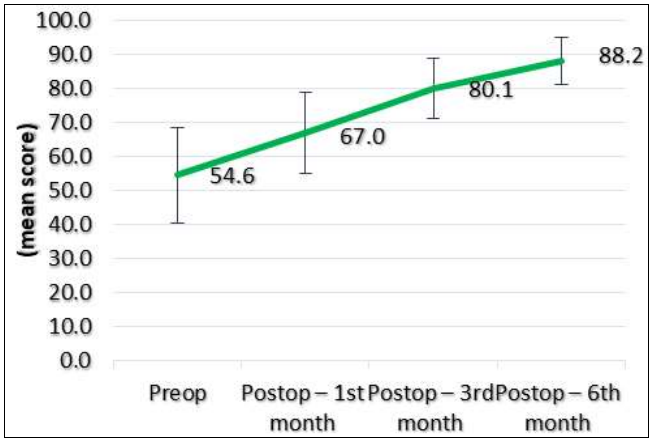

Fig 2: Distribution of clinical KSS score

The average Visual Analog Score at 1st month, 3rd month and 6th month were 4.5, 3.5 and 2.5 with a standard deviation of 0.9 respectively as compared to pre-operative score of 7.5 ± 0.9. The average medial joint space calculated post-operatively was 4.4 ± 0.5 mm as compared to the pre-operative value of 2.8 ± 0.5 mm.

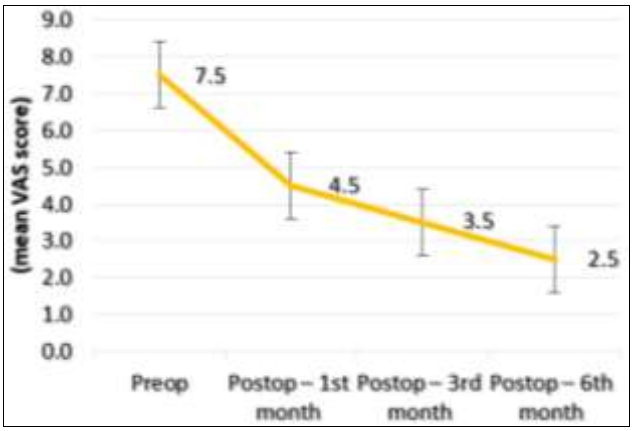

Fig 3: Distribution of Visual Analogue Score.

The average American Knee Society Functional Score at 1st month, 3rd month and 6th month was 58.8 ± 13.7, 77.3 ± 11.1 and 79.9 ± 12.6 respectively as compared to pre-operative value of 35.4 ± 15.1. The average American Knee Society Clinical Score at 1st month, 3rd month and 6th month was 67.0 ± 11.9, 80.1 ± 8.7 and 88.2 ± 6.9 respectively as

compared to pre-operative value of 54.6 ± 14.1. Only 5 patients had post-operative complications, of which 4 patients [9.52 %] had superficial infections and 1 patient [2.38 %] had deep infection.

Significant difference in VAS, KSS functional score and KSS clinical score was recorded over the course of the study, suggestive of improvement in the mentioned scores. Significant relation was established between VAS at 6th month and Age where the age group 50 – 59 years showed better improvement as compared to the age group 60 – 69 years.

Similarly, a significant relation was established between KSS functional score at 6th month and Age where age group of 50 -59 years showed more improvement when compared to the age group of 60 – 69 years. Similarly, KSS clinical score at 6th month and Age also showed a significant relation where age group of 50 - 59 years showed more improvement as compared to age group of 60 – 69 years. The Relation between VAS, KSS functional score and KSS clinical score when compared to Gender and Side affected was not significant as both males and females and both left side and right side showed equal outcomes respectively.

Fig 4: Pre and post-operative x-ray left proximal fibular osteotomy

Fig 5: Day 2 images of patient showing weight bearing and knee flexion.

Discussion

Medical treatment of OA knee is very long term and has recorded to affect both systemic and local physiology [13]. Other options like wedged insole shoes and knee bracing do not cure the symptoms of the disease [14]. Visco supplementations have also been tried by many surgeons but have failed to be of much use [15]. IA injections with Plasma rich proteins and steroid have been used regularly for symptomatic relief, but the repeated use has reported to have serious problems in the joint locally [16]. Polycentric brace have proven to be of use in OA knee but are more effective after an interventional surgical modality [17].

Surgery should only be suggested after a through course of medical and non-operative management that has been tried at least for 90 days and/or quality of life has reduced significantly [18]. Arthroscopy for treating OA knee has a very limited role and does not affect the outcome even when combined with medical modalities or physical therapy [19, 20].

In 2016, AOOS introduced 3 operative procedures for treating OA of knee, which included TKA, re-alignment osteotomies and uni-condylar arthroplasty [21].

90% of patients who are have high grade OA knee and severe symptoms will have a good outcome aven after 20 years post TKA [22]. Apart from being a risky procedure, TKA patients can experience pain, infection, VTE, prosthetic loosening and can require a secondary revision surgery to correct the complications [22]. It is also a costly procedure and requires a good surgical setup with experienced team of surgeons [23], which is difficult to encounter in a rural setup in India.

Patients undergoing uni-condylar osteotomies and unloading procedures for uni compartmental OA knee have reported a good outcome but have been subjected to secondary correction surgeries in the following years [24]. UKA has a shorter post-operative rehabilitation time and can be used for aged patients, but HTO is reserved only for younger patients due to its drawbacks like late union, delayed union and increased rehabilitation time [25-27]. Van der Woude *et al*. have tried joint distraction with external fixators to help the cartilage regeneration and repair in the knee joint [19].

Fibula supports 1/6th of the total body weight and PFO helps in the equal distribution of the loading force over the knee joint. It can be indicated for the patients who are activate with BMI <23, having medial compartment OA knee with <5º of varus angulation and >2mm of lateral joint space in knee [28].

PFO is a simple, safe, cheap and fast surgery when compared to TKA, UKA and HTO and does not need any hardware installation [8]. Patients after PFO, show improved joint function as well as improved radiographic picture [29]. It has also been suggested that PFO will delay the need for TKA in young patients with OA of knee [8]. When comparing with arthroscopy, PFO shows to have a good outcome and better pain relief in patients with OA knee. Combination surgery of PFO and Arthroscopic debridement have given a good outcome and can be used in OA knee with varus deformity ass well [30].

Moreover, patients undergoing PFO have encountered very less complications in the course of studies with only 2.6% cases reporting Common peroneal nerve injuries and 3.9% cases having post-operative knee instabilities [31].

In the present study, we recorded very less complications, time for surgery was less, time for rehabilitation was less, VAS was improved post-operatively and so did KSS functional and clinical score. Patients reported relief of their symptoms post-operatively and even after 6 months of procedure continued to do the same.

Conclusion

It can be concluded that Proximal Fibular Osteotomy is a procedure which is effective is reducing symptoms in patients of OA knee. It improves joint functions of the operated knee as well. PFO is a cheap and cost-effective procedure, simple to perform under minimal surgical setup and requires less skill when compared to TKA or HTO. Time taken for patient to resume normal day to day activities was less as well. Care must be taken during procedure to avoid injuries to peroneal nerve.

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