

Functional and radiological outcome following proximal fibular osteotomy in patients with knee osteoarthritis: a prospective study

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Abstract

Background: Osteoarthritis of knee is a common joint disease, with a prevalence of about 30 percent of individuals older than 60 years of age. Medial compartmental OA Knee, is by far the most prevalent variant of degenerative tibio-femoral joint disease and makes upto 90% of uni-compartment knee OA. Proximal Fibular Osteotomy (PFO), which essentially is resection of upper fibular diaphysis, had become increasingly adopted for the surgical intervention in the last decade. **Aim:** To Assess the functional and radiological Outcome In Patients Who Had Medial Compartment Knee Arthritis following Proximal Fibular Osteotomy. **Materials and methods:** The study was done in the Department of Orthopaedics, at Chettinad Hospital & Research institute, Tamil Nadu. The study population included total 22 cases with knee medial compartmental osteoarthritis and underwent Proximal Fibular Osteotomy. **Results:** In our study, mean age group of cases was 52.51 years. The mean post-operative VAS was 1.4 which was significantly lesser than pre-operative value. Significant improvement in the functional and clinical outcome, was observed. The post-operative medial joint space and knee joint ratio, were significantly enhanced. **Conclusion:** PFO is a suitable option for pain relief, as well as to achieve a painless knee ROM to benefit activities of daily life in patients with medial compartment osteoarthritis.

Keywords: Proximal Fibular Osteotomy, Medial Compartment, Knee Osteoarthritis

Introduction

Osteoarthritis (OA) is a disease which slowly progresses and eventually brings about articular degenerative changes, resulting in the clinical manifestations of pain in the joint, rigidity and lack of mobility.^{1,2} It is most common in the elderly. Knee osteoarthritis can be compartmentalized as a dual variant, viz; secondary and primary. In Primary osteoarthritis, there is cartilaginous articular degeneration, while in Secondary osteoarthritis, it is considered a sequelae, of either an anomalous congregation of forces traversing the joint, as in the cases causing uneven articular cartilage, such in posttraumatic conditions or in autoimmune systemic conditions like rheumatoid arthritis (RA).³ Medial compartmental knee osteoarthritis (MCKOA), is a prevalent ailment, in the aging population, especially over the age of 60 years and accounting for around 30 percent, in the general society. Not taking into the account the biological age, the prevalence of a typical knee osteoarthritis is roughly 240 cases per one lakh individuals annually. Medial compartmental OA knee, is by far the frequent variant, pertaining to the diseases of the knee joint, thereby contributing to over ninety percent of the uni-compartment knee OA.⁴ Knee varus deformities, are a common finding in individuals with genu osteoarthritis and affects about three-fourths of the individuals, with idiopathic osteoarthritis. It has been established, that even in the healthy individuals, the medial compartment of the knee bears about 60 to 80 percent of the load. High tibial osteotomy (HTO) has been in vogue since 1961, ever since it was introduced by Jackson and Waugh for close to 4 decades. Yazdi H et al,⁵ in 2014 has been able to establish that the fibular

osteotomy effectively decreases the joint reaction forces across the medial facets constituting the knee joint, however his studies, focussed on the distal third fibular resection. It is only after the studies of Yang ZY and Zhang, proximal fibular osteotomy (PFO)⁶ that which essentially is resection of upper fibular diaphysis, had become increasingly adopted for the orthopaedic surgical intervention of especially medial compartmental OA, in the last decade. In our study, we use a simpler procedure PFO to treat MCKOA, which is a degenerative disorder pertaining to the knee joint⁷

Materials and methods

This is a prospective study of the clinico-functional and radiographic outcome of the patients who had medial compartment osteoarthritis of knee and underwent osteotomy of the proximal fibula, in Chettinad Hospital and Research Institute, during the period, January 2018 to June 2020. Those patients who satisfied the inclusion criteria alone were included in the study. The patients were followed up at intervals of 3 and 6 months, from the day of surgery.

- **Inclusion criteria:** • Patient of both sexes between the age group of 40 to 65 years. • Isolated medial compartment osteoarthritis of the knee joint. • At least an available knee Rom of 90 Degrees.
- **Exclusion criteria:** • Genu valgum. • Intra-articular step in the tibial articular surface, as a sequelae of intra-articular malalignment. • Inflammatory joint disease. • Malignant tumors. • Ipsilateral hip pathology. • BMI > 30.
- **Study Method:** Hospital based study
- **Study Population:** Patients who presented with medial compartmental knee osteoarthritis, satisfying the parameters, as laid in the inclusion criteria.
- **Sample size:** 22 patients.
- **Study design:** Prospective study.

Methodology: The study was started after obtaining Institutional ethical approval. Consent for the study was obtained from the patients prior to the surgery. Post discharge from the hospital, the patients were reviewed in OPD on POD 12 for removal of suture/staples. From that time onwards, patients were reviewed at monthly intervals for the first 3 months, and then once in 2 months. The clinical and functional outcome of each patient was evaluated based on the Visual Analogue Score and the American Knee Society Score. The radiological outcome was measured using standing Knee AP X-rays. The evaluations for data gathering were done at the end of 6 months time from the surgical intervention.

Statistical analysis: The collected data was checked for completeness before entering into the Microsoft excel spreadsheet. The validation of the data was checked at regular intervals. The “F” / “T” test was applied wherever applicable for which p value <0.05 was taken as significant.

Image 1: Intra Operative Pictures

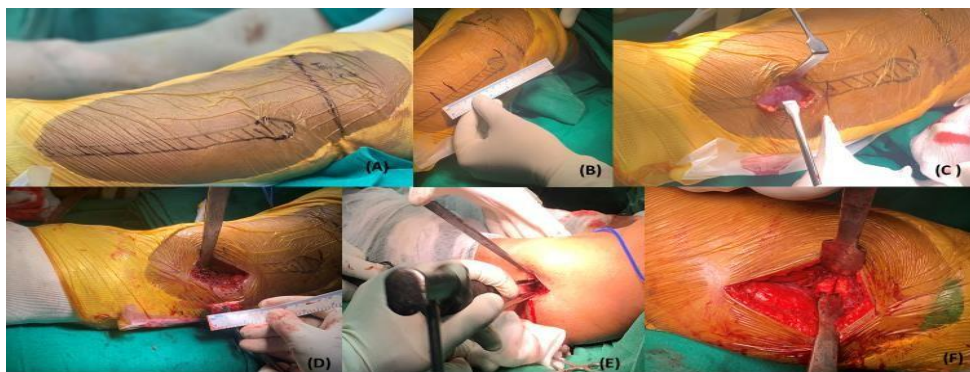
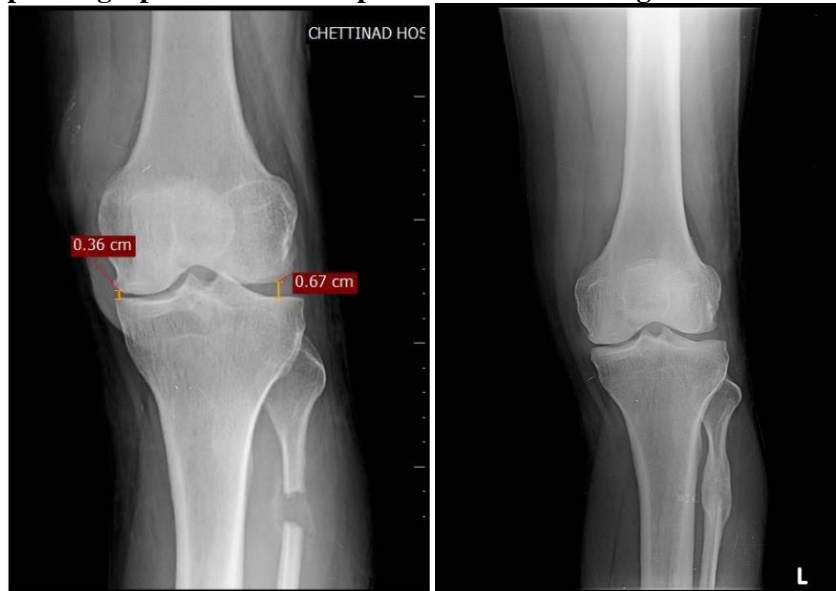


Figure 2: Pre- OP Radiograph**Figure 3: Post-op radiographs with follow-up at 15 months showing union of fibula**

Results

Our study included 22 patients in which there was a female predominance (n=12) of 55.5% and right side was the most commonly involved side. The most common age group affected was 51-55 years and the mean age was 52.51 years,

The mean post-operative Visual Analogue Score was 1.4 as against the pre-operative VAS of 8.17. the drop in the VAS (depicting relief of pain) was a significant 6.77 points. KSS (American Knee Society Score) was calculated in the pre-operative period and post-operatively at end of 6 months. The mean pre-operative KSS Score was 61.34 which significantly improved to 79.54 after proximal fibular osteotomy, in the post-operative 6th month of follow up, it was statistically significant ($P < 0.001$). KSS (Functional) Score was calculated in the pre-operative period and post-operatively at the end of 6 months. The mean pre-operative knee society functional subscore was 63 which significantly improved to 82.28 in the post-operative follow-up period.

Figure 4: Analysis of VAS

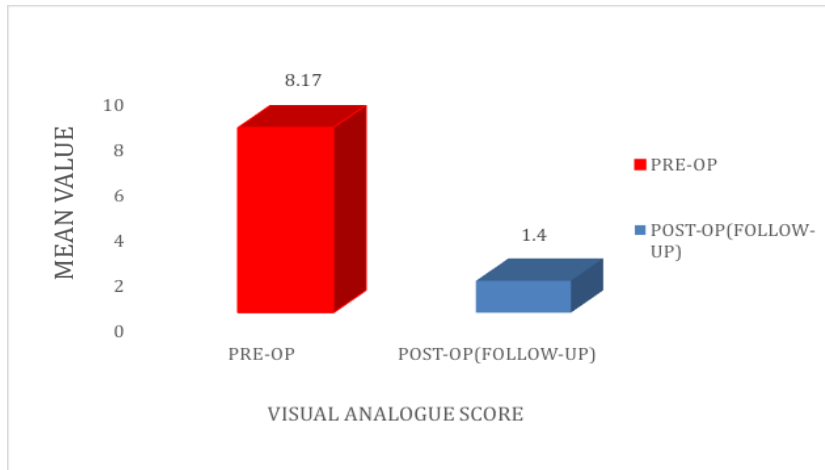


Figure 5 : Pre-Op and Post-Op analysis of KSS

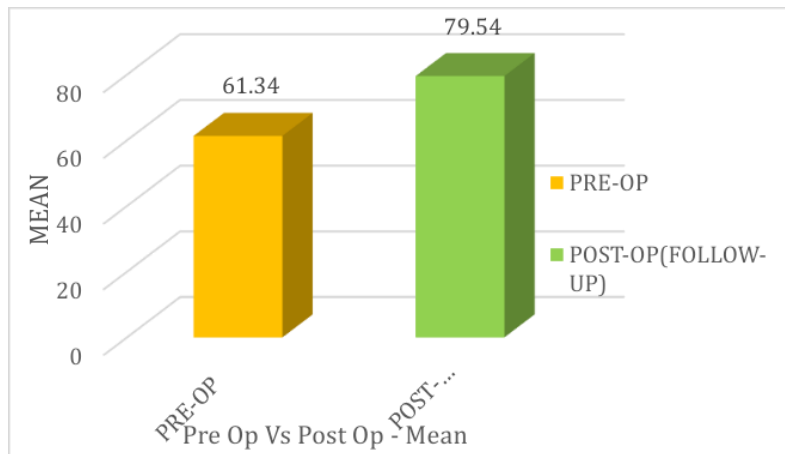
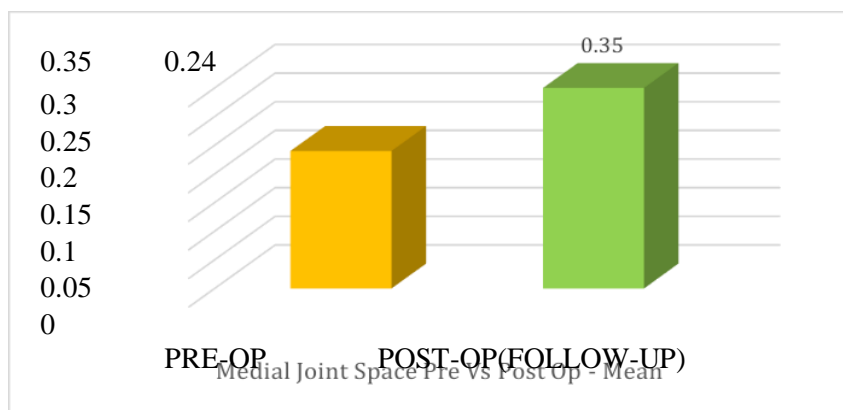
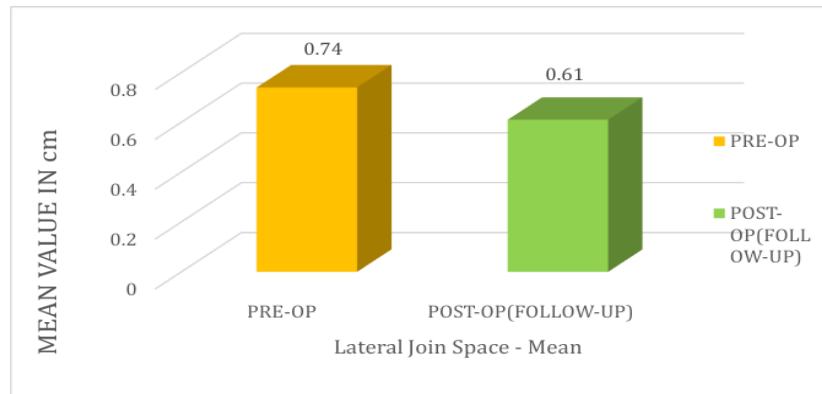


Figure 6 : Pre-Op and Post-Op analysis of medial and lateral joint space

The medial joint space was measured with the help of a weight bearing Antero-Posterior radiograph of the involved knee joint , in the pre- operative and at the post-operative 6th month follow up. The mean pre-operative medial joint space was 0.24 cm which significantly improved to a mean post- operative value of 0.35cm (P<0.001). The lateral joint space was measured with the help of a weight bearing Antero-Posterior radiograph of the involved knee joint , in the pre-operative and during the post - operative 6th month follow up. The mean pre-operative lateral joint space was 0.74 cm which significantly decreased to a mean post- operative value of 0.61cm (P<0.001).





EHL weakness was observed post-operatively in 13%(n=3) of patients, who underwent Proximal fibular osteotomy. It was clinically diagnosed as neuropraxia, since it got resolved within 2-3 months in all the affected patients.

Discussion

It was only after the study by Yang et al. in 2015, Proximal fibular osteotomy (PFO) has become a unique surgical option, that could be practiced, in the surgical management of medial compartmental knee osteoarthritis (MCKOA). It has become widely popular of the recent past, due to the fact that, PFO can be complemented if needed later, by HTO or TKA. Many an explanation have been hypothesized to detail the mechanism behind PFO in the surgical management of MCKOA. In 2017, Huang W et al. reported a case where he deduced, that indeed there existed an alteration in the knee kinematics subsequent to PFO, in the form of an increased valgus, femoral external rotation and distal translation of the knee.⁸ He also concluded that these alterations in the knee kinematics, resulted in the early functional recovery of the patient and contributing towards pain relief. Zou G et al. in 2017, did a comparative study between HTO and PFO in a group of ninety-two patients with a varus knee osteoarthritis.⁹ They assessed the functional outcome among the two study groups, with the help of VAS and Japanese Orthopaedic Association (JOA) score, wherein, the radiological outcome was measured using the Femoro-tibial angle (FTA) and they concluded that even though the indirect varus correction capacity of HTO was superior than that of PFO.^{10,11} The short term and long-term surgical effect of PFO also were found to be superior, in comparison with HTO. In our present study, the average pre-operative medial joint space was 2.46 mm, which improved to 3.49 mm in the analysis at 6th month follow-up. This was in comparison with the values concluded by Shamma et al; and Garg P et al.¹²

Conclusion

PFO for Knee OA is a simple, safe, cost effective and a reliable outcome-based procedure. PFO, is a suitable option, not only for the relief of pain, but also to achieve better and painless arc of knee ROM to benefit ADL in patients with medial compartmental osteoarthritis of knee. However, the right choice of cases, have to be followed to the tee, in order to deliver the expected patient outcome and to delay more morbid surgical interventional procedures. Although the fibular bone is osteotomized, by virtue of the fact that the periosteal sleeve is retained and sutured back, there have been documented instances (such as in fig) wherein, there is evidenced a regeneration of the fibular bone in the osteotomized zone, thus, restoring the normal anatomy. Further undertaking procedures, either in the form of HTO or TKR at a later date are in no way compromised. As PFO is a less morbid and an equally efficacious procedure, it also has a better outcome or sometimes even better than that after HTO, in some instances. Hence, the statement that “PFO supersedes the outcomes of HTO may not be an exaggeration”

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