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PROXIMAL FIBULAR OSTEOTOMY IN MEDIAL COMPARTMENT OSTEOARTHRITIS OF KNEE JOINT(A PROSPECTIVESTUDY OF 25 CASES)

Orthopaedics

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ABSTRACT

BACKGROUND: A Prospective study was conducted to evaluate the efficacy of PFO in terms of pain relief, and functional improvement in medial compartment OA of the knee joint. Design: A prospective clinical study with 6 months of follow-up. **MATERIALS AND METHODS:** This study conducted between Dec 2018 to Dec 2020. 25 patients with medial compartment knee joint OAwere included in the study according to **INCLUSION AND EXCLUSION CRITERIA.** The medial and lateral joint spaces, VAS & WOMAC scores were recorded preoperatively and postoperatively. **RESULTS:** M: F ratio was 10:15. Unilateral: Bilateral knee involvement ratio was 18:7. A total of 32 knees of 25 patients were operated.Most common age group was 46-60 years (80%). Mean pre-operative and post-operative VAS score was 8.60& 1.56 and WOMAC score was 76.88 & 26.56 respectively. The mean ROM and Medial joint spaceimproved from 107.18o to 124.06o and 1.28 mm to 1.73 mm respectively. The mean analgesic use per week decreased from 6.26 tablets/week to 2.44 tablets/week.EHL weakness and Dorsal foot numbness were observed in 3.12% (1 case) each which also recovered at final follow-up. 88% (22 patients) were in Excellent category, 8% (2 patients) were in Good category and 4% (1 patient) was in Fair category. **CONCLUSION:**PFO may reduce knee pain significantly in early medial compartment OA knee and improve the functional recovery of the knee joint.

KEYWORDS

medial compartment; osteoarthritis; Proximal Fibular osteotomy.

INTRODUCTION

Osteoarthritis (OA) is a chronic degenerative joint disease of dynamic pathology with multifactorial etiology. It involves progressive softening and loss of articular cartilage, subchondral bone sclerosis, cyst formation and the development of osteophytes. OA of the knee accounts for more dependence in walking, stair climbing and other lower-extremity tasks that any other disease.[1]OA knee usually starts after 40 years of age and progresses to affect about 30% population beyond 60 years of age because of certain precipitating factors like mechanical, structural, genetic, and environmental, involving medial compartment more frequently than the lateral one.[2-4] The progression of degenerative process causes altered mechanics of weight bearing resulting into genu varum deformity in about 74% of patients of primary OA.[5] Genu varum deformity is more common in OA because of the fact that the mechanical axis, even in normal knees, passes a little medial to the centre of the joint that drives 60%-80% of body weight through the medial compartment of the knee joint.[6] In addition to various biomechanical alterations, the increased internal tibiofemoral rotations and peak knee adduction moment during weight bearing because of altered gait mechanics, are supposed to be the main culprits in the initiation and progression of medial compartment OA.[7,8] Any option of treatment for OA is aimed at restoration of tibio-femoral rotation and peak adduction moment to normal to relieve pain and to delay progression of OA. Various treatment options available are conservative that encompasses the life style modifications, NSAIDS, physical therapies like hot wet packs/ice packs/ultra violet rays/paraffin wax bath, exercise program, intra-articular steroid injections, viscosupplementation, biological agents like platelet rich plasma, modified footwear and assistive devices like lateral insole wedges with or without subtalar strapping, variable stiffness shoes with softer medial side, abduction knee braces using three-point bending.[9-14] But once all these modalities of treatment are exhausted due to progression of disease or are non-responsive, then surgical intervention becomes inevitable, such as high tibial osteotomy, unicompartmental/total knee replacement (UKR/TKR). Under the shadow of the complications associated with osteotomy and UKR/TKR there had been a continuous desire to develop a technique to relieve the pain of moderate to severe OA of medial compartment and which should be possibly least invasive and should not commensurate with problems of aforesaid procedures. In the present study, to meet these challenges recently a new procedure in the form of proximal fibular osteotomy (PFO) has been carried out with gratifying results.

MATERIALS & METHODS

This study was carried out in the department of Orthopaedics and Trauma centre, Sardar Patel Medical College, Bikaner. Under this prospective study, twenty five (25) patients were considered who underwent the procedure between Dec 2018 to Dec 2020. The total follow up time was 6 months.

INCLUSION CRITERIA

- Age group of 40 to 70 years both male and female presenting with medial compartment OA of the knee with normal patella- femoral joint.
- Medial compartment OA of the knee with a Kellgren-Lawrence score of grade 2 and grade3.
- Varus knee deformity $<15^0$.

EXCLUSION CRITERIA

- Lateral compartment osteoarthritis KneeJoint.
- Fixed flexion deformity more than 15° at KneeJoint.
- Pregnant Females.
- Comorbidity (Rheumatoid Arthritis, Gout, Infective Osteoarthritis Knee Joint).

Surgical technique

The patient was positioned supine on the operating table following administration of spinal anaesthesia. Area to be operated was washed with betadine scrub, then painted with betadine and finally covered with sterile draping. The tip of fibular head was marked with a skin marking pen, and the appropriate downward distance (6-10 cm) measured. A lateral fibular incision, approximately 5cm was used for the procedure. Skin and subcutaneous tissue were cut. The incision should be a little more than twice the length of the resected segment.

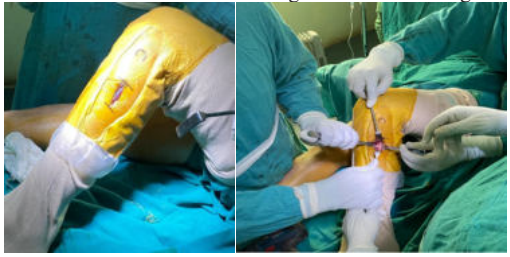

Fig. 1 : Skin marking of Fibular head & incision (L) ; Fibula exposed in between peroneus and soleus muscle (R)

The fibular periosteum was now exposed by separating the peroneus longus and soleus. The periosteum was incised in line of skin incision, and a 1.5 to 2 cm piece of fibula resected with help of multiple drilling, osteotome & bone wax applied at ends.

Fig. 2 : Periosteum incised in line with skin incision (L) ; About 2 cm Fibula resected (R)

Wound was washed, closed in layers, and a light compression bandage given before the patient was shifted out of the operation theatre.

Follow up and Assessment: Assessment was done at 6 months postoperative on basis of Clinical &Radiological factors and analysis of result done by using VAS and WOMAC score.

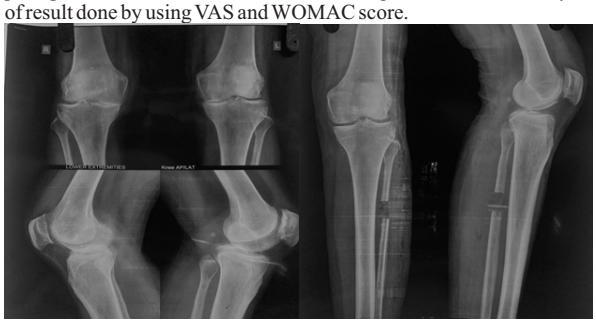

Fig. 3 : Pre-operative X-Ray with bilateral medial compartment OA right>left (L) ; Post-operative X-Ray right Knee joint at 6 months (R)

OBSERVATIONS

We have selected 25 cases of medial compartment osteoarthritis of knee jointin which total 32 knees were operated for proximal fibular osteotomy and followed up to six months postoperative. At six month we assessed the cases radiologically, clinically and used VAS & WOMAC score for final outcome. Following are our observations. Most of the cases were from the age group of 46-60 years which constituted 80% of the total cases. Female predominance was found out of 25 patients 14 (56%) were female and 11 (44%) were male. Affected knees were classified according to Ahlback grading. 22 (68.75%) out of the 32 knees that were operated were Ahlback grade 1 and 10 (31.25%) knees were Ahlback grade 2.

We followed-up all the patients at 1, 3 and 6 months and final assessment was done on the basis of VAS score, WOMAC score, Range of movement at knee joint, medial joint space and analgesic used at 6 months.

Table 1.VAS score wise distribution

VAS	Pre-operative	At 1 month	At 3 month	At 6 month	p-value
Mean	8.60	4.48	2.08	1.56	0.01
SD	0.50	0.59	0.40	0.51	

We measured VAS score for all the patients pre-operatively and post-operatively at 1, 3 and 6 months. Mean pre-operative VAS score was 8.60 with standard deviation of 0.50 which improved significantly to a mean VAS score of 4.48, 2.08 and 1.56 at 1, 3 and 6 months respectively.

Table 2. WOMAC score

WOMAC	Pre-operative	At 1 month	At 3 month	At 6 month	p-value
Mean	76.88	58.00	36.88	26.56	0.01
SD	3.60	5.20	5.71	2.61	

WOMAC score was also calculated for all the patients pre-operatively and post-operatively at 1, 3 and 6 months. The mean pre-operative WOMAC score was 76.88 with standard deviation of 3.60. Significant improvement was observed in the patients as WOMAC score improved to mean value of 58, 36.88 and 26.56 at 1, 3 and 6 months respectively.

Table 3. Knee joint range of movement

ROM	Pre-operative	At 1 month	At 3 month	At 6 month	p-value
Mean	107.18	115.15	121.25	124.06	0.01
SD	6.46	6.53	5.53	4.10	

Range of movement was assessed for all the patients pre-operatively and post-operatively at 1, 3 and 6 months. The mean ROM pre-operatively was 107.18° with standard deviation of 6.46°. Range of movement improved significantly in post-operative follow-up to 115.15°at 1 month and further increased to 121.25°and 124.06° at 3 and 6 months follow-up respectively.

Table 4.Medial joint space

Medial joint space	Pre-operative	At 1 month	At 3 month	At 6 month	p-value
Mean	1.28	1.31	1.54	1.73	0.01
SD	0.28	0.30	0.33	0.28	

Medial joint space of all the affected knees were assessed pre-operatively and post-operatively on digital AP radiographs in weight bearing position. The mean pre-operative medial joint space was 1.28 mm with standard deviation of 0.28 mm. It was observed that medial joint space increased to a mean value of 1.31 mm, 1.54 mm and 1.73 mm at 1, 3 and 6 months of post-operative follow-up respectively.

Table 5. Analgesic use wise distribution

Analgesic use per weeks	Pre-operative	Post –operative (after 6 month)	p-value
Mean	6.26	2.44	0.001
SD	0.96	0.91	

The mean analgesic use by the patients per week was also taken into account to assess the pain relief after the surgical procedure. The mean analgesic use per week pre-operatively was 6.26 tablets per week with standard deviation of 0.96. The analgesic use decreased significantly to 2.44 tablets per week at 6 months of post-operative follow-up.

Table 6. Complication wise distribution of study subjects

Complication	No of cases	Percentage
EHL weakness	1	3.12
Dorsal foot numbness	1	3.12

During whole study we noticed few complications i.e. EHL weakness and Dorsal foot numbness 1 case each till 3 months after which they recovered. At final follow-up at 6 months no patient had any complication.

Table 7. Final assessment

Final assessment	No of cases	Percentage
Excellent	22	88.00
Good	2	8.00
Fair	1	4.00
Poor	0	0.00

Final assessment was done according to final WOMAC score at 6 months of follow-up and the patients were categorized into Excellent, Good and Fair categories. Most of the patients 88% (22 patients) were in Excellent category, 8% (2 patients) were in Good category and 4% (1 patient) was in Fair category.

DISCUSSION

We have selected 25 cases of medial compartment osteoarthritis of knee jointin which total 32 knees were operated for proximal fibular osteotomy and followed up to six months postoperatively. At six month we assessed the cases radiologically and clinically and used VAS & WOMAC score for final outcome.

The complex biomechanics of knee can never be simulated by any prosthetic design and replaced knee will always be second best to normal natural knee. Hence knee conservation and repairing the damage provides us an extra chance of achieving our goal of healthy

knee and better long term results than artificial replaced knee. Moreover there are always chances of failure of prosthesis. Thus these procedures might be the ones for the future.

In certain specific indications, proximal fibular osteotomy is the surgical method of choice for knees with medial compartmental osteoarthritis. The major advantage of the operation is that it allows unlimited activity to the patient. Thus, for patients who have an occupation requiring vigorous activity or who wish to continue playing sports, an osteotomy is a reasonable procedure that in no way precludes a later total knee arthroplasty.

In a varus aligned knee success cannot be expected with these knee conserving procedures unless alignment is restored to normal. Thus the role of PFO might take yet another turn and become all the more important in future.

In our study VAS score was measured for all the patients pre-operatively and post-operatively at 1, 3 and 6 months. Mean pre-operative VAS score was 8.60 with standard deviation of 0.50 which improved significantly to a mean VAS score of 4.48, 2.08 and 1.56 at 1, 3 and 6 months respectively.

Verma R K et al[15] (2020) found that mean VAS score at pre-operative, postoperative 1week, 6 weeks and 9 months to be 8.77, 6.96, 4.36 and 2.52 respectively. Significant results were obtained while comparing the mean VAS at different postoperative time interval

In the study by Xiaohu Wang et al[16] (2017)the mean visual analogue scale scores significantly decreased from 8.02±1.50 preoperatively to 2.74±2.34 postoperatively with p value <.001.

In the study by Guoping Zou et al[17](2017) mean visual analogue scale scores significantly decreased from 4.6 ± 1.3preoperatively to 0.5 ± 0.2 postoperatively.

In the study by Zong-You Yang et al [18](2015) mean VAS score at final follow-up was 2.0which was significantly lower than the preoperative VAS 7.

WOMAC score was also calculated for all the patients pre-operatively and post-operatively at 1, 3 and 6 months. The mean pre-operative WOMAC score was 76.88 with standard deviation of 3.60. Significant improvement was observed in the patients as WOMAC score improved to mean value of 58, 36.88 and 26.56 at 1, 3 and 6 months respectively.

Range of movement was assessed for all the patients pre-operatively and post-operatively at 1, 3 and 6 months. The mean ROM pre-operatively was 107.18^{o} with standard deviation of 6.46^{o}. Range of movement improved significantly in post-operative follow-up to 115.15^{o}at 1 month and further increased to 121.25^{o}and 124.06^{o} at 3 and 6 months follow-up respectively.

Medial joint space of all the affected knees were assessed pre-operatively and post-operatively on digital AP radiographs in weight bearing position. The mean pre-operative medial joint space was 1.28 mm with standard deviation of 0.28 mm. It was observed that medial joint space increased to a mean value of 1.31 mm, 1.54 mm and 1.73 mm at 1, 3 and 6 months of post-operative follow-up respectively.

In our study we prescribed same analgesic to a particular patient preoperatively and postoperatively. The mean analgesic use per week pre-operatively was 6.26 tablets per week with standard deviation of 0.96. The analgesic use decreased significantly to 2.44 tablets per week at 6 months of post-operative follow-up.

Final assessment was done according to final WOMAC score at 6 months of follow-up and the patients were categorized into Excellent, Good and Fair categories. Most of the patients 88% (22 patients) were in Excellent category, 8% (2 patients) were in Good category and 4% (1 patient) was in Fair category.

None of the studies of PFO have compared the results of WOMAC score, joint space, uses of analgesics preoperatively and postoperatively.

PramodSunda et al[19](2020) found that joint space, range of motion was significantly changed after operation.

In our study we observed that most of the knees that were operated 93.76 % (30) had no complications at all. EHL weakness and Dorsal foot numbness was observed in 3.12% (1 case) each till 3 months of follow-up after which they recovered at the final follow-up.

In the study by Zong-You Yang et al [18](2015),4 (3.6%) patients reported numbness in the ipsilateral lower leg due to common peroneal nerve palsy and superficial peronealnerve injury. Xiaohu Wang et al[17] (2017)no postoperative complications were observed, including wound infection, delayed healing or nerve damage.

CONCLUSION

Proximal fibular osteotomy may reduce knee pain significantly in early medial compartment osteoarthritic knee and improve the functional recovery of the knee joint. It is a safe, simple, affordable and effective procedure that is an alternative to HTO and may delay or even negate the need for uni-compartmental knee arthoplasty or total knee arthroplasty for medial compartment OA of the knee joint. TKR is an effective procedure to make patient pain free and improvement in function in advanced stage arthritis. However TKR is complex and costly. HTO preferred in young patients with osteoarthritis knee but has drawbacks like non-union, infection, implant failure and may complicate the further TKR. PFO has emerged as boon for patients to relief pain immediate after surgery and improve joint function. In comparison to TKR or HTO, PFO is easy, cheaper and simple which does not use any implant. Care must be taken to avoid potential nerve injuries.

LIMITATION OF STUDY

Sample size of our study was small and follow up period was short and therefore more and more multicentric studies need to be conducted for validation of this procedure. We donot have any comparison group of PFO with HTO, Uni-Compartmental TKR. No availability of scanogram at our centre due to which the deviation of femoro-tibial mechanical axis could not be measured

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