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Research Article

Role of proximal tibial osteotomy in knee osteoarthritis

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ABSTRACT

Background: Osteoarthritis is an inevitable consequence of aging and second only to cardiovascular diseases in producing severe chronic disability. Osteoarthritis is characterized by degenerative changes in articular cartilage of diarthrodial joints and subsequent new bone formation at the articular margin. It is the result of excessive aging that primarily produces an alteration in the ratio of total glycosaminoglycans to that of fiber content in the matrix. The aim was to evaluate the results of proximal tibial osteotomy in medial compartment osteoarthritis (OA) of knee in terms of relief of pain, range of movement, correction of deformity and functional outcome
Methods: This prospective observational study was conducted on 24 patients in the age range 54 to 70 years at the department of orthopedics, Era's Lucknow Medical College from July 2014 to May 2016. The femorotibial angle was assessed radiologically. A written informed consent was obtained. A closed wedge osteotomy was done followed by rehabilitation programme.
Results: It was concluded that proximal tibial osteotomy is a satisfactory alternative to joint replacement surgery in osteoarthritis limited to medial compartment of the knee in developing countries like India.
Conclusions: The study concluded that proximal tibial osteotomy is a satisfactory alternative to joint replacement surgery when the disease is restricted to medial compartment of the knee.

Keywords: Osteoarthritis, Deformity, Osteotomy

INTRODUCTION

Osteoarthritis is an inevitable consequence of aging and stands second only to cardiovascular diseases in producing severe chronic disability.[1] Osteoarthritis is characterized by degenerative changes in articular cartilage of diarthrodial joints and subsequent new bone formation at the articular margin. It is the result of excessive aging that primarily produces an alteration in the ratio of total glycosaminoglycans to that of fiber content in the matrix.[2,3]

Although the etiology of osteoarthritis of knee is multifactorial but the basic pathology lies in the biomechanical stress produced at the knee.[4,5] The disease process is more pronounced on the medial compartment of knee leading to greater loss of articular cartilage and subchondral bone in the medial compartment giving rise to a varus deformity which gradually enhances with time due to over loading of the medial compartment of the knee.[6,7] Various surgical procedures including replacement arthroplasty have been advocated in modern times to overcome the problem as most of conservative procedures have their limitations in arresting the progress of disease. In a developing country like India most of these patients do not undergo replacement arthoplasty because of financial reasons and continue to suffer in pain due to the disease. In these cases osteotomy stands as a proven concept in literature to combat the degenerative diseases.[8-10] Various recent studies on proximal tibial osteotomy for osteoarthritis of knee have advocated the technique and established the fact that correction in the alignment of weight bearing axis brings

about regeneration of articular cartilage and relief in pain to the patients.[11-15] The objective of this study was to describe the results of lateral closing wedge proximal tibial osteotomy in medial compartment osteoarthritis of knee in terms of relief of pain, range of movement, correction of deformity and functional outcome.

METHODS

After clearance from ethical committee of institution a prospective study was conducted between May 2014 to June 2016 at Era's Lucknow Medical College Lucknow. A closed wedge proximal tibial osteotomy was performed on 24 knees in 24 patients (10 males and 14 females) in patients ranging between 54 to 70 years of age.

Inclusion criteria

- Pain and deformity that significantly interfered with routine work.
- Patients with varus deformity due to medial compartment osteoarthritis.
- Patients with satisfactory general condition who could be mobilized on crutches and carry out rehabilitation after surgery.

Only patients who consented to the study were included in the study.

Those excluded from the study were the patients <40 years of age, patients with bicompartmental/tricompartmental knee osteoarthritis, patients who had been diagnosed with rheumatiod arthritis, patients with femur-tibial subluxation of >1 cm, patients with varus deformity >15 degrees and those having flexion deformity of >20 degrees. Weight bearing anteroposterior and lateral radiographs of knee were done in addition to skyline view.

Tibiofemoral angle of the knee was measured which is the angle between the femoral and tibial axis. The femoral axis is the line between midpoint of medullary canal in the diaphysis and apex of intercondylar notch of femur and tibial axis is the line between center of interspinous notch of tibia and midpoint of the medullary canal of the tibial diaphysis.

The base of wedge to be removed was calculated using the 'rule of thumb' method in millimeters approximately equal to the degree of angle to be corrected. The study aimed at a little overcorrection of 5 degrees with an anticipation of further growth in osteoarthritis. An additional 5 degrees of correction was achieved for normal valgus of knee. It was in accordance with the recommendations by Coventry 1969.[16] Radiographic findings were classified according to Ahlback's classification 1968.[17]

Surgical technique

Under regional or general anesthesia, patient lying supine on operating table. The limb was placed over a pillow with the knee in 45º of flexion to allow relaxation of popliteal structures. A pneumatic tourniquet was used to ensure a bloodless field. An 8-10 cm long vertical incision on the anterolateral aspect of knee was used in all the cases. The lateral condyle was exposed by reflecting the fascial attachment proximally. Anterior surface of superior tibiofibular joint was thereby exposed, and using an osteotomy the fibres of capsule of this joint was divided completely so that the fibular head can move freely on tibia. The posterior surface of tibia was then exposed by driving the periosteal elevator across medial border. A retractor is placed posteriorly and anteriorly beneath the patellar ligament for protection of neurovascular structures. Under image control 2 Kirschner [k-wires] wires were passed from lateral to medial in the tibia, one passing parallel and 1.5 cm below the joint and the other passing obliquely and distally at an angle to converge with the first wire medially. Distance between the entry points of two wires was equal to the base of wedge to be removed in millimeters as calculated pre operatively. A wedge osteotomy was carried out between 2 K-wires using oscillating saw or osteotome removing a triangular bone fragment. The medial cortex was then cracked while closing the open wedge gap. The surfaces of osteotomy were adjusted to bring the k-wires parallel. Firm fixation was obtained by a metal plate.

The tourniquet was released and hemostasis achieved. The wound was closed in layers over the suction drain and well-padded compressive dressing was applied. A long leg plaster of Paris (POP) cast was applied at 10-15 degree of flexion at knee. POP was continued for six weeks and then range of motion exercises was started. The patients were evaluated as per criteria by Japanese orthopedic knee score at 6 months, 1 year and 2 years.

RESULTS

The mean age was 60.83 years ranging between 54 to 70 year with standard deviation of 4.764. There were 10 male and 14 female patients with 15 right sided and 9 left sided knees. Pre-operatively the mean VAS score was 5.21±1.18 which reduced to mean VAS score 0.88±0.61 post-operatively. The mean varus deformity pre operatively was 16.66º which was reduced to 0º during operation and further 5º of valgus was created intra-operatively in every case. The mean flexion deformity was 10.37º pre-operatively which was corrected to neutral post operatively in all cases. The most of the knees were graded as grade III osteoarthritis according to Ahlback's system (Table 1). Assessment of relief of pain after surgery is summarized in Table 2. The results were graded according to Japanese orthopedics knee score as shown in Table 3.

Table 1: Osteoarthritis grade (Ahlback-1968).

Grade	No. of knees
I (narrowing of joint space)	0
II (obliteration of joint space)	07
III (minor attrition of bone)	13
IV (moderate attrition of bone)	04
V (major attrition of bone)	0
Total	24

Table 2: Post-operative relief of pain.

Pain on walking	Preoperative (No. of knees)	Postoperative (No. of knees)
No pain at any time	0	6
Mild starting pain	2	18
Moderate pain	12	0
Severe pain	10	0
Severe pain at rest	0	0
Total	24	24

Table 3: Overall results (%).

Results	Pre-operative	Post-operative		
		At 6 months (%)	At 1 year (%)	At 2 year (%)
Good	0	8.33	66.67	25
Fair	0	50	25	58.33
Poor	100	41.67	8.33	16.67
Total	100	100	100	100

DISCUSSION

The reversal or arrest of degenerative process of knee by changing the alignment and transfer of weight bearing axis to a relatively better portion of knee has been advocated in the literature.[15,16,18-20] High tibial osteotomy may not provide an absolutely painless knee but brings patients in comfortable zone by correction of deformity, which ultimately leads to improved functional ability and quality of life.[20] Proximal tibial osteotomy as described by Coventry et al and Levy et al has been followed in this study.[18,20] The exact mechanism by which the patients are relieved of pain by osteotomy is not clearly understood. Some of the postulations are:

- Reduction in the intra-osseous venous engorgement which has been seen on osteo-medullography.[21,22]
- Redistribution of weight bearing stress produced by varus or valgus deformity (Coventry et al).
- Relief of tension of capsule and ligament (Lloyd et al).

Close wedge proximal tibial osteotomy has proved to a be satisfactory operative technique for the correction of varus deformity of knee and our results are comparable to those obtained by other pioneer workers.[23-26] The importance of adequate correction and maintenance of valgus alignment has been emphasized by many workers to achieve optimal clinical outcome.[27,28] This study cannot make a statement regarding the advantage or otherwise of using a closing wedge osteotomy as compared to an opening wedge osteotomy, however, review of the literature favors a closing wedge osteotomy.[29,30] Superficial infection was noted in one patient which healed with antibiotics and wound care in 2 weeks. An undisplaced fracture of lateral tibial plateau occurred in one patient which healed without affecting the joint space. Similar complications have also been reported by Hernigow et al.[31] In one patient the varus deformity persisted even after surgery which could possibly be due to error in removing the wedge at the time of osteotomy resulting in inadequate correction.

The recurrence of varus deformity with the progression of osteoarthritis has been reported in the literature.[18] However, none of the patients have shown recurrence of deformity in this study.

CONCLUSION

The study concluded that proximal tibial osteotomy is a satisfactory alternative to joint replacement surgery when the disease is restricted to medial compartment of the knee. It may be used in developing countries like India and other nations with limited resources.

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