

Original article

Evaluation of lateral closed wedge high tibial osteotomy for medial compartment osteoarthritis

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Abstract:

Introduction: Osteoarthritis of the knee is a common orthopaedic condition. Medial compartment osteoarthritis results from undue stress on the medial compartment of the knee joint following varus deformity. High tibial osteotomy (HTO) has been a long-standing treatment for osteoarthritis of the medial compartment of the knee. Although knee replacement has gained wide popularity for its treatment, still HTO is a good and cost effective procedure for young patients having good range of motion and uni-compartmental involvement. **Objective:** To evaluate the results of HTO in medial compartment osteoarthritis. **Methods and Material:** This study was conducted in a tertiary care teaching hospital of North India over a period of 3 years. The patients with disabling knee pain due to medial compartment osteoarthritis with genu varus deformity refractory to conservative treatment were treated by High Tibial Osteotomy. **Results:** Overall 40 patients with medial compartmental osteoarthritis were treated with HTO. Patients were evaluated for the severity of pain as per Visual Analogue Score (VAS). There was satisfactory pain reduction (up to 80%) in most of the patients. **Conclusions:** HTO is a good procedure for young patients with good range of motion and changes confined to one compartment only.

Keywords: High Tibial Osteotomy; osteoarthritis; medial compartment

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Introduction

The etiology of degenerative disease of the knee is multifactorial and one of the principal causative and accelerating factors is abnormal stress produced by a biomechanical alteration in the weight bearing. Even a minor degree of varus or valgus deformity of the knee alter the load on the femoral and tibial condyles and with time, may result in degenerative changes.

Medial compartment osteoarthritis results from undue stress on the medial compartment of the knee joint following varus deformity, leading initially to degeneration of the cartilage of the medial tibial plateau. This has been treated by high tibial valgus osteotomy by various techniques. These include a closing wedge osteotomy, opening

wedge osteotomy, dome osteotomy, hemicallotaxis progressive corrective osteotomy and other modifications¹⁻⁴. The osteotomy has been fixed using staples, plates, external fixators, Kirschner wires, plaster casts and combinations.^{5, 6} High tibial osteotomy is a good procedure for young patients with good range of motion and changes confined to one compartment only.

Materials and Methods:

The present study was conducted over a period of 3 years in the Department of Orthopaedics, Himalayan Institute of Medical Sciences, Swami Ram Nagar, Dehradun. The patients with disabling knee pain due to medial compartment osteoarthritis with genu varus deformity refractory to conservative treatment in the form of NSAIDS, exercises, shoe

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modification etc. were included in the study.

Antero-posterior roentgenograms of both the knees during weight bearing were taken to demonstrate the loss of articular cartilage and to measure the degree of varus. The Tibio-femoral angle of the knee was measured and the size of the wedge of the bone to be removed was calculated. The base of the wedge in mm was approximately equal to the degree of angle to be corrected. The idea was to obtain 8-10 degree of valgus post operatively. Lateral and skyline views of both the knee were also done to assess the degree of patella-femoral arthritis. Radiographic findings were classified according to Ahlback's criteria.⁷

Severity of pain was assessed on visual analogue scale (VAS). Preoperative range of motion and Patello-femoral side-to-side mobility was noted. Pain on walking and distance walked was also noted.

Exclusion criteria: The patients having femoro-tibial subluxation >1cm, Knee flexion contracture > 20 degree, Varus deformity >15 degree, gross hip and ankle deformities and obese patients (BMI \geq 30 Kg/ m²) were excluded from the study.

Surgical procedure

A lateral closed wedge High Tibial Osteotomy was performed under spinal anesthesia. In supine position, limb was exsanguinated using a pneumatic tourniquet and limb was placed over a pillow with the knee in 45° of flexion.

A lateral inverted hockey stick incision was made from a point 2 inches above the fibular head to a point one inch below the tibial tuberosity. The proximal tibio-fibular capsule was divided, cut and the fibula was made free. The proximal end of tibia was exposed subperiosteally.

Under image control, two 1.5 mm diameter kirschner (K) wires were passed from lateral to medial; one passing parallel and 2cm below to the joint line and the other placed obliquely & distally at an angle to meet the first wire medially. The size of base at the entry points of two wires was equal to the base of wedge to be removed in

mm as calculated preoperatively. The wedge was removed in between the K wires and osteotomy was completed by breaking the postero-medial cortex. The correction obtained was checked with an alignment rod placed over the center of the femoral head and the center of the knee and ankle. Osteotomy was closed and fixed with Coventry two-stepped staple.

The wound was closed in layers, well padded and compression dressing was done. Long leg POP cast applied with 10°-20° flexion at knee and correction in desired degree genu valgus was maintained. Post operatively, intravenous antibiotics were given for three days. From third postoperative day, isometric quadriceps exercises were started. The sutures were removed on 12th postoperative day. Non-weight bearing crutch walking was started as soon as the patient was able to ambulate and this was progressed to toe touch weight bearing subsequently. Cast was continued for four weeks and then check x-rays were done after removing the cast. Range of motion exercises commenced along with gradual weight bearing with support of crutches and later with a cane in opposite hand. Cases were followed up every month for first six months and then at every 6 months for successive two years.

In every follow up, the patient was assessed for union, relief of pain, range of motion at knee and distance walked without pain. The patients were evaluated as per criteria suggested by Coventry (1)

➤ **Good:** - All or most of pain relieved, 90 degree or more flexion at knee joint, back to full work

➤ **Fair:** - Bothersome pain, limited motion, mild instability or combination of these but able to work and pain less than before operation

➤ **Poor:** - Pain unrelieved or reoccurred, stiffness, instability.

Results

The present study was started in the year 2006 and overall 47 patients with medial compartment osteoarthritis of knee were enrolled in the study

Table 1: Age and Sex distribution of Patients:

| Age group (years) | Male | Female | Total |
|-------------------|------------|-----------|------------|
| ≤50 | 10 (100.0) | 0 (0.0) | 10 (100.0) |
| 51-60 | 14 (50.0) | 14 (50.0) | 28 (100.0) |
| >60 | 2 (100.0) | 0 (0.0) | 2 (100.0) |
| Total | 26 (65.0) | 14(35.0) | 40 (100.0) |

with an intention of follow up of at least 2 years. 7 patients did not complete the two years of follow up, so they were excluded and final analysis of 40 patients was done. The age of the patients ranged from 47-62 years; mean age being 54.9 years. Majority (65 %) of the patients were males. Twenty four (60%) patients had right knee involved and sixteen (40%) had left knee involved. (Table-1) Severity of pain was assessed on Visual Analogue Scale (VAS) pre-operatively. No patient had VAS score < 5 (Table-2). Maximum number of patients (70%) had a score of 7-8 according to VAS. Post-operatively, at the 2 years follow up, 75% of the patients were in VAS category 1-2 and 20% in 3-4. Only 2 patients (5 %) had poor VAS score of >5. Complete relief of pain could not be achieved, which may be due to the preexisting damage of the joint cartilage.

Table 2: Distribution of Patients by VAS:

| VAS | Pre-Op | At 2 years follow up |
|------|---------|----------------------|
| 1-2 | 0 (0) | 30 (75) |
| 3-4 | 0 (0) | 8 (20) |
| 5-6 | 10 (25) | 01 (2.5) |
| 7-8 | 28 (70) | 01 (2.5) |
| 9-10 | 2 (5) | 0 (0) |

Pre-Operative Varus Deformity was 7-8° in twenty six (65 %) patients (Table-3). Preoperative range of motion was assessed in all forty patients and ten (25%) were in the group ranging 0-130 degree. Preoperatively majority of the patients (65 %) experienced pain in walking for less than 100 meters of distance.

Table 3: Distribution of Patients by Pre-operative Varus Deformity:

| Tibio-femoral Angle | No. of Patients (40) | Percentage (%) |
|---------------------|----------------------|----------------|
| 5-6 | 0 | 0 |
| 7-8 | 26 | 65 |
| 9-10 | 10 | 25 |
| 11-12 | 4 | 10 |
| 13-14 | 0 | 0 |

In all the patients, postoperative Tibio-femoral angle of > 7 degree was achieved. In majority of the patients, valgus angle of 9-10 degree was obtained. Postoperative range of motion remained same in

almost all the patients as found preoperatively.

Table 4: Distribution of Patients by Post-operative Valgus Angle:

| Tibio-femoral Angle | No. of Patients (60) | Percentage (%) |
|---------------------|----------------------|----------------|
| 5-6 | 0 | 0 |
| 7-8 | 18 | 45 |
| 9-10 | 20 | 50 |
| 11-12 | 02 | 5 |

Table 4: Distribution of Patients by Coventry criteria:

| Results | No. of Patients | Percentage |
|---------|-----------------|------------|
| Good | 34 | 85% |
| Fair | 4 | 10% |
| Poor | 2 | 5% |

Time of union at osteotomy site in most of the patients ranged between 12 to 14 weeks. Overall two patients (5%) developed superficial wound infection and one patient developed delayed union. In the present study, none of the patients had knee instability.

Out of 40 patients, 85% (34) patients showed good results, 10% had fair results and 5 % had poor results (Table -4).

Discussion

Asymmetrical loading of one or the other compartment of the knee in the presence of varus or valgus deformity is a major contributory factor for joint degeneration. It is rational to correct malalignment, which would transfer the load to the less affected compartment of the knee to relieve clinical symptoms and hopefully slow down the progression of degeneration^{8, 9}. HTO, by various techniques, is widely accepted as a method of treatment for uni-compartmental osteoarthritis of the knee.

In our study, we preferred lateral closing wedge osteotomy over medial open wedge osteotomy as favoured by many studies^{1, 2}. Closing wedge osteotomy is done through the cancellous bone that would minimize chances of delayed union or nonunion. It is an excellent operative option with a long experience of success with minimum chances of nonunion.^{1-4, 9, 10}. The osteotomy close to the joint line ensured more accurate correction of deformity.

No difficulty was encountered by us in the above mentioned technique for removal of the wedge and correction of tibio-femoral angle.

Different types of the implants have been used for fixation of osteotomy. Less extensive implants would probably cause least disturbance for any future replacement procedures^{9, 11, 12}. We used single staple for fixation as it is a simple procedure and the implant is cheap. It was found that fixation with a single staple supplemented with POP cast is an effective method to maintain the correction achieved. Many authors have used staple as a fixation implant^{13, 14}.

HTO provides an alternative to unicompartmental replacement or total knee arthroplasty in selected

patients. When properly performed, HTO should not much compromise later arthroplasty, if it becomes necessary. The patient can achieve appreciable relief of pain lasting for 10-15 years with normal proprioception and with no drastic restriction of preoperative activities.¹⁵⁻¹⁷

High tibial osteotomy is a good and cost effective procedure for patients having unicompartmental osteoarthritis. We recommend this as a good substitute for unicompartmental knee replacement in the patients with financial constraints.

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