ORIGINAL ARTICLE

MEDIAL OPEN WEDGE HIGH TIBIAL OSTEOTOMY FOR VARUS ARTHRITIC KNEES BY DYNAMIC EXTERNAL FIXATOR SYSTEM (DISTRACTION CALLOTASIS)

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ABSTRACT

Introduction: Varus arthritic knee is a major disabling condition in a relatively younger individual. Fixator assisted medial open wedge osteotomy has been found to be a good modality of treatment with promising results.
Material & methods: In last 6 years total 52 patients with varus arthritic knee were treated with medial open wedge HTO fixed with external fixator and gradual distraction. The required degree of correction was calculated pre-operatively on a long axis weight bearing films. Distraction of Osteotomy was started at 1 week post operatively and continued till desired degree of correction was achieved. Patients were assessed clinically and radiologically by check X-rays periodically. Fixator was removed after satisfactory consolidation of osteotomy site on x-ray and results were assessed. The follow-up ranged from 3 months to maximum of 6 years.
Results: Excellent pain relief was obtained in 43 patients out of 52. Four patients had good pain relief and 3 patients were not satisfied and had persistent symptoms. One patient had loss of correction after removal of fixator and 1 had over-correction. Pin-tract infection was found in 2 patients. None of the patients had non-union of osteotomy or conversion to TKR till last follow-up.
Conclusion: Medial open wedge osteotomy with dynamic external fixator has many advantages over other modalities of treatment with promising results. It gives life to varus arthritic knees in younger individuals.

Keywords: Medial Open Wedge, HTO-Ex Fix, Tibia, Osteoarthritis, Total knee replacement

Abbreviations: HTO (High Tibial Osteotomy), TKR (Total Knee Replacement), OA (Osteoarthritis)

INTRODUCTION

Osteoarthritis of the knee in relatively younger patients is a major disabling condition[1]. Joint Replacement for OA is the ultimate treatment option but only for those who are above 60 and not very physically demanding[2]. If the axis of the varus angle is realigned in young and active patients having arthritic process limited to medial compartment[1,2,3], with open wedge HTO to unload the medial compartment, patients get significant pain relief and surgery adds life to the knees[1,4,5,6,7].

The present study is to evaluate the results of open wedge HTO by Dynamic External Fixator as a treatment modality to correct the varus deformity and stabilization of osteotomy as compared to other modalities [1,8-12]

MATERIALS AND METHODS

Apart from routine investigations, pre-operative evaluation of the degree of varus and required degree of correction was carried out by taking full-length weight bearing x-rays and by drawing axis of weight bearing and anatomical axis and calculating desired degree of correction.

Pre-operative counselling of patients regarding the time up to which the external fixator device to be kept on the legs and need for regular periodical physical & radiological check was done.

Patient with intra-articular pathologies, ligament laxities and other deformities were excluded from the study.

SURGICAL TECHNIQUE

All the patients were operated under spinal anaesthesia and in supine position. Tourniquet control and IITV

guidance were used. The preferable position for surgeon was on medial aspect of patient's knee. Patient's limb was kept on 2 pillows (for lateral radiography) and in neutral rotation with support below trochanter. The first pin was inserted at the level of fibular head in lateral view as near the posterior cortex of tibia as possible. The second pin was inserted parallel in AP and anterior to 1st pin in lateral view. Distal two pins were inserted in shaft of tibia at the junction of middle 1/3 and lower 1/3, after marking location of clamp holes on tibia. Osteotomy was done obliquely directed towards head of fibula by a 2 cm incision over medial cortex, after conforming position by inserting guide-wire under IITV guidance. Care was taken not to break the lateral cortex of the apex of osteotomy. The Fixator is applied. Completion of Osteotomy was confirmed by slightly distracting the osteotomy & observing the opening of the wedge under IITV. Osteotomy is closed again and fixator is locked. The wound is closed in layers. Check X-Rays were taken immediately post-operatively. Patients were discharged after 5-7 days of surgery.

Prior to discharge patient & relatives were taught distraction on another fixator device and pin tract care. Fixator was unlocked and distraction was started 1 week after the operation. Distraction was done by 1/4th turn every 6 hours i.e. 1 mm/day. At 2 weeks stitches were removed, check x-rays were taken and adequate opening of Osteotomy was confirmed. The MPTA (Medial Proximal Tibial Angle) was measured to assess progress.

X-Rays were repeated at the end of one week, two weeks, four weeks, Six weeks and Twelve weeks or the before the removal of fixator On full length X-Ray, we looked for The MPTA (Medial Proximal Tibial Angle) was as projected/predicted from the pre-op full length x-ray. The HKA (Hip knee angle) the angle between the lines joining centre of femoral head to centre of knee to centre of ankle which should be between 175 to 178 on lateral view. The mechanical axis of the limb (line joining centre of femoral head and centre of ankle) should be passing through the base of lateral tibial spine. The FTA (femoral tibial angle) should be between 8 to 14 degrees.

Physiotherapy in the form of Knee bending, static quadriceps & hamstring and ankle-toe movements were started at the earliest. Non-weight bearing walker was used for walking for 6 weeks. Weight bearing was allowed after confirming callous formation on X-ray.

At the end of 4 weeks check x-rays were done to confirm the distraction gap by calculating MPTA. We also looked for signs of pin-tract infection and non union. Gait of the patient and proper execution of physiotherapy was observed. At six weeks, when the patient was nearing completion of distraction and correction, full length weight bearing film was taken.

Once the correction was deemed to be complete, the fixator was locked by tightening the central body locking nut. The patient was then allowed bearing weight with the help of a walker.

Further follow-ups were done every three weeks at which time only spot films were taken to see the progress in consolidation of the regenerate & signs of loosening of pins.

At the end of 3 months usually the regenerate was fully consolidated and patient was allowed full weight bearing using a walker or stick.

Prior to removal of pins, we performed "stress test". The patient was asked to walk full weight bearing without support in clinic to observe gait and signs of pain or limp. After unlocking the nuts, patient was allowed weight bearing and walking. The Fixator was removed with pins in situ & patient is allowed walking with full weight bearing, if there is pain or limp, the fixator is reapplied and maintained for few more days. Finally when there was no pain, fixator and pins were removed in OPD. No cast was given. Six monthly reviews were done with x-rays to see maturation of regenerate, opening of medial compartment and cartilage healing. At one year another full length x-ray was taken to see maintenance of re-aligned axis.

RESULTS

During 2005-2011, 52 patients having varus arthritic knees were operated by medial open wedge HTO and gradual distraction with fixation by dynamic external fixator. The age of the patients ranged from 35 to 67 years.

Table 1: Age and sex distribution of Patients

Age	Male (%)	Female (%)	Total (%)
35-44	3 (27.3)	8 (19.5)	11 (21.2)
45-50	2 (18.2)	9 (22.0)	11 (21.2)
51-55	2 (18.2)	9 (22.0)	11 (21.2)
56-60	0 (0.0)	9 (22.0)	9 (17.3)
61-64	3 (27.3)	4 (9.8)	7 (13.5)
65-67	1 (9.1)	2 (4.9)	3 (5.8)
Total	11 (100.0)	41 (100.0)	52 (100.0)

Out of 52, 11 patients were males and 41 were females. In 41 patients unilateral and in 11 patients bilateral HTO was done. The average operative time was 60 minutes.

We encountered pin-tract infection in 2 patients, loss of reduction in 2 patients, micro-fracture at the apex of osteotomy in 1 patient and over correction in one patient. None of our patients had infection at osteotomy site, non union or ligament laxity after the surgery.

Minimum follow-up was 3 months & maximum follow-up was 6 years. The evaluations were carried out as per Oxford Knee Score[10]. The patients were assessed for pain, walking, stair climbing, gait, range of

movements, flexion deformity, ligament laxity, and radiological evaluation on each follow-up examination. The pre-operative score which was in the range of 20 to 29, had improved to 40-48 after HTO in majority of the patients.

Table 2: Results as per Oxford Knee Score

Oxford Knee Score	Patients (%)
Pre-Operative Score	
24	1 (1.9)
25	5 (9.6)
26	9 (17.3)
27	10 (19.2)
28	12 (23.1)
29	15 (28.8)
Post-Operative Score	
40	5 (9.6)
41	0 (0.0)
42	4 (7.7)
43	4 (7.7)
44	4 (7.7)
45	3 (5.8)
46	2 (3.8)
47	10 (19.2)
48	20 (38.5)

None of our patients required Total knee replacement after HTO.

DISCUSSION

High Tibial Osteotomy is an established procedure for treating Varus arthritic knees in relatively young, active individuals. The aim of this study is to evaluate advantages of Dynamic External Fixator as a modality of fixation of an open wedge osteotomy as compared to other modalities e.g.: TOMO-fix plate, Puddu plate etc[1,5,8,9,11].

Closed wedge and open wedge osteotomies are two modalities of high tibial osteotomies.

Open wedge HTO is better than closed wedge HTO as the anatomy ofupper tibia is significantly changed in closed HTO making future TKR difficult. The conventional way of fixation of HTO with plates has many disadvantages as it needs more surgical dissection and chances of infection and non-union are high. Also conventional open wedge HTO which needs bone graft also carries donor site morbidity.

The fixator assisted medial open wedge high tibial osteotomy has significant advantages. It is relatively a simpler procedure.[3] External fixator is easy to apply. Surgical incision is less than 2 cm. The soft-tissue dissection/surgical incision are limited to osteotomy site only. There is no major dissection, so future replacement is easier as far as skin is concerned[13.] Accurate degree of distraction, correction of varus is possible. Correction can also be controlled post-operatively due to modularity of external fixator[3,14]. There is no bone graft donor site morbidity[2,12,15]. There is no need for anaesthesia for removal of implants as external fixator can be removed on out-door patient basis. Good ligamentotaxis of medial ligaments can be achieved with distraction open wedge osteotomy. Medial open wedge Osteotomy has been established to be superior to closed lateral wedge adding life to knees[1,16]. As there is no change in anatomy of upper tibia, future TKR is not jeopardised[1,13,17,18]. Medial Open Wedge HTO provides subjective improvements in pain and quality of life. Studies have shown articular cartilage recovery secondary to improved mechanical environment by unloading the medial compartment by open wedge HTO[5].

This surgery is not free from complications at the same time. Pin tract infection can be distressing and painful. This can be prevented by educating the patient for pin-tract care and sterile cleaning of pins regularly at home. Use of HA coated pins have less incidence of infection. Patient has to carry device on leg till the treatment is over. More frequent follow-up visits & regular radiological assessment is required during distraction phase to evaluate correction of varus. Patient should be counselled properly regarding advantages of the device like accurate degree of correction and avoidance of bone Grafting.

We feel that still longer follow-ups are required to evaluate pain relief, maintenance of correction & conversion to TKR if at all. Considering above observations, Medial open wedge HTO by external fixator has been found to have promising results in young individuals with arthritic knee.

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