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Unicompartmental osteoarthritis of the knee: an innovative osteotomy

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Abstract Thirty patients with unicompartmental osteoarthritis of the knee and genu varum deformity ranging from 2° to 15° were treated with high tibial osteotomy by using a medial open wedge, stabilized and distracted with our fixator. Pain relief and correction of deformity were achieved in all except two cases.

Résumé Etude de 30 patients, avec arthrose unicompartmentale du genou traitée par ostéotomie tibiale, d'ouverture interne, fixée par un nouveau fixateur externe. Tous les patients avaient un genu varum entre 2 et 15. Le fixateur fut laissé en place jusqu'à la consolidation. La réaxation du genou et la disparition complète des douleurs furent obtenues dans 28 cas sur 30.

Introduction

We have treated 30 patients with unicompartmental osteoarthritis with a high tibial osteotomy (HTO) stabilized and distracted by our own external fixator.

Patients and methods

Between 1994 and 1998 we treated 30 patients (40 knees) with medial compartment osteoarthritis of the knee with a gradual opening wedge upper tibial osteotomy. Stabilization and distraction at the osteotomy site was performed with our fixator/distractor (Fig. 1), which was designed and made in our orthopaedic workshop. It is made of stainless steel and consists of three units. The central hexagonal hollow threaded portion is a turn-buckle. There are two end pieces, one T-shaped and one straight; both are threaded and can be introduced in or out of the turn-buckle for the

purposes of distraction or compression. The end pieces have holes for the passage of Schanz screws. One full turn of the hexagonal turn-buckle leads to distraction of about 3 mm; thus, one third of a full thread per day will distract by 1 mm. The preoperative tibia femoral angle was measured on A-P weight-bearing X-rays (Fig. 2). All operations were performed under general or regional anesthesia with a tourniquet and X-ray control. The lateral hinge of cortex and periosteum was maintained. Osteotomy or excision of a part of the fibula was performed in two patients. Postoperative mobilization exercises started on the day of operation. The patients remained non-weight-bearing until 10 days post-operatively when partial weight-bearing commenced. The pin sites were dressed on alternate days. Full weight-bearing was allowed after about 3 weeks. Gradual distraction was started from the seventh to tenth postoperative days and proceeded at a rate of 1 mm per day until the deformity was corrected clinically and radiologically, and

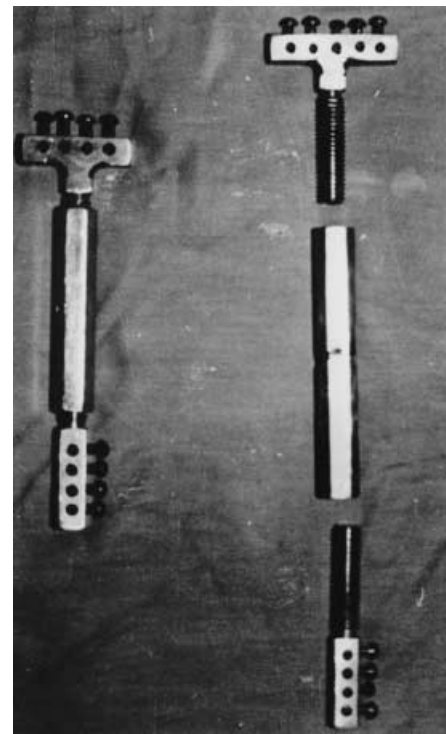


Fig. 1 External fixator-cum-distractor

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Fig. 2 Preoperative X-ray, X-ray with distraction, and final X-ray of a patient with unicompartmental osteoarthritis of the knee

7–10° of valgus achieved. The fixator-distractor was retained until consolidation of the osteotomy had occurred (2–4 months). The results were evaluated according to relief of pain, correction of deformity, union of the osteotomy and stability and range of movement of the knee joint.

Results

Thirty patients (40 knees) underwent HTO; the age ranged from 45–70 years. The degree of genu varum ranged from 2–15°. Patients with a flexion contracture of more than 15° and limitation of active flexion beyond 90° were excluded from the study. The period of follow-up ranged from 2–5 years.

Good results with complete relief of pain, correction of deformity with improved range of knee movement, no instability and satisfactory union of the osteotomy occurred in 28 cases (Table 1). Increased pain from the patellofemoral joint was not reported. There were two poor results: in one the patient developed septic arthritis of the knee after a fall, and one of the proximal Schanz screws penetrated the knee joint, requiring the fixator to be removed. In the second, the fixator was removed prematurely after only 2 months with a recurrence of a symptomatic deformity. Superficial pin tract sepsis, particularly in relation to the proximal pins, was the main complication (Table 2). Temporary limitation of movement of the knee occurred in 5 cases but the preoperative range of movement was regained after removal of the fixator.

Table 1 Postoperative tibiofemoral angle

Postoperative tibiofemoral angle achieved	No. of knee joints
No correction	2
Neutral	2
0–5° valgus	4
6–10° valgus	32
Total	40

Table 2 Complications

Complications	No. of cases
Superficial pin tract infection	10
Septic arthritis	1
Temporary knee stiffness	5
Loss of correction	1
No correction	1

Discussion

HTO is the established method of treatment for unicompartmental osteoarthritis of the knee. The medial compartment is the most commonly involved. Coventry, in 1965 [2], reported the results of HTO, proximal to the tibial tubercle, using staple fixation in 22 patients (30 knees). The results were satisfactory and he considered that the osteotomy should fulfil the following criteria: it should fully correct or slightly over-correct the varus or valgus deformity; it should be near the site of deformity; it should be performed through cancellous bone in order to ensure union; it should allow early movement of the knee with weight-bearing; and it should provide the opportunity of intra articular exploration of the knee joint at the time of operation. The calculation of the amount of correction required had previously been described by Bauer [1]. In 1979 Coventry [3] reported an 18 year follow-up of 213 patients with medial compartment osteoarthritis of the knee with a varus deformity; and emphasized that good results could be obtained if the degenerative changes were predominantly unicompartmental and if there was a good range of movement of the knee. Poor results were seen in knees with a flexion contracture of more than 15° or with limitation of flexion beyond 90°. The main limitations of the procedure were caused by difficult access to the lateral aspect of the proximal tibia with possible damage to the lateral popliteal nerve; alteration of the kinetics of the patellofemoral joint; the requirement, at operation, to obtain accurate closure of the osteotomy; and local complications following the use of staples or cast immobilization with subsequent limitation of movement of the knee joint. A medial-opening wedge osteotomy with bone graft has been described for the treatment of unicompartmental osteoarthritis. The main disadvantages of this procedure are a tightening of the patellar ligament with increased postoperative patellofemoral symptoms; the requirement for bone graft and prolonged immobilization.

The complications of these methods may be reduced by using the technique that we describe, which also has various advantages: accurate preoperative measurement is not required as the correction is obtained gradually and assessed clinically and radiologically; there is no shortening of the tibia; and there is no risk of damaging the lateral popliteal nerve or the proximal aspect of the fibula. The range of movement of the knee is maintained with less postoperative physiotherapy and early rehabilitation. There are no internal fixation devices and no cast immobilization. There is no requirement for bone graft with the associated local morbidity. The length of stay in hospital is short and the required distraction can be performed by the patient. Accurate and controlled correction of the deformity can be achieved. The osteotomy site can be compressed in the postoperative course if the amount of postoperative new bone formation at the osteotomy site seems poor; it may then be distracted again.

The complications and limitations of this procedure include pin track sepsis. Although the fixator-distractor

gives reasonable stability, the quality of external fixation is not as good as that obtained with some other external fixation devices such as the Ilizarov frame. The fixator is applied medially and this may interfere with gait and give discomfort at night.

We conclude, however, that HTO with gradual distraction with this technique is a safe, simple and very effective treatment for patients with unicompartmental osteoarthritis of the knee.

References

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