CASE REPORT

Stretching the indications: high tibial osteotomy used successfully to treat isolated ankle symptoms

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SUMMARY

High tibial osteotomy (HTO) is successful in treating symptomatic varus arthritis of the knee. We present a case where ankle pain and instability were attributed to varus ankle malalignment. This was found to be secondary to constitutional varus of the proximal tibia but the patient's knee was asymptomatic. The decision to operate on an asymptomatic knee in the hope of improving ankle symptoms took a period of careful consideration, planning and discussion. HTO was performed without immediate complication and the patient reported an excellent outcome with marked improvement in Mazur's foot and ankle score from 18 to 85. In well selected and planned cases, HTO may be considered as an instrument of deformity correction with improvement in symptoms from joints distant to the surgical site.

BACKGROUND

High tibial osteotomy (HTO) is considered when young active patients with varus knees are symptomatic from medial compartment arthritis. This is a pre-arthroplasty procedure aiming to reduce pain and prolong function by unloading the damaged medial compartment.¹ The failing knee joint is preserved with successful short-term and mid-term results.^{2–5} Improvements in technique and the mechanical properties of fixation devices have led a revival of interest.⁶ In 2005, the International Society of Arthroscopy, Knee Surgery and Orthopaedic Sports Medicine (ISAKOS) defined indication criteria for HTO.⁷ Typically these younger patients were not obese, with metaphyseal varus and isolated medial joint line pain. Surgeons with greater experience have since evolved these criteria, such that osteotomies are now being performed in patients under 40, over 60 and in overweight patients.⁸ In selected cases osteotomy surgery is being combined with additional joint preserving procedures such as cartilage surgery and meniscal transplantation.⁸ The majority of literature addresses how HTO affects the knee.

There is one series reporting on 16 knees with symptomatic varus arthritis in the ankle and knee.⁹ HTO was shown to be beneficial with improvement in ankle and knee scores. As the knee was brought into valgus, the degree of ankle varus was subsequently reduced.⁹ Realignment surgery has been performed for symptomatic ankle arthritis but in a study of 35 patients, most of whom received benefit from supramalleolar osteotomy, there was exclusion of high tibial osteotomies.¹⁰

We present a case report where HTO was used to address symptoms arising from the ankle joint. Primary constitutional varus was present in the knee, which itself was asymptomatic.

CASE PRESENTATION

A 46-year-old male personal trainer, presented with a two-decade history of foot and ankle symptoms. While serving as a paratrooper and aged 26, he had an accessory navicular removed from the dorsal aspect of his left foot. This procedure was complicated by an insidious onset but marked pes planus. Precise information was absent from his notes and so it was assumed that his deformity was subsequent to iatrogenic injury to tibialis posterior tendon. Progressive pain caused him to pursue calcaneal osteotomy and flexor hallucis longus transfer, aged 43. This surgery (figure 1) improved his pes planus and restored a symmetrical heel shape when compared with the contralateral foot and ankle. However, his symptoms persisted with exertional pain, swelling and instability on uneven ground.

Examination on the couch revealed a neutral and symmetrical heel appearance. The left foot had increased mobility into varus and when standing his hindfoot was markedly varus. The hindfoot and mid-foot were tender without localised swelling. Bilateral mild genuvarum was noted. His left knee was non-tender, stable and unrestricted in movement. Hip movements were symmetrical, full and pain free. Examination of the spine was normal with no neurological abnormality.

INVESTIGATIONS

Plain radiographs (figure 2) of the knee demonstrated primary or 'constitutional' varus which was confirmed on long-leg alignment views (figure 3) where Mikulicz's weight-bearing line bisected the medial compartment of the knee at 26% of the tibial plateau (medial to lateral). The tibia was examined according to the parameters defined by Paley *et al*¹¹ (table 1). The lateral distal tibial angle at the ankle was normal but the reduced medial proximal tibial angle (MPTA) at the knee indicated that the deformity was proximal in the tibia. His ankle was noted to have 7° of varus talar tilt⁹ (figure 4). An MRI of the knee was normal.

TREATMENT

We considered the patient and generated the hypothesis that his ankle symptoms could be attributed to malalignment. Working from the first principle that true alignment improves limb function we proposed realignment surgery. HTO, supramalleolar

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Figure 1 Calcaneal osteotomy prior to this presentation which was fixed with a solitary screw.

osteotomy and revision of the calcaneal osteotomy were considered. Our analysis had demonstrated that the deformity was proximal in the tibia but his symptoms were centred on the ankle. Surgeons are naturally apprehensive when operating without symptoms; hence, this was a quandary. To resolve this, a medial offloading brace was successfully trialled. The patient was compliant and reported reduced pain severity and improved ankle stability, especially when ascending stairs. The success of this bracing trial increased our confidence in the anticipated success from HTO. By this stage the patient had exhausted conservative treatment modalities and was pursuing definitive surgery. Ankle arthroplasty could not be justified with preserved joint spaces. Ankle arthrodesis was ruled out because stiffness would limit the patient's ability to work as a personal trainer.

We were aware that employing HTO to treat isolated ankle symptoms would be considered an 'off piste' indication. Subsequently the literature was searched for guidance on this indication. A paper on ankle realignment surgery¹⁰ was identified but this excluded patients with proximal tibial osteotomies. Therefore, we sought the consensus of expert opinion and discussed this patient's case at the British Orthopaedic Foot and Ankle Society and the Basingstoke knee osteotomy masterclass. No immediate contraindication was lodged and so the patient was offered HTO surgery. He was made aware of our rationale for choosing this operation and received the guarded counselling that there could be no guarantee of symptomatic improvement. Had his ankle symptoms failed to improve, we remained assured that HTO would benefit his tibial varus in the long term.

The long-leg views were annotated using a modification of the Miniaci method¹² through a PACS (Picture Archiving and Communication System) browser to generate a preoperative wedge angle of 7.5° and opening distance of 8.5 mm. Through a medial approach above the pes anserinus, an opening wedge HTO was performed and fixed at the predetermined angle, with a Tomofix plate (Synthes, Welwyn Garden City, UK). The patient recovered without any immediate complication and was discharged with a rehabilitation programme in place.

Figure 2 Orthogonal weight-bearing radiographs of the left knee demonstrate mild joint space narrowing in the medial compartment.

Figure 3 The preoperative alignment view showing the Mikulicz weight-bearing line passing through the medial compartment in this varus knee.

OUTCOME AND FOLLOW-UP

The patient was delighted with the outcome of his surgery, stating a marked reduction in pain and improved stability in the ankle. At 8 weeks he volunteered a subjective improvement in ankle pain of 90%. Postcorrection alignment views (figure 5) yielded the improved measurements documented in table 1.

At 3 months he mentioned that the screw in his calcaneus was more tender and prominent which we believe is due to subtle change in shape of his leg causing a localised pressure effect upon his footwear.

Table 1 Alignment measurements made from long leg weight bearing radiographs, according to standard nomenclature¹¹ and talar tilt as defined by Takeuchi⁹ (where positive talar tilt is varus and negative is valgus)

Angle (population normal)	Preoperative	Postoperative
aTFA	7°	9.2
mTFA	1°	2.8
MPTA	87°	90.9
LDTA	89°	89.5
JLCA	0–2°	1.2
Talar tilt	0°	–0.9

aTFA, anatomical tibiofemoral angle; JLCA, joint line convergence angle; LDTA, lateral distal tibial angle; MPTA, medial proximal tibial angle; mTFA, mechanical tibiofemoral angle.

At 6 months he was able to play football with only transient discomfort around the medial proximal tibia, correlating with the site of the tibial plate. Radiographs at 6 months show excellent new bone formation at the site of the osteotomy.

At 8 months he was listed for removal of the calcaneal screw, a relatively minor surgical procedure. He has otherwise obtained an excellent functional result from this surgery. The objective improvement in patient reported outcome measures (Mazur,¹³ Lysholm,¹⁴ Oxford¹⁵ and Kujala¹⁶) are shown in table 2.

DISCUSSION

In this case deformity in the lower limb caused ankle pain and instability. We worked from first principles and hypothesised that surgery to correct deformity and restore alignment would improve the patient's symptoms. We searched the literature to find examples of HTO used to treat isolated ankle symptoms and the absence of such a report has prompted us to prepare this manuscript. Unable therefore to practice direct evidence-

Figure 4 Weight-bearing views of the ankle showing a varus talar tilt of 7°.

Figure 5 The postoperative alignment view showing a correction such that Mikulicz weight-bearing line now falls just lateral to the lateral eminence. Notice how swinging the proximal wedge open has altered the slope of the ankle joint.

Table 2 Improvement in patient reported outcome measures (PROM), recorded prior to surgery and at eight month follow up. PROMs are recorded thus: Mazur (0–100), Lysholm (0–100), Kujala (0–100), Oxford (0–48)

Joint	PROM	Preoperative	Postoperative
Ankle	Mazur	18	85
	Lysholm	55	79
Knee	Kujala	55	74
	Oxford	37	40

based medicine, we undertook consultation with experienced foot and ankle and knee specialists. Having made the decision to proceed the operation was performed without complication and a successful outcome was achieved with marked improvement demonstrated in the Mazur foot and ankle score as well as neutralisation of the talar tilt on radiographs. Our assurance that HTO would be of benefit to his varus knee are borne out by the improvement observed in his knee scores.

While these improved scores were achieved in the short-term following the acute correction of HTO. The tomofix plate is stable enough to maintain correction until union at the osteotomy site has occurred. We attribute the knee and ankle score improvement to the normalised MPTA and talar tilt. Provided that the normalised alignment is maintained then there is no reason to suspect that the beneficial effects of this surgery should not be sustained.

Thorough clinical examination is essential and in this case the hindfoot varus deformity only became apparent when the patient was standing. We recommend that patient selection prior to HTO remains critical as do the processes of preoperative planning to maximise the chances of a successful outcome. In this case we did not recognise a candidate for HTO from the typical patient group.⁷ Instead the principle that alignment is critical to limb function justified our considered decision to proceed with HTO.

In well selected and planned cases, HTO can be considered as an instrument of deformity correction with improvement in symptoms from joints distant to the surgical site.

Learning points

- High tibial osteotomy (HTO) is a successful operation for patients with symptomatic varus knee arthritis.
- In this case, the indications for HTO were stretched to include ankle symptoms secondary to a proximal tibial deformity but without knee pain.
- Alignment is critical to limb function.
- Restoration of normal alignment can result in excellent outcomes.

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Competing interests None.

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