LESSER METATARSAL TECHNIQUES FOR RELIEF OF THE IPK

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INTRODUCTION

Lesser metatarsal osteotomies have very specific indications, and are used primarily to alleviate focal metatarsalgia secondary to intractable plantar keratoses (IPK's), which are unresponsive to conservative care. Frequently the metatarsal head is plantarflexed, as evidenced on an axial sesamoid x-ray, however, this is not necessarily the case in the presence of a thick, sensitive, and nucleated IPK. The goal of surgery is to relieve focal plantar pressure by elevating the metatarsal head.

Metatarsal elevating osteotomies are performed in the metaphyseal section of bone, where there is a rich blood supply and ample cancellous bone, both of which augment healing. Surgical planning requires attention to the direction and placement of the osteotomy, as well as its apex or hinge.

Execution of the osteotomy requires the delicate use of a power saw. The instrument must produce high-torque with little cross-vibration. One must also use a thin, sharp, saw blade to make the cut as exact as possible. The amount of bone removed depends on the relative prominence of the metatarsal head and the length of the lever arm. Reciprocal planing will help to make an exact cut, while keeping the hinge intact. Frequent irrigation with cool saline during the cutting will help prevent thermal osteonecrosis.

LESSER METATARSAL OSTEOTOMIES

There are five osteotomy techniques currently recommended for the relief of lesser metatarsalgia secondary to an intractable plantar keratosis. These will be presented individually with clinical illustrations.

Plantar Condylectomy

This procedure is indicated in older, more sedentary patients, and when osteoporosis prevents utilization of an osteotomy which requires bone healing. It can also be used when previous metatarsal elevation procedures have failed. Complications include flexor pad adhesions and "floating toes".

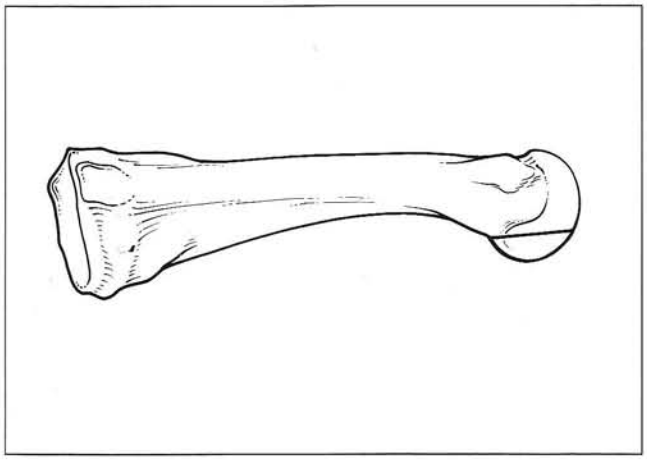

Figure 1. Orientation of plantar condylectomy on a lateral view.

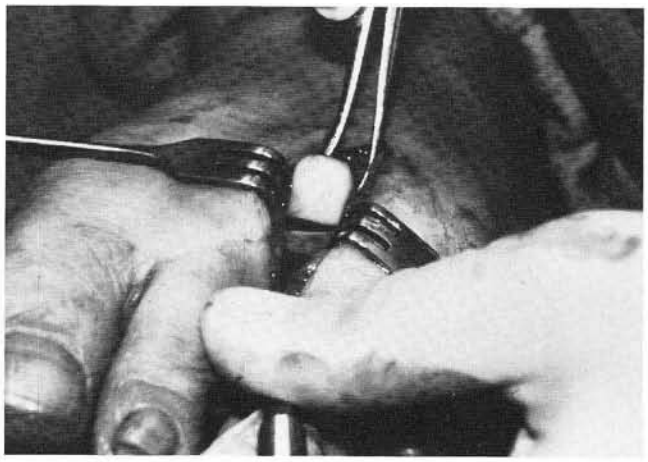

Figure 2. Resection of plantar condyle.

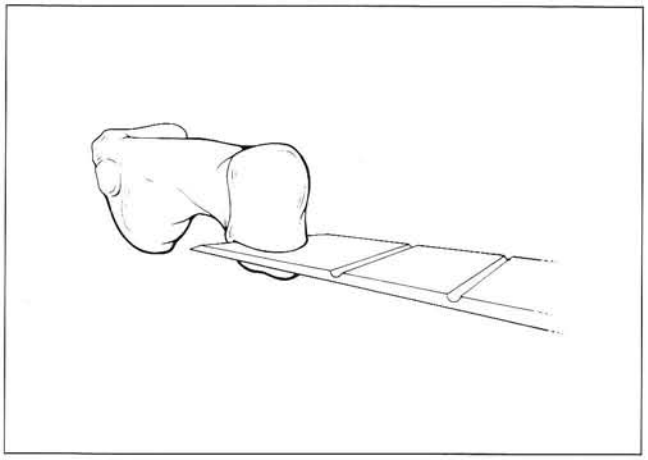

Figure 3. An osteotome or power saw may be utilized for the osteotomy.

Figure 4. Removal of resected plantar condyle.

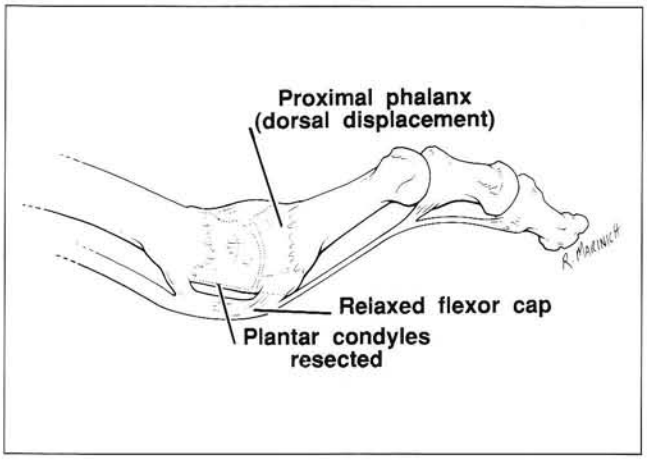

Figure 5. Mechanical changes following resection of plantar condyles leading to digital instability.

Distal V-Osteotomy

A distal, sagittal plane, "V" osteotomy allows the metatarsal head to be maneuvered either dorsally or plantarly. Stable fixation is recommended, as motion at the osteotomy site can lead to callus formation and delayed healing. In addition, transfer lesions are potential complications. The technique can also be adapted to shorten or lengthen a lesser metatarsal.

Figure 6. Incisional approach to the distal lesser metatarsal osteotomy.

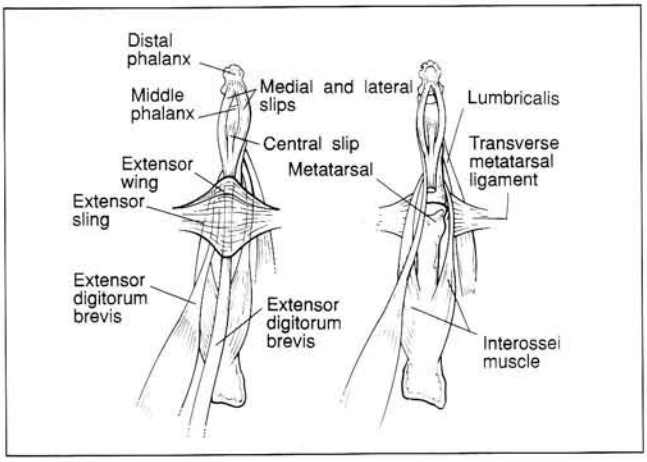

Figure 7. Exposure of the metatarsal head between the long and short extensor tendons.

Figure 8. The osteotomy is placed at the surgical neck, with the arms of the "V" at 60° to the long axis of the metatarsal.

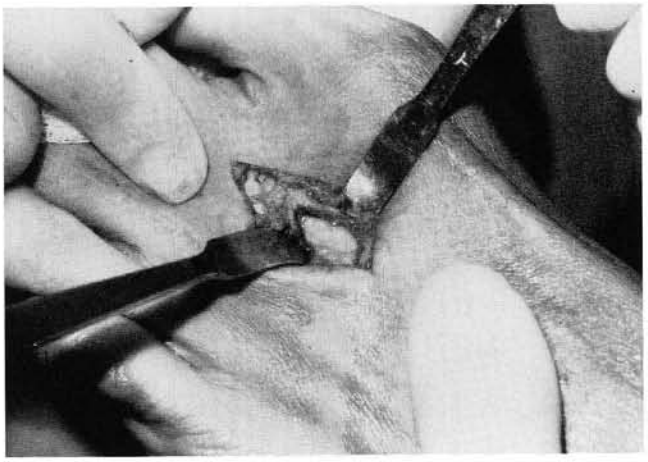

Figure 9. The metatarsal head is elevated and impacted on the metatarsal shaft.

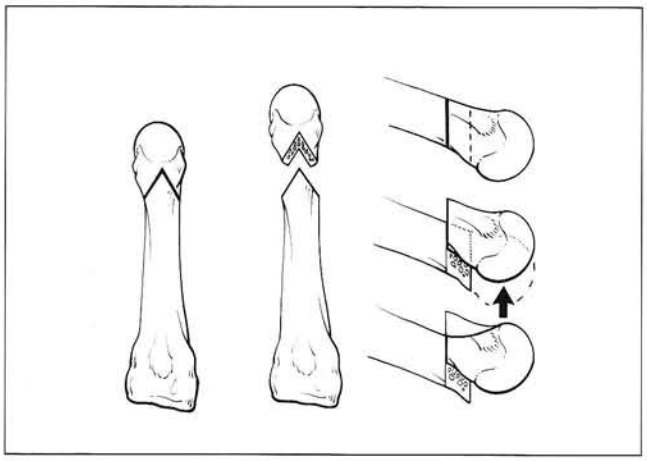

Figure 10. The capital fragment is repositioned dorsally.

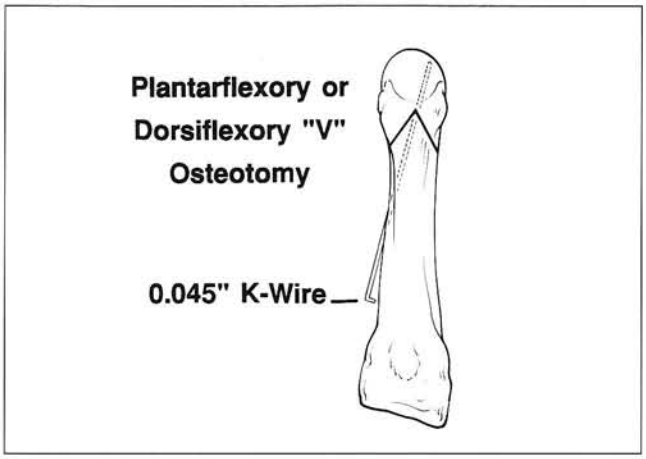

Figure 11. The "V" osteotomy is stabilized with a 0.045" K-wire, and advanced into subchondral bone.

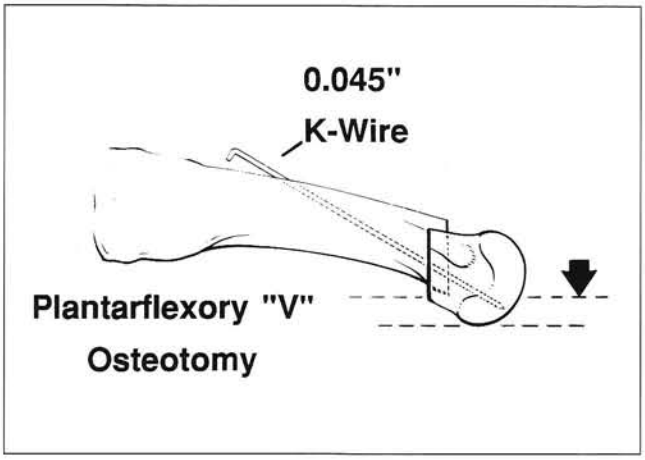

Figure 12. The capital fragment can also be displaced and stabilized in a more plantar position.

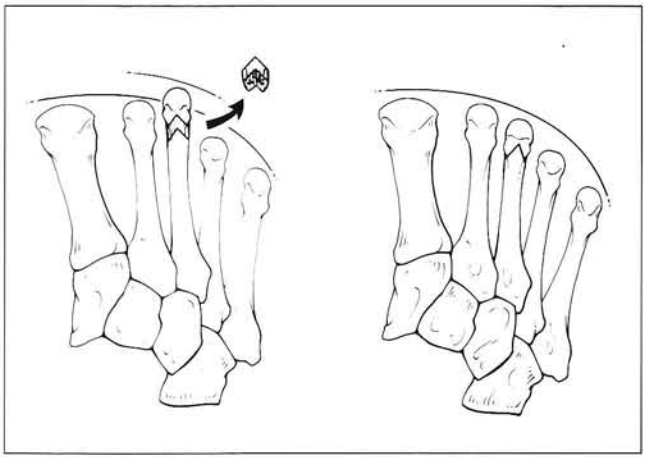

Figure 13. The "V" osteotomy can be utilized to shorten a lesser metatarsal by resecting a wedge of bone.

Distal Oblique Osteotomy

This osteotomy allows for a controlled elevation of the metatarsal head in conjunction with rigid internal fixation.

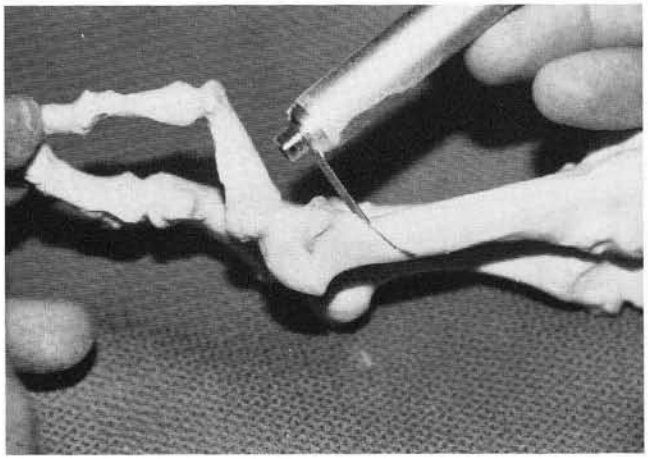

Figure 14. Angulating the osteotomy for maximum stability.

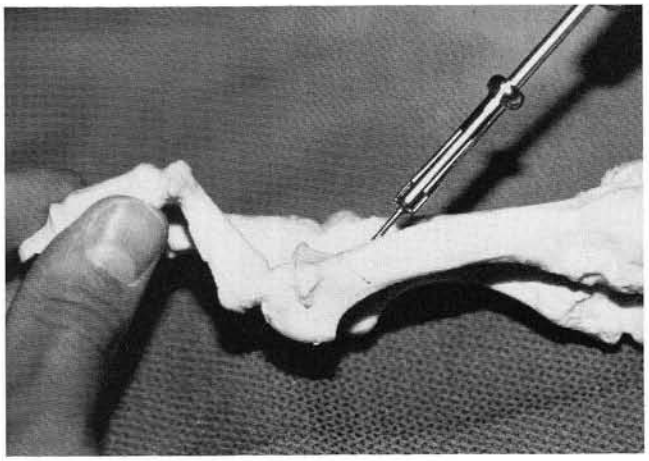

Figure 15. Screw fixation is utilized to stabilize the osteotomy.

Proximal Oblique Osteotomy

This osteotomy avoids periarticular dissection at the metatarsophalangeal joint level, and also allows for rigid internal fixation.

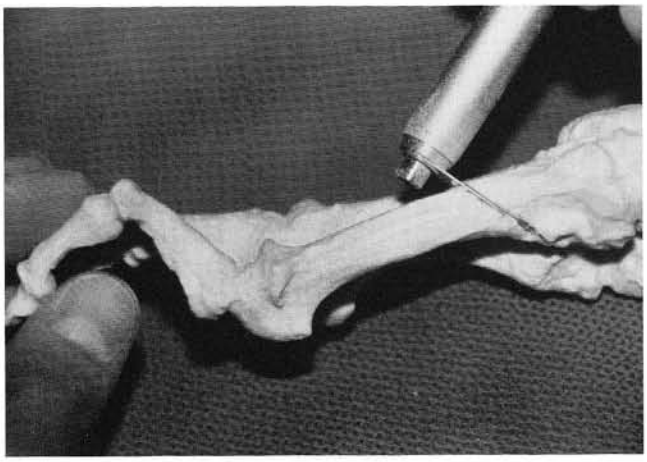

Figure 16. The proximal osteotomy requires less bone removal due to the lever arm effect.

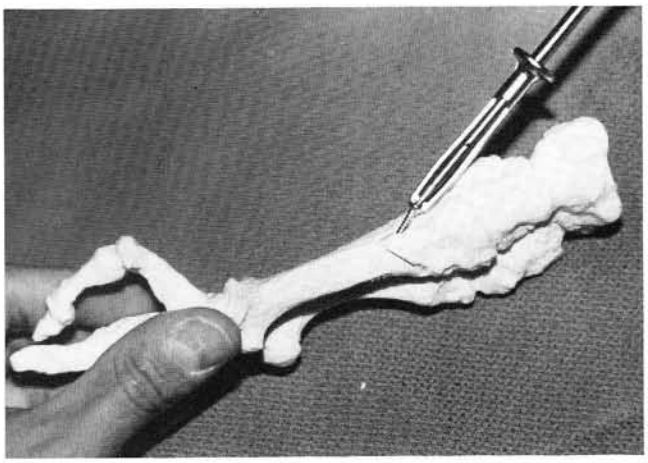

Figure 17. The obliquity of the osteotomy allows for rigid interfragmentary compressive fixation.

Osteoarthrotomy

When the goal of surgery is to mobilize a lesser metatarsal to relieve pressure at the head, the articular base of the metatarsal can be removed. This technique does not rely on bone healing for its success. It cannot be used to relieve deep IPK's or severely plantarflexed lesser metatarsals.

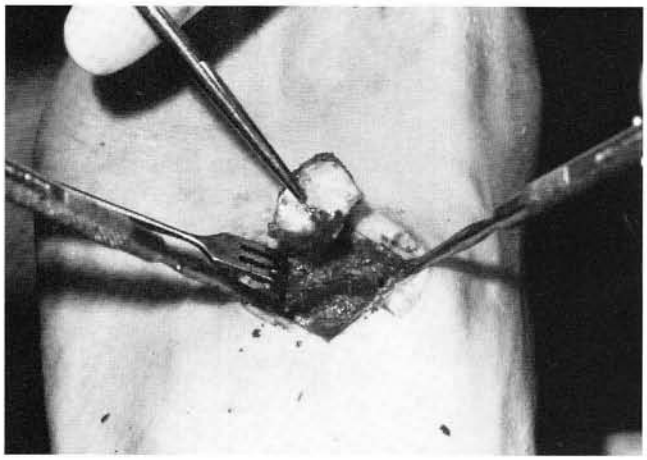

Figure 18. An osteoarthrotomy (pictured at the base of the second metatarsal) removes the base of the lesser metatarsal at its tarsometatarsal articulation.

Figure 19. Postoperative oblique x-ray following osteoarthrotomy of the metatarsal base.

Postoperative Weight Bearing

The principles of rigid internal fixation, as well as the conditions necessary for bone healing (eg. immobilization), indicate that non-weight bearing for six weeks postoperatively provides the most optimal environment for healing. However, judicious application of technical factor may allow for weight bearing while the bone heals. These factors include: osteotomy placement, direction of the cut and preservation of the hinge, and method of fixation. The final decision should be based upon the judgement and experience of the surgeon.

Excision of the Plantar Lesion

The decision to excise the plantar skin lesion depends on the lesion's characteristics. If the lesion is somewhat diffuse but well-localized under a metatarsal head, then an osteotomy alone should result in its resolution.

If the lesion is thick, nucleated and extremely painful, then an osteotomy alone is less likely to provide sufficient relief. To test for this, one can apply lateral compression over the lesion. If this causes exquisite pain, then cutaneous nerve entrapment is likely, and the lesion must be extricated for complete resolution of symptoms.

When a broad diffuse tyloma is observed beneath several metatarsal heads (2, 3, and 4), one should become suspicious of either a gastrocnemius or triceps equinus. Metatarsal surgery alone, in the face of such a deforming force, is contraindicated and the equinus must be addressed.

The plantar lesion can be excised using a double-elliptical incision technique. The ellipse should be planned and marked prior to making the incision. The ellipse should be 3 to 4 times as long as it is wide. A vertical mattress type suture is recommended.

In order to achieve minimal scar formation following the excision of a plantar lesion, the patient must be non-weight bearing for three weeks. The sutures are alternately removed over the next week as the patient begins gradual weight-bearing.

Figure 20. Planing the elliptical incisions.

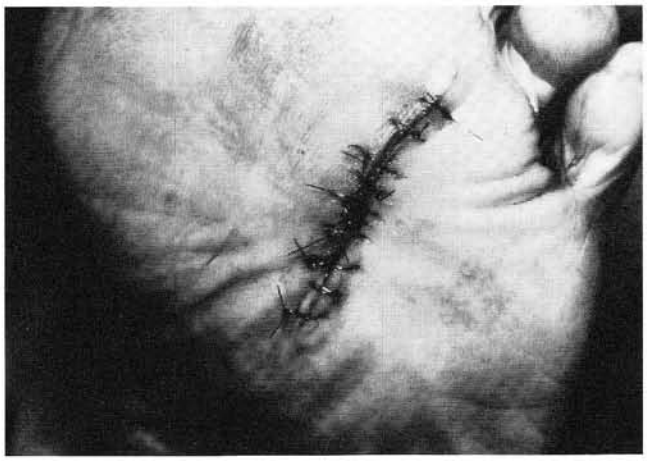

Figure 21. Suturing of the plantar wound under minimal tension.

Figure 22. Appearance of the plantar scar three months post-excision.

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