CHAPTER 53

EXCISION OF THE PLANTAR MASS

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Specialists in the lower extremity may occasionally be faced with a patient possessing a plantar mass that will require surgical excision. However, there may be some reticence on the part of individual surgeons when faced with this circumstance, particularly when the mass appears to be beneath the deep fascia. While removal of a deeper plantar mass may require some degree of preoperative planning, the task should not be difficult. The author will present basic principles which can be employed to make procedures of this nature more manageable. However, the reader should be aware that this paper is not meant to detail the actual diagnostic steps available once a soft tissue mass is identified, but more about the method of evaluating the mass for actual excision.

PREOPERATIVE EVALUATION

The mere presence of a mass is usually enough to motivate a patient to seek medical attention. While lesions such as a plantar fibroma may be readily diagnosed, other lesions may require further evaluation. Pain may be a source of concern as well, particularly if the lesion happens to compress on one of the plantar nerve branches. In some instances the patient may demonstrate numbness or dysthesias as opposed to pain. When dysthesias or numbness are present, one may obtain an initial impression as to the nerve branches involved by mapping the areas of the skin which are affected. This may help with the ultimate surgical plan, as well as identifying to the patient those areas which may remain symptomatic following surgery.

An initial assessment may provide the physician with an idea as to whether or not the lesion is superficial to, within, or deep to the plantar fascia. If the mass is within the fascia or more superficial, then additional studies such as Magnetic Resonance Imaging (MRI) may generally become less important from the standpoint of surgical planning. Lesions at this level are more easily evaluated, accessible, and superficial to major nerve or vascular structures. There are always exceptions, but the author would argue that MRI is probably overutilized in this scenario. Lesions such as plantar fibromatosis are usually self-evident. Those more superficial are generally of a more limited nature. Any changes in the character of the skin should be noted. Some tumors, such as a hemangioma, may invade the dermal layers and create pigmentary changes. While MRI has become the primary imaging modality for soft tissue masses, arteriography is still helpful in some individuals with hemangiomas, to determine the source of blood flow.

For lesions below the plantar fascia, or in other special situations, MRI may be quite helpful in determining the full size and extent of the mass. In particular, one would like to know the relationship of the mass to the plantar muscles. This may allow for dissection between the muscles themselves without disruption of the main bundles. In some instances portions of the intrinsic musculature will have been obliterated by the compressive effects of the mass. MRI also provides a general guide as to the location of any major neurovascular structures and their relationship to what might otherwise be a distorted anatomy (Figs. 1A-1C).

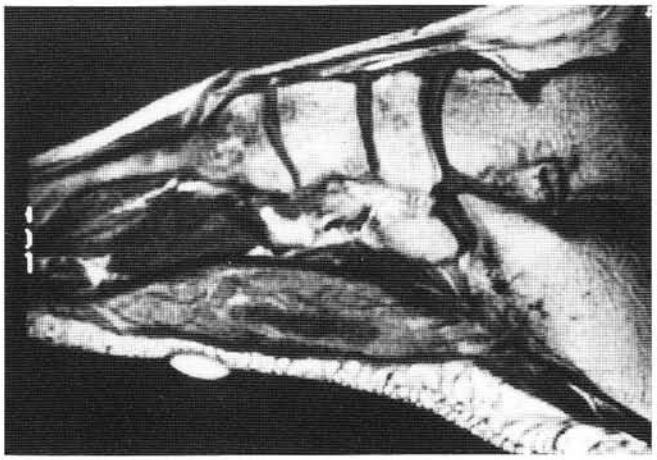

Figure 1A. Sagittal plane MRI of an adolescent male with a mass and reduced sensation in the plantar right foot. The lesion is located just below the plantar fascia. The image depicts the extent of the lesion.

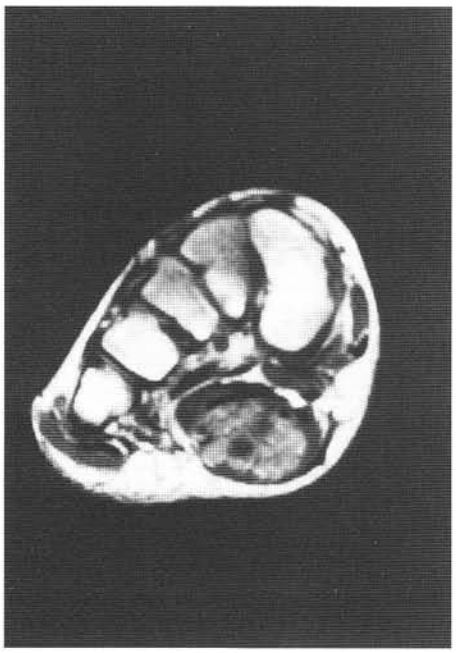

Figure 1B. Coronal view also depicts the extent of the well-encapsulated lesion.

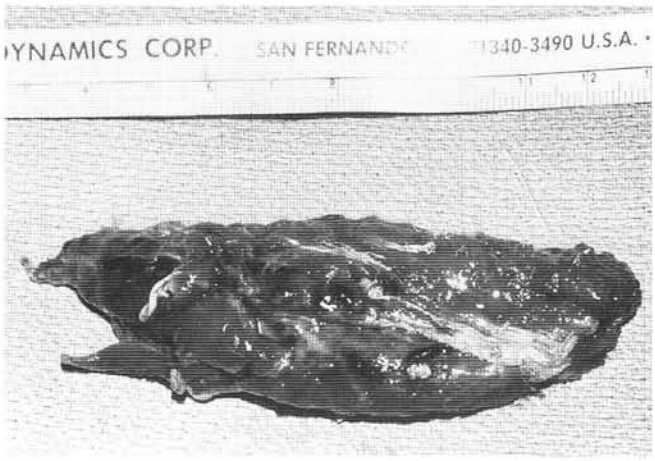

Figure 1C. The lesion, an intramuscular hemangioma of the flexor digitorum brevis is excised.

SURGICAL APPROACH

In patients with a large plantar mass, a fair degree of surgical exposure may be required. The goal is to achieve the amount of exposure necessary for excision of the mass, yet avoid the neurovascular structures and reduce the likelihood of a painful or hypertrophic scar. A transverse incision satisfies the latter concern. This orientation is parallel to the relaxed skin tension lines on the plantar aspect of the foot, and therefore, less likely to create a problem with scarring. However, the amount of surgical exposure may be limited, possibly creating a problem with complete visualization in some instances. One is also limited in the amount of visibility which may be achieved linearly, from anterior to posterior.

Although a linear incision from proximal to distal would afford excellent exposure, this is also directly perpendicular to the relaxed skin tension lines. Therefore, there would be a greater tendency for a patient to sustain a postoperative problem with the scar. However, this would provide good wide exposure over a large area. If extended too far proximally, the medial calcaneal branches could possibly be transected at the heel.

An oblique incision would possibly provide adequate exposure with less tendency for a thick scar, but again, achieving adequate length could be problematic. This last concern may be addressed by making several oblique approaches, such as one would see with a "Z"- or "S"-shaped incision. This is a very versatile technique that addresses most of the concerns one may have with a plantar dissection. Should the original incision not prove adequate, additional exposure may be achieved by simply adding another segment to the Z or S. A transverse incision may also be converted to this orientation provided there is adequate space at each end of the incision.

Should there be any need to extend dissection into the tarsal tunnel canal, one may extend the incision into this area. This would reach from the distal heel area proximally. By maintaining this orientation, one will parallel the medial calcaneal nerve branches.

Historically, there has been concern over the potential for vascular compromise whenever a plantar incision has been required. In particular, vascular supply to the medial arch has been considered suspect. Curtin felt that a linear incision in the plantar arch would interrupt most of the arterial supply to the skin. Accordingly, a serpentine incision was recommended in the arch. However, later studies have demonstrated that the plantar skin derives its blood supply from a variety of sources. Therefore, the incision may be oriented as the surgeon desires, without risk of vascular problems. Incisions within the arch may be safely performed, contrary to previous concerns. The key factor is preservation of the subcutaneous layer with the skin.

Once the incision has been made, the first step is to dissect directly down to the level of the plantar fascia. This is the known level from which

the subcutaneous tissue will be separated with the accompanying skin. Full preservation of the relationship between these two layers is required to maintain the viability of the soft tissues. There are no major neurovascular structures superficial to the plantar fascia. Therefore, one is assured of defining this level without any risk of significant neurovascular compromise, so long as a good layer of subcutaneous tissue remains attached to the skin.

As one extends dissection to the medial and lateral aspects of the foot, the subcutaneous tissue over the deep fascia may become thicker in some individuals. Because of the change in this tissue layer, one may dissect through portions of the superficial fascia instead of preserving it in its entirety. This may compromise the viability of the apices of each flap (Figs. 2A, 2B).

Once the flaps have been raised, then the full extent of the plantar fascia should be evident. A suture tag may be placed into the tip of each flap to facilitate retraction and reduce handling of the superficial tissues. If a complete plantar fasciectomy is to be performed, the author prefers to begin the next phase of the dissection proximally. At this level the plantar fascia is incised transversely. Dissection then proceeds distally as the plantar fascia is dissected free from the muscle belly of the flexor digitorum brevis. Once in the arch area, one needs to be particularly careful to avoid damage to the branches of the medial plantar nerve. These will tend to become evident as dissection progresses. In particular, the nerve branches may be more difficult to discern as the plantar fascia begins to split into digitations, especially when a plantar fibroma extends to this level.

Should the lesion lie deep to the plantar fascia, then the fascia is split either linearly or transversely depending on the specific needs. This may be folded back and enable better exposure to the deeper levels of the foot. Once the lesion has been removed, the plantar fascia is typically reapproximated as part of the wound closure (Figs. 3A-3D, 4A-4D).

If the mass remains deep to the first layer of plantar muscles, then a decision will need to be made as to how to best proceed. Generally speaking, the best approach will be to separate between the muscle units. Entry points may lie between the flexor digitorum brevis and abductor hallucis, or the flexor and abductor digiti quinti.

Figure 2A. Plantar left foot following excision of the plantar fascia. Note the branches of the medial plantar nerve lying on the muscle belly of the flexor digitorum brevis. Also note at the lateral apex of the "Z" incision, that portions of the subcutaneous tissue remain over the muscle.

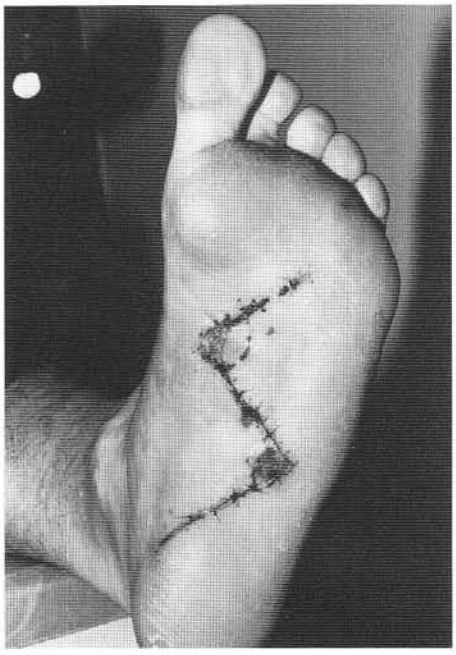

Figure 2B. Four weeks later. Failure to maintain the full complement of subcutaneous tissue resulted in a partial slough of skin at the lateral apex.

Figure 3A. Plain radiograph of a patient with a very large plantar mass.

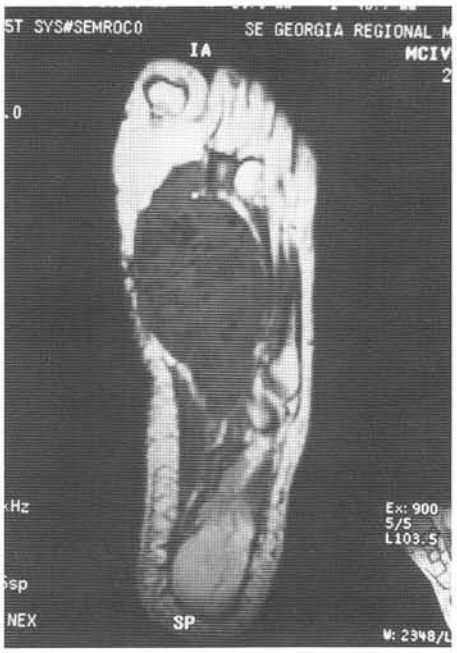

Figure 3B. MRI of the same patient. A very large plantar mass with obliteration of much of the intrinsic musculature, but still confined to the plantar vault. Previous incisional biopsy revealed a diagnosis of leiomyoma.

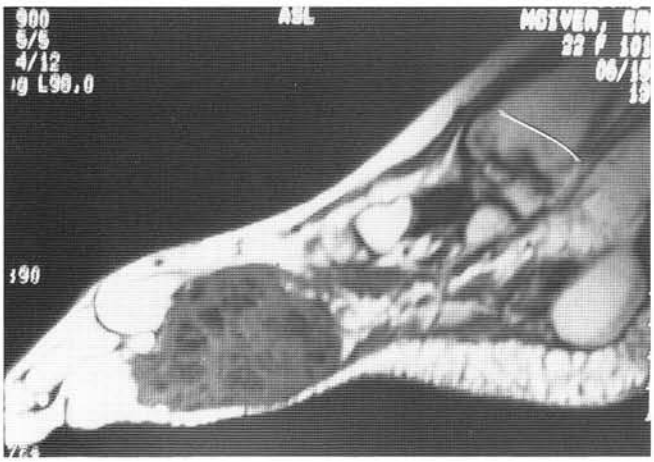

Figure 3C. Sagittal MRI image.

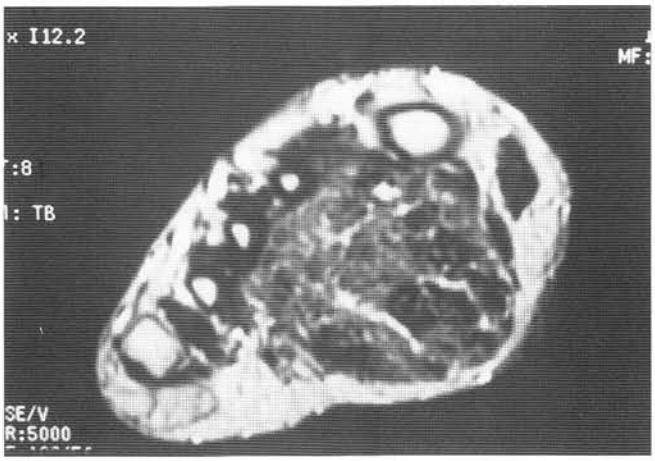

Figure 3D. Axial MRI image.

Figure 4A. Same patient as demonstrated in Figure 3. Incisional approach for the large plantar mass.

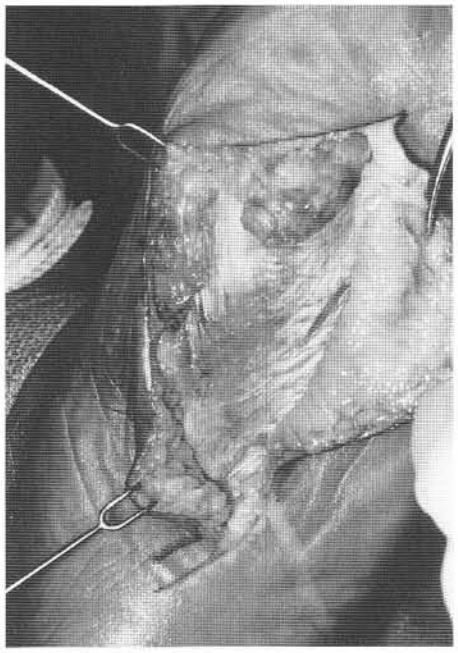

Figure 4B. Dissection to the level of the deep fascia. Note the perforation of the mass through the plantar fascia distally.

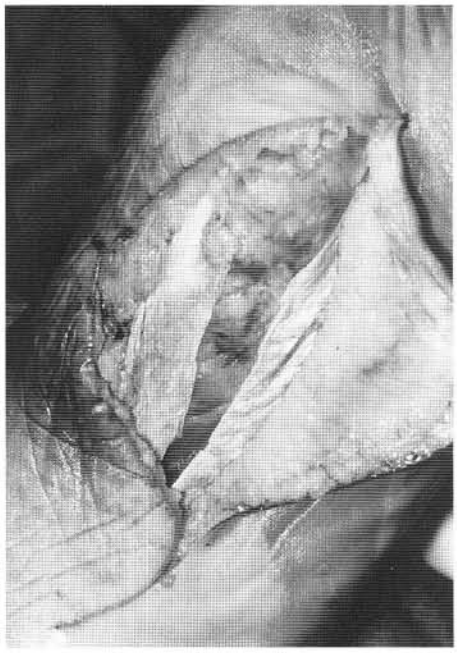

Figure 4C. The plantar fascia is incised linearly to provide access to the remainder of the mass.

Figure 4D. Complete removal of the well-encapsulated mass, later identified as a neurolemmoma.

If a significant soft tissue defect remains after closure, or bleeding after tourniquet release, then a TLS drain is an effective adjunct to reduce the likelihood of a problematic hematoma. The patient is placed into a Jones compression dressing and maintained non-weight bearing for 4 weeks. Sutures are generally removed at 3 to 4 weeks following surgery. Weight bearing is then instituted as the patient tolerates. Some type of compression is generally maintained to try and reduce the likelihood of a painful or hypertrophic scar.

BIBLIOGRAPHY

Banks AS, McGlamry ED: "Z" incision and surgical access to the plantar aspect of the foot. *J Foot Surg,* 27:134-138, 1988.

Burns AE, Harvey CK: Plantar fibromatosis: surgical considerations and a case report. *J Am Podiatry Assoc,* 73:135-141, 1983.

Curtin JW: Fibromatosis of the plantar fascia. *J Bone Joint Surg,* 47A:1605, 1965.

Hidalgo DA, Shaw WW: Anatomic basis of plantar flap design. *Plast Reconstr Surg,* 78:627-636, 1986.

Mahan KT: Plastic surgery and skin grafting, in McGlamry ED, Banks AS, Downey MS eds. *Comprehensive Textbook of Foot Surgery,* 2nd ed, Baltimore, MD: Williams and Wilkins; 1992: 1256-1296.