History
Plantar fibromatosis is a connective tissue disorder that is characterized by a well organized soft tissue mass that is the result of an unregulated proliferation of fibroblasts. The masses form into nodules that are located within the plantar fascia. The fibroma is characterized as a well defined, slow growing mass that is benign in nature. Although typically benign, these fibromas can transform into malignant tumors on rare occasions.

Clinical Presentation
Plantar fibromas can be asymptomatic for a long period of time. As the mass increases in size, which is usually slowly, or if the location is in a weight bearing location of the arch, the pain is more likely to be present and worsens with time. The fibroma mass is typically found in the medial band of the plantar fascia and can spread into the central band if left untreated. Although rare, plantar fibromatosis can also involve the lateral band of the plantar fascia.

Fibromas can present as isolated nodular masses, or they can occur as a cluster of multiple small nodules. Occasionally, a large nodular mass with satellite nodular masses is observed; however, these are typically associated with recurrent fibroma.

Surgical Technique
Conservative care is usually recommended before surgical intervention. Conservative care typically consists of padding or custom molded orthotics to transition weight off of the fibromas. Corticosteroid injections are another non-surgical option to reduce fibromas, however this type of conservative care does not appear to provide long term relief. It is only when these conservative treatment options fail that surgical management is justified.

The surgical procedure consists of a Z-shaped or curvilinear skin incision centered over the suspected plantar fibroma. The incision should be deep into the plantar fascia. Blunt dissection is required to isolate the superficial side of the plantar fascia. It is also necessary to confirm that clean margins are isolated. Then, using scissors, the plantar fascia is teased away from the superficial layer of muscles since the flexor digitorum brevis is immediately inferior to the undersurface of the plantar fascia. In addition, running between the flexor hallucis brevis muscle and the flexor digitorum muscle are the medial plantar artery and nerve. These can easily be injured since they are frequently exposed. The fibroma is excised completely along with the plantar fascia of which it is contained within, leaving an exposed muscle and other structures. Sometimes grafts are used to repair the missing plantar fibroma, however, there are no studies to validate the use of grafts.

A small drain is occasionally inserted into the foot to help prevent hematomas. After the drain is placed, the subcutaneous tissues and skin are closed.

Discussion
When excising a plantar fibroma, a section of the plantar fascia is removed. Wide margins are desired to help prevent recurrence. This leaves direct contact between the subcutaneous tissue in the plantar arch and the superficial layer of the intrinsic musculature. The highly vascular muscle layer and the vascularity of the subcutaneous tissues lend themselves to forming fibrotic tissue. This coupled with an extended period of immobilization following the surgery increases the risk of forming scar tissues. Fibrosis in this area may lead to other complications as well. Since the plantar medial neurovascular bundle is located between the abductor hallucis and flexor digitorum brevis muscles in the superficial muscle layer, fibrosis can cause neuritis symptoms. This complication is more likely in the procedures involving recurrent fibromas secondary to the more extensive dissection and greater exposure of the first layer of intrinsic muscles. Limiting the opportunity for fibrosis and subsequent soft tissue attachments may increase the overall success of the fibroma excision.

The OrthoWrap™ sheet is made from 70:30 Poly (L-lactide-co-D,L-lactide), more commonly known as PLA. This material has been used in other podiatric and orthopedic implants such as...
bone fixation plates and screws. The PLA material has a non-porous, hydrophobic nature that resists attachments.

The degradation of PLA weakens the OrthoWrap™ sheet, however, it is impermeable throughout the critical healing period and up to 8 weeks; retaining nearly 80% of the original mechanical strength for the 0.02mm sheet and nearly 100% of the mechanical strength for the 0.05mm sheet. Loss of 50% of the mechanical strength is not seen in either size until after 20 weeks. The retention of mechanical strength is adequate since it functions during the critical period of scar tissue formation (typically up to 8 weeks).

By using the OrthoWrap™ sheet to separate the intrinsic muscles and subcutaneous tissue, as demonstrated in the cases here, formation of fibrotic tissue and subsequent soft tissue attachments to the muscles and underlying neurovascular structures is less likely. This is important when the disorder being treated is one of exuberant fibrotic tissue in a vascular area that is likely to develop soft tissue attachments or scar tissue.

**Post-Operative Care**

Post-operative care usually consists of non-weight bearing immobilization of the repaired foot for approximately three to four weeks. Immobilization is usually done to help prevent reattachment and hypertrophic scar formation. There is a gradual return to activity after sutures are removed and weight bearing is resumed.

Recurrence is the most common complication of plantar fibroma excision. This usually occurs in light of incomplete resection. Fibrosis also occurs along with the potential for hammertoes since a section of plantar fascia was removed. Other minor complications known to be associated with this surgical procedure are: dehiscence, bleeding, hematoma, scarring, and infection.

**Notes**