Repair of Tibialis Anterior Muscle Herniation Using Periosteum

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Abstract: Muscular herniation consists of focal muscular protrusions through an acquired or congenital fascial defect. The anterior tibialis muscle is most frequently affected. Asymptomatic muscle hernias are usually treated conservatively. For severe symptoms or cosmetic complaints, several surgical techniques are available to treat muscle herniation, including fasciotomy, fascial patch grafting using autologous fascia lata, or synthetic mesh. However, the optimal surgical approach remains debatable. The authors propose a novel and reproducible surgical method using a periosteal turnover technique. This surgical technique has the advantages of fewer complications, greater cost-effectiveness, and high reproducibility. The authors find this to be a useful technique. [Orthopedics. 2014; 37(11):748-750.]

Muscle herniation of the lower leg is not uncommon. Surgical treatment is not recommended for asymptomatic tibialis anterior herniation or cosmetic purposes. A symptomatic herniation should be initially managed with a compressive stocking bandage. Only after persistent conservative therapy has failed should surgical management be considered. Although various techniques, including fasciotomy, fascial patch grafting using autologous fascia lata, and synthetic mesh, have been described for muscular herniation of the tibialis anterior, consensus has not been reached regarding the best treatment option.

The authors describe a novel technique of repairing tibialis anterior muscle herniation using the adjacent periosteum of the tibia. This method has been technically easy for other orthopedic surgeons in their hospital to reproduce.

Materials and Methods

Between June 2011 and May 2012, three patients with anterior tibialis muscle herniation were prospectively treated using the local periosteal graft technique. These were 1 man and 2 women with a mean age of 32 years (range, 20-49 years). The patients were followed for at least 12 months after surgery.

Case Reports

The first patient, a 49-year-old woman, underwent closed reduction and intramedullary nailing for a distal tibial fracture and open reduction and internal fixation for lateral malleolus, respectively. The fracture was healed completely and implants were removed 1 year after surgery. Several months later, the patient reported a painful mass measuring 4.5x3.5 cm along the anterior aspect of the middle third of the right leg.

The second patient, a patient of another orthopedic surgeon, was a 20-year-old woman who suffered a fracture of the middle third of her left fibula in a motorcycle accident and was treated conservatively. She reported a gradually increasing mass measuring 3x4 cm along the anterolateral aspect of the middle third of the left leg. On examination, the mass was noted to have increased in size on ankle dorsiflexion.

The final patient, a 37-year-old man, had a soft tissue mass of 6x4 cm on the left leg that was incidentally detected. No history of trauma was reported (Figure 1).

In all cases, static and dynamic ultrasound examination was performed. Also in all cases, a focal fascial discontinuity with muscle herniation was easily identified below the palpable soft tissue masses dur-
ing plantar and dorsiflexion of the foot (Figure 2).

RESULTS

All patients underwent repair of the tibialis anterior muscle herniation using the local periosteal graft. No cases of remaining muscle herniation were observed 12 months postoperatively. No other complications, including infection, pain, or cosmetic problems, were noted. No evidence of calcification or bone formation was apparent in the grafted tissue on radiographic study. All patients were satisfied with the outcome of treatment.

SURGICAL TECHNIQUE

Each patient was positioned supine on the operating table. A pneumatic tourniquet was applied to the affected extremity in the thigh. A 10-cm longitudinal incision was made along the medial border of the mass, and the subcutaneous tissues were further dissected. The tibialis anterior muscle was immediately exposed through the fascial defect and the size of the defect was measured. The tibialis anterior muscle was covered with a pseudomembranous fibrous tissue (Figure 3A). The long duration of these conditions had caused the fascia to be retracted and rigid; thus, a primary repair of the fascial defect was not possible. The skin and soft tissue were retracted medially to expose the anteromedial side of the tibia (Figure 3B). The surgeon (Y.-R.C.) measured the defect to prepare for a periosteal graft that was 5 mm wider than the defect. Meticulous subperiosteal dissection was performed, being careful not to tear the periosteal flap (Figure 3C). After the periosteum was detached from the bony surface of the tibia, the periosteal graft was turned over on itself to cover the defect. The graft was sutured using PDS 2-0 (Ethicon, Diegem, Belgium) without excessive tension (Figure 3D). The remaining periosteum was overlapped and sutured with Vicryl 3-0 (Ethicon, Livingston, United Kingdom) for augmentation (Figure 3E). The incision was closed using Ethilon 3-0 (Ethicon, Livingston, United Kingdom) in a routine manner. No external splint was used.

Toe-touch weight bearing was permitted during the first 2 weeks postoperatively and was increased progressively in the fourth week. Full weight bearing was permitted after 4 weeks.

DISCUSSION

Muscle hernias are not rare but have received little attention in the medical literature. Muscle herniation is usually asymptomatic, but a patient may seek medical treatment because of pain or cosmetic concerns. If a patient suffers from pain, applying a stock- ing bandage is recommended initially. If symptoms persist despite the ongoing treatment, surgery should be considered.
There are several surgical methods for treatment of muscle herniation, including fasciotomy, fascial patch grafting using autologous fascia lata, and synthetic mesh. Direct repair is usually not recommended for asymptomatic tibialis anterior herniation because compartment syndrome can occur after surgery.\(^1\),\(^2\)

Longitudinal fasciotomy for decompressing the entire compartment is the preferred surgical technique. However, this technique is indicated only for small fascial defects and often results in adhesions between the muscle and the cutaneous scar, causing an evident skin depression on muscle contracture.\(^2\)

A reinforcing patch of autologous or synthetic material is an option when repairing a fascial defect.\(^2\) Fascial patch grafting using autologous fascia lata has the disadvantages of donor site morbidity and a linear scar on the lateral thigh. The use of a synthetic patch has other disadvantages, including the high cost of synthetic material, increased risk of infection, and graft intolerance to the surrounding tissue.

Another surgeon at the authors’ medical center performed a periosteal grafting procedure to repair a tibialis anterior muscle herniation in the same manner (second case). The procedure is not technically demanding and is easy for inexperienced surgeons to perform. At 12 months postoperatively, the patients had resolution of the preoperative pain and good function with full weight bearing.

**CONCLUSION**

The authors have reported 3 cases of symptomatic fascial herniation of the tibialis anterior muscle that were successfully repaired by using a local periosteal graft. This surgical technique has the advantages of fewer complications, greater cost-effectiveness, ease of performance, and high reproducibility. Therefore, local periosteal grafting is a useful modality for tibialis anterior muscle herniation.

**REFERENCES**