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Case report

Treatment of a subcutaneous tibialis anterior tendon rupture with a semitendinosus autograft

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Abstract. The subcutaneous rupture of the tibialis anterior tendon is a rare and silent lesion which can lead to foot and ankle dysfunction with gait difficulty. The treatment can be either conservative or surgical. Conservative management is reserved for inactive patients and those with a general or local contraindication to surgery, whereas surgical repair includes direct and rotational suture, as well as tendon transfer and auto- or allograft. The choice of surgical treatment is based on multiple factors, including the symptoms, the timespan from injury to treatment, the anatomopathological pattern of the lesion, and the patient's age and level of activity. Large defects present a particular reconstructive challenge, and there is no consensus on the optimal method of treatment. That being said, one of the options is an autograft using the semitendinosus hamstring tendon. We present a case of a 69-year-old woman who sustained a hyperflexion trauma to her left ankle. Three months later, ultrasound examination and a magnetic resonance imaging showed a complete tibialis anterior rupture with a gap of more than 10 cm. The patient was successfully treated with surgical repair. An autograft of the semitendinosus tendon was used to bridge the gap. The tibialis anterior rupture is a rare lesion that must be promptly diagnosed and treated, especially in physically active patients. Large defects pose particular challenges. Surgical management was found to be the treatment of choice. In the case of a lesion with a major gap, semitendinosus grafting can be successfully employed.

Key words: Tibialis anterior tendon, rupture, inveterate rupture, tendon repair, tendon graft, semitendinosus

Introduction

A tibialis anterior (TA) tendon rupture is a rare lesion that can be acute or chronic (1, 2). There are a low number of cases reported in the literature (3-5). Usually, a pre-existing degenerative condition in the tibial tendon is present due to general or local morbidity (6). The rupture can occur after even minimal trauma. The origin can either be of a sharp-cutting type or an indirect or blunt hyperflexion trauma (7-9).

The function of the TA tendon is the foot dorsiflexion and inversion; foot dorsiflexion is also performed by the extensor hallucis longus (EHL) and the extensor digitorum longus (EDL), while foot inversion is performed primarily by the tibialis posterior (TP) tendon. Patients with a TA rupture complain of foot and ankle dysfunction, pain, weakness, and gait impairment. This is due to weakness in dorsiflexion and reduction of inversion that is supported by the important role of the posterior tibialis tendon (3-5).

The treatment is generally surgical, although conservative management can be employed in older patients with less demanding lifestyles as well as a contraindication to surgery. The choice of surgical technique is based on the onset of the lesion (acute or chronic), the gap, and the quality of the tendon (4). In the literature, chronic lesions are those with a delay in treatment for longer than four weeks (5).

In acute lesions with a gap of less than 2.5, direct repairs should be attempted, while lengthening and rotationplasty is indicated when the lesion is less than 5 cm (5).

For chronic lesions with the presence of a fatty infiltration, the extensor hallucis longus (EHL) or extensor digitorum longus (EDL) transfers are recommended (5). In an uncommon lesion with a major gap, a tendon graft can be employed. We present a rare tibialis anterior tendon lesion with a gap larger than 10 cm, which was successfully treated with an autologous tendon graft by utilizing the semitendinosus hamstring tendon.

Case report

A 69-year-old woman presented to our orthopaedic department with an impairment of the left foot and ankle function as well as gait difficulty.

History

The patient sustained an indirect minor ankle hyperflexion trauma three months ago. The patient complained of foot and ankle pain and weakness, with impairment to full weight-bearing. The patient's medical history is significant for hypertension and a history of tobacco use.

Physical examination

The patient presented anterior ankle swelling and bruising with weakness in the active foot dorsiflexion and walked with a slight drop foot. A loss of contour in the normal tibialis anterior anatomy was present in regard to the contralateral foot. Heel gait on the left foot was impossible. The forced ankle dorsiflexion with forefoot adduction was indicative of a tibialis anterior lesion.

Investigation

The X-rays of the foot and ankle were unremarkable. The patient's MRI (magnetic resonance imaging) and ultrasound examination showed a subcutaneous complete rupture of the tibialis anterior tendon, with a tendon gap of 11 cm.

Treatment

The surgical management approach was favoured and performed in the supine position under spinal anaesthesia. Initially, an anterior ankle approach incision was made, extending distally from the superior extensor retinaculum to the medial cuneiform. The tendon sheath was opened. The proximal stub was in the ankle position. A residual tendon was found at the level of insertion on the first cuneiform bone and the first metatarsal base (Figure 1). An antero-medial pretibial approach with the harvesting of the semitendinosus tendon was performed, which is the classical technique.

The semitendinosus tendon was then prepared and sutured to bridge the gap with the foot in a neutral position (Figure 2), in addition to the previous debridement of the residual, proximal, and distal tibialis anterior tendon. The autograft was sutured to the proximal stump by Pulvertaft weave and to to the distal residual 2 cm stump by side-to-side repair and fixation of the graft end to the medial cuneiform by trans-osseus non-absorbable suture.

Figure 1. The anterior ankle approach showed a complete rupture of the tibialis anterior tendon with the proximal stub in the ankle position.

Figure 2. The semitendinosus tendon is sutured to bridge the gap.

Follow-up

Postoperatively, there was an expected three weeks of complete immobilization with the ankle at 10 degrees of dorsiflexion. At three weeks, passive mobilization was allowed and weight-bearing under observation as tolerated with a walking boot for six weeks was observed. No complication occurred.

At the 12-month follow-up, the patient achieved a very satisfactory outcome. According to the postoperative American Orthopaedic Foot & Ankle Society (AOFAS), the ankle-hindfoot score was 90, further presenting good alignment and lacking in pain or gait abnormality, with only a mild restriction on the sagittal extension motion and a limitation on recreational activities.

Discussion

The tibialis anterior is the most medial tendon in the anterior leg compartment, with its proximal origin being from the tibial lateral condyle, the proximal half or two-thirds of the tibial lateral surface shaft and the interosseous membrane; the distal insertion is performed vertically on the cuneiform and the first metatarsal base (1, 11). The function of this tendon is to induce dorsiflexion and inversion of the foot.

A tibialis anterior tendon rupture is a rare lesion, to the extent that, in an extensive literature review of publications from 1905 to 2018, Vasoughi (5) reported only 80 case reports and case series in total.

A tibialis anterior lesion can be a traumatic open tear or subcutaneous lesion. A subcutaneous TA tendon rupture usually occurs spontaneously in older patients with general or local comorbidities that cause structural tissue weakness. The most common location for a tibialis anterior tendon lesion is the avascular portion, which is located 5-30 mm from its distal insertion (9).

Predisposing factors include diabetes mellitus, rheumatoid arthritis, gout, psoriasis, hypothyroidism, cancer, and the chronic systematic or local administration of corticosteroid injections (10).

Early diagnosis and prompt management lead to the best outcome. In older patients, TA lesions are diagnosed late due to the mild symptoms and other associated diseases. A subcutaneous non-traumatic lesion can be misdiagnosed, with the reason for that being a compensatory foot dorsiflexion permitted by the extensor digitorum longus and extensor hallucis longus. In our case, the delay in diagnosis was three months.

To restore the function of the ankle dorsiflexion and appropriate walking, surgery is usually required. Surgical management is indicated in young and active patients. However, there is no consensus in the literature regarding the optimal treatment.

Non-surgical treatment should be considered for low-demand patients and in the case of contraindication to surgical treatment (i.e., vasculopathy, infections, or general medical conditions that preclude surgery). Conservative treatments include the use of orthoses, as well as physiotherapy and lifestyle modification.

In the literature, several surgical methods are reported for repairing the tibialis anterior tendon lesions. Although there is no gold standard technique, the treatment of choice is based on the anatomopathological pattern, the patient's level of activity, and the surgeon's preference.

The aim of the surgery is to restore the function of the tibialis anterior muscle that is responsible for foot dorsiflexion and inversion.

Direct repair is generally adopted for acute trauma, especially within open lesions. When it is possible, this must be the treatment of choice, as end-to-end suture provides the best result reported. In all cases of acute TA rupture with a gap of less than 2.5 cm, this method must be undertaken. Postoperative immobilization can be assisted by a cast boot or external immobilizer that allows for surgical wound care to avoid cutaneous complications. Acute traumatic ruptures with a gap of less than 5 cm in otherwise healthy tendons can be treated with lengthening and rotationplasty techniques.

Delayed treatment leads to a major gap that requires a tendon transfer or graft, and provides an inferior outcome in comparison to a direct suture. In chronic degenerated lesions with a fatty infiltration and in the case of acute large ruptures, EHL or EDL transfer is recommended. Different techniques for tendon fixation to the medial cuneiform have been reported, but the main ones are a screw tenodesis or bone tunnel with suturing the tendon backup to itself.

A free tendon autograft or allograft is indicated for lesions with large gaps. Furthermore, employing free tendons allows large lesions to be connected using a distal tibialis anterior tendon repair or medial cuneiform fixation. Different autografts are used (i.e., semitendinosus, gracilis, Achilles, peroneus brevis, plantaris and EDL) (12). Allografts have the advantage of the absence of a donor site and a short operative time (13). The main employed tendons are the tibialis anterior, Achilles, peroneus longus, gracilis and semitendinosus.

In our case, the site of the tibialis anterior lesion was 2 cm from the distal tendon insertion, in a similar location to that described by other authors and corresponding to the hypo-vascular segment (6). The gap was of 11 cm. Such a retraction made end-to-end suture or rotational repair impossible. Our preference was for using the hamstring tendon, which is one of the most preferred techniques because some orthopaedic surgeons are familiar with harvesting the hamstring in cases with low donor site morbidity. Furthermore, the majority of patients with spontaneous TA ruptures are middle-aged or elderly individuals and unlikely to experience any functional deficits or require hamstring surgery for subsequent procedures. Moreover, the use of a strong healthy tendon aids in recovery and allows for early weight-bearing.

In the literature, most published articles about TA repair are case reports or small number case series (11, 13-15). When employing the semitendinosus, some authors (16-19) reported good results even in lesions with major gaps (16). Goehring (15) detailed a beneficial effect in three patients who underwent the hamstring tendon method at a postoperative five-year follow-up. Michelis (17) recorded a good result in nine patients affected by spontaneous TA ruptures who were managed with a semitendinosus, with an average AOFAS score of 95.7, using a minimal approach in eight of the cases. Karnovsky (18) described a positive result in all eight cases with an AOFAS ankle-hindfoot score at a 17-month follow-up. Kontogeorgakos (19) noted one case of a TA lesion, complicated by infection, which was successfully treated with two-stage repairs. In the first stage a debridement and placement of a silicon tube was completed, followed by a graft with the semitendinosus performed 10 weeks later after the local control of the infection.

In a comparative multicentre study of 48 patients with acute and chronic cases treated with a direct repair, semitendinosus graft or EHL transfer, the authors (20) found no difference in the outcomes between the different surgical techniques. However, they (20) concluded that further multicentre studies are necessary to compare the results of the direct suture, autograft, allograft and tendon transfer.

Conclusion

The tibialis anterior rupture is a rare lesion. Early diagnosis and treatment are mandatory, especially in active patients. The diagnosis of the rupture should first be established by clinical examination and confirmed by ultrasound and/or MRI investigation. Large defects pose particular challenges; in active patients, surgical management is the treatment of choice. In the case of lesions with major gaps, semitendinosus grafting can be successfully employed.

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