CASE REPORT

Compensating for loss: running on one tibialis anterior

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SUMMARY

Rupture of the tibialis anterior (TA) tendon is rare and may be either traumatic or spontaneous. TA is the main ankle dorsiflexor, providing 80% of the power, as well as contributing to inversion of the foot. We describe a case of an 84-year-old male who was incidentally diagnosed with absence of his left TA at age 46 while preparing for his first-ever marathon. There was no history of specific injury to this tendon. He subsequently went on to lead an active sporting life, completing over 20 marathons with a best time of 3 hours 12 min.

BACKGROUND

We believe this case demonstrates the ability for the body to compensate despite loss of a principal dorsiflexor of the foot and allow a high level of athletic achievement, which may offer some reassurance to patients and surgeons exposed to similar circumstances. It also offers an opportunity to review the relevant anatomy for educational purposes.

CASE PRESENTATION

An 84-year-old retired male presented to the foot and ankle clinic with bilateral hallux rigidus and a lesser toe deformity. He had a history of hypertension and hypercholesterolaemia, but was otherwise healthy and a non-smoker. Nearly 40 years previously a doctor noted he had clinical absence of the left tibialis anterior (TA) tendon. The patient could not recall any history of trauma at the time and had been very active to date, including participating in cross-country since his teens and working in the armed services. He recalled having to regularly stop and 'shake out' his left foot while running. He had

Figure 2 Axial cut from T2-weighted MRI of both legs showing fatty replacement of left TA muscle belly.

no orthopaedic intervention at that time and went on to complete the marathon.

On examination, he had visible and palpable absence of the left TA tendon (*figure 1*), with no tenderness along its usual course or insertion. Calf bulk and circumference were equal; however, there was asymmetry between the left and right anterior compartments. Power in dorsiflexion and inversion of the ankles was clinically equal bilaterally.

INVESTIGATIONS

An MRI was performed on both legs (*figure 2*), which showed a tiny remnant of the left TA muscle at its origin and complete fatty atrophy of the remainder of the muscle, together with evidence scar tissue at its insertion, suggesting previous distal rupture. No abnormality was seen in the right leg.

DIFFERENTIAL DIAGNOSIS

- ▶ Acute rupture (complete or incomplete) of the TA tendon
- ▶ Chronic rupture (complete or incomplete) of the TA tendon
- ▶ Atrophy of the TA (eg, secondary to compartment syndrome, focal neuropathy or muscular dystrophy)
- ▶ Congenital absence of TA

The patient did not report any noticeable functional limitation resulting from this abnormality and so no intervention was necessary.

DISCUSSION

The TA muscle is found in the anterior compartment of the leg, lateral to the tibia. It originates from the upper two-thirds of the tibia and the interosseous membrane, and is bordered laterally by the extensor digitorum longus.¹ It descends to become the TA tendon in the lower third of the leg, passes under the extensor retinacula, and inserts onto the inferior and medial aspects of the medial

Figure 1 Both ankles. EHL, extensor hallucis longus.

CrossMark

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cuneiform. Its termination can, however vary, with insertions into the proximal phalanx of the great toe, the distal half of the first metatarsal and the dorsalis pedis fascia². Innervated by the deep peroneal nerve, the TA provides 80% of ankle dorsiflexion³, with contributions from the extensor hallucis longus and extensor digitorum longus. It also assists with inversion of the foot.

Low demand patients who suffer with a foot drop after TA rupture may be treated non-surgically with an ankle-foot orthosis;

however, they should be counselled that persistent gait abnormalities and weakness in dorsiflexion are likely outcomes.⁴ For higher demand patients, management is much more commonly operative. There are numerous surgical strategies available to suit the spectrum of patients who are symptomatic after their rupture, including direct repair, tendon transfers and ankle fusion.

The few published cases of congenital absence of the TA have resulted in significant lifelong disability.^{5 6} In contrast, one series of 19 TA ruptures treated surgically showed an improvement of American Orthopaedic Foot and Ankle Society (AOFAS) ankle-hindfoot scores from 55.5 points preoperatively to 93.6 points postoperatively,⁷ suggesting significant improvement in function with treatment.

In this case of a chronic untreated rupture where the patient did not wear any orthosis, loss of TA's ability to dorsiflex of the ankle has been compensated for by extensor hallucis longus and extensor digitorum longus, allowing him to run competitively and achieve marathon times that would put him in the top 15% of finishers in the London 2016 marathon.

Contributors RACD: main author. EJCD: coauthor and acquisition of data. OA: senior author and reviewer.

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Patient's perspective

"My first indication I consciously had of missing my tibialis anterior tendon was about a year before my first marathon (London, April 1981). My aim in this was simply to complete it and I went to a sports clinic beforehand seeking advice soon after I had started training for the event. I managed to beat 4 hours and progressively, running one or two marathons a year, I did my best one in 1985 with a time of 3 hours 12 min. In my younger years I ran cross-country, however, I could not understand why I wasn't just that bit better than the champion school runner. I had no idea there might be another factor such as a missing tibialis anterior. A cluster of facts seem to have compensated for the missing T.A.: my father's genes (he was a sprint champion and first rate football player); never having a family car; the expense of public transport; the use of a bicycle; and the urge to catch up with the man or woman in front."

Learning points

- The tibialis anterior (TA) tendon is usually visible and easily palpable.
- Absence, or a gap in the tendon, together with weakness in dorsiflexion of the ankle, is suggestive of TA tendon rupture.
- Chronic ruptures can be managed without surgery in most patients.
- Loss of function of the TA may be well tolerated in some patients even when returning to sports.

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