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Dynamic ultrasound findings of bilateral anterior tibialis muscle herniation in a pediatric patient

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Introduction

Muscular hernias through an overlying fascial defect are most commonly described in athletic men or individuals with occupations requiring excessive strain on the legs. The tibialis anterior muscle is the most common site of herniation [1]. Other reported sites of muscular herniation in the lower extremity include the extensor digitorum longus, peroneus longus, and peroneus brevis and gastrocnemius muscles [2]. Primarily an asymptomatic cosmetic deformity, muscle herniation can cause local pain and tenderness after prolonged exertion that subsides with rest. The sonographic finding in a 14-year-old male who was referred for suspected lower extremity soft tissue tumors is presented. In addition to static and dynamic sonographic images, I found that the addition of immediate post-exercise imaging improved conspicuity of the lesions and confidence in the diagnosis.

Abstract

Muscular hernias represent focal muscular protrusions through an acquired or congenital fascial defect. The anterior tibialis muscle is most frequently affected. The ultrasound (US) findings in a pediatric patient with bilateral anterior tibialis muscle herniation are presented. US examination performed following exercise enhanced sonographic visualization of the fascial defect and the associated muscular herniation.

Case report

A healthy 14-year-old male was referred to the ultrasound department for evaluation of focal soft tissue masses at the anterolateral margin of the mid tibiae of both legs. The masses had been present for the past year. The patient complained of an increase in size of both masses with flexion of the extremities and after physical exertion. The lesions were asymptomatic at rest, but associated with local tenderness following exercise. He denied any history of trauma.

Physical examination demonstrated bilateral solitary nodules on both legs. The masses measured 1.0 cm on the left and 0.5 cm on the right. On palpation, the masses were soft and compressible. While standing with the hip, knee, and ankle in the flexed position (the “fencer’s lunge” position [3]), the lesions were more pronounced and firmer. There was no localized skin discoloration, varicosity, or edema.

Ultrasound examination was performed utilizing a Sequoia Ultrasound System (Acuson, Mountain View, Calif.) with a high-resolution linear 8–5MHz transducer in the longitudinal and transverse planes. Imaging included static and dynamic examination of both extremities. The dynamic examination included direct transducer compression over the mass and imaging during plantar and dorsiflexion of the foot. Sonography was performed in the supine position, standing with weight bearing of the individual lower extremities and following a short interval of jogging.

Longitudinal images best identified the pertinent sonographic findings. In all positions, both before and after exercise, a focal fascial discontinuity with muscle herniation was easily identified below the palpable soft tissue masses (Fig. 1). Transducer compression reduced the herniated muscle below the fascial defects, with subcutaneous fat noted to extend through the defect, further displacing the underlying muscle (Fig. 2). With active plantar and do-
risflexion of the foot, the muscle could be demonstrated sliding under the fascial defect with lesser and greater degrees of herniation. During forced flexion of the extremities in the upright position, the soft tissue masses were both more discretely palpable and sonographically definable. Because the patient noted the masses to be both more cosmetically deforming and symptomatic following physical activity, the patient was asked to perform a brief jog around the imaging center. Both masses subsequently enlarged and were firm and tender to palpation. Sonography demonstrated

![Fig. 1 Longitudinal image of the right anterior tibialis muscle at rest, demonstrating focal fascial discontinuity (arrows) and muscular protrusion (arrowhead). b Longitudinal image of the left anterior tibialis muscle, demonstrating larger fascial defect (arrows) and muscular protrusion (arrowhead; M muscle, F- fascia, S- subcutaneous fat)](image1)

![Fig. 2 Longitudinal image of the right anterior tibialis muscle with probe compression, demonstrating reduction of the muscular hernia (arrowhead) below the fascial defect (arrows). Subcutaneous fat is seen to herniate below the fascial defect (curved arrows)](image2)

a measurable enlargement of the fascial defect on the left and slight enlargement on the right (Fig. 3).

**Discussion**

Fascial defects are classified as traumatic or constitutional [1, 4]. Direct traumatic defects are the result of penetrating trauma to the muscle fascia. Indirect traumatic defects result from a blow to the contracted muscle causing disruption of the overlying fascia. Constitutional defects are either congenital or the result of regular, vigorous exercise with subsequent muscle hypertrophy and elevated intra-compartmental pressure. This causes muscular herniation through weaknesses in the fascia at entrance sites of perforating vessels. Constitutional hernias may be single, or multiple and bilateral [5].

The reported use of US for the evaluation of muscle herniation is limited. A single series of eight patients was reported by Bianchi et al. [6] in 1995. Seven male and one female patient, with an age range of 18 to 25 years, presented with a unilateral mass in the anterolateral aspect of the lower leg. As in our patient, ultrasound demonstrated the muscle fascia as a continuous hyperechoic linear structure, with a mean thickness of 1 mm, separating the overlying subcutaneous fat from the deeper underlying musculature. Discontinuity at the site of the fascial defect with associated muscle herniation was identified in all eight patients. Fascial defect size, as defined by US, did not correlate with the success of medical therapy versus the need for surgical management.