The case:

A 41-year-old man presented with tenderness along the lateral aspect of the left elbow and weakness with overhead lifting.

Figure: Grayscale ultrasound images of the proximal bilateral brachioradialis.

Your diagnosis?

For answer see page 906
Diagnosis:

Brachioradialis Strain, Grade I

Scott Tyson, MD; Patricia Delzell, MD; Naveen Subhas, MD; Murali Sundaram, MD

A 41-year-old man employed as a factory worker presented with worsening pain along the lateral left elbow that began acutely and reported occasional left elbow weakness when overhead lifting. The patient reported no trauma, erythema, or swelling.

On physical examination, mild tenderness was observed over the proximal left forearm. Range of motion was normal without apparent weakness. A grayscale ultrasound of the left arm, with attention given to the region of pain in the lateral arm, demonstrated a mildly enlarged and hypoechoic brachioradialis compared with the unaffected side (Figure 1).

In addition, sonoelastography demonstrated increased hardness of the musculature on the affected side (Figure 2A) compared with the unaffected side (Figure 2B).

Muscle strains are relatively common injuries, usually related to overuse or overstretching and present as soreness and stiffness of the affected muscle with variable loss of functionality. Muscle strains are divided into 3 grades: grade I strains consist of tearing none or few muscle fibers without functional impairment; grade II strains consist of partial muscle tears and at least partial loss of function; and grade III strains consist of a complete tear of the muscle with essentially complete loss of muscle function.¹

IMAGING

Although the diagnosis of muscle strain is often made on a clinical basis, imaging is occasionally needed either to diagnose or confirm a clinical diagnosis or to assign a grade to the suspected muscle strain because treatment will vary depending on clinical severity. Although magnetic resonance imaging remains the dominant modality used in the United States, the value of ultrasound in the evaluation of musculoskeletal pathology is firmly established in the medical literature.²,³ The advantages of musculoskeletal ultrasound over magnetic resonance imaging include superior spatial resolution, the ability to evaluate structures dynamically, and a lower cost.

Figure 1: Longitudinal ultrasound image of the proximal bilateral brachioradialis showing asymmetric enlargement and decreased echogenicity of the left brachioradialis compared with the right. No definite muscular tear or hematoma is seen.
On ultrasound evaluation, grade I strains often have a normal appearance or may have focal areas of decreased echogenicity; the echogenic muscle fibers, or perimysium, remain intact. Grade II strains are differentiated by loss of integrity of the echogenic perimysium, denoting tearing of the muscle fibers. In addition, an increased severity of associate muscle edema is observed, as evidenced by muscle enlargement and hypoechogenicity of the muscular background. Small foci of hemorrhage within the muscle may demonstrate increased echotexture. Grade III strains, the most severe, are diagnosed by complete myotendinous rupture or tendosseous avulsion, often with concomitant hematoma.

Sonoelastography

Ultrasound elastography is a method by which tissue strain, or hardness, can be evaluated and provides an additional point of assessment of the region under clinical evaluation. Tissue strain induced by compression is lower in harder tissues relative to softer tissues, and the degree of strain is color coded and superimposed over a grayscale image of the compressed tissue.

In instances of muscle edema, the muscle becomes hard and less compressible and is coded as blue. Soft, compressible tissues are coded as red. Tissues of intermediate hardness are coded as green. Although the use of sonoelastography for muscle strain has not been fully validated, the use of this technique to provide additional information with respect to the mechanical properties of the tissue appears feasible.

Treatment and Prognosis

The importance of distinguishing between a grade I and II strain is illustrated by their respective clinical prognosis. Although grade I strains have little risk of further muscle tearing and generally heal within 2 weeks of conservative management, grade II strains require conservative management for at least twice as long, with significant risk of further muscle tearing should the patient resume exercise too soon. Grade III tears are generally treated surgically to restore function and avoid muscle retraction and atrophy.

References