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Denervation Edema of Hamstring Muscles Following Acute Strain Injury

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A 20-YEAR-OLD MALE AMERICAN football player sustained a first-time, left hamstring strain injury (HSI) during competition. Magnetic resonance imaging indicated involvement of the biceps femoris long head (BFLH) and semitendinosus (ST) (FIGURE 1). Following 3 weeks of rehabilitation, the athlete was pain free, demonstrated full hamstring strength on clinical exam, and returned to competition without further incident.

Fourteen weeks after injury, magnetic resonance imaging was repeated as part of an ongoing study monitoring HSI recovery. Despite full athletic function, imaging revealed atrophy and increased signal intensity of the BFLH and a portion of the ST (FIGURE 2). Eccentric strength testing revealed that the involved limb was 15% weaker than the uninvolved limb, and an increase in strength in the uninvolved limb since preinjury testing. Due to lack of concomitant systemic symptoms and no personal history of inflammatory or autoimmune conditions, local tissue injury was the most likely differential diagnosis. Lack of subsequent trauma and diffuse edema evident throughout the BFLH, but absent in overlying subcutaneous tissues, indicated subacute denervation edema,^{1,3} which commonly presents 2 to 4 weeks after denervation¹ and may be due to water shifting to extracellular spaces² as a result of decreased viability of local muscle tissue. The tibial branches of the sciatic nerve to the BFLH and a portion of the ST were likely damaged during the initial injury or by ischemic compression due to subsequent scarring. If innervation is not restored, atrophy with fatty infiltration can develop, indicating irreversible changes and a potential decrease in long-term muscle performance.¹ At 12 months post injury, the athlete reported no limitations and demonstrated a 10% increase in eccentric strength.

Because most individuals who sustain an HSI return to play within the time frame in which denervation edema may present, this condition may often go undetected. Continued monitoring of muscle performance, such as eccentric strength testing, is warranted after HSI to identify strength deficits.

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FIGURE 1.

Magnetic resonance imaging 6 days after injury. (A) Coronal and (B) axial T2-weighted images of the thighs demonstrating increased T2 signal (increased brightness) in the left BFLH, surrounding a thickened proximal musculotendinous junction and tracking along the muscle's fascicles in a feathery pattern. Axial images reveal ST involvement. The yellow lines represent the locations of coronal and axial slices. Abbreviations: BFLH, biceps femoris long head; SM, semimembranosus; ST, semitendinosus.

FIGURE 2.

Magnetic resonance imaging 14 weeks after injury. (A) Coronal and (B) axial T2-weighted images of the thighs demonstrating a diffuse increase in signal (increased brightness) throughout the entirety of the left BFLH muscle and a portion of the ST, most consistent with subacute denervation edema. The yellow lines represent the locations of coronal and axial slices. Abbreviations: BFLH, biceps femoris long head; SM, semimembranosus; ST, semitendinosus.