The case:

A 24-year-old man presented for follow-up magnetic resonance imaging to rule out tumor recurrence 1 year after he underwent an above-knee amputation for synovial cell sarcoma.

Figure: Coronal T1-weighted (A) and T2-weighted (B) fat-suppressed images of the left thigh. Post-contrast T1-weighted fat-suppressed image in the coronal plane (C).

Your diagnosis?

For answer see page 769
Diagnosis:

Stump Neuroma

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Answer to Radiologic Case Study
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A 24-year-old man underwent above-knee amputation of the left leg for a synovial sarcoma in the popliteal fossa. One year after surgery, follow-up magnetic resonance imaging (MRI) was performed to rule out tumor recurrence. An enhancing soft tissue mass measuring approximately 2 cm was noted in the soft tissues of the stump. This mass showed an isointense signal compared with muscle on T1-weighted images and a moderately hyperintense signal on T2-weighted images (Figure). Careful inspection showed this enhancing mass to be continuous with the sciatic nerve proximally, and a stump neuroma was diagnosed.

DISCUSSION

Stump neuromas, which can be caused by trauma or surgery, are non-neoplastic proliferations of the proximal end of a severed, partially transected, or injured nerve. These neuromas are often seen after limb amputation.1,3 Traumatic neuromas typically have a bulbous end that is continuous with the normal nerve proximally.2 The scar at the end of the stump stops the neuron’s growth, which causes the characteristic bulbous shape.4,5 Traumatic neuromas typically occur 1 to 12 months after transection or injury, although cases of neuromas occurring decades after the injury have also been reported.3,6,7 Stump neuromas vary in size depending on the length of time over which the neuroma has developed and the diameter of the affected nerve trunk.2 Thus, one of the largest types of neuroma is the sciatic neuroma.5

Traumatic neuromas are most commonly located in the lower extremity after amputation, followed by the head and neck; more than 50% of these lesions are related to tooth extraction. Other commonly affected sites include the radial nerve and brachial plexus.2

The most common clinical symptom of a stump neuroma is pain, which a clinician can reproduce by tapping the affected area (Tinel sign). A firm soft tissue mass may also
be seen. The current case did not have symptoms related to a stump neuroma. Postamputation neuromas may only become painful if they are large enough to affect surrounding structures. Other potential causes of pain in this patient population are the contraction of surrounding scar tissue, pressure produced by a prosthesis, ischemia, infection, bony pathology, phantom limb pain, recurrent tumor, abscess, foreign bodies, and abnormal bursa formation.

Histological analysis of traumatic neuromas will reveal a dense collagenous matrix of non-neoplastic, nonencapsulated masses of axons, Schwann cells, endoneurial cells, and perineurial cells surrounded by fibroblasts. On histology, a stump neuroma can be distinguished from neurofibroma by disorganization of the neurogenic tissue. In cases of a stump neuroma, this disorganization is caused by the multidirectional proliferation of cells in an attempt to repair the injured nerve.

In cases of a stump neuroma, computed tomography, ultrasound, and MRI may show a fusiform mass or enlargement of the nerve ending in a bulbous shape. The neuroma appears homogeneously hypoechoic on ultrasound and may show small hyperechoic internal bands without significant vascularity. Traumatic neuromas typically show intermediate signal intensity on T1-weighted MRI and intermediate to high signal intensity on T2-weighted images, as was seen in the current case. Enhancement after intravenous gadolinium injection, when present, is variable and nonspecific. Sharp et al reported that in a study of 29 cases, the diagnosis of neuroma based on MRI was 96% accurate as confirmed by histology. Additionally, MRI was found to be more sensitive than ultrasound in detecting small lesions (<6 cm) and offered superior soft tissue contrast.

CONCLUSION

When a soft tissue lesion is encountered on a post-amputation MRI, the relationship of this mass to nearby nerves should be carefully examined to exclude a stump neuroma.

REFERENCES