High-Resolution Ultrasound as a Diagnostic Adjunct in Common Peroneal Neuropathy

Entrapment neuropathy of the common peroneal nerve is caused mostly by compression at the fibula head region. In cases of severe axon loss, demonstration of conduction block or reduction of conduction velocity would be difficult. Apart from demyelination, mechanical factors and ischemic mechanisms may play a role. Differing degrees of damage to individual nerve fascicles may occur within the common peroneal nerve, rendering interpretation of needle electromyography (EMG) difficult. High sciatic nerve lesions are also known to mimic peroneal neuropathy at the fibular head if electrodiagnostic examination is not performed adequately. High-resolution ultrasonography (US) may be a potential diagnostic tool in these technically challenging circumstances.

Methods. Over a 1-year period, we studied 32 healthy controls and 8 otherwise well patients who presented with footdrop. All controls and patients underwent US of the peroneal nerve as well as electrodiagnostic studies. Peroneal sensory and motor nerve conduction studies (NCS) were performed with standard techniques.

Blinded US examination was conducted with a General Electric Logiq 7 Pro machine (GE Healthcare, Chalfont St Giles, England), using a 5- to 10-MHz linear array transducer. Transverse scans of the peroneal nerves were obtained at the level of the fibula head bilaterally with the subject’s legs supported and slightly flexed (20° to 30°) at the knees in the lateral position (Figure 1). We measured the maximum transverse length, maximum transverse breadth (perpendicular to transverse length), ratio of these 2 parameters (breadth/length), and cross-sectional area (Figure 2). The upper limit of normality was 2 SDs above the mean. \( P < .05 \) was considered statistically significant.

Results. The peroneal nerve was identified without difficulty with US in controls (Table 1) and patients, using the fibula head as a prominent landmark. Of the 8 patients, 3 (patients 3, 5, and 8) with normal US findings were eventually diagnosed as having causes other than peroneal neuropathy, resulting in footdrop. The remaining 5 patients with peroneal neuropathy all had 1 or more abnormal US parameters. Of these, 4 had etiology related to

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<th>Table 1. Ultrasonography Parameter Results in Normal Controlsa,b</th>
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<td>Ultrasonography Parameterc</td>
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<tr>
<td>Transverse length, cm</td>
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<td>Transverse breadth, cm</td>
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<td>Ratio</td>
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<td>Area, cm²</td>
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aThirty-two subjects (19 men) and 64 nerves; mean age: 48 years; range: 21 to 78 years. Age distribution (number of subjects) included: 20 to 29 years (5), 30 to 39 years (5), 40 to 49 years (6), 50 to 59 years (6), 60 to 69 years (5), and 70 to 79 years (5).

bUltrasonography data in healthy controls were normally distributed (Shapiro-Wilk test, \( P > .05 \) for all).

cUltrasonography parameters were computed by pooling data from the right and left sides. No correlation was significant for all 4 US parameters with age (Pearson correlation coefficient \( r \), \( P > .05 \) for all). Only transverse length was significantly greater in men (unpaired t test, \( P = .02 \)).
local pressure and leg crossing. In terms of US parameters (Table 2 and Table 3), all 6 limbs with peroneal neuropathy had abnormal area and transverse breadth. In addition, 5 limbs showed abnormal transverse length, but only 2 had abnormal ratios. In comparison, apart from patient 7 (Figure 3) with motor conduction block, none of the other patients' NCS results had localizing value. Peroneal neuropathy was supported by EMG examination findings showing denervation in the tibialis anterior and sparing of the other muscles sampled in our protocol.

We found significant negative correlation of peroneal motor amplitude with transverse length (Pearson correlation coefficient, \( r = -0.66 \), \( P = .04 \)) and area (\( r = -0.63 \), \( P = .04 \)). However, no significant correlation was found between superficial peroneal sensory amplitude and all 4 US parameters (\( P > .05 \) for all).

**Comment.** The present study demonstrated high sensitivity and specificity of US in relation to electrophysiological techniques. In particular, the area, transverse...
breadth, and transverse length were particularly useful, consistent with previously observed pathological changes of diffuse or focal nerve thickening.4

As with previous investigators, it was technically difficult to image the peroneal nerve proximal to the fibular head5 and longitudinally in the popliteal fossa. Hence, we used transverse US scans at the fibula head level, the most common site of abnormality.

Our findings of negative correlation of motor amplitude with transverse length and area supports a relation between morphological nerve swelling in keeping with axon loss (patients 1, 2, and 4) over focal demyelination (patient 7), although both processes may coexist. This was also the experience reported in a study of ulnar elbow neuropathy.6 In conclusion, we have demonstrated the value of US as a diagnostic adjunct to electrophysiological testing for the localization of peroneal nerve entrapment.

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Financial Disclosure: None reported.

Additional Contributions: M. P. Lee and H. Y. Gan assisted with data analysis.

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