Hyperactive deep tendon reflexes (DTRs) are the hallmark of an upper motor neuron lesion. Assessment of the DTRs is a fundamental component of the evaluation of patients with cervical myelopathy. The usefulness of the DTRs in discriminating the levels of spinal cord compression is well known. Clarke and Robinson observed that compression of the high cervical spinal cord at levels C3–4 and C4–5 correlated with brisk or hyperactive reflexes, whereas normal arm reflexes were more commonly observed with compression at lower levels (C6–7 and C7–T1). Careful examination of the reflexes may help localize the lesion, especially in the context of cervical myeloradiculopathy associated with radiculopathy. The pectoralis reflex is easily tested but not part of the routine reflex examination. Von Bechterew first described the reflex in 1902, and Noto later named it “il riflesso costo-pettorale” or the costopectoral reflex. This reflex involves the lateral and medial pectoral nerves and, thus, innervation from the C-5 through T-1 roots. In the normal state, contraction may be felt, but gross contraction and movement are not seen. A hyperactive response causes adduction and internal rotation of the shoulder after tapping of the tendon of the pectoralis major in the deltopectoral groove. The presence of a hyperactive pectoralis reflex was seen only in patients with spinal cord compression at the C2–3 and/or C3–4 levels (nine patients). No patient with compression at or below the C4–5 disc space without coexisting compression at a higher level had hyperactive pectoralis reflexes. This association between the C3–4 level and a hyperactive pectoralis reflex was significant (p < 0.004, Fisher’s exact test). The deltoid reflex was tested in the last nine consecutive patients. It was present in patients with compression of the upper spinal cord at levels C3–4 and C4–5 (four of five patients) but appeared in only one of four patients with compression below C4–5. This association did not attain statistical significance. The presence of a hyperactive pectoralis reflex is specific for lesions of the upper cervical spinal cord. Examination of upper-extremity DTRs may be helpful in planning the appropriate levels for surgical decompression in patients with multilevel spondylosis and myelopathy.

KEY WORDS • deep tendon reflex • cervical spondylosis • myelopathy • neurological examination

Hyperactive pectoralis reflex as an indicator of upper cervical spinal cord compression

Report of 15 cases

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exaggerated in some of our patients. Therefore, this reflex, which is mediated through the axillary nerve (C-5 and C-6), was also tested.

Study Methods

Seventeen consecutive male patients presented for neurosurgical evaluation of cervical myelopathy. Two patients were excluded from the study because of other causes of an upper motor neuron lesion (one with a hemispheric stroke and another with human T-cell leukemia virus-I–associated paraparesis). Documentation of the DTRs was performed by a single neurosurgeon (J.C.W.) in all cases. Biceps, brachioradialis, triceps, quadriceps, and Achilles reflexes were recorded on the standard 0 to 4 scale. Hoffmann’s sign, Babinski’s sign, and a hyperactive pectoralis reflex were recorded as present or absent. The pectoralis reflex was tested by placing the index finger of the left hand lightly on the tendon of the pectoralis major at the deltopectoral groove and striking the finger with a reflex hammer. Reflex adduction and internal rotation of the shoulder were scored as a hyperactive pectoralis reflex. The deltoid reflex was examined in a similar fashion, placing the index finger over the deltoid tendon above its insertion on the lateral surface of the humerus. This reflex was tested in the last nine patients and was documented as normal or hyperactive. Examinations were performed without knowledge of the patient’s radiographic findings. Levels of spinal cord compression as seen on magnetic resonance (MR) images (14 cases) or myelogram/computed tomography studies (one case) were determined by a single neuroradiologist (W.S.K.). The findings are represented in Fig. 1, which shows that eight of 15 patients had compression at more than one level. Figure 2 illustrates typical MR findings on sagittal T2-weighted views in patients with cervical disease, with or without significant spinal cord impingement at the C3–4 level.

Results

A hyperactive pectoralis reflex was very specific for compression of the upper cervical spinal cord at the C2–3 and C3–4 levels. The levels of compression seen on radiographic studies for each of the 15 patients are displayed in Fig. 1. All nine patients with compression that included C3–4 and none with compression at or below C4–5 had hyperactive pectoralis reflexes. The association between the presence of a hyperactive pectoralis reflex and the C3–4 level was statistically significant (p = 0.004). No patient had isolated compression at C2–3; therefore, statistical analysis of this level was not possible. Hoffmann’s sign was present in all cases and Babinski’s sign in 14 of 15. The presence of a hyperactive deltoid jerk tended to accompany upper cervical compression at C3–4 and C4–5. However, in the nine patients tested, one had a hyperactive reflex despite only lower level compression, and one patient with upper spinal cord compression failed to display the abnormal reflex. No statistical significance was achieved at any level for this reflex.

Conclusions

The presence of a hyperactive pectoralis reflex in the context of cervical spondylosis and myelopathy is indicative of spinal cord compression at the level of C3–4 or above. It does not exclude coexisting compression at lower levels. This is in keeping with the concept that compression of the spinal cord above the level of the innervating roots of the reflex should prevent the normal...
descending inhibition of the spinal reflexes, resulting in hyperreflexia. We would therefore predict that isolated compression at the level of C2–3 would also cause an increased pectoralis reflex.

All patients in our series had pronounced myelopathy as manifested by Hoffmann’s sign in all patients and Babinski’s sign in 14 of 15. Therefore, we cannot predict the usefulness of the pectoralis reflex test in more subtle cases of myelopathy. All of our patients were adult males, but we would expect the same results in a mixed population.

A detailed examination of other upper-extremity reflexes may be helpful. For example, the deltoid reflex is also hyperactive in upper cervical compression. However, in our series it was not as sensitive or as specific as the pectoralis reflex, and it is also more difficult to elicit. Another reflex that may be specific to the upper cervical spinal cord is the jaw jerk. Clarke and Robinson observed that the jaw-jerk reflex was present in five of 73 patients with spinal cord compression. Specifically, in the five cases exhibiting a jaw jerk, compression was found at C3–4 in two cases, C4–5 in two, and C5–6 in one case. We did not test this reflex in our series.

Examination of the pectoralis reflex in the context of cervical myelopathy is a useful part of the neurological assessment. This reflex is quickly and reproducibly tested, and its pathological state is readily recognized. In the modern era of diagnostic imaging, physical examination is crucial for identifying the clinically significant lesions among those demonstrated by the imaging studies. Particularly in the context of multilevel spondylosis, it may be instrumental in planning the appropriate levels and nature of surgical intervention. For instance, in the case of multilevel spondylosis at C3–4, C4–5, and C5–6 (as in Case 9, Fig. 1), the presence of a hyperactive pectoralis reflex would argue in favor of including C3–4 in a surgical decompression if the clinical scenario warrants surgery. Clinical criteria for considering surgical decompression, which are beyond the scope of this report, would also apply to the pathology at C4–5 and C5–6.

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