

Chapter 2

The Diagnostic Tests

Duplex Ultrasound

As mentioned in the previous section, not every case of neurogenic thoracic outlet syndrome shows signs of arterial compression. In a recent study [1] 148 patients were evaluated with duplex ultrasound; when the patients were subjected to routine maneuvers of abduction of the arm to elicit compression of the artery, 51% of them showed definite arterial compression, while the remaining 49% did not. Thus, the duplex ultrasound exam done as outlined by Longley et al. [2, 3] is a noninvasive reliable and reproducible test to determine if arterial compression exists. It is an objective test with clear identifiable endpoints which can be accurately reproduced. MRI, CT scan, arteriogram, or EMG tests should not be requested routinely. Clinical evaluation and duplex ultrasound are sufficient to establish the diagnosis.

Abduction Maneuvers

Most reports in the literature [4] have referred to the diagnostic value of finding a loss of pulse during several maneuvers including the Adson test, the Wright test, and simple abduction of the arm to 90° and 180° but this is a highly subjective interpretation test depending on the experience of the examiner. Often enough, however, when the radial pulse does not disappear the patients are told that they do not have thoracic outlet syndrome, and are left in an undiagnosed limbo. Among the provocative tests available to elicit the symptoms [4–7] we have found the two most important to be first the Wright maneuver in which the arm is placed in 90° abduction rotating the hand outwards. The patient turns his/her head in the opposite direction and takes a deep breath, holding on to the inspiration, all the while the radial pulse is monitored. The Adson maneuver, with abduction of the arm to 180°, may elicit the symptoms immediately. One other maneuver that may be helpful and aimed to relieve the nerve compression is asking the patient to shrug his or her shoulders up.

When the shoulder is elevated the symptoms usually go away or the patient feels better. Some of these patients have adopted the posture of having the shoulders always shrugged up above the normal level to obtain some relief of their symptoms. When these maneuvers are implemented even when the radial pulse persists, signs of neurogenic compression should be interpreted as positive.

EMG

Urschel et al. [8, 9] had reported that using electromyography to determine the velocity of nerve impulse transmission from the neck to the hand and fingers is an accurate objective test to determine the presence of neurogenic compression. These conclusions have not been verified by many later reports and by our own clinical experience [10–14]. We found that only about 2% of patients show some abnormality in the EMG results even when they had clear clinical signs of neurogenic thoracic outlet syndrome. Therefore the use of EMG is not an accurate diagnostic test in this condition, at least until the patient has developed degenerative changes in the nerve trunks and/or in the muscles innervated by them. As Leffert has stated [15], the diagnosis of neurogenic compression in the thoracic outlet syndrome remains essentially a clinical one. Several useful maneuvers have been found to be helpful. In particular, as noted, the duplex ultrasound exam is helpful in determining the need for surgical decompression of the thoracic outlet in these patients. Figure 1.6a, b, shows the typical signs of positive duplex ultrasound tracings when arterial compression exists while applying the maneuvers of abduction to the arm involved. However in the patients who have a negative duplex ultrasound exam, whether or not neurogenic compression is the correct diagnosis can only be determined clinically.

Other Tests

As noted previously the symptoms of the neurogenic thoracic outlet syndrome which, also as noted, are associated with arterial vascular compromise 50% or more of the time are caused by the compression of the brachial plexus trunks and the subclavian artery in the posterior zone of the thoracic outlet, specifically between the anterior and the medial scalene muscle. This zone is called the “trigonum costo-interscalenicum” [16, 17] which is formed by those two muscles and the floor by the first rib. To accomplish complete decompression of these structures it is necessary to remove the first rib at that level along with dividing the scalene muscles inserting onto it [18–21]. Arteriography is rarely needed and is indicated only in cases where the duplex-ultrasound shows intrinsic abnormalities of the artery like aneurysm formation or stenosis. Ct scan exam falls in this category as well. Examples of these tests are shown in Figs. 1.5 and 1.6.

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<http://www.springer.com/978-1-4614-5470-0>

New Techniques for Thoracic Outlet Syndromes

Molina, J.E.

2013, XXIV, 124 p., Hardcover

ISBN: 978-1-4614-5470-0