THE SCALENUS MEDIUS BAND*

A Contribution to the Study of the Thoracic Outlet Syndrome

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This is a study of a group of patients who came with symptoms and signs of interference with the lower trunk of the brachial plexus. In each case the cause of the nerve lesion was found to be an aponeurotic band stretching from the transverse process of the seventh cervical vertebra to the first rib.

CLINICAL MATERIAL

Twelve patients, eleven women and one man, were seen between 1957 and 1963. Their ages ranged from fifteen to sixty-seven years, with an average of forty-two. The right upper limb alone was affected in seven cases and the left alone in four. One patient, the man, had symptoms in both upper limbs. The dominant limb was affected in seven cases and the non-dominant limb in six.

FIG. 1

Motor affection from interference with lower trunk of the brachial plexus by scalenus band. Photograph of hands and lower forearms showing marked wasting of all intrinsic muscles of the right hand, and of the medial group of muscles of the right forearm. (Case 11.)

CLINICAL FEATURES

The symptoms were predominantly those of an irritative lesion of a peripheral nerve, namely, the lower trunk of the brachial plexus. All patients complained of pain or other paraesthesiae affecting the medial aspect of the forearm and, usually, the medial two digits. The pain was usually produced or increased by actions such as carrying or lifting. Six patients developed progressive weakness of the affected forearm and hand. These six and four others,

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including the man, noticed alteration of sensibility in the medial two digits. Three patients complained that the affected hand easily became cold, but there was no instance of true Raynaud phenomenon.

Physical signs—Six patients, all with unilateral affection, showed motor paralysis, with weakness and wasting of the flexor carpi ulnaris, flexor digitorum profundus, flexor pollicis longus,

FIG. 2

FIG. 3

Radiological features. Figure 2—Radiograph of thoracic outlet showing elongation of seventh cervical transverse process on right (affected) side. On the left (unaffected) side there is a cervical rib. (Case 2.) Figure 3—Radiograph of thoracic outlet showing rudimentary "cervical" rib on the right (affected) side. (Case 4.)

and of all the intrinsic muscles of the hand (Fig. 1). The flexor pollicis brevis was sometimes less severely affected than the other intrinsic muscles, but it was never entirely spared. These six patients and four others, including the man with bilateral affection, showed signs of sensory paralysis in the form of altered sensibility in the medial two digits and the medial side of the forearm.

The usual signs at the root of the neck were: 1) local tenderness (nine cases); 2) fullness or a palpable band (five cases); and 3) a systolic bruit over the subclavian artery. In two cases the systolic bruit was present in all positions of the shoulder girdle. In eight others it was heard only when the shoulder was braced back. The effect of shoulder bracing on the radial pulse was variable.

RADIOLOGICAL FEATURES

In three cases radiographs showed no abnormality. In six the transverse process of the seventh cervical vertebra was elongated on the affected side, and in four there was a rudimentary cervical rib on the affected side (Figs. 2 and 3).

In one patient (Case 7) with a constant bruit over the subclavian artery and with severe motor and sensory paralysis, subclavian arteriography was undertaken after catheterisation of the ascending aorta (Dr David Sutton). The vertebral artery on the affected side was very large, and there was slight stenosis of the subclavian artery medial to the first rib.

In one patient with paralysis myelography (Dr Ronald Murray) showed no abnormality (Case 10).

OPERATION

In all cases the root of the neck was explored on the affected side. A transverse incision was made in the skin; the cleido-mastoid, omohyoid and anterior scalene muscles were divided and the subclavian artery and lower part of the brachial plexus were displayed. The artery was mobilised and retracted downwards, the suprapleural membrane was divided, and the apical pleura was exposed and pushed away from the first rib (Fig. 4).

In all cases the cause of compression of the lower trunk of the plexus was found to be a strong aponeurotic band passing from the seventh cervical transverse process behind the lower trunk and in front of the scalenus medius to the upper surface of the first rib. This band had a sharp edge, which distorted and compressed the emerging lower trunk (Figs. 5 and 6). In

FIG. 4

Relations of the brachial plexus in the "normal" right thoracic outlet. The scalenus anterior has been divided and the subclavian artery and apical pleura have been retracted forwards and downwards. The upper and middle trunks have been retracted upwards to show the lower trunk. Note the direct and unobstructed outward course of the lower trunk.

one case the trunk medial to the band was markedly reddened and swollen; in the others there was evident swelling medial and lateral to the point of crossing (Fig. 7).

In all cases the lower and middle trunks of the plexus were mobilised and the band was fully removed. When the upper part of the band incorporated a rudimentary cervical rib this was removed too. After removal of the band the lower trunk of the plexus appeared perfectly free. In all cases the subclavian artery appeared normal; there was no dilation or discoloration of its wall, nor any evidence of thrombosis.

The two more superficial muscles were repaired, and the platysma and skin were closed without drainage.

RESULTS

The patients were observed after operation for periods varying from four months to five years with an average of two years. All had immediate relief from pain and other paraesthesiae; freedom from these symptoms has so far been maintained in all cases. Four patients with severe motor affection has been under observation for two years or more after operation. The affected upper limbs of all have shown improvement in voluntary power

FIG. 5

FIG. 6

The scalenus medius band displayed at operation. In both cases the scalenus anterior has been divided and the subclavian artery has been retracted forwards and downwards. Figure 5—Marked motor affection. Right thoracic outlet. The band is seen mainly below the lower trunk of the plexus, which is held up by a hook. Note the swelling of the lower trunk. (Case 10.) Figure 6—Sensory affection only. Left thoracic outlet. The band is seen above and below the lower trunk, which is held a little upwards by a hook. Note the swelling of the trunk proximal to the point where it crosses the band. (Case 12.)

and increase in muscle bulk. The improvement has been particularly marked in the forearm muscles and least good in the abductor pollicis brevis. All these patients have recovered sensibility. Improvement of initially impaired sensibility in the affected hand has been felt by all patients who have been under observation for a year or more.

In the two patients with a persistent systolic bruit over the subclavian artery the bruit was absent after operation and did not later return.

Complications—In two cases a small hole was made in the apical pleura; the resulting small pneumothorax did not cause any significant trouble. In one other case there was a slight and transient Horner's syndrome on the side of operation.

FIG. 7

Severe motor affection. Marked affection of lower trunk. Findings at operation on left thoracic outlet. The scalenus anterior has been divided, the artery has been retracted downwards and the upper and middle trunks of the plexus have been retracted upwards. The lower trunk is seen crossing the scalenus band and being distorted by it. There is marked vascular engorgement of the lower trunk at and proximal to the point of crossing. (Case 8.)

FIG. 7

DISCUSSION

Compression of the lower trunk of the brachial plexus by an aponeurotic band stretching from the seventh cervical transverse process to the first rib is a rare but real cause of symptoms in the upper limb. Diagnosis depends on the recognition of the objective signs of paralysis of the lower trunk of the brachial plexus or on the linking of paraesthetic symptoms with local signs in the root of the neck.

Adequate demonstration of the band at operation depends on familiarity with the local anatomy, careful dissection and strict haemostasis. Under such circumstances the band can be displayed well and the affection of the lower trunk can be recognised clearly. Adequate

removal of the band gives good decompression of the lower trunk and is followed by disappearance of paraesthesiae and regression of the motor signs.

This type of "thoracic outlet syndrome" is distinct from the "vascular" syndrome, in which symptoms are produced by direct affection of the subclavian artery (Eastcott 1962).

FIG. 8

FIG. 8

Findings at operation in the "vascular" type of thoracic outlet syndrome. The right thoracic outlet of a woman of twenty-five, who three weeks previously had experienced sudden blanching and coldness of the right hand. No pulse was palpable in the affected limb. Cervical ribs were present on both sides. Early phase of operation. The scalenus anterior has been divided. The subclavian artery is seen crossing the cervical rib. At the point of crossing (marked by the crossing of the artery by a supraclavicular nerve) the vessel is thrombosed and the wall is discoloured. The tendon of the cut scalenus anterior is seen below the vessel at this point. Distally there is dilation of the artery with marked periarteritis (Mr C. G. Attenborough's case.)

Pickering (1963) ascribed the arterial affection to compression between the clavicle and a cervical rib. But it is more likely, as Eastcott (1962) suggested, that the site of the lesion is the point where the artery, the scalenus anterior and the cervical rib (or less commonly the first rib) come together (Fig. 8). Under these circumstances the relations are different from those obtaining when there is a scalenus band. In arterial affection the vessel is as it were snared between the rib and the scalenus anterior. In neural affection the posterior compressing element does not reach forward far enough to cause major affection of the vessel. Instead it affects the lower and posterior element of the neurovascular bundle—that is, the lower trunk of the brachial plexus.

SUMMARY

1. Thirteen instances of compression of the lower trunk of the brachial plexus at the thoracic inlet are described.
2. In each case the cause of compression was an aponeurotic band passing from the seventh cervical transverse process to the first rib.
3. The symptoms, physical signs, radiological features and findings at operation are described.
4. Satisfactory results followed removal of the band.
5. The anatomical arrangements are compared with those of the "normal" thoracic outlet and with those obtaining in cases of "vascular" thoracic outlet syndrome.

I wish to thank my colleagues, Dr Denis Brinton, Dr Harold Edwards, Mr C. G. Attenborough and Mr Donal Brooks, for asking me to help in the treatment of most of the patients. One patient (Case 9) was throughout under the care of my colleague Mr J. Crawford Adams, and I wish to thank him for permission to report this case. I am glad too to thank Dr David Sutton and Dr Ronald Murray for angiography and for myelography respectively, and Mr R. J. Whitley of the Institute of Orthopaedics for the photograph reproduced in Figure 5.

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