Relief of Costoclavicular Syndrome by Infraclavicular Removal of First Rib
Technical Note

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The costoclavicular syndrome appears to have been described first by Bramwell in 1903. In 1910 Thomas Murphy reported symptomatic relief in this condition following division of the first thoracic rib. Since then, a large body of literature has grown on the subject, and this was well summarized in Naffziger and Grant's paper of 1938.

The surgical relief of the syndrome has largely conformed to Adson's original technique intended for removal of the cervical rib, although other techniques have been described, namely, the posterior approach recommended by Clagett and the axillary approach by Roos. It should be noted that Adson's technique was intended for a largely supraclavicular structure, and its widespread acceptance as a technique for removing the first thoracic rib is surprising, considering that more than 50% of this rib lies deep to, or below, the clavicle. This supraclavicular approach leads to a lengthy and laborious dissection with displacement of axillary and subclavian vessels and the trunks of the plexus, as well as sectioning of the branches of the thoracocervical trunk, and careful retraction of the lymphatic duct. These steps are both time-consuming and hazardous.

The posterior approach advocated by Clagett also has its difficulties. An incision has to traverse a considerable depth of vascular muscle tissue to reach the goal on the anterior surface of the body. Although the transaxillary approach described by Roos is more attractive than the two approaches described above, the goal of the dissection again lies deep to the incision at the apex of a cone-shaped dissection.

The simplest approach in our experience has been through an anterior infraclavicular incision. Here, the first thoracic rib lies close to the surface and is easily identified; the anterior third lies well below the clavicle and is easily accessible. The neurovascular bundle is enclosed in a simple tubular sheath, and no significant vessels or nerves cross the field of the dissection. We have used this approach for resection of the first thoracic rib with complete success in five patients; three different surgeons have obtained excellent relief of symptoms and signs. The procedure has shown itself to be much less time-consuming than the supraclavicular approach.

Technique

An oblique 5-inch incision is made over the first rib, starting just medial to the costochondral junction (Fig. 1). The pectoralis muscle is split to reveal the first costal cartilage and the perichondrium of the first rib. With periosteal elevators, the perichondrium and periosteum are stripped from an area of about 1 inch in length at the costochondral junction. Then, with Leksel rongeurs, the lateral part

* The Leksel rongeur is specifically recommended for this operation.
of the cartilage is nibbled away, so that the first rib now floats freely, attached only at its posterior end (Fig. 2).

The most anterior part of the rib is also nibbled away with the rongeur, and the rib and its periosteum can then be easily stripped from the pleura with a sponge ball. With the use of the sponge ball and a finger for dissection, the pleura is stripped off the back of the first rib as far as the transverse process. This is quite easily accomplished since the rib is mobile and the pleura is lightly attached.

The rib is now depressed and the finger introduced between the rib and the clavicle. The pulsations of the subclavian artery can be felt, and the neurovascular bundle is found to be enclosed in a simple tubular sheath, with no branches that would obscure the field. While one hand depresses the first rib, the index finger of the other hand slides between the rib and the neurovascular bundle. The plane of dissection is easy to follow, and the bundle strips without difficulty from the depressed rib. A space has now been opened between the neurovascular bundle and the first rib and also between the first rib and the pleura.

An assistant now retracts the pleura. The patient's arm is abducted to 90°. The surgeon's left index finger is introduced between the first rib and the neurovascular bundle and holds the latter away from the first rib, at the same time depressing the first rib and opening up the costoclavicular gap (Fig. 3). A Leksel rongeur is now used to nibble away the rib. The rongeuring is carried out in full vision right up to and under the index finger of the left hand, which protects the neurovascular bundle.

At this point, the dissection can stop, since the decompression has been accomplished. We have, however, usually continued the dissection farther posteriorly, although at this point the actual rongeuring becomes a matter of feel rather than vision; even so, it is quite safe since the neurovascular bundle is completely protected by the index finger and the pleura has been retracted by the assistant. In this fashion the rib can be removed right up to the transverse process, as illustrated in Fig. 4. It is, of course, not necessary to resect the rib this far back, since satisfactory relief