

## A CASE OF CERVICAL RIB WITH SYMPTOMS RESEMBLING SUBCLAVIAN ANEURISM.<sup>1</sup>

BY JOHN B. MURPHY, M.D.,

OF CHICAGO.

THE existence of "surgical cervical rib" has been recognized by anatomists since Hunauld, in 1742, published his observation on this anomaly. True or complete cervical rib as described by Turuis (*Mém. de l'Académie Royale des Sciences de Paris*, 1742) has no surgical significance. The surgical literature, however, has not been very profuse on the topic, and the number of cases accurately described is comparatively small. A good review of the literature is given by Dr. Daniel N. Eisendrath (*American Medicine*, August 20, 1904), in which he abstracts practically all of the published cases (thirty-four).

The development of a cervical rib is either from the ossific centre of the transverse process of the sixth or seventh cervical vertebræ, or from a separate centre of ossification, articulating with the body and transverse processes of the cervical vertebræ in the same manner as the thoracic ribs. In the cases requiring surgical attention, it apparently develops from an individual ossific centre, as do the remainder of the ribs. Judging from the statistics of cases, cervical rib does not appear to develop until the patient is well into adult life; as in twenty-nine cases the average age was twenty-seven years. In eight other cases (age not given) it is mentioned that they were adults. The elongation and growth, therefore, of the transverse process or true rib would appear to correspond somewhat with the development or exfoliation of the wisdom teeth. Why the cervical process or rib should increase at this period of life is not known. While the transverse vertebral process has a separate centre of ossification, the process normally does not exceed

---

<sup>1</sup> Read before the Chicago Surgical Society, November, 1904.

five-eighths of an inch in length. In the development of a cervical rib from this process or from an independent centre of ossification, the rib not only increases in length but also in diameter as the distance from the spine increases, but the portion attached to the body of the vertebra remains the same diameter as the normal process (Fig. 1, A). Whether the growth is an addition to the tip from the cartilage that has been found capping it in many of the specimens, or whether it is an outward elongation from the vertebral body end, has not been definitely determined. It appears to me, however, on account of the increasing diameter of the rib, that the growth is by the deposit of additional bony material on the tip, in a manner similar to the growth of other long bones. In a number of cases; however, the attachment of scalenus medius or anticus to the rib is so far from the vertebra, that it would look as though the bone had elongated from its base and had been there from birth.

The length and size are well illustrated by the skiagram of Dr. Carl Beck's case. In my specimen the base of the rib measured three-eighths of an inch, while at the tip, where it curved downward to become attached to the first rib, it measured seven-eighths of an inch, and was flattened from above downward (Fig. 1, B). Cervical ribs exist normally in crocodiles (Eisendrath). In some cases the new-formed rib develops beneath and behind the branches of the brachial plexus and carries the nerve-trunks forward with the subclavian artery above it, so that the pulsation of the latter is the first conspicuous sign of trouble. Again, the end of the rib pressing on the nerves or artery and compressing them against the lower portion of the scalenus anticus (not against the margin of the first rib) causes in the former case severe pain and occasionally paralysis of the brachial plexus or one of its trunks, and in the latter an endarteritis or thrombosis, with suppression of the circulation and gangrene, or weakness of the vessel wall and aneurism (Fig. 4).

In looking over the clinical records of these cases, I was struck by the absence of œdema as a symptom, showing the

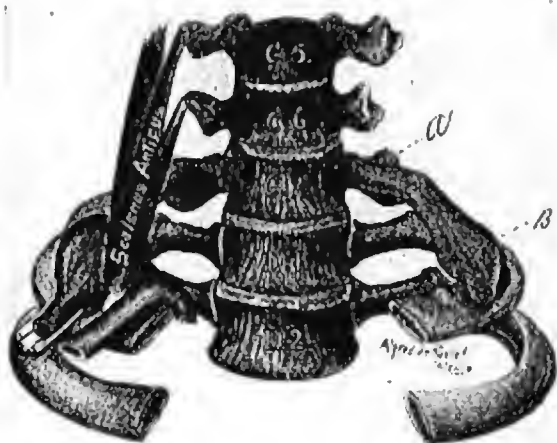


FIG. 1.—Cervical rib.



FIG. 2.—Case of Dr. Murphy.



FIG. 3.—Case of Dr. Beck.  
Schiagrams of cervical ribs.

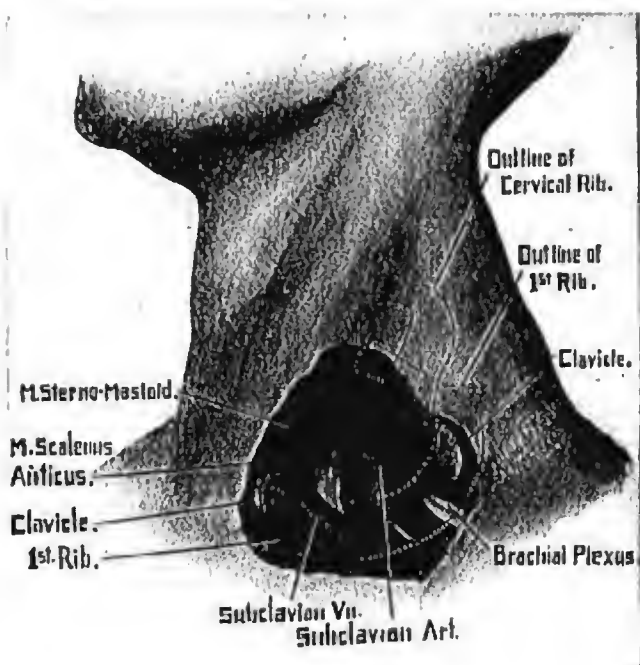


FIG. 4.—Cervical rib.



FIG. 5.—Cervical rib.

subclavian vein was not compressed, while the artery and nerves were severely compromised. This, I think, can be explained by the fact that the scalenus anticus is attached to the first rib and lies between the artery and vein, so the latter, situated in front of the muscle, has nothing to hold it firm for counterpressure. As the cervical rib advances forward, it carries the nerves and artery against the unyielding muscle and severely compresses them, while the vein, being anterior and external to the muscle, is never compressed (Fig. 5).

The small number of pulsating tumors recorded would indicate that aneurism was not common, and even those classed as such are doubtful in my mind. In our case the vessel spread out so as to cover almost the entire inch of rib surface, very much resembling an aneurism, but dissection showed there was very little dilatation of the vessel at that point.

The scalenus anticus is occasionally attached to the cervical rib, which seems to indicate its embryonal origin, but this may be only the lower attachment of the scalenus medius carried forward as the rib developed in an anterior direction. This would also tend to bind the artery and nerves beyond the possibility of escape from pressure and ultimate destruction if the rib continued to grow.

Gruber's classification is a good one:

- A. The process-like projection scarcely extending beyond the transverse process.
- B. The moderate degree extending an inch beyond the process with a free end or one attached to the first rib.
- C. A thin quarter rib extending to the external border of the scalenus anticus with a free or attached end.
- D. A complete rib with a sternocostal cartilage either individual or combined with the first rib.

The supernumerary rib exists on both sides in 67 per cent., or on one side in 33 per cent. of the cases in which they are found.

## SYMPTOMATOLOGY.

The symptoms of cervical rib are entirely those of pressure and displacement involving the structures as follows:

- A. Pressure on the nerve-trunks of the brachial plexus. (Paræsthesia, paralysis.)
- B. Pressure on the subclavian artery. (Brachial ischæmia, aneurism, thrombosis, gangrene.)
- C. Tumor formation in the supraclavicular triangle.

The symptoms produced by pressure on the nerve-trunks vary from slight tingling in the forearm and hand to complete paralysis in the area supplied by the compressed nerves. In the early manifestations, the symptoms are increased and diminished by changing the position of the arm. Elevation of the arm and shoulder relieves the nerve pressure, and the patients find that they rest more comfortably at night with the arm above the head, and that the boring neuralgic pains, as well as the numbness of fingers, hand, and forearm, are relieved by elevating the shoulder or supporting the body on the elbows. As the pressure becomes more severe and continued the paræsthesia and paresis are followed by anæsthesia and paralysis. The numbness and tingling announce the existence of pressure for months and even years before paralysis develops. The muscles of the forearm fatigue on very slight exertion; this may be due to the cellular ischæmia or nerve exhaustion. These cases are most frequently diagnosed as brachial neuralgia, neuritis, etc.

The change in the circulation is peculiar and striking and involves the arterial, never the venous, current. If the patient presses his hands firmly together there will be a rapid return of circulation to the "life-glow" on the normal side; while on the diseased side the hand remains blanched, wrinkled, and cold from a minute to a minute and a half, resembling the anteperiodic pallor of impending Raynaud's disease. This was one of the most striking symptoms in our case. Cold water felt many degrees colder on the affected than on the healthy side. There was no evidence of venous stasis. If



there had been, the "pallor" symptom would have been absent. Where the pressure had been great and continuous, the records of cases show that an obliterating endarteritis took place, and in two cases it was followed by gangrene. One can scarcely comprehend that a slow obliterating endarteritis from compression would produce a gangrene, as collateral circulation so rapidly develops; but a sudden and severe trauma of the artery in its exposed position for pressure might produce thrombosis with distant necrosis.

The sudden trauma of the artery could weaken its walls so that an aneurism would be produced, and this has undoubtedly occurred. But the diagnosis of aneurism should not be accepted in these cases except where a dissection and exposure of the artery have been made. Our case, on first sight, and, indeed, without the most careful examination, would have been diagnosed as aneurism, and one could scarcely convince himself that aneurism was not present on account of the broad pulsation as well as the lateral expansion signs. The broad surface was due, however, to the flattened condition of the subclavian artery over the wide terminus of the rib. This also permitted the lateral expansion with cardiac contraction. The bruit was present and extended in a downward direction, more marked with the shoulder depressed. With depression there is frequently an absent or diminished radial pulsation; when the shoulder is elevated the pulsation again becomes normal. In a number of the recorded cases radial and brachial pulsation were absent, and did not return after the relief of the pressure by removal of the rib.

The vein is not caught by the advanced end of the rib, as it is situated entirely anterior to the middle scalenus muscle, and therefore admits of great displacement in a forward direction without angulation or compression. There was no edema of the arm or forearm in our case, nor did I find it mentioned as a symptom in any of the histories even where aneurism is recorded. This, as stated above, is probably due to the relation which the vein and the artery bear to the scalenus muscle. Even an aneurismal dilatation of the artery at that point would not press on the subclavian vein, but against

the anterior scalenus muscle, and, until that muscle had been destroyed by the aneurism, it could not compress the vein. Even then the vein would have ample opportunity to escape, as there would be no resisting body anterior to its inner side to act as a counter support. The relation of the scalenus muscle to the artery, nerve, and rib, and its effect as a counteracting force, has not up to this time been appreciated.

The following is a case of special interest because of the extreme severity of the symptoms before operation, and their prompt subsidence after the removal of the rib.

Patient, Mr. J. G., was admitted to Mercy Hospital, November 4, 1904. He was thirty-eight years of age and a farmer by occupation.

*Present Illness.*—About one and one-half years ago the patient first noticed a tingling sensation in the last phalanx of the left index-finger. This tingling and numbness were noticed especially when the hand was exposed to cold, and would disappear entirely if kept warm. The index-finger was the only part affected for six months after the onset, when the same trouble developed in the distal phalanx of the little finger. Symptoms continued about the same throughout the winter, and gradually subsided as the weather became warmer. During the summer the numbness and tingling were entirely absent, and did not reappear until two months ago, since which time all the fingers of the left hand have been affected. In addition to the disturbances of sensation, the patient now suffers severe pain in the palmar surface of the thumb and the anterior aspect of the wrist on the radial side. During the past few weeks this sharp lancinating pain has been so intense that he has been unable to sleep at night, and even large doses of morphine have failed to give relief. The left forearm and hand are always cold, and the muscular power is much weaker than before the onset of the trouble. At times the pain has radiated up the forearm to the elbow. When exposed to the cold, the forearm and hand become pale and the ends of the fingers ischæmic. To the left hand everything feels much colder than to the right. He has lost some flesh during the past few months, but the general health has been good. The patient has been treated for rheumatism and neuralgia without result.

*Previous and Family History.*—Negative. *Examination.*—Medium stature; well nourished; lungs negative; heart negative. One inch above the junction of the inner and middle thirds of the left clavicle a pulsating prominence is seen. Palpation of this prominence shows the pulsation is expansile, but greater in the horizontal direction than in the vertical. By deep pressure the pulsation of the tumor disappears, and the examining fingers then come in contact with a hard, unyielding mass, which can be traced backward to the lateral process of the seventh cervical vertebra. The pulsating tumor stands half an inch above the surrounding surface, and cannot be compressed to the level of the clavicle, which might be done were it an aneurism pure and simple. The brachial and radial pulsations are normal with the arm extended, but with the shoulder depressed there is a pronounced diminution in the arterial tension and force of the pulsation. There is a deep pallor of the hand and forearm, very pronounced after pressure on the hand. There is also a peculiar coldness of the forearm and hand.

*Operation*, November 9, 1904.—The shoulders were elevated on a small sand-bag, and the chin turned to the extreme right. An incision three inches long was made at the posterior border of the scalenus anticus muscle, almost parallel to it, but slanting a little backward. The subclavian artery was exposed and displaced forward, bringing the anterior end of the cervical rib into view. The rib was freed from its attachments back to the spine and divided. The brachial plexus was then displaced inward, rib slowly elevated, and the tissues gradually displaced until the anterior attachment to the first dorsal rib was in view. It was detached with the bone forceps, and the surface of the first rib smoothed off with a chisel. The artery was then carefully examined and seemed somewhat enlarged at the point of greatest pressure from the rib. The muscles were all replaced and fixed in position by catgut sutures. Primary wound healing occurred and the patient was discharged from the hospital, November 14. The pain had almost entirely subsided and the circulation was much improved.

Examination of patient, December 22, 1904, showed that the vessel had contracted to about its usual size, and the former elevated area had sunk to the normal level. Circulatory disturbances

in the hand and forearm had subsided, the pain disappeared, and the strength of the muscles was rapidly returning.

The greatest difficulty is in the diagnosis of the condition in its early manifestations; once it is suspected, it can usually be verified by palpation and a skiagram. The latter, however, in some cases is not so satisfactory as one would wish. All cases should be operated as soon as diagnosed.

The removal of the rib is not difficult or dangerous, if care be exercised in displacing the artery and nerves. The periosteum should be removed with the rib, otherwise it might be reproduced. I know of no reported case of reformation of the rib after removal.