

Cervical Rib - a Short Case Study on Features, Incidence and Clinical Correlation

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Abstract: The cervical rib represent the elongated costal element of the seventh cervical vertebra .It may be complete and incomplete. . The occurrence of bilateral cervical rib lies between 67 and 80% of all cervical ribs according to different opinions .Complete bilateral ribs are very rare The cervical rib is found more often on the left side, but symptoms are more common on the right side. This is because of the greater use of the right arm, because the right plexus is in closer connection with the corresponding rib than the left, and because the right plexus is in closer connection with the corresponding rib than the left, and because there is a greater drop of the right shoulder in the right-handed persons. Symptoms are much more common in women than in men .During demonstration of different cervical ribs the following findings were found.

Keywords: Brachial Plexus, Cervical Rib, Reynaud Disease, Scalene Tubercle, Thoracic Outlet Syndrome

I. Introduction

In man apart from twelve thoracic vertebrae , the cervical vertebrae possesses rudimentary transverse processes containing the costal elements. The costal elements of the seventh (and occasionally the sixth) cervical vertebrae however sometimes undergo abnormal development and form cervical ribs.[1] Cervical rib may be unilateral or bilateral and varies from a simple exostosis of the costal element to a fully formed rib, articulating by a complete synovial joint with the transverse process and body of the seventh cervical vertebra. The rib may reach the sternum or it articulates with the first thoracic rib at the scalene tubercle or it may be attached to the first thoracic rib by a fibrous band or it may have free extremity.[2] X-ray taken in a AP plane frequently fail to show a cervical rib due to the foreshortening consequence on its downward and forward direction of its anterior extremity.[3] The complete cervical rib extends out laterally, then turns forward and downward between the scalenus anticus and scalenus medius muscles to meet the costal cartilage of the first rib, the brachial plexus passes over it. Then on its downward course the subclavian artery arches backward and laterally over it.[4]

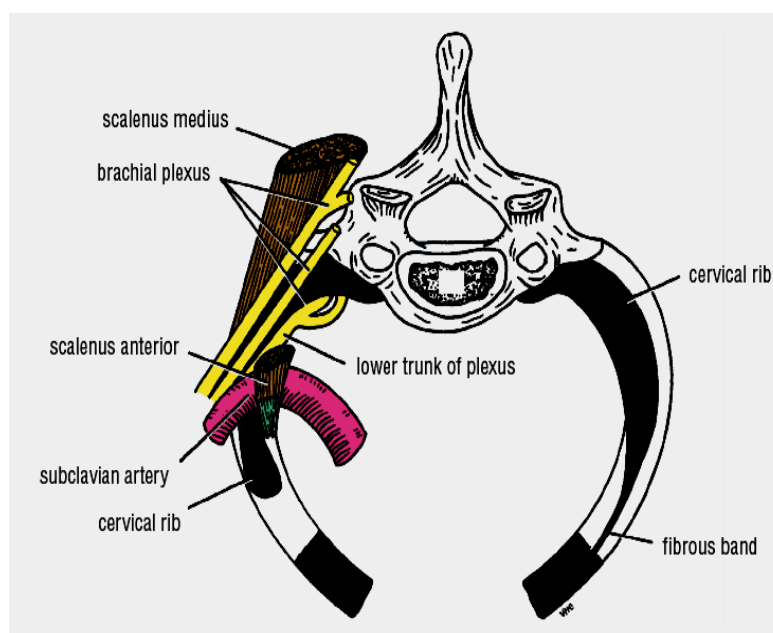


Fig-1: thoracic outlet as seen from above. the cervical rib (black) are present on both sides. on the right side of the thorax ,the rib is the almost complete and articulates anteriorly with the first rib.on the left side the rib is rudimentary forms the fibrous band and is attached with first cartilage.

II. History

Galen and Vesalius were the first to describe a cervical rib in detail as a supernumerary rib, springing from one of the cervical vertebrae, usually the seventh, rarely the sixth, and very rarely the fifth. Helkiah Crooke, in his *Microcosmographia* of 1651, mentioned Bauhin finding of thirteen ribs on each side at necropsy. Hunauld, the pioneer of present conception published his article in 1743. In 1818 A. Cooper was treating symptoms of cervical ribs medically with some success. Pilling reported 139 necropsy cases of cervical rib in 1860. In 1861, Coote performed the first operation.[4]

III. Incidence

In a study of 250 necropsy subjects, Todd found three cases of cervical rib and one of rudimentary first rib. Pilling in 1894 published an account of 139 cases of cervical rib found at necropsy; in three of these it had caused symptom. The occurrence of **bilateral cervical** rib lies between **67 and 80%** of all cervical ribs according to different opinions. Murphy stated that 30% of bilateral ribs that give bilateral symptoms. Complete bilateral ribs are very rare, up to 1907 Keen could find only two cases of complete bilateral ribs with bilateral symptoms. Among Pilling's 139 cases was one complete bilateral. Three authentic cases of bilateral cervical ribs have been reported, one each by Beck, Ehrlich and Struthers.[4]

3.1. Side Involved.-The **cervical rib is found more often on the left side, but symptoms are more common on the right side.** This is because of **the greater use of the right arm**, because the right plexus is in closer connection with the corresponding rib than the left, and because there is a greater drop of the right shoulder in the right-handed persons. Symptoms are much more common in **women** than in men. Todd thinks that the greater movement of the upper part of the chest in women during respiration has much to do with it. **Evans** suggests that **deformities in the neck** are more noticeable in **women**.[4]

IV. Embryology

- Jones attributed the embryologic formation of supernumerary ribs to a conflict between forming plexuses and ribs[4]
- Todd stated that ribs are normally present in the foetus in articulation with vertebrae above the eighth, and that after birth they are present only as transverse processes of the cervical vertebrae.[4]
- Eisler asserted that when a cervical rib is well developed the plexus either receives no contribution, or only a very small one, from the first dorsal nerve.[4]
- Mutations in **Hox genes** have been shown to cause the development of **cervical ribs** from the costal or ventral processes of the primitive vertebral arches.[5]
- **Side Involved.**-The **cervical rib is found more often on the left side, but symptoms are more common on the right side.** This is because of **the greater use of the right arm**, because the right plexus is in closer connection with the corresponding rib than the left, and because there is a greater drop of the right shoulder in the right-handed persons. Symptoms are much more common in **women** than in men. Todd thinks that the greater movement of the upper part of the chest in women during respiration has much to do with it.
- **Evans** suggests that **deformities in the neck** are more noticeable in **women**.
- Study had been done to detect the prevalence of the cervical ribs by using CT. The prevalence of the rib varied between races. Individual with a cervical rib are ten times more likely to develop Thoracic Outlet Syndrome[6] and Reynaud Disease. Provocative maneuver (scanning with the arm up and rotated outward) may lead to the demonstration of the occlusion or compression of the subclavian artery and or compression of the brachial plexus.[5]

V. Comparative Anatomy

Cervical ribs are normal in crocodiles. The anthropoid ape has thirteen pairs of ribs. Adolphi found a dog with twenty-six ribs.

Gruber, of St. Petersburg, in **1869 classified cervical ribs** in complete a manner as follows :

- a) **Slight degree**, rib reaching beyond the transverse process;
- b) **More advanced**, rib reaching beyond the transverse process either with a free end or touching the first rib;
- c) **Almost complete**, the connection with the cartilage of the first rib by a distinct band' or by the end of the long body of the cervical rib;
- d) **Complete**, the rib is complete and possessed of a true cartilage to unite with the cartilage of the first rib.

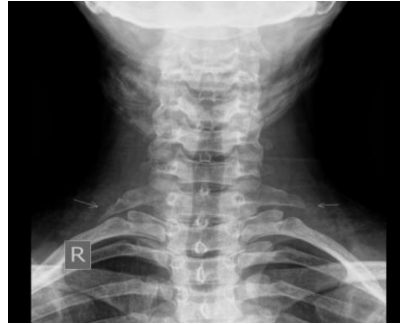


Fig-2: radiograph showing bi-lateral cervical ribs

VI. Symptomatology

In many cases a cervical rib produces neither signs nor symptoms. Symptoms are much **more common in women** than in men. Cervical ribs have been recognized in children by the presence of a tumour in the neck. Characteristic symptoms are one or more of the following: pain, atrophy, circulatory abnormalities and disturbance of sensation. Pain may be sharp and lancinating and may be brought on by sudden rotation of the head or by a forceful, downward pull of the shoulder on the ulnar side of the forearm. The pain may be associated by hyperaesthesia, paraesthesia, or both sides. Anaesthesia, depending on the degree of involvement, affecting chiefly the distribution of the middle and lower cervical trunks. Wilson finds atrophy to be of two types: the median or partial thenar type and the ulnar type. The circulatory changes are caused by constriction of the subclavian artery or subclavian vein, obstruction of the radial and ulnar arteries by emboli from thrombosis at the site of constriction, or possibly by disturbance of the sympathetic innervation. Horner's syndrome may be due to pressure and traction on the inferior cervical ganglion.[4] Trophic ulceration or even gangrene of the fingers-the hand is generally colder than its normal, may be cyanosed or mottled, especially on exposure to cold. The radial pulse weaker or absent, and the subclavian artery in the neck feels prominent, and pulsation visibility. Auscultation over the pulsatile vessels reveals a systolic murmur.[3] The clinician must differentiate such arm ischaemia from Raynaud Syndrome, Vasospastic disorders, distal small-artery obstructive diseases. So, the **Aim** of study was a short case study on features, incidence and clinical correlation of Cervical rib and the **Objective** of the study was Observations for incidence and taking measurements of seventh cervical vertebra having rib like features among Cervical vertebrae sets and discussions regarding clinical findings.

VII. Material & Methods

Dry seventh cervical vertebrae among cervical vertebrae sets available in the department of anatomy at KIMS with the features of cervical ribs. All the seventh cervical vertebrae available in the department were observed for incidence of cervical rib. The extension of the transverse process was measured by slide callipers. All the measurements were observed & analyzed. All available Text books & articles were gone through to get information for the present observational study for analysis.

VIII. Observation

Present study shows 0.6 % incidence of cervical rib in available cervical vertebrae sets:

| Table-1: Measurements of the Cervical ribs: | | |
|---|------------------|------------|
| Specimen no. | Presentin (side) | Length(cm) |
| 1 | Left | 1.5 |
| 2 | Left | 0.7 |
| 3 | Left | 0.8 |
| 4 | Both side | 0.2 |
| 5 | Left | 1.3 |
| 6 | Left | 0.4 |



Fig-3: elongated tr.process of C7 measured by slide calipers



Fig-4: facet for rib in a 7th cervical Vertebra



Fig-5: elongated transverse process of C7.

IX. Discussion & Conclusion

The first recognition that the syndrome of the cervical rib with subclavian artery thrombosis could be complicated by combination of right upper extremity and cerebral thromboembolism was made by Gould 1884. Pathogenesis was assumed as a progressive obliteration of the brachial artery. The cervical rib may be associated with spinal anomalies. The embryologic formulation of cervical rib is attributed to conflict between forming ribs and plexuses.[7] Management of Thoracic Outlet Syndrome is rib resection and anterior Scaleneotomy.

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