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Case Report

AN UNUSUAL CASE OF SYNOSTOSIS OF FIRST AND SECOND RIB

Anupama K [1], Prathap Kumar J [2], Radhika PM [3].

[1,2,3] Assistant Professor, Department of Anatomy, M.S.Ramaiah Medical College, Bangalore – 560054, Karnataka, India.

ABSTRACT

Introduction: Congenital anomalies of the ribs are not so common but they are usually discovered as an incidental finding on routine radiography. Bicipital rib results due to fusion of cervical rib with the first rib or the first rib with the second. Its occurrence is not uncommon and more frequently unilateral. **Observation**: During routine course of osteology teaching we observed that the first rib had fused with the superior surface of second rib, on the left side. Fusion between the ribs had occurred 3cms from the tubercle of the first rib obliterating the first intercostal space anteriorly. **Conclusion**: The incidence of synostosis of ribs is 0.3% of the population. It is usually asymptomatic but they may cause musculoskeletal pain or intercostal nerve entrapment. Involvement of the 1st rib is one of the causes of thoracic outlet syndrome. A rib anomaly usually indicates an underlying systemic disease and might need surgical intervention. Hence the present paper is an attempt to highlight its morphological implications and clinical significance

KEYWORDS: Synostosis; Bicipital rib; Thoracic outlet syndrome; Intercostal nerve.

Address for Correspondence: Dr. Anupama K. Assistant Professor, Department of Anatomy, M.S.Ramaiah Medical College, Bangalore – 560054, Karnataka. India.
E-Mail: dranukodial@yahoo.co.in

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INTRODUCTION

Ribs are twelve pairs of elastic arches that articulate with the vertebral column posteriorly. It consists of highly vascular trabecular bone, enclosed in a thin layer of compact bone [1]. Congenital anomalies of the ribs are rare and they are usually discovered as an incidental finding during routine radiography. Its incidence has been reported to be 0.3% in a study based on chest radiograph. Bicipital rib results due to fusion of cervical rib with the first rib or the first rib with the second [2].

Its occurrence is not uncommon and more frequently unilateral. It is usually asymptomatic but they may cause musculoskeletal pain or intercostal nerve entrapment. Involvement of the first rib may be an uncommon cause of thoracic outlet syndrome. A rib anomaly usually indicates an underlying systemic disease and significant vascular compromise has been reported with fused first and second ribs and needs early diagnosis and surgical intervention [3]. This paper is an attempt to highlight the evolution, morphological implications and clinical significance of bicipital rib. Hence it is useful for the anatomists, radiologist and thoracic surgeons who are dealing with this region.

MATERIALS AND METHODS

During routine osteology demonstration in the department of Anatomy, M V J Medical College we found an anomalous rib. The specimen showed synostosis of the first and second rib and the line of fusion was very prominent. The specimen was examined in detail and photographed and relevant measurements were recorded.

OBSEVATIONS & RESULTS

The morphological analysis showed that the specimen was a fusion of first and second ribs on the left side. Each of these ribs possessed two separate head, an elongated neck, a tubercle and the beginning of the shaft. The two shafts are fused with each other at 3cms from the tubercle of the first rib on the superior surface of the second rib.

Both the heads had articular surfaces for its articulation with the corresponding thoracic vertebrae. A cleft between the two ribs was 1cm in a vertical diameter and 2.5cms long from its vertebral end thus obliterating the first intercostal space. Fig 1

The breadth of the shaft of first rib immediately before the fusion was 1.5cms and that of the second rib was 2cms.

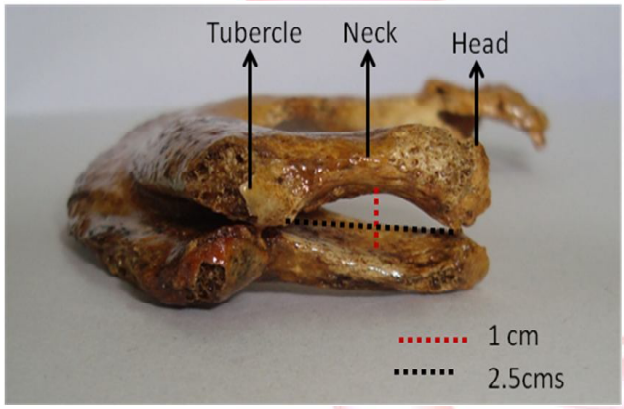

Fig 1: Showing the posterior view of the bicipital rib.

After the fusion the common body assumed a breadth of 3cms at its widest part. The line of fusion of both the ribs was marked by a faint groove on the inferior surface and a ridge extending from the tubercle of the first rib to the middle of the conjoint shaft on the superior surface. Fig 2

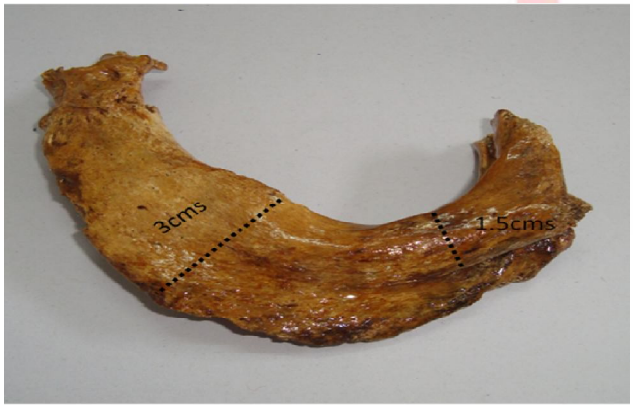

Fig 2: Showing the superior view of the fused rib.

The ribs develop from the mesenchymal processes of the primitive vertebral arches in the thoracic region. Malsegmentation of the axial skeleton, before 20th day of embryonic life leads to multiple morphological anomalies of the vertebrae and ribs. Malexpression of myogenic determination factors like Myo D, Myogenin, Myf 5 and MRF4 could be potential cause of such anomalies [4].

DISCUSSION

The fusion anomalies of the thoracic ribs can be classified into three types:

A) Bicipital rib: Fused anterior ends and shafts but separate posterior ends.

B) Bridged rib: Fused shafts but separate anterior and posterior ends.

C) Forked rib: Fused posterior ends but separate shaft as well as separate anterior ends [4].

First rib anomalies create a narrow space through which the Brachial Plexus and subclavian vessel passes causing compression. These anomalies include a fused cervical and first rib or a fused first and second rib [5].

The tunnel formed between first and second rib transmits the first intercostal nerve and posterior intercostal vessels and this could form a potential site for nerve entrapment or compression of vessels. These clinical manifestations may be seen with congenitally abnormal first rib or with first and second rib synostosis. First rib malformations such as rudimentary first rib, fused ribs are commonly associated with post fixed brachial plexus with a large contribution from second thoracic nerve[3].

The first and second thoracic nerves may get stretched over the broadened shaft of fused first and second rib and it may result in neurological symptoms of thoracic outlet syndrome. Significant vascular compromise has also been reported with fused first and second ribs and warrants an early diagnosis and surgical intervention. Rib fusion also causes scoliosis and restriction of chest wall expansion [3].

Anomalous ribs are rare anatomic finding discovered incidentally on routine radiographs. Many a times they are associated with different syndromes and therefore should not be neglected.

There are 22 syndromes described, in which rib anomalies is one of their constant component. Few examples: Klippel-feil syndrome, Jarco-levin syndrome, Poland syndrome, Basal cell naevus syndrome (Gorlin syndrome) [3].

Jaw cyst basal cell naevus- bifid rib syndrome or Gorlin- Goltz syndrome is a rare autosomal dominant disorder associated with multiple odontogenic cysts in the jaw and basal cell carcinoma of the skin with bifid rib [6].

The first case to be recorded was communicated in 1740 to Royal Academy of Sciences in Paris by M. Hunauld who stated that "The skeleton of an adult in which the first rib in each side is well formed posteriorly and articulated with the first dorsal vertebra, joins and fuses with second rib, which by this union becomes larger than usual [7].

In primitive tetrapods the ribs were double headed: a capitulum or head proper which is attached in early forms to the intercentrum and the tuberculum or an accessory head attached to the transverse process of the neural arch [8,9]. In mammals, fused two headed ribs are seen with a foramen between them. Fused ribs are also called as pleuroapophysis [8].

A few tetropods like anurans, lizards, snakes and monotrems exhibit single headed ribs resulting from the fusion of the 2 heads or from the disappearance of one head during development. Necturus exhibits very short, almost vestigial bicipital ribs along the entire length of the body and tail [9].

CONCLUSION

The rib anomalies were found in 0.3% of the population. It is usually asymptomatic but they may cause musculoskeletal pain due to stretching of the nerve following broadening of the conjoint shaft formed by the synostosis of the two ribs. It may also cause intercostal nerve entrapment due to obliteration of the intercostals space. Involvement of the first rib may be an uncommon cause of thoracic outlet syndrome. A rib anomaly usually indicates an underlying systemic disease and might need surgical intervention. The present paper made an attempt to highlight the evolutionary basis, morphological implications and clinical significance of synostosis of the first and second rib.

Conflicts of Interest: None

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