IJCRR
Vol 05 issue 11
Section: Healthcare
Category: Case Report
Received on: 26/04/13
Revised on: 14/05/13
Accepted on: 06/06/13

BICIPITAL RIB – A CASE REPORT

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ABSTRACT

Introduction: Bicipital rib results due to fusion of cervical rib with the first or the first rib with the second rib. Its incidence has been reported to be 0.3% based on chest radiography.

Observation: During routine course of osteology teaching we noticed left sided first rib which had fused with the second rib on its superior surface, 1.5 cm from the tubercle of first rib obliterating the first intercostals space anteriorly. Single articular facet was present on the heads and tubercles of both the ribs. **Conclusion:** A Rib anomaly usually indicates an underlying systemic disease and might need surgical intervention. First rib anomaly is an uncommon cause of thoracic outlet syndrome hence should not be neglected. The present paper is an attempt to highlight its morphological implications and clinical significance.

Keywords: Bicipital rib, Anomalous ribs, fusion of ribs, Synostosis of ribs.

INTRODUCTION

The rib is composed of highly vascular cancellous bone in a flattened tube of compact bone which is thicker on its two surfaces and thinner at its borders. Anomalous ribs are rare anatomic entity usually discovered as an incidental finding on routine radiographs. The first rib may be rudimentary or fuse with cervical rib or with second rib to form bicipital rib. Its incidence has been reported to be 0.3% in a study based on chest radiography. Any rib anomalies whether normal variants such as cervical rib, pelvic rib, bifid rib, bicipital ribs or pathological, often indicates an underlying systemic disorder and hence should not be neglected. A rare but well documented cause of thoracic outlet syndrome is a congenital anomalous first rib which is connected to the second rib by synarthrosis. This study is not only of interest to anatomists from academic point of view but also of importance to radiologists and surgeons who deal with this region. The present paper is a sincere attempt to explain its embryological basis, morphological and clinical implications.

CASE REPORT

During the routine course of osteology discussion with undergraduate students in Anatomy department, JSS Medical College, Mysore, we noticed a bone specimen displaying fusion of two ribs of left side. The specimen was examined in detail and relevant anatomical features and various measurements were recorded.

OBSERVATION

The morphological examination revealed that the specimen was a fusion of first and second ribs. The first rib had fused with superior surface of the second rib from a point 1.5 cm from tubercle of first rib to form a conjoint shaft, obliterating the first intercostal space completely anterior to the fusion. Single oval articular facet was seen on the heads and tubercles of both the ribs. Conjoint shaft showed a depressed area on its superior

surface with a less prominent scalene tubercle on the inner border and a tuberosity close to the outer border. Neck of the first rib showed remarkable deep oblique groove on its superior aspect. The maximum gap separating the neck region of the two ribs was 4.5 mm. The anterior end of the conjoint shaft showed concave facet for the costal cartilage. The inferior surface exhibited a smooth contour with presence of costal groove in the lower rib towards outer margin.

Fig 1& 2 (has two photos inserted in one)

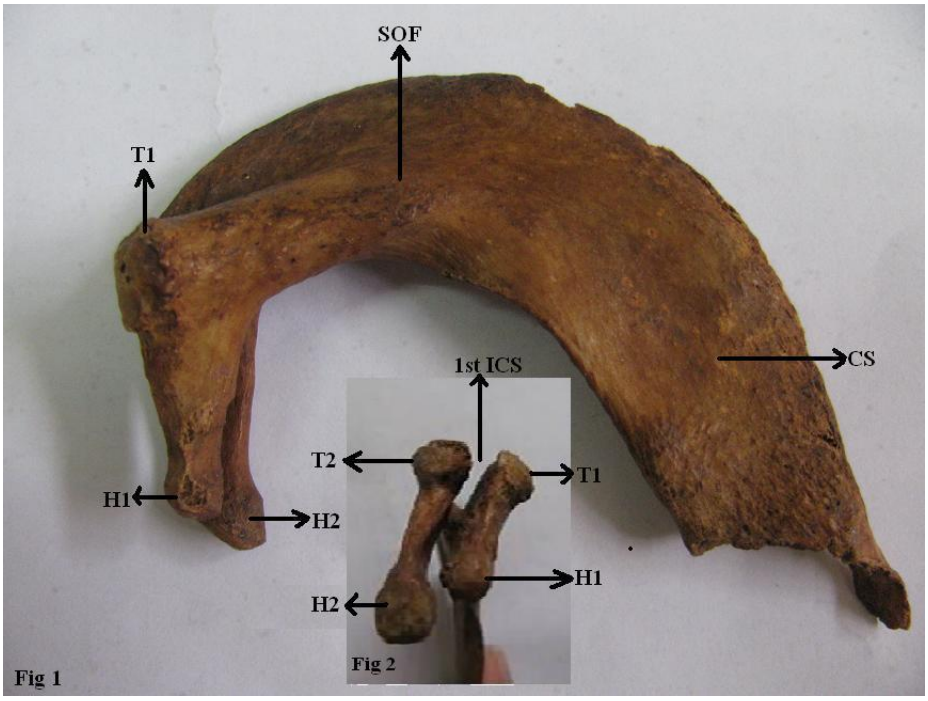

Fig 1 &2: **H1**- Head of first rib, **H2**- Head of second rib, **T1**- tubercle of first rib, **T2**- tubercle of second rib, **SOF**- site of fusion of first rib with second rib, **CS**- Conjoint shaft, **1st ICS**- 1st Intercostal space.

DISCUSSION

In the present case report, the deformed rib is bicipital rib that is synostosis of first and second thoracic ribs and the same kind has been reported by Deepak S[1], Anita R et al[2] and Gupta V et al[3].

Common congenital rib anomalies can be classified in to numerical and structural. Numerical anomalies include supernumerary ribs like cervical, lumbar, pelvic or sacral and deficient pairs like 11 pairs. Structural abnormalities include short ribs; bifid rib, fused or bridged ribs and pseudoarthrosis of first rib[1, 2].

The fusion anomalies of the thoracic ribs can be classified in to three types: (a) Fused anterior ends and shaft but separate posterior ends called bicipetal rib, (b) Fused shafts but separate anterior as well as posterior ends called bridged rib, (c) fused posterior ends but separate shafts as well as separate anterior ends called forked rib[2].

Malexpression of some myogenic determination factors such as Myo D, myogenin, Myf 5 and MRF 4 could be the potential cause of such anomalies which are detected in the medial half of somites prior to the myotome formation[2].

Du Plessis quoted that anomalous first thoracic rib is usually poorly developed and ends freely in the muscles or joins with the second rib by synostosis [4].

According to Glass RBJ[5] anomalous ribs are the initial indication of previously unsuspected systemic disease and can yield important diagnostic clues in the work-up of patients with congenital bone dysplasia, metabolic disorder, iatrogenic conditions, trauma, infections, abuse and neoplasia. Few of them are reported: Cervical rib arises from seventh cervical vertebra and they resemble hypoplastic first thoracic ribs. Its prevalence is reported to be 0.2% - 0.8%. It is most commonly associated with klippel – Feil syndrome. Increased numbers of ribs are seen in trisomy 21 and with VATER association. 11 pair of ribs is usually associated with cleidocranial dysplasis and campomelic dysplasia. Short rib constitutes an integral part of several syndromes such as short rib – polydactylyl syndrome, thanatophoric dysplasia, achondroplasia etc. Diminished bone density is associated with osteogenesis imperfect. Increased bone density is seen in tuberous screrosis, osteopetrosis. Abnormal rib shape such as rib notching is commonly seen with coarctation of aorta. Slender ribs are seen in trisomy 18, neurofibromatosis and widened ribs is commonest feature of mucopolysacharidoses and in thalassemia major[5].

Jaw cyst- Basal cell nevus- bifid rib syndrome or Gorlin – Goltz syndrome is a rare autosomal dominant disorder associated with multiple odontogenic keratocysts in the jaw and basal cell carcinoma of skin with bifid rib. The fourth rib has been reported to be commonly bifid. Other rib anomalies include agenesis, supernumerary ribs, distorted shape, and fusion of adjacent rib[5, 6].

A rare but well documented cause of thoracic outlet syndrome (TOS) is congenitally fused first and second rib by synarthrosis which may manifest with vascular symptoms due to subclavian vein and arterial compression[7]. Most cases of TOS resulting from first rib aberrations involve hypoplasia of the first rib with fusion at the anterior margin of the second rib, frequently with bony exostosis at this fusion to which scalenus anticus muscle inserts. The exostosis may thereby press surrounding neurovascular structures. Two cases of TOS associated with subclavian artery compression caused by rudimentary first ribs have been reported. Transaxillary first and second rib resection resulted in relief of symptoms of TOS[8].

A medicolegal autopsy of three day old baby girl had revealed multiple rib anomalies with Patent ductus arteriosus. Hence apart from the standard methods of evaluation of ribs like computerized tomography and magnetic resonance imaging, autopsies should be made available to teach and study ribs[9].

Rashid reported a case of sacral rib which was found incidentally on pelvic radiograph which appeared as large bony protuberance arising from right sacral region. This should be distinguished from post traumatic ossification and avulsion injuries to avoid unnecessary additional investigations. He concluded saying that sacral rib should be known by every radiologists as an incidental finding for which no further action is required[10].

Development and Comparative anatomy

The bony portion of each rib is derived from sclerotome cells that remain in the paraxial mesoderm and grow out from costal process of thoracic vertebrae. Cervical ribs occur in 1% of the population and are usually attached to the seventh cervical vertebra[11].

Cervical ribs are normal in fishes, reptiles, tetrapods and birds and extend from neck to tail base. In snakes ribs are highly developed and are important in locomotion[12]. A typical tetrapod rib is bicipital; that is it exhibits two heads tuberculum and capitulum[13].

CONCLUSION

Bicipital rib is a rare congenital anomaly usually detected on radiography. Any rib abnormality

pathological or normal variant often indicates an underlying systemic disease and also an uncommon cause of thoracic outlet syndrome which necessitates surgical intervention. Knowledge and awareness of such anomalies is important for clinicians, surgeons and radiologists.

ACKNOWLEDGEMENTS

Authors acknowledge the immense help received from Dr Pushpalatha, Associate professor and Dr G Saraswathi, Professor, Department of anatomy JSS Medical College in writing this article. The authors are also grateful to authors/editors/publishers of all those articles, journals and books from where the literature for this article has been reviewed and discussed.

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