

Synostosis of First and Second Ribs: A Case Report

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ABSTRACT: Partial fusion of ribs is a rare anatomical entity. Its incidence is reported to be 0.3% in a study based on radiographs. In an incidental finding in the Dissection Hall, Department of Anatomy, Bangalore Medical College & Research Institute, Bangalore, there was a specimen with partial fusion of left first and second ribs. Such specimens can present with thoracic outlet syndrome and may have underlying systemic disorder. The present study is an attempt to show its morphological implications and clinical significance.

INTRODUCTION

Presence of an extra rib, like a cervical rib, may cause nervous and vascular symptoms. Similarly the fusion of two ribs can also cause similar effects. Pressure on a nerve cause motor and sensory effects in the structures they supply (Williams and Warwick, '80)).

Bicipital rib is an unusual anatomical peculiarity which results due to fusion of shafts of two distinct ribs into a common body and is seen exclusively in relation to the first rib, either due to fusion of a cervical rib with first rib or more commonly due to fusion of first rib with the second (Turner, 1883; Terry and Trotter, '53). Its incidence has been reported to be 0.3 per cent in a study based on chest radiographs (Gupta *et al.*, 2009). It has got many clinical implications. The present report is an attempt to explain its embryological basis, morphological implications and clinical significance.

CASE AND OBSERVATION

The present specimen was an incidental finding in the Dissection Hall, Department of Anatomy,

Bangalore Medical College & Research Institute, Bangalore. The specimen was examined and relevant anatomical features and various measurements were observed.

Morphometric analysis revealed fusion of left first and second ribs from a point 2.5 cm beyond the tubercle of upper rib obliteration first intercostal space except 3 cm anteriorly from first rib and 6 cm from second rib. The line of fusion was marked by a ridge extending from tubercle of first rib to middle of inner border of conjoint shaft. The length of the common shaft along the inner border measured 4 cm and presented as scalene tubercle. The length of the outer border measured 5 cm and had a tuberosity for scalenus anterior. The maximum width was 4 cm. The posterior part of internal surface of second rib had a costal groove (Fig. 1).

DISCUSSION

Fusion of sternal ends of ribs occurs in old age and is due to ossification spreading into and from costal cartilages. Fusion of vertebral ends of ribs occurs following lesions of intrathoracic contents, especially in long-standing collapse of lung. Fusion of middle third of first and second ribs is a rare condition.

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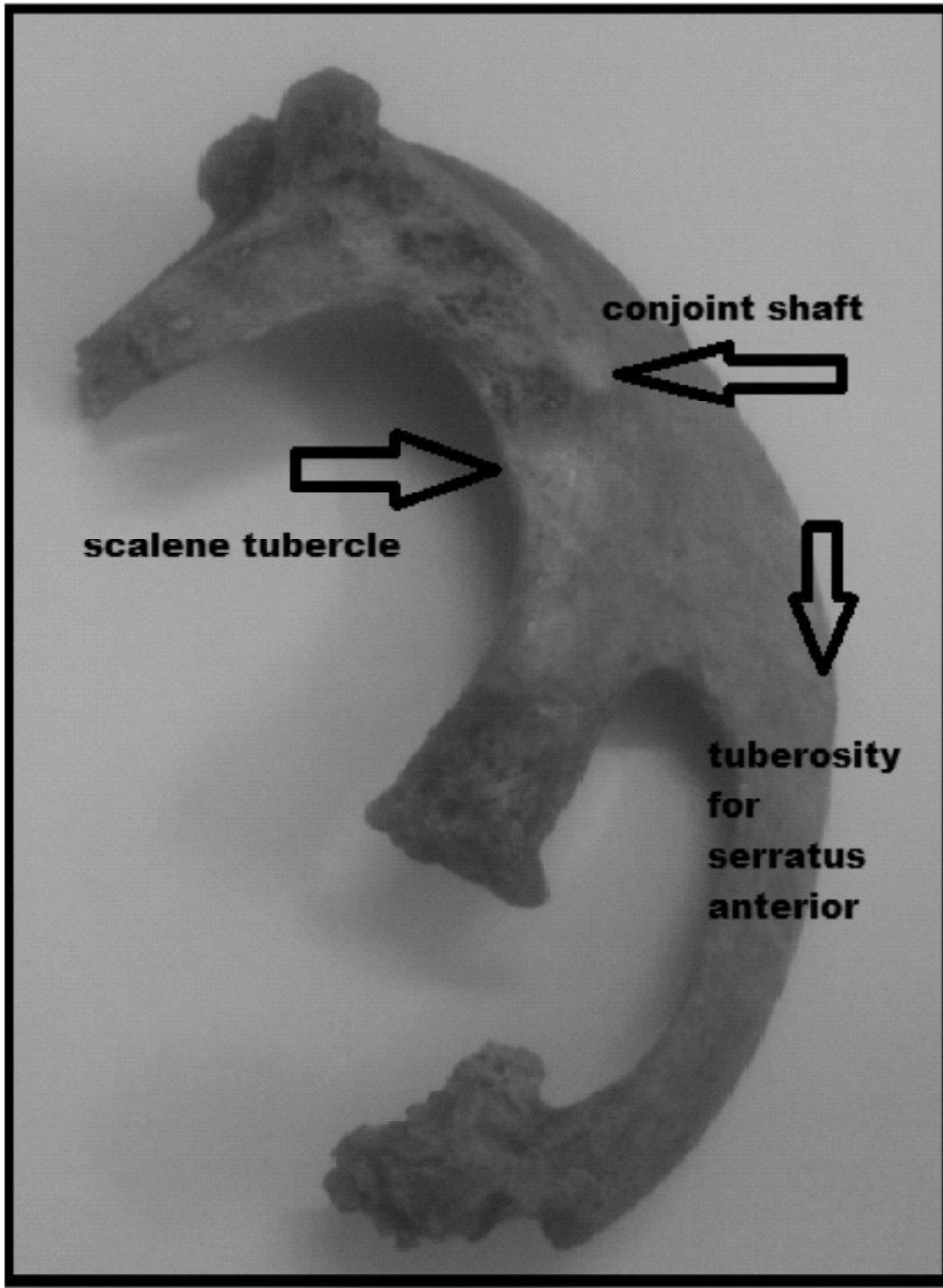


Fig. 1: Synostosis of first and second ribs

Rib anomalies have been traditionally classified into numerical and structural (Rani *et al.*, 2009). Numerical anomalies are common – supernumerary (cervical / lumbar) and deficient pair of eleventh ribs. Structural anomalies are rather rare and they can be further classified into i) short ribs, ii) replacement of costal cartilage / part of rib shaft by fibrous tissue, iii) fused ribs. Fusion anomalies can be further classified as bicipital, bifid or bridged varieties.

The ribs normally develop as extensions of sclerotome tissue in the thoracic region (Arey, '59). Irregular segmentation of primitive vertebral arches leads to fusion anomalies. Recent experimental studies in mice have implicated splotch gene mutations for various structural abnormalities in the ribs (Evans, 2003).

In congenital anomalies of first rib, there is postfixation of brachial plexus with a large contribution from T2. As the shoulder girdle sags traction affects the lower trunk causing neurological symptoms (Plessis, '75). There are at least 22 known syndromes in which fused ribs are a constant component. Klippel Feil, Jarco Levin, Poland and Gorlin syndrome are a few among them. Lastly fused ribs cause curvature of spine towards the area of involvement causing an impediment both for normal lung growth & respiration resulting in a condition which has been aptly called thoracic insufficiency syndrome (Leiwandrowski *et al.*, nd.).

CONCLUSION

Bicipital rib can occur as an isolated anomaly not associated with other disease or may be a part of a serious underlying disorder which has to be

thoroughly investigated. Variations is not only of interest to anatomists from academic point of view but is also of importance to radiologists & surgeons who deal with this region as it has been implicated in thoracic inlet syndrome & a number of systemic disorders. Fused ribs may also restrict the expansion of chest wall which may require surgical correction.

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