

## Case Report

### A Bicipital Rib- A Case report

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#### Abstract

Congenital anomalies of the ribs are rare. Incidence of 0.3% of fused first and second ribs has been reported in a study based on chest radiograph. Bicipital rib is an unusual anatomical peculiarity results due to fusion of shaft of cervical rib with first rib or the first rib and second rib. We found the bicipital rib belonging to left side in osteology lab, Department of anatomy, Vijayanagar institute of medical sciences, Bellary, Karnataka, India. Detailed morphological examination done and relevant measurements recorded. A rib anomaly may indicate underlying systemic disease causing musculoskeletal pain or intercostals nerve entrapment and may also cause Thoracic outlet syndrome. Thus the bicipital rib is anatomically, clinically and surgically important variation.

**Keywords:** Synostosis, Bicipital rib, Fused ribs, Thoracic outlet syndrome

#### 1. Introduction

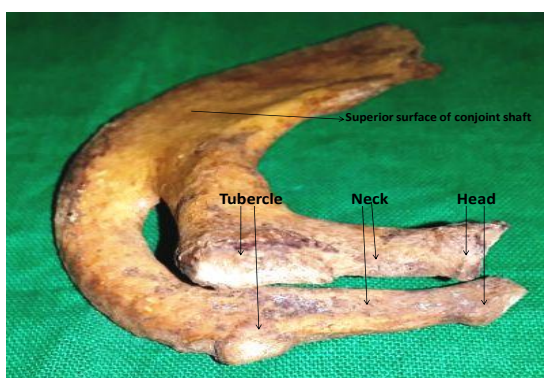
Ribs are twelve pairs of elastic arches that articulate with the vertebral column posteriorly. It consists of highly vascular trabecular bone, enclosed in a thin layer of compact bone<sup>1</sup>. Congenital anomalies of the ribs are rare. Incidence of 0.3% of fused first and second ribs has been reported in a study based on chest radiographs<sup>2</sup>.

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 the first rib with second rib<sup>3</sup>. 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<sup>4</sup>. Precise knowledge of bicipital rib is important for anatomists from academic point of view and also important for clinicians, surgeons and radiologists who are dealing with this thoracic region.

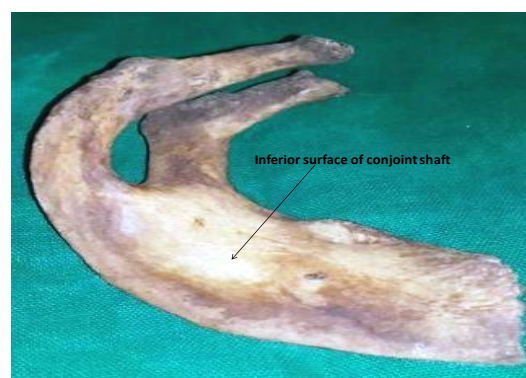
#### 2. Materials and Methods

We found the present specimen during routine scanning of bones in osteology lab, Department of anatomy, Vijayanagar institute of medical sciences, Bellary, Karnataka, India. We noticed that the bone specimen belonging to left side showing synostosis of first and second rib. The specimen was examined in detail and relevant measurements were recorded.

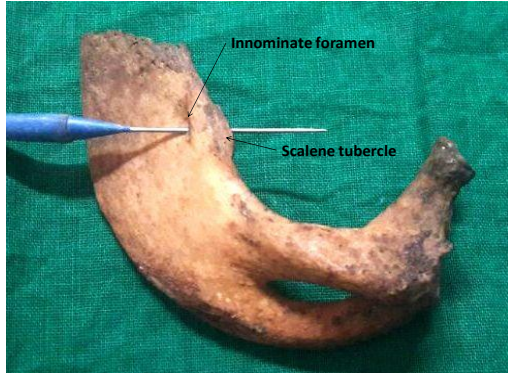
**Figure 1: Showing superior surface of bicipital rib**



**Figure 2: Showing inferior surface of bicipital rib**



**Figure 3: Showing a probe passing through innominate foramen beneath the scalene tubercle**



**Figure 4: Showing Slide caliper and bicipital rib**



### 3. Observations

Morphometric analysis showed that the specimen was a fusion of first and second ribs on the left side. This fused rib possessed two separate head, neck, tubercle and beginning of the shaft. The two shafts are fused with each other from a point 3.2 cm beyond the tubercle of first rib. Both the heads had articular surface for its articulation with the corresponding thoracic vertebrae. A cleft between two ribs was 0.8 cm in a vertical diameter and 4.4 cm long from its vertebral end thus obliterating the first intercostal space. The breadth of the shaft of first rib immediately before the fusion was 1.2 cm and that of second rib was 1.2 cm. After the fusion the common shaft along inner border measured 4.6 cm in length and presented a prominent scalene tubercle. Outer border measured 6.5 cm long and had a tuberosity for serratus anterior. Maximum width at widest part is 3.1 cm. Anterior end had a single articular facet. Inferior surface had smooth contour with presence of a costal groove in lower segment. Superior surface of the specimen displayed grooves and ridges. A ridge extending from tubercle of first rib to outer border of conjoint shaft. Rough impression was observed on this superior surface for attachment of scalenus medius muscle and for subclavian artery and lower trunk of brachial plexus was observed on this surface. And also an innominate foramen of 3mm diameter is present about 8 mm distance from the inner border at the level of scalene tubercle. It is about 25 mm away from the line of fusion of shaft. Possibly it may be a vascular foramen and may have clinical significance as it may cause compression of structures passing through it.

### 4. Discussion

The fusion anomalies of the thoracic ribs can be classified into three types; i) Bicipital rib-fused anterior ends and shafts but separate posterior ends; ii) Bridged rib-fused shafts but separate anterior and posterior ends. iii) Forked rib-fused posterior ends but separate shaft as well as separate anterior ends<sup>5</sup>.

Mal-expression of some myogenic determination factors such as MyoD, Myogenin, Myf5 and MRF4 could be the potential cause of such anomalies which are detected in the medial half of somites prior to the myotome formation. First rib anomalies include-floating rib, rudimentary first rib forming synostosis or pseudorthosis with second rib or bifurcated first rib etc<sup>6</sup>.

Bicipital rib anomaly may occur when a cervical rib fuses with vertebral end of first rib or first rib may be rudimentary and may fuse with the second rib making a bicipital rib<sup>7</sup>. There are 22 syndromes described in which the rib anomalies is one of their constant component-Klippel feil syndrome, Jarco Levin syndrome, Poland and Gorlin syndrome are few among them<sup>8</sup>.

Anomalies of first rib commonly associated with post fixed brachial plexus with a large contribution from second thoracic nerve. First and second thoracic nerve may get stretched over the broadened fused shaft resulting in neurological symptoms<sup>9</sup>. Brachial plexus and subclavian vessels may undergo compression while passing from neck to axilla between first rib and scalenus anterior muscle, hypertrophied scalenus medius<sup>10</sup>.

### 5. Conclusion

Rib fusion causes scoliosis and restriction of chest wall expansion which may require surgical correction<sup>11</sup>. Bicipital rib is anatomically, clinically and surgically important variation. Bicipital rib may cause musculoskeletal pain or intercostals nerve entrapment and may also cause thoracic outlet syndrome<sup>12</sup>. Congenital anomalies of ribs are rare and reported incidence of 0.3% by study based on chest radiograph<sup>2</sup>. Bicipital rib usually discovered incidentally on routine radiograph. Occurrence of bicipital rib may be a part of underlying disorder, therefore should not be neglected. Thorough investigations must be done and may need surgical intervention. Knowledge and awareness of such anomalies is important for anatomists, clinicians, surgeons, and radiologists who are dealing with this thoracic region.

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