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## FUSION FIRST AND SECOND THORACIC RIB NEAR STERNAL END

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### ABSTRACT

During routine work in the osteology section in the department of anatomy, Al- Ameen medical college Bijapur, we got an unusual specimen showing fusion of first and second rib near its sternal end on left side. Fusion was along the outer margin of first rib and inner margin of second rib, 2.2 cm and 2.8cm behind the costo-chondral junction, along the inner and outer margin of first and second ribs respectively. Fused segment was 8.5cm in front of vertebral end along outer margin of first rib. 8.2cm in front of vertebral end along inner margin of second rib. Transverse Length of fused part between first and second rib was 3.3cm and length of intercostal space in front and behind the fusion was 0.6cm and 1.1cm respectively. Both the ends of both ribs were free so intercostal space at the costochondral junction and at the vertebral end was open. Because of such type of rib variations there are chances of compression of neurovascular bundle along the intercostal space. These fused rib affect chest wall expansion, may result in respiratory complications. Knowledge and awareness of such anatomical variation of rib is important for physicians, radiologist and surgeons.

**Key Words**-Fusion, first and second thoracic rib.

### INTRODUCTION

There are two types of variations related to ribs, numerical and structural. In numerical type, number of ribs either more or less. Cervical or lumbar rib may be present as extra ribs, one or more ribs may be absent as in less ribs. In structural type, there is bifid rib, short rib and fused rib.<sup>1</sup>

Each rib originates from the caudal half of one sclerotome and the cranial half of the next

subjacent sclerotome. Head develops from somatome cells from one somite which migrate with the caudal half of sclerotome, proximal portion of the rib develops from both caudal and cranial sclerotomal halves, and there is no mixing of cells from these origins. Distal portion of rib developed from caudal and cranial halves of sclerotome, these cells mix as the rib extends into the ventral bodywall and segmentation diminishes.<sup>2</sup> Any change or variation at this step

of development may be the reason for fusion of ribs .

Irregular segmentation of primitive vertebral arches lead to fusion anomalies, recent experimental studies in mice have implicated splotch gene mutation for various structural abnormalities in the ribs<sup>3</sup>.

Bicipital rib is an unusual anatomical peculiarity which results due to the fusion of shaft of two distinct ribs into a common body and is seen exclusively in relation to the first rib, either due to fusion of cervical rib with first rib or more commonly due to fusion of the first rib with second rib<sup>4, 5</sup>. Its incidence has been reported 0.3% in a study based on chest radiograph.<sup>5</sup>

The rib anomalies whether pathological or normal variants such as cervical rib, pelvic rib, bifid rib and bicipital rib etc. often indicate an underlying systemic disorder.<sup>6</sup>

#### **CASE REPORT**

We noticed a left sided bone specimen showing fusion of first and second ribs, during routine work in the osteology section of department of anatomy, Al- Ameen medical college Bijapur .Specimen was examined in detail for its anatomical features, measurements were done and photograph taken from both aspects of rib as in figure 1.

Complete length of first rib along the outer margin was 13cm, complete length of second rib, along the inner margin was 14.3cm. Fusion of two ribs was near the sternal end, fused segment was 2.2cm and 2.8cm behind the costochondral junction of sternal end, along the inner and outer margin of first and second rib respectively. Fused segment was 8.5cm in front of vertebral end along outer margin of first rib and 8.2cm in front of vertebral end along inner margin of second rib .Transverse length of fused segment was 3.3cm. The remaining part of intercostal space, before and after the fused segment of rib was open. The first rib had normal anatomical features, that is head, neck and tubercle of vertebral end was normal and

at the sternal end it had depression at the tip for costal cartilage. Along the outer margin of first and second ribs there were prominent impressions for serratus anterior muscle towards the vertebral end. The second rib had rudimentary vertebral end, head, neck and tubercle was not prominent and sternal end was cut.

#### **DISCUSSION**

The first rib anomalies include the floating rib, central defects bridged by ligamentous band , rudimentary structure terminating in a synostosis or pseudoarthrosis with second rib, bifurcated rib etc.<sup>7</sup>Vinita Gupta et al reported partial fusion of rib in anterior and posterior portion and completely blended with each other in middle ,the first intercostal space was obliterated<sup>8</sup>.Rib fusion causes scoliosis and restriction of chest wall expansion, which may require surgical correction. Fused ribs also encountered in Gorlin syndrome.<sup>6</sup> Rani Anita et al reported synostosis between the anterior ends and shafts of 1<sup>st</sup> and 2<sup>nd</sup> ribs of right side. There was single articular oval facet on head with scalene tubercle at the inner margin of shaft of upper segment<sup>1</sup>.

David Levi reported a case of 8 year boy with lump at inner end of first right rib. There was history of injury, the skiagram showed fusion of first and second rib in the middle third of their curve, he stated that condition appeared to be congenital. He also stated that when fusion is at the sternal end is due to ossification at the costochondral joint, it spread towards the sternal end of ribs, when fusion occurs at the vertebral end, it is due to lesion of intrathoracic content, especially long standing collapse of lung. Fusion of middle third is a rare condition for that no instance is recorded in anatomy textbooks<sup>9</sup>.

Any scoliosis associated with fused rib may result in three dimensional thoracic deformity with adverse effect on thoracic growth and function with development of thoracic insufficiency syndrome, which is defined as the inability of the

thorax to support normal respiration or lung growth. He also stated that children suffering from thoracic insufficiency syndrome referred to them were on oxygen or ventilator support, in all of these patient the common denominator was a small, stiff distorted thorax that could not provide volume for growth of the underlying lungs and functioned poorly, with minimal secondary breathing mechanism because of fused, malformed or absent rib.<sup>10</sup>

Baumgarlner F et al reported two cases of fused first and second ribs associated with thoracic outlet syndrome in a radiological study.<sup>11</sup> Seema Deepak reported an unusual case of a bicipital rib in which first and second rib of right side were fused obliterating the intervening intercostals space, she concluded that such a specimen cannot present with thoracic outlet syndrome but can also be an indicator of an underlying systemic disorder.<sup>12</sup>

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Fig 1: Showing superior and inferior aspect of fused part between 1st & 2nd rib