

Anatomical variation of human Thoracic rib in dry bone.

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Abstract:

Introduction: The Ribs are essential structure of osseous thorax and provide information that aids in the interpretation of radiologic images. The purpose of this study to investigate variations in thoracic rib and its morphological & clinical importance. So, In present study attempted to find out additional intercostal spaces due to bifurcation of ribs, less intercostal space due to fusion of ribs, variation of the normal ribs like, gap in the rib, fusion of one rib to another at a shaft of rib. Congenital abnormalities of the ribs are usually asymptomatic, often discovered incidentally on chest X-ray. Effects of this neuroskeletal anomaly can include respiratory difficulties and neurological limitations. **Materials & Methods:** The study was carried out in Bone Store of Department of Anatomy, B. J. Medical College, Ahmedabad, Gujarat. Study was carried out on 500 human dried ribs and the variations in the ribs are studied. We got variation in the human ribs and studied. **Result:** Variations were seen like out of 500 ribs, Bifid rib having two ends 9(1.8%), rib having bifid space 2(0.4%), fusion rib at the level of shaft 1(0.2%), fusion of first rib and second rib 1(0.2%), first rib having two ends 1(0.2%). **Conclusion:** Bifid rib is an anatomical variant where the sternal end of the rib is cleaved into two. So we can rule out mesoderm abnormalities, parenchyma lung disease, chest wall tumor or costal fracture.

Keywords: Bicipital rib, Bifid rib, Forked rib, Fused rib.

Introduction:

The Ribs are essential structure of osseous thorax and provide information that aids in the interpretation of radiologic images. They develop from the mesenchymal **costal processes** of the thoracic vertebrae. They become cartilaginous during the embryonic period and ossify during the fetal period.^[1]

The original site of union of the costal processes with the vertebra is replaced by costovertebral synovial joints. Seven pairs of ribs (1-7)-**true ribs**-attach through their own cartilages to the sternum. Five pairs of ribs (8-12)-**false ribs**-attach to the sternum through the cartilage of another rib or ribs or remain free. The last two pairs of ribs (11 and 12)-**floating ribs**-do not attach to the sternum.^[2] In Thorax normally having 12 pairs of ribs & 11 intercostal spaces, & intercostal spaces contain intercostal muscles, nerves, & vessels.



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Fusion of rib:

Abnormalities detected in the ribs can

sometimes be the initial indication of systemic disease. 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.

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.

Materials & Methods:

The study was carried out in Bone Store of Department of Anatomy, B. J. Medical College, Ahmedabad, Gujarat. Study was carried out on 500 human dried ribs and the variations in the ribs are studied.

Inclusion Criteria: Intact rib with variation in the normal structure.

Exclusion Criteria: Broken ribs.

Result:

Out of 500 ribs, we had found Bifid rib having two ends in 9(1.8%), rib having bifid space in 2(0.4%), fusion rib at the level of shaft in 1(0.2%), fusion of first rib and second rib in 1(0.2%) and first rib having two ends in 1(0.2%) rib.[Table 1]

Table: 1 Variations of ribs

Sr. No.	Type of abnormality	No. of cases of Abnormality	Percentage of Abnormality
1.	Bifid rib having two anterior ends	9	1.8%
2.	Rib having bifid space	2	0.4%
3.	First rib having two anterior ends	1	0.2%
4.	Fusion of the rib at the shaft of the rib	1	0.2%
5.	Fusion of first rib with the second rib	1	0.2%

Out of 9 bifid rib having two anterior ends, 8 ribs were of right side and 1 rib was of left side.

Table 2 Bifid Rib with Side distribution

Rib Abnormality	Right side	Left side
Bifid rib having Two anterior ends	8	1

Image 1 Bifid ribs having two anterior ends**Image 2 Rib showing bifid space****Image 3 Fused shaft of the rib****Image 4 First rib with two anterior ends****Image 5: fusion of first with second rib****Discussion:**

A rib normally develops from the costal process of the developing thoracic vertebrae. Embryologically, development of the bifid rib is uncertain and probably results from incomplete fusion of cephalic and caudal segments of sclerotome during embryogenesis, occurring around the 4th - 6th week of fetal life. During the mesenchymal and chondrogenic state of development, faulty fusion or anomalous chondrification may give rise to unusual fusion deformities of the ribs (bifid ribs), has been suggested as a possible cause.^[3]

Ribs originate from the mesoderm. Bifid ribs may, therefore, be associated with other mesodermal abnormalities. Look specifically for malformations in other organs of mesodermal origin that is heart and kidneys. Differential diagnosis: parenchymal lung disease, chest wall tumor or costal fracture. Patient with bifid rib may remain asymptomatic throughout life but if he/she is symptomatic then we should rule out above diseases.^[5]

Conclusion:

In our study we observed the bifid rib is an anatomical variant where the sternal end of the rib is cleaved into two. Bifid ribs can be unilateral or bilateral. They are slightly more common on right side than on the left. 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. In few cases, the ribs fuse and are associated with progressive scoliosis, thereby reducing the thoracic volume.

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