

CASE REPORT

MULTIPLE BIFID RIBS: A CASE REPORT

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ABSTRACT: Ribs are twelve pairs of elastic arches which articulate with vertebral column posteriorly and sternum anteriorly forming much of thoracic skeleton which protects the vital organs. Variations of ribs are being reported and this case report is of multiple bifid ribs observed in a male cadaver. Bifidity occurred in right 2nd, 4th ribs and in left 3rd rib. Dimensions of the foramina were measured and its way of fusion with sternum through costal cartilages were observed. Multiple bifid ribs are a rare anomaly with the incidence of 0.15% to 3.4%. Bifid rib can be a feature of Gorlin - Goltz syndrome. Its clinical importance to physicians, surgeons and radiologists were emphasized.

KEYWORDS: bifid ribs, costal cartilage, sternum.

INTRODUCTION: Ribs are twelve pairs of elastic arches which articulate with vertebral column posteriorly and sternum anteriorly forming greater part of thoracic skeleton. The first seven pairs are connected to the sternum by costal cartilages and are referred as true ribs. The remaining five are false ribs; the cartilages of eighth to tenth usually join the superjacent costal cartilage whereas eleventh and twelfth ribs are free at the anterior ends¹. Anomalies of the ribs such as congenital absence of ribs with costal cartilages, increase or decrease in their number, synostoses between any two ribs from first to tenth or any of the first seven ribs can be bifid². Bifid rib is also called as forked rib.

MATERIALS AND METHODS: During routine dissection of thoracic cage of a male cadaver in the Institute of Anatomy, Madras Medical College, bifidity of multiple ribs were observed. The dimensions of the foramen formed due to the bifidity and the distance of bifurcated ribs from the sternum and the mode of its union with sternum were measured using digital vernier caliper and photographed.

RESULTS: Bifidity was observed in right 2nd rib, 4th rib and left 3rd rib [Fig: 1]. Right 2nd and 4th ribs were expanded and bifurcated at a distance of 52.93mm and 93.07mm respectively from mid sternum. The osseous ends of the bifurcated ribs had its own costal cartilages which then fused to form a trunk and then articulated with sternum.

The left 3rd rib expanded and bifurcated 40.48mm from mid sternum but the upper and lower osseous ends articulated with sternum through separate costal cartilages. The dimensions of the foramen were tabulated (Table 1).

Narrowing of right first intercostal space with a difference of 6.19mm from the other side was observed because of the bifidity. Similarly right 3rd space and 4th space were narrow with difference of 14.02mm and 6.28mm respectively from left side. Left 2nd intercostal space was narrowed and the difference between the two sides was 5.61mm. Intercostal muscles, vessels and nerves were found to be normal.

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DISCUSSION: Ribs develop by endochondral ossification from tips of lateral mesenchymal condensations called costal process in the thoracic region. On 35th day ribs begin to lengthen. By 45th day, first seven ribs are connected ventrally to sternum through costal cartilages. Primary ossification centres appear near the angle of each rib in the sixth week and further ossification occurs in a distal direction. Secondary ossification centres develop in the tubercles and heads of the ribs during adolescence.³

Bifid rib or bifurcated rib or forked rib is an anatomical variant where the sternal end of the rib is cleaved into two. Bifid ribs can be unilateral or bilateral. Incidence of bifid rib ranges from 0.15% to 3.4% and it accounts for upto 20% of all congenital rib anomalies.⁴

Bifid ribs are more common in males than females, and occur most frequently in third and fourth ribs (Incidence: third = fourth > fifth > sixth > second). They are slightly more common on right side than on the left.⁵

In 2001 M. L. Fily et al reported bifid rib in a man buried around 3400 B.C.⁶ Wattanasirichaigoon et al in 2003 described various patterns of rib defects in 47 cases with bifid rib accounting for 28% of cases.⁷ Oostra RJ et al in 2006 reported a case with multiple bifid ribs, interpedicular fusion and malsegmentation of vertebral laminae at various upper thoracic levels in a skeleton of a newborn infant.⁸ al- Anazy Fh et al reported a case of bifid rib presented along with calcified falx cerebri and a cystic mass occupying left maxillary sinus protruding into nasal cavity.⁹ As a structural abnormality bifid rib is usually asymptomatic. But may present as a lump in anterior chest wall.¹⁰

Anomalies of ribs may represent as an early indicator of other systemic diseases. It can be a feature of Gorlin - Goltz syndrome, a multisystem disorder that manifest with multiple Nevoid basal cell carcinoma, jaw cysts, congenital skeletal abnormalities such as bifid, splayed or synostotic ribs.¹¹

Bifid rib is considered as one of the major criteria for Gorlin syndrome¹². It is caused by mutations in the PTCH1 gene mapped on chromosome 9q22.3. PTCH1 protein is a Hedgehog (Hh) protein receptor and is pivotal for early development, stem cell maintenance and differentiation.¹³ Bifid fourth rib was reported in a case of Kindler syndrome, a rare genodermatosis characterized by acral bullae and photosensitivity.¹⁴

Bifid rib should be differentiated from other pathological conditions like parenchymal lung lesions in chest radiograph. 3-Dimensional computed tomography is highly effective in differentiating bifid rib from other lesions.¹⁵

Normally counting of ribs is done from second costal cartilage at sternal angle. As the upper and lower osseous ends of the left 3rd rib in the present case articulated with sternum separately, it may mislead in counting the ribs. Multiple bifid ribs which is rare, is reported for its association with many syndromes and its significance to physicians, cardiothoracic surgeons and radiologists.

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Side	Rib	Transverse(mm)	Vertical(mm)
Right	2 nd	24.59	13.97
Right	4 th	49.33	18.15
Left	3 rd	22	8.39

Table 1: The dimensions of the foramen formed by bifid rib

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Figure 1: Thoracic cage showing bifidity in right 2nd, 4th ribs and in left 3rd rib

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