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Bifid Ribs with Additional Intercostal Spaces: A Case Report

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Abstract

Introduction:- *In the thorax there are normally 11 pairs of intercostal spaces, that contain intercostal muscles, intercostal nerves and vessels. Bifurcation of the ribs and presence of additional intercostal spaces is a rare variation of the thoracic wall .This may be due to defect in the process of segmentation of the developing somites.*

Case Report:- *During a routine dissection for undergraduate medical students ,we observed a variation involving the right 4th and 5th ribs and its costal cartilages in the human cadaver of a man of Indian ethnicity aged about 55 years. The right 4th and 5th ribs and their costal cartilages were bifurcated at their costochondral junction enclosing two small circular additional intercostal spaces. Muscles covered with deep fascia were present in these circular intercostal spaces. Muscles received nerve supply from the collateral branches of 3rd and 4th intercostal nerves respectively.*

Conclusion:-*These anomalies may remain asymptomatic, can create misinterpretations during radiological or physical examinations. The knowledge about these variations will be helpful to reduce incidences of misinterpretations.*

Keywords:- *rib bifurcation, intercostal space, Gorlin's syndrome.*

Introduction

In human body the thoracic cage is made up of twelve vertebrae, sternum and twelve pairs of ribs. A rib develops from the costal process of the developing thoracic vertebra through endochondral ossification[1]. These costal processes are small lateral mesenchymal condensations of the developing thoracic somites. The case being reported here is that of the rib bifurcation.

Bifurcation of the distal end of the ribs are due to defect in the process of segmentation and re-segmentation of costal processes. It is usually unilateral and asymptomatic but it can present as an isolated abnormality or associated with pathological malformations such as jaw cysts and

basal cell nevus syndrome. Knowledge of variations of ribs and intercostal spaces is important for clinicians and radiologists.

Case Report

During a routine dissection for undergraduate medical students we observed a variation involving the right 4th and 5th ribs and its costal cartilages in the human cadaver of a man of Indian ethnicity aged about 55 years. The bifurcation of 4th rib occurred approximately 7 cm from the lateral border of the sternum and that of 5th rib occurred 6 cm from the lateral border of the sternum (figure 1.).

Costochondral joints were present on both the superior and inferior portions of the bifid ribs. Both divisions of the bifurcation became bony after the costochondral joints; total dimension of the bifurcation in the 4th rib was approximately 5.2cm and that of 5th rib was 5 cm. The width of the 4th and 5th ribs lateral to the bifurcation were considerably wider than any other rib within the thoracic cage (figure 2.).

The articulations of both 4th and 5th ribs were found to be normal with the thoracic vertebra and no abnormalities were evident in the articulating vertebrae. Both additional intercostal spaces contained intercostal muscles covered by fascia. The muscles of these additional intercostal spaces were found to be supplied by the collateral branches from the 3rd and 4th intercostal nerves respectively. Normal neurovascular structures were found in the intercostal spaces above and below the bifurcations. This variation was unilateral.

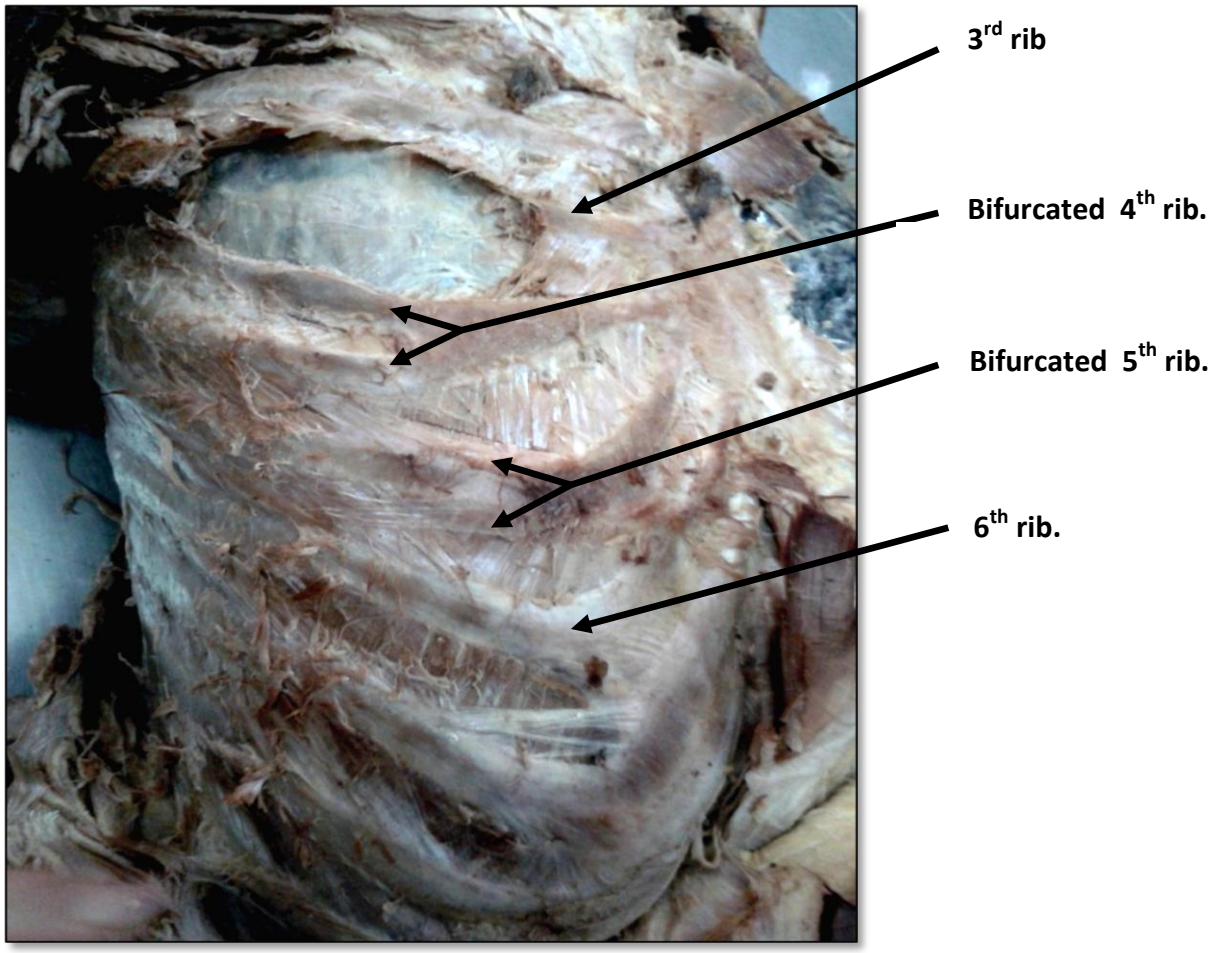

Fig.1, Dissection of right side of thorax showing additional spaces in relation to the 4th and 5th ribs

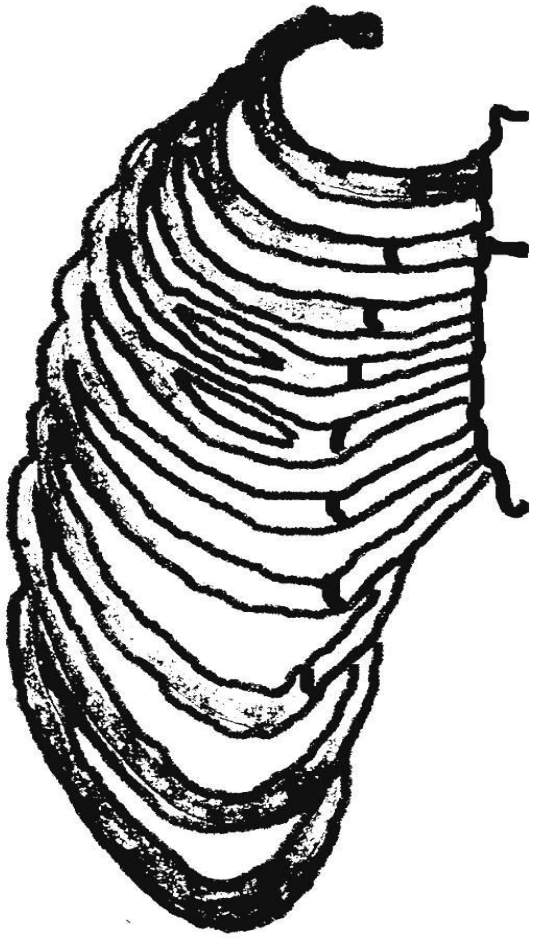

Fig.2.schematic diagram of the rib cage (rt. Side) to show rib bifurcation

Discussion

The ribs are components of the osseous thorax and provide essential informations needed for interpretation of physical examination and radiographic images of the thoracic region. Anatomical variations of human ribs have been well documented, common variations include asymmetric ribs, cervical or lumber ribs, fusion of 1st and 2nd ribs and absence of 1st rib[2,3]. Unusual variations include fibrous tissue replacing costal cartilage, ribs bifurcated at the sternal insertion, two adjacent ribs articulating at their costal cartilages by a diarthrosis, synarthrosis or syndesmosis. The prevalence of rib variation has been reported to be between 0.04% and 14%, bifurcated ribs being least common and cervical ribs being most common [2,4].

The ribs develop from the sclerotomal cells of somites. Each somite of the thoracic region forms the caudal part of one rib and the cranial part of the next rib .Rib anomalies probably occur during the process of segmentation and re-segmentation of developing costal processes from the somites.

Bifurcation of ribs is having incidence of 20% of all congenital anomalies of the ribs[5].It has been found to be more common in males as compared to females and more frequently seen in right 3rd and 4th ribs . Presence of bifid rib may be associated with pathological malformation such as Gorlin-Goltz syndrome also known as nevoid basal cell carcinoma syndrome, which is autosomal dominant in inheritance [6-9].Approximately 60-70% of patients diagnosed with this syndrome demonstrate skeletal variations including ribs and 5-10% develop the brain malignancy medulloblastoma, that can lead to early death of the patient[7,9].

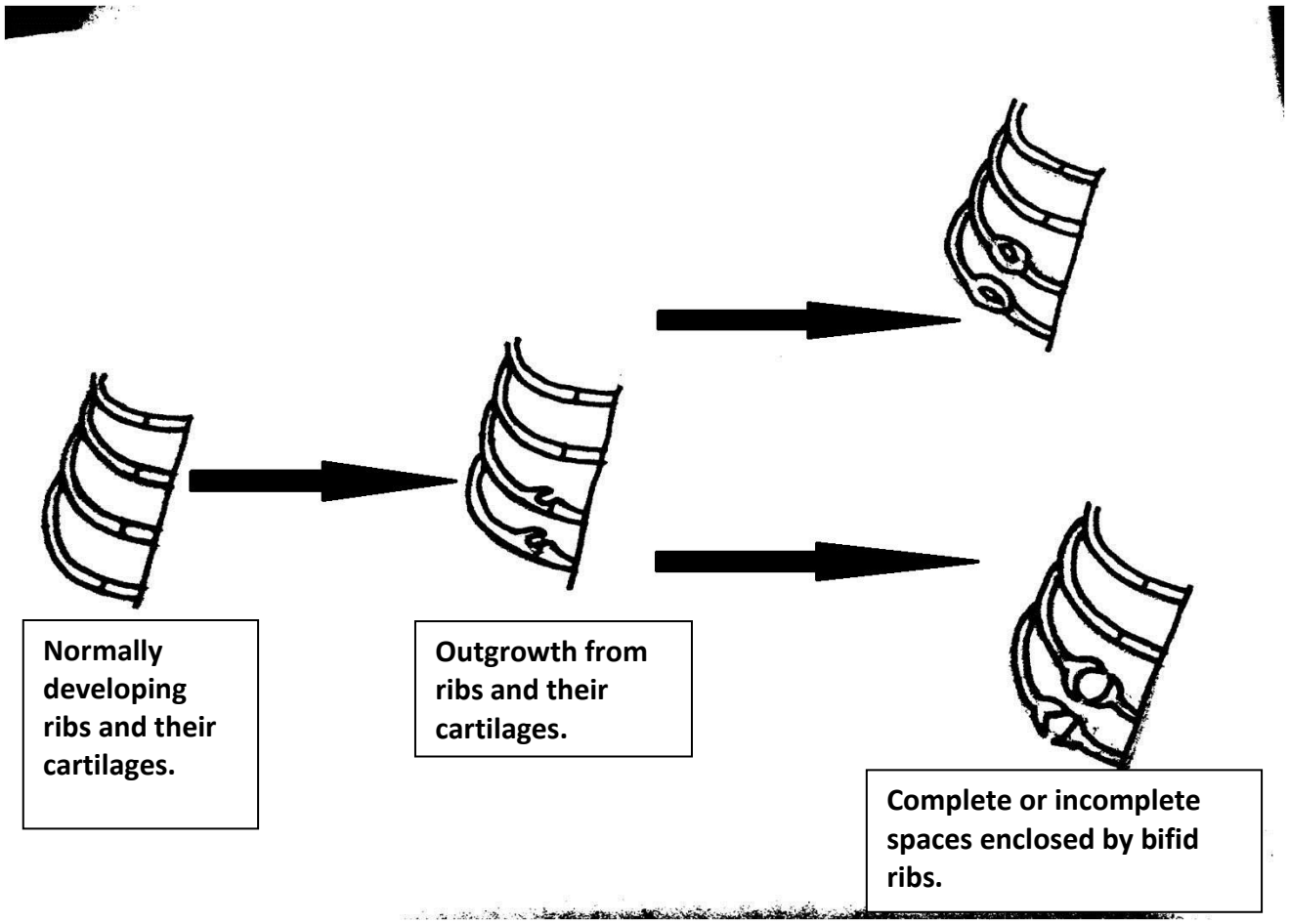

Fig.3. Schematic diagram to show the probable cause of rib bifurcation

Conclusion

The case reported here is different from the previously reported cases of the bifid ribs because the bifurcation observed in this cadaver is occuring in two consecutive ribs of the right side. Though it is a rare variation, it might lead to serious misinterpretations in the physical examinations and clinical diagnosis. It is also important for surgeons performing thoracic surgeries because such anomaly could mislead them during the procedure. Detection of bifid rib can help early diagnosis of Gorlin's syndrome, thus reducing the chances of development of long term complications of this syndrome.

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