
VALUE OF RADIOLOGICAL CHANGES
AT THE FIBS IN THE DIAGNOSIS OF LOCAL AND SYSTEMIC
DISEASES

A THESIS

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INTRODUCTION

INTRODUCTION
AND
AIM OF THE WORK

There are many local and systemic diseases which may affect the ribs and show radiological manifestations at them. These changes may be in the form of periosteal new bone formation, fracture, radiotranslucency [rib erosion], increased density of ribs or displacement and change in the course of the ribs . These changes may discovered accidentally during routine examination of chest X-ray films or may be looking for from the start of the investigation according to the clinical picture of the patient .

The aim of this work is to describe these radiological changes and their value as a guide in diagnosis of their affecting diseases whether local or systemic .

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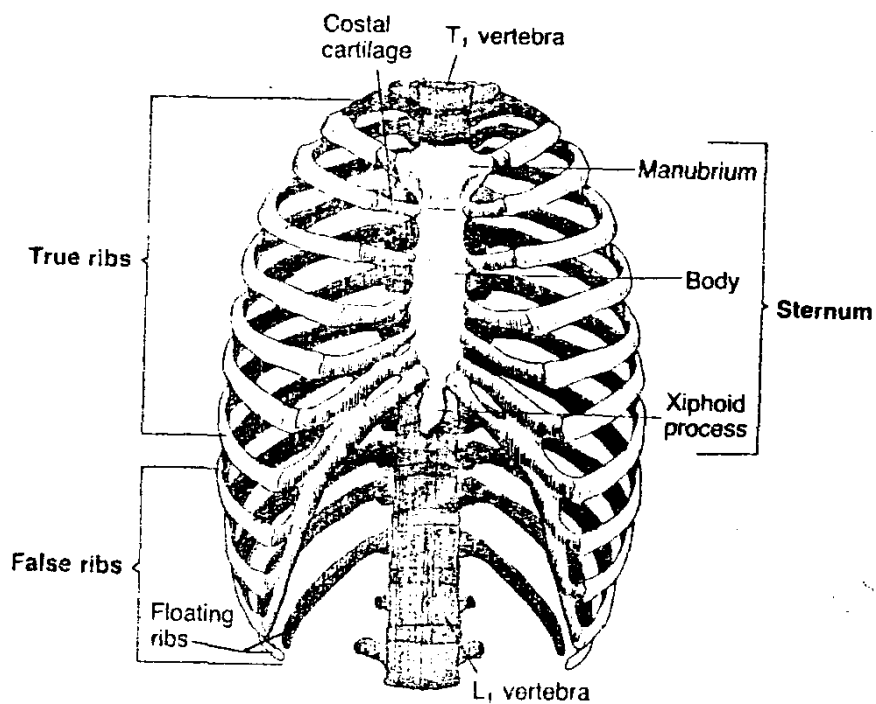


Fig. [1] The thoracic cage.

[Quoted from Marieb ,1984]

ANATOMY OF THE RIBS

The ribs are elastic arches of bone, which are connected behind with the vertebral column, and form a large part of the skeleton of the thorax. There are twelve pairs, but this number may be increased by the development of a cervical or a lumbar rib, or may be reduced to eleven by the absence of the twelfth pair. The first seven pairs are connected in front, through the costal cartilages, to the sternum ; they are called true ribs. The remaining five are so called false ribs ; of these the cartilages of the eighth , ninth and tenth are joined to the cartilage of the rib immediately above, the eleventh and twelfth are free at their anterior ends , and are floating ribs [fig.1] [Gray,1973].

The ribs are situated one below the other in such a manner that intercostal spaces intervene. The spaces are deeper in front than behind, and deeper between the upper than between the lower ribs. The ribs vary in direction ,the upper ones being less oblique than the lower; the obliquity reaches its maximum at the ninth rib, and ragually decreases to the twelfth. The ribs increase in length from the first to the seventh , and then diminish to the twelfth. in breadth they decrease successively from above downwards; in the upper ten the greatest breadth is at the anterior extremity.

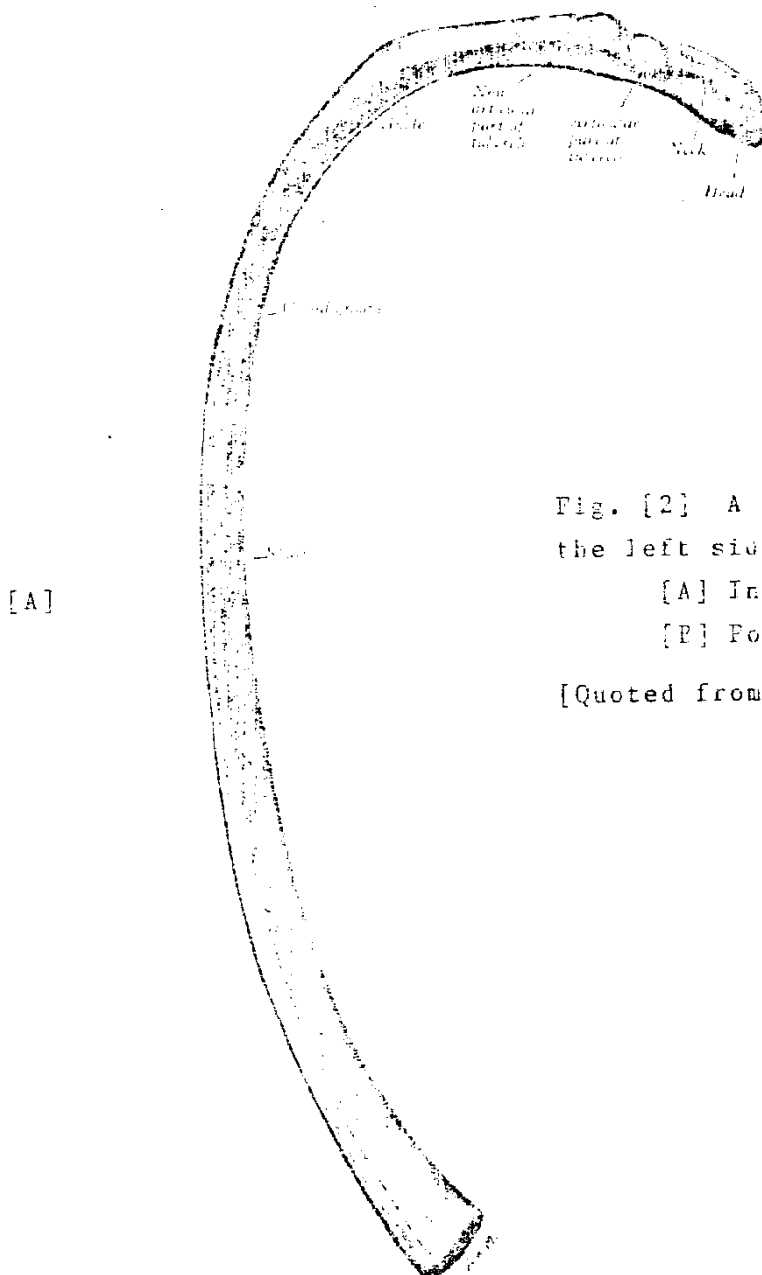
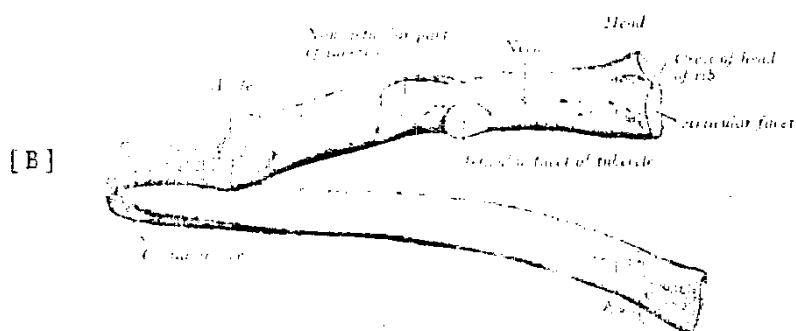


Fig. [2] A typical rib of the left side.

[A] Inferior aspect.

[B] Posterior aspect.

[Quoted from Gray's Anatomy, 1973]



The first two and the last three ribs present special features, but the remaining seven conform to a common plan and referred to as typical [Gray, 1973].

A typical rib has a posterior and an anterior end, and an intervening portion - the shaft [fig.2].

The anterior end has a small cup-shaped depression for the lateral end of the costal cartilage.

The shaft is curved with the convexity outwards and is grooved along the lower part of its inner surface forming the costal groove which lodges the intercostal nerves and vessels, so that the lower border of the shaft is thin and sharp in contrast to the thick, rounded upper border.

The posterior end [or the vertebral end] possesses a head, a neck and a tubercle. The head presents two facets, separated by a transverse ridge named the crest. The lower facet, which is the larger, articulates with body of the numerically corresponding vertebra. The upper facet articulates with the vertebra above, and the crest is attached to the intervetebral disc.

The neck is flattened portion which succeeds the head, lies in front of the transverse process of the corresponding

vertebra. It is oblique, so that its anterior surface is directed forwards and upwards . Its upper border is sharp and forms the crest of the neck of the rib ; its lower border is rounded.

The tubercle is on the outer of the posterior of the rib, at the junction of the neck with shaft; it is more prominent in the upper than in the lower ribs and is divided into a medial articular and a lateral non-articular portion. The articular portion bears a small, oval facet for articulation with the corresponding transverse process; the non-articular portion is rough for ligamentous attachments.

The shaft is thin and flattened , with external and internal surfaces, superior and inferior borders. It is not only curved but also bent forming an angle 5-6 cm from the tubercle .

The head of a typical rib gives attachment along its anterior border to the radiate ligament, and on its crest to the intra-articular ligament. The anterior surface of head is related to the costal pleura, and , in the lower ribs, to the sympathetic trunk. The costal groove on the internal surface of the shaft gives attachment to the internal intercostal muscle, which intervenes between the bone and the

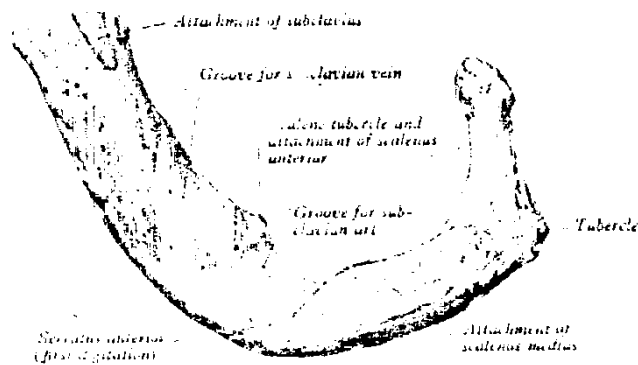


Fig. [3] The first rib of the left side . Superior aspect .

[Quoted from Gray's Anatomy,1973]

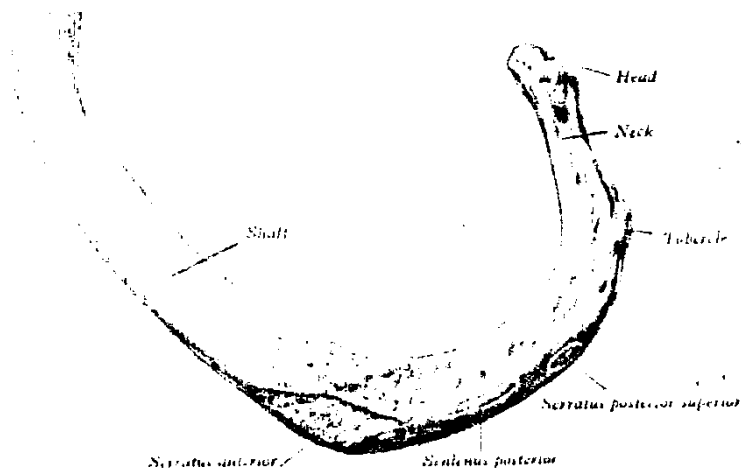


Fig. [4] The second rib of the left side. Superior aspect .

[Gray's Anatomy,1973]

intercostal vessels and nerves.

The first rib [fig.3] is the most curved and usually the shortest of the ribs ; it is broad and flat. it is placed very obliquely , sloping downwards and forewards from its vertebral to its sternal end. The head is small and round, and has a single articular facet for the first thoracic vertebra. The neck is rounded and directed upwards, backwards and laterally. At the tubercle the rib is bent, the angle and the tubercle therefore coincide . The upper surface of the shaft is crossed obliquely by two shallow grooves , separated from each other by a slight ridge, which ends at the inner border of the rib in a projection, the scalene tubercle. The under surface is smooth and has no costal groove. The outer border is convex, thick behind and thin in front. The inner border is concave and thin and marked near its centre by the scalene tubercle. The anterior end is larger and thicker than in any other rib [Gray, 1973].

The second rib [fig.4] is about twice the length of the first, but has a similar curvature. The non-articular portion of the tubercle is often small. The angle is slight and close to the tubercle. The external surface is marked by a rough muscular impression. The internal surface is smooth and concave ; on its posterior part there is a short

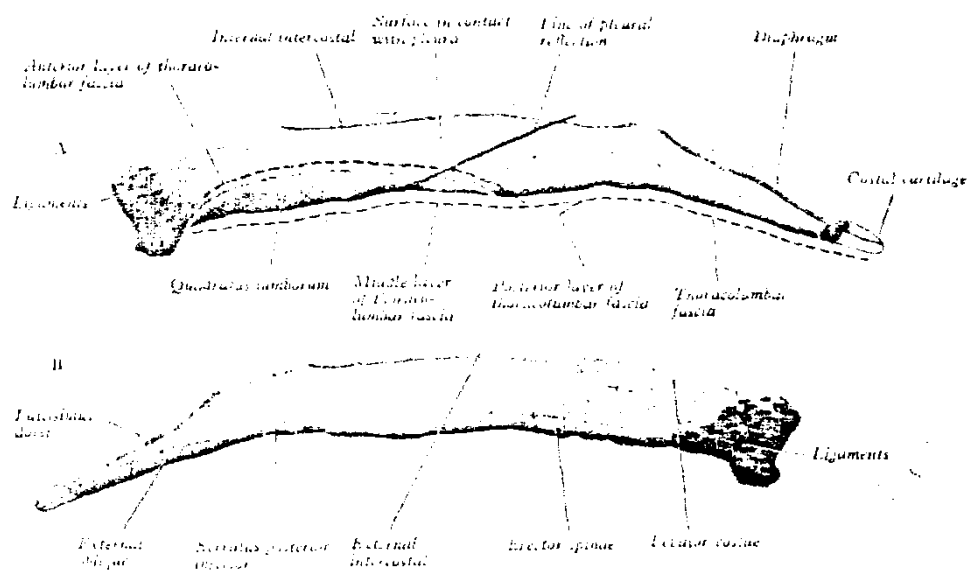


Fig. [5] The twelfth rib of the left side.

[A] anterior aspect

[B] posterior aspect.

[Quoted from Gray's Anatomy, 1973]

costal groove .

The tenth rib has a single articular facet on its head.

The eleventh and twelfth ribs [fig.5] each have a single articular facet on the head; they have no necks or tubercles; their anterior ends are pointed and tipped with cartilage. The eleventh has a slight angle and a shallow costal groove. The twelfth has neither; it is much shorter than the eleventh and its vertebral end is directed slightly upwards. The inner surfaces of both ribs look upwards as well as inwards, the upper inclination being more in the twelfth.

DEVELOPMENT AND OSSIFICATION

During intrauterine development, the earliest parts of the skeleton become recognizable as mesenchymal concentrations [or masses] in a stage called the blastemal stage which is rapidly followed by the cartilagenous stage. In the development of the spinal column, conversion to cartilage begins first in the blastemal mass in the region of the centrum, and then chondrification centers appear in each neural and each costal process. these spread rapidly until all the centers fuse and the entire mass is involved.

The cartilage miniature of the vertebra thus formed is