

The manubriosternal joint—an anatomicoradiological survey

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Cameron, H. U. and Fornasier, V. L. (1974). *Thorax*, 29, 472–474. The manubriosternal joint—an anatomicoradiological survey. The movement of the manubriosternal joint is said to be a significant factor in respiration. The incidence of fusion of the manubriosternal joint in necropsy cases has been investigated with fine detail radiography.

In over 600 cases, fusion of the joint was found in 14% and partial fusion in 8%. In total, the joint was found to be abnormal in 66% of cases. There was an increase in fusion with increasing age. Little relationship was found with degenerative disc disease, and no relationship with ankylosing spondylitis.

The incidence of joint abnormality suggests that hinging of the manubriosternal joint is not as significant a factor in respiration as has previously been thought.

During the course of routine necropsy, the number of manubriosternal joint fusions observed seemed to be fairly high. Consulting the major anatomy texts, two conflicting views were found. Grant (1962), quoting Trotter (1934), stated that synostosis of the manubrium occurred in about 10% of adults unrelated to age. Romanes (1972) stated that fusion was age-related. Last (1966) said that movement of the manubriosternal joint was essential to movement of the ribs.

As it is the custom in routine necropsy at The Princess Margaret and Wellesley Hospitals to obtain a 0.5 cm slice of the whole sternum and submit it to fine detail radiography in a search for tumour (Fornasier, 1973), a large number of radiographs were readily available for examination. It therefore seemed a matter of relative ease to clear up this point of anatomical contention.

MATERIALS AND METHODS

Using the fine detail radiographs referred to above, the manubriosternal joints were divided into groups (Fig. 1) according to a classification of normal, demonstrating significant irregularity, partly fused, and completely fused. The classification was correlated with age, and an attempt was made to correlate the condition of the joints with the condition of the spines, which were also radiographed routinely for evidence of degeneration. Any other points of interest in the sternum were also noted.

RESULTS

The total number of cases was 606. The total number fused was 86, that is, approximately 14%. The total number partly fused was 50, roughly 8%. Therefore the total number with part or complete fusion of the manubriosternal joint was about 22%. The total number showing significant irregularity of the joint surfaces was 263, approximately 44%. Therefore the joint is abnormal in 66% of necropsy cases.

The average age of those showing an almost fused joint was 55.5 years. The average age of those showing complete fusion of the manubriosternal joint was 60. The youngest case showing complete fusion was 25, and there were several cases in the fourth decade.

There was a 1/1 male/female relationship as far as fusion was concerned. A relationship with disc degeneration in the thoracic and thoracolumbar spine did exist. If the thoracic or thoracolumbar spine showed evidence of disc degeneration with narrowing and osteophyte formation, then the manubriosternal joint was abnormal. The converse did not hold true. There was no relationship with disc degeneration in the lumbar spine.

Six cases of ankylosing spondylitis were present in the series. The manubriosternal joint was irregular in all but showed fusion in none, demonstrating little or no relationship.

Several other interesting factors were observed.

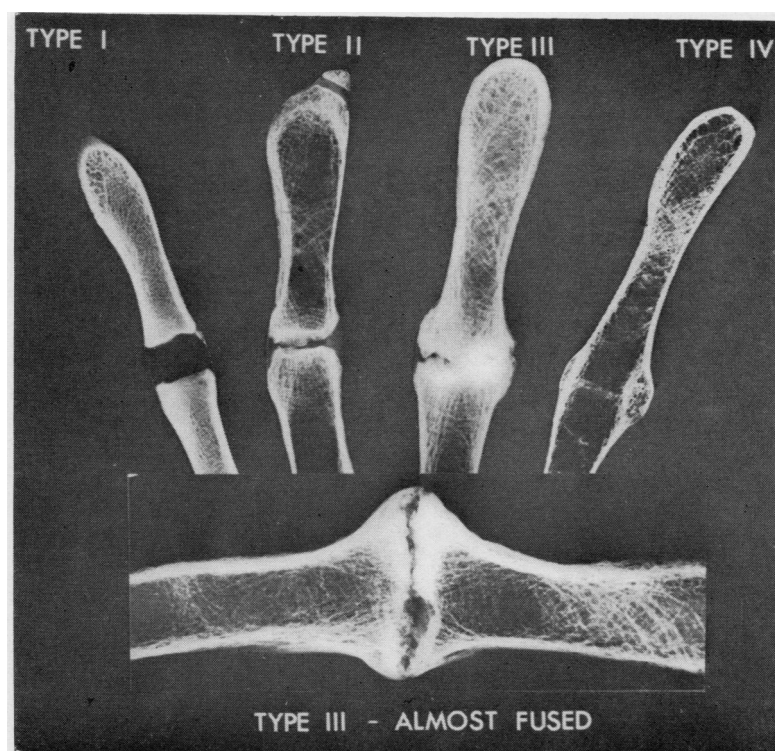


FIG. 1. Radiological classification.

A separate ossicle was seen in the ligament of the sternoclavicular joint in four cases, that is in about 0.7%. A low sternal angle at the level of the third costal cartilage, which is said to be usual in the gibbon (Grant, 1962), was found in two cases (Fig. 2). Six fractures of the sternum were found. In each case a malunion had occurred with a significant backward angulation of the distal fragment and overriding of the proximal fragment (Fig. 3).

DISCUSSION

From the results found above it is apparent that the manubriosternal joint can fuse at any age, but the five-year difference in average age between the almost fused and fused group indicates that the incidence of fusion does increase with increasing age. When a graph of percentage fusion is plotted against age, a fascinating double curve is

obtained (Fig. 4). The reason for this is obscure. It may be indicative only of the small number of cases involved as no relationship was found between fusion and respiratory disease.

It is of interest that the joint was found to be abnormal in 66% of cases. This would seem to indicate that hinging at the manubriosternal joint to increase the anteroposterior diameter of the chest is not really as significant a factor in respiration in adult life as has previously been thought.

CONCLUSIONS

A synostosis occurs at the manubriosternal joint in 14% of adults. The number of cases showing fusion increases with increasing age. Hinging at the manubriosternal joint is probably not as significant in respiration in adult life as has previously been thought.

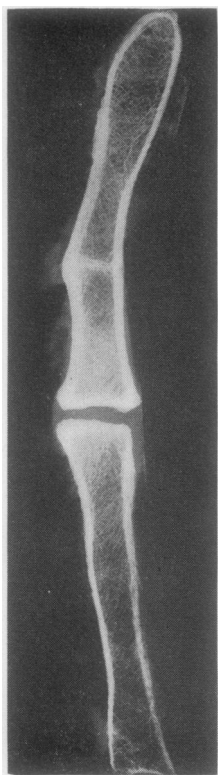


FIG. 2. Radiograph of a low sternal angle.

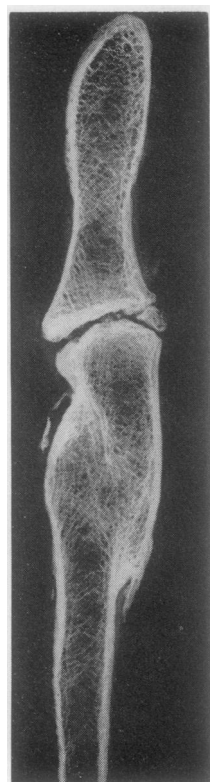


FIG. 3. Radiograph of a typical malunion of a sternal fracture.

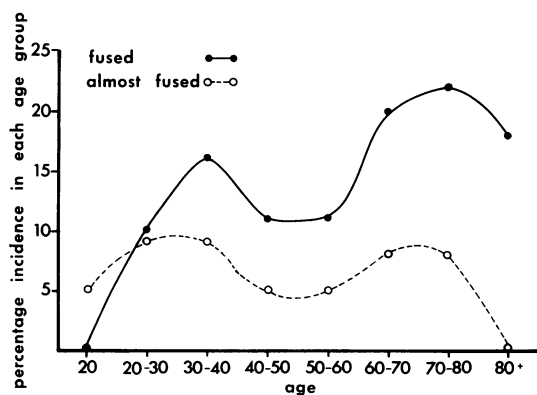


FIG. 4. Percentage incidence plotted against age incidence. The curves are irregular, probably due to the small number of cases, but the trend is clear. There is an increase in fusion with increasing age.

We should like to thank Mary Smith, whose excellent fine detail radiography made this study possible.

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