

INTRODUCTION

- Although costal cartilage rupture was first described by Roland as early as 1499, there has been an increased focus on the anatomy of the anterior chest wall.¹
- The standard teaching describes ribs 7-10 attaching to the cartilage of the rib above with no mobility of the rib.²
- Subsequent exploration of variations in costal margin anatomy and anterior chest wall attachments has been limited.
- A comprehensive grasp of chest wall anatomy and thorax variability is imperative for effectively addressing pathologies involving costochondral junctions and the costal margin.

OBJECTIVE

- Our study sought to evaluate the location of interchondral joints and evaluate their effect on mobility of the rib cage.

METHODS

- Bilateral chest wall anatomy of 28 cadavers (n = 56 hemithoraces) were dissected (14 males, 14 females) to evaluate the anatomy of ribs and composition of the costal margin.
- Complete dissections were recorded on video for detailed analysis and documentation.
- Evaluations were performed by an experienced chest wall surgeon and anatomist.
- The presence of interchondral joints and attachments of ribs were quantified.
- Movement of ribs with upward pressure on the costal margin was assessed.
- Data was collected and compared using Excel and statistics performed with SPSS v27.

RESULTS

- The first rib attached to the manubrium, the second rib attached to the sternal/manubrial junction, and ribs 3-6 attached directly to the sternum in 100% of the specimens.
- Interchondral joints were observed between ribs 4/5 in 0% (0 of 56), 5/6 in 35% (20 of 56), 6/7 in 96% (54 of 56), and 7/8 in 96% (54 of 56).
- The 8th, 9th, and 10th ribs had a free tip in 58%, 92%, and 44% of evaluations, respectively. The 10th rib was identified as a floating rib in 46% of evaluations.
- Upward pressure on the costal margin resulted in compression of the ribs up to, on average, the 5.7 +/- 0.6 rib with no compression above this level.
- This level corresponded to the rib interspace just above the most superior interchondral joint in 98% of evaluation.
- The transmission of these upward forces illustrated rib articulation of the ribs at the costal cartilage – sternal junction in the lower ribs.

Presence of Interchondral Joints between Adjacent Ribs

N= 56 hemithoraces

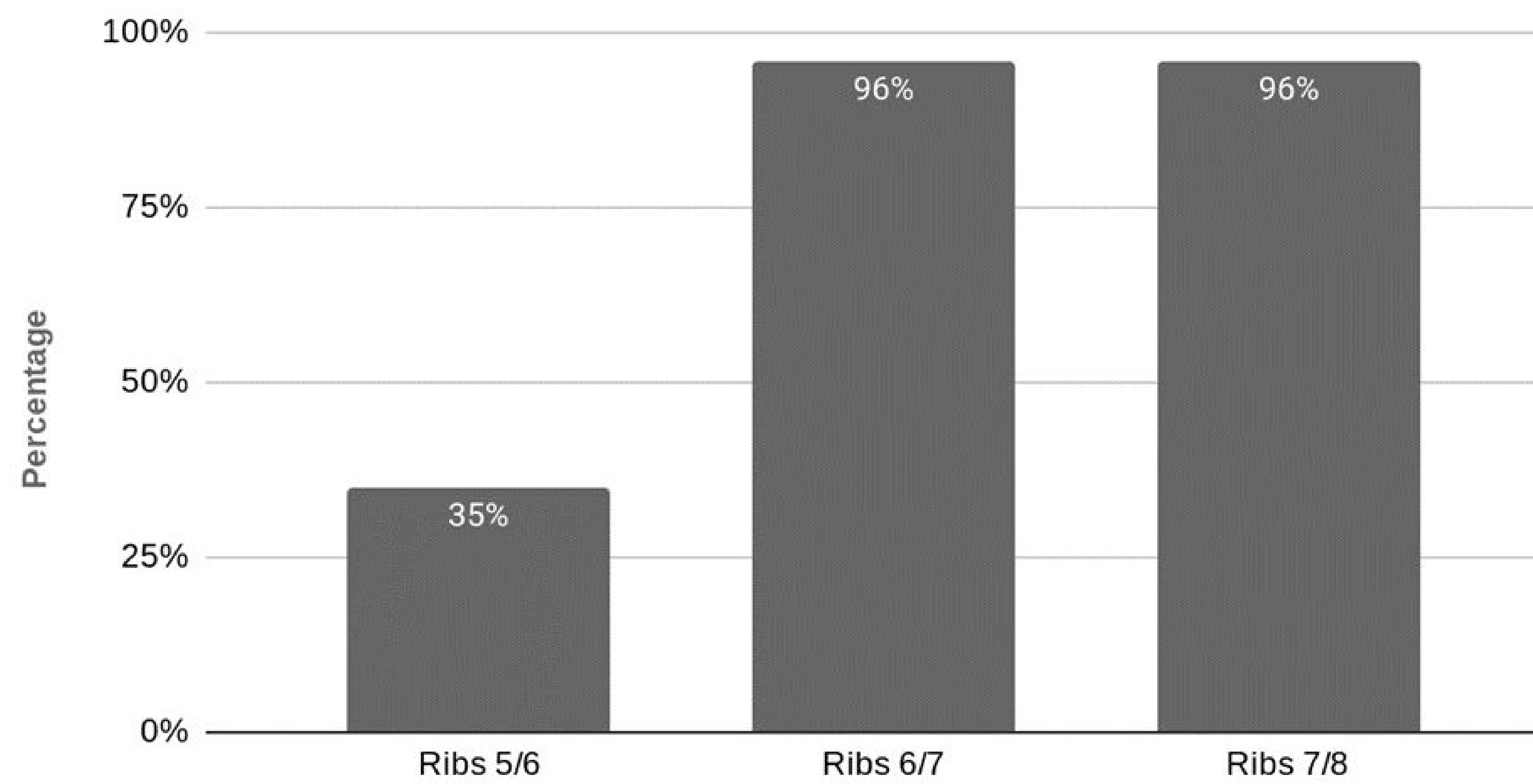


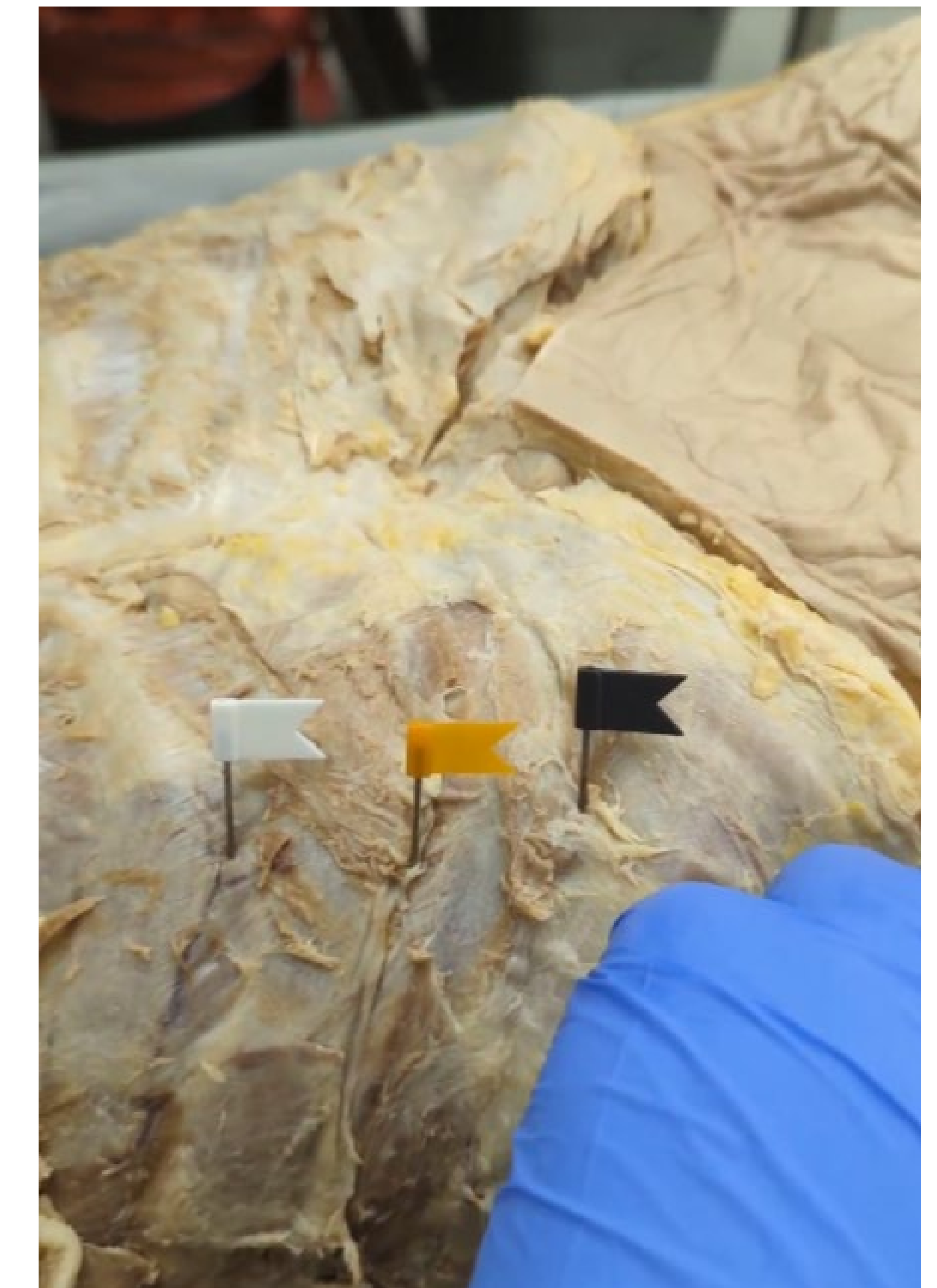
TABLE 1. Rib Tip Mobility Analysis

	No Mobility	Moderate Mobility	Hypermobility
8th Rib	20 (35%)	21 (38%)	15 (27%)
9th Rib	5 (9%)	26 (46%)	25 (45%)
10th Rib	0 (0%)	3 (5%)	53 (95%)

Description: Mobility analysis for ribs 8 to 10 (n = 56 hemithoraces) defined as no mobility, moderate mobility, and hypermobility at the rib tip.

CONCLUSION

- Our study reveals a prevalent occurrence of bridging interchondral joints among ribs 5 to 8.
- These primarily synovial joints facilitate thoracic movement by enabling anteroposterior motion.³
- The chest wall appears to be divided into two regions. The upper region which is minimally affected by forces to the costal margin and the lower region which is affected by multidirectional forces.
- We theorize that this increased mobility may impair fracture healing by increasing motion at the fracture site.
- This increased motion may predispose patients to increased pain, increased respiratory insufficiency, and increased mobility of fractured ribs resulting in nonunion/malunion rib fractures.
- Ongoing investigations are continuing to outline these interactions and their clinical ramifications.



REFERENCES

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