

## Osteosynthesis of type III acromial fractures with locking compression plate, lateral clavicular plate, and reconstruction plate: a biomechanical analysis of load to failure and strain distribution

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### BACKGROUND

Acromial stress fractures following reverse shoulder arthroplasty have been increasingly studied because of potential functional impairment caused by this complication. The purpose of this study was to evaluate and compare different plating techniques for a type III acromial fracture (also referred to as "scapular spine fracture") in a biomechanical setting with special regard to primary stability and modes of failure.

### METHODS

Type III acromial fractures were simulated on 19 Sawbones scapulae and plated with either a lateral clavicular plate (LatCP), a locking compression plate (LCP), or a reconstruction plate (RecoP). We performed testing on 5 scapulae for each plate according to a staircase protocol (100 cycles each step): 50 N and 100 N, then increasing 100 N each step up to 800 N or until failure. The last series of mechanical tests included 3-dimensional micro-motion analysis.

### RESULTS

The average force needed to cause failure of the osteosynthesis construct was 376 N for the LatCP, 506 N for the LCP, and 360 N for the RecoP. The difference between the LCP and RecoP was significant ( $P = .047$ ). The average displacements of the acromion were 12.1 mm, 13.4 mm, and 11.7 mm, respectively. The spring constant was not significantly different between the plates. The LatCP showed increased strain medially, whereas the strain on the RecoP was spread more laterally. The LCP presented a balanced strain distribution, spread evenly over the fracture line.

### CONCLUSIONS

In a biomechanical setting, the LCP showed superiority over the LatCP and RecoP as stabilization hardware for type III acromial fractures.

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