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# Comparison of Different Coracoclavicular Stabilization Techniques in Acute Acromioclavicular Injury with Augmented Acromioclavicular Ligament Repair: A Whole-Body Cadaveric Study

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## Introduction and Background

Acute acromioclavicular (AC) joint injuries account for approximately half of all shoulder injuries. While surgical intervention is typically reserved for high-grade injuries, the optimal surgical strategy remains controversial. Coracoclavicular (CC) stabilization using suspensory devices has become increasingly popular due to favorable clinical outcomes. However, biomechanical studies have largely relied on isolated specimens and have not comprehensively evaluated three-dimensional AC joint motion.

## Material and Method

A controlled laboratory study was conducted on eight shoulders from four fresh-frozen whole-body cadavers. Three-dimensional scapular and clavicular motions were recorded during forward flexion, abduction, and adduction using an inertial measurement unit (IMU)-based motion tracking system. Kinematics were assessed under intact conditions, after sequential ligament transections, and following reconstruction using each stabilization technique. Data were analyzed using mixed-effects models and polynomial regression to compare angular deviations across conditions.

## Results

Following AC and CC ligament transection, significant deviations in scapular and clavicular kinematics were observed, especially at arm elevations beyond 120°. None of the reconstruction techniques fully restored native motion. Among the methods, the double tunnel construct most closely approximated the intact shoulder, demonstrating less reduction in clavicular retraction and upward rotation and lower deviations in scapular rotation. The single tunnel construct resulted in the greatest deviation, including increased scapular upward rotation and diminished clavicular motion. The loop technique provided intermediate results. Notably, all reconstructions showed persistent increases in scapular rotation and reductions in clavicular dynamics at higher angles of elevation, which may predispose repairs to mechanical overload during early postoperative rehabilitation.

## Conclusions

Although no reconstruction fully restored native AC joint kinematics, the double tunnel CC stabilization with AC ligament repair most closely approximated physiologic scapular motion. Its anatomical construct appears to provide superior rotational stability. However, notable deviations beyond 120° of elevation suggest a zone of mechanical vulnerability. Delaying high-elevation activities in early rehabilitation may reduce the risk of failure.

Figure & Table 1.

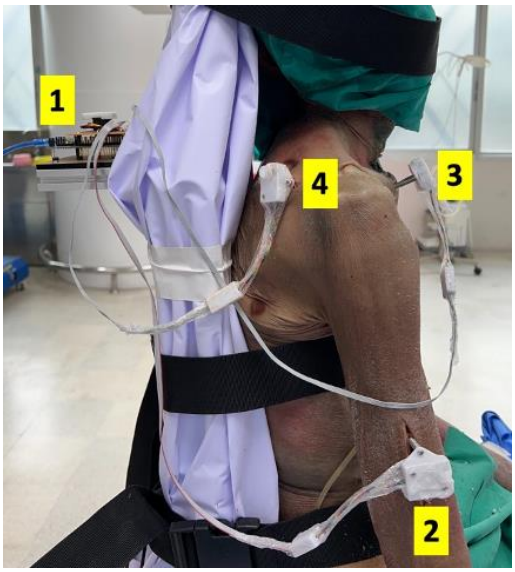


Figure & Table 2.