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"The Biomechanical Assessment of Complex Shoulder Instability"

The shoulder is the most commonly dislocated joint. The incidence varies between 11 and 24 per 100,000 person-years with a maximum incidence occurring between the ages of 20-29 years. The incidence of recurrent shoulder dislocations approaches 75% in young active patients. Shoulder instability is a disabling condition, associated with pain and an inability to participate in sports and work. Recurrent instability is more common when there are associated bony defects, such as anterior glenoid bone loss (bony Bankart) and humeral head impression fractures (Hill-Sachs defect). Shoulder instability with associated bone defects has been termed "complex" instability.

The occurrence of these associated humeral and glenoid bone defects is directly related to the risk of recurrence and importantly, the failure of standard surgical stabilization techniques. Due to this high failure rate, several new, alternative and controversial surgical techniques have been developed. Surgical procedures used for the management of humeral Hill-Sachs defects include, the remplissage procedure, humeral head allograft reconstruction and partial resurfacing arthroplasty. Surgical techniques used to manage glenoid bone loss include, bone graft reconstruction (allograft or autograft), Bristow transfer, classic Latarjet transfer, and the congruent arc modification of the Latarjet transfer. While each surgical technique has purported advantages and disadvantages there is a lack of high level of evidence clinical outcomes literature comparing the various procedures. In circumstances of insufficient clinical literature, biomechanical studies can assist with decision making. Therefore, the purpose of this work was to employ an experimental biomechanical approach to study the advanced surgical techniques used to manage complex shoulder instability.

Biomechanically, these techniques were assessed for strength, stability and load transfer. Kinematically, the techniques were performed on cadaveric specimens and tested on a newly developed custom dynamic shoulder simulator to evaluate their effects on range of motion and stability. The body of work focused on the assessment of several surgical procedures, such as the Latarjet procedure, Bristow transfer, remplissage procedure, allograft humeral head reconstruction, and partial resurfacing arthroplasty. Ultimately, this research has led to an improved understanding of the advantages and disadvantages of the advanced surgical techniques used to manage complex shoulder instability.