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Dynamic Anterior Stabilization for Anterior Shoulder Instability: A Meta-Analysis and Systematic Review of Clinical and Biomechanical Studies

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Faculty Disclosure Information

- No potential conflict of interest in relation to this presentation
- I will not be discussing any off-label or unapproved of drugs or products

Background

- Anterior shoulder instability (ASI) is common, affecting 23.1/100,000 individuals [1-4]
- High-risk individuals, such as younger age at the time of first dislocation, males, and those with hyperlaxity have higher risk of recurrence if treated non-operatively[5,6]
- Several adjuvant procedures, such as Remplisage and Laterjet, have been introduced to decrease the recurrence rate. However, these procedures are not without complications [6-8]
- Dynamic anterior stabilization (DAS) provides an anterior sling augment effect to complement Bankart repair (BR), while minimizing the risk of complications [9,10]
- DAS involves anchoring the intra-articular portion of the long head of the biceps tendon or the conjoined tendon to the anterior glenoid rim, combined with Bankart repair
- The biomechanical and clinical evidence supporting DAS remains limited

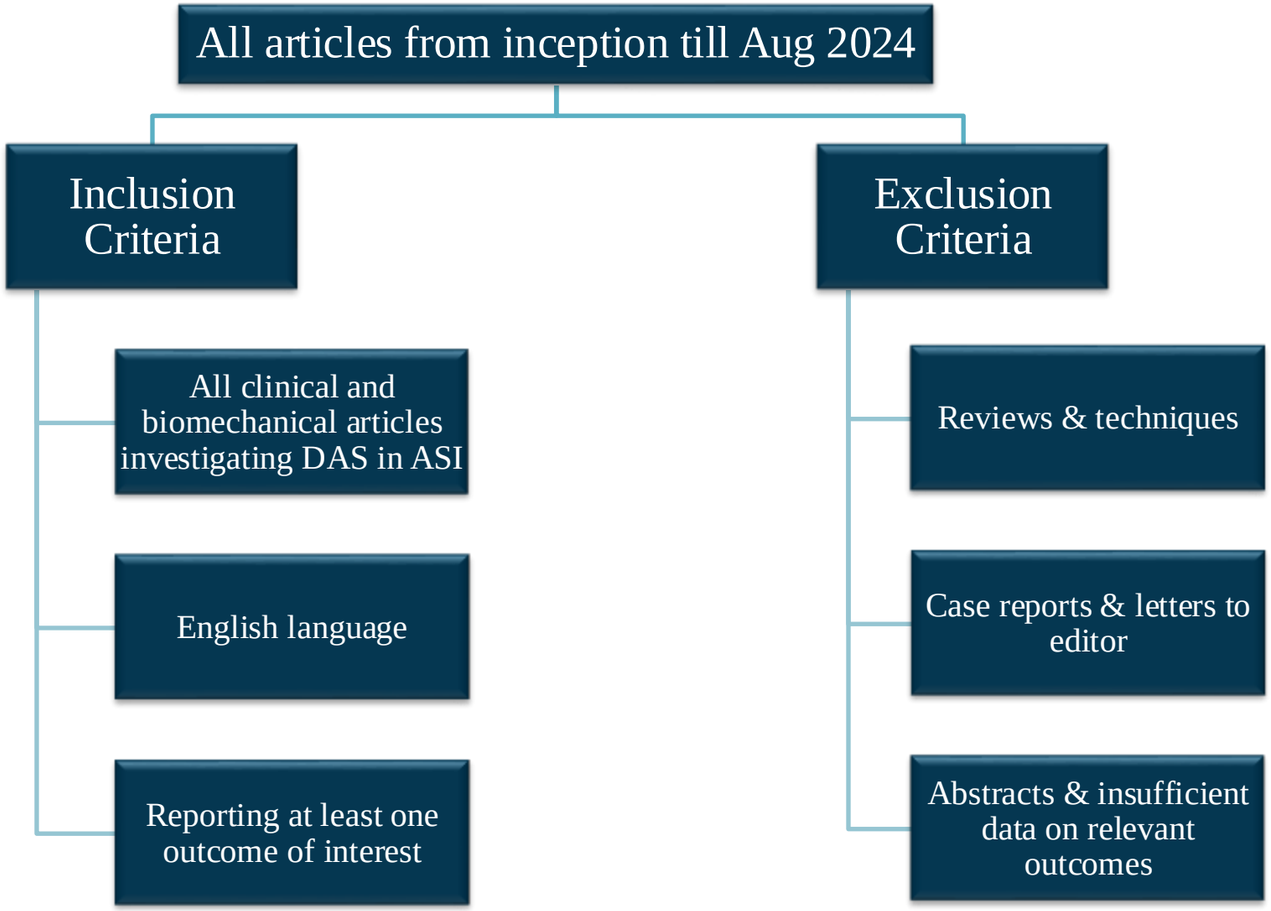
Methods – Aims & Search Strategy

- Aim: To systematically evaluate the biomechanical outcomes, clinical outcomes, and complication rates of DAS combined with BR for ASI

- PubMed, Embase, and Scopus databases were searched from inception until August 2024

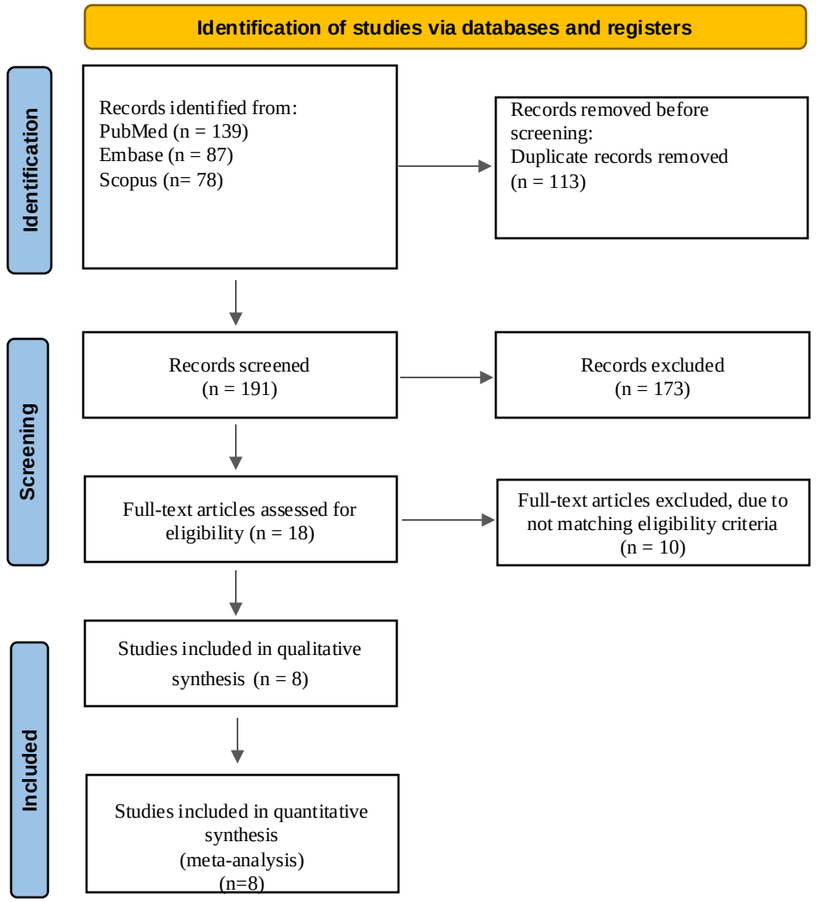
- Search terms: [Shoulder] AND [Instability] AND [Dynamic] AND [Anterior] AND [Stabilization or Stabilisation]

Methods – Search Strategy



Methods

PRISMA



Data of Interest

- **Biomechanical outcomes of interest:**
  - glenohumeral anterior translation
  - Joint stability under various loading conditions
  - Load-to-dislocation
- **Clinical outcomes of interest:**
  - Patient-reported shoulder scores
  - Range of motion
  - Complication rates

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Methods - Analysis

- **For biomechanical studies:**
  - No formal statistical pooling was performed due to heterogeneity in methodologies, including variability in GBL models, treatments compared, and biomechanical parameters assessed
  - Descriptive statistics were used.

- **For clinical studies:**
  - Pre- to post-treatment weighted mean differences (WMDs) with 95% confidence intervals (CIs) were calculated for continuous outcomes
  - Statistical significance was set at a p-value of < 0.05
  - Heterogeneity was assessed using the I^2 statistic
  - Random-effects model was applied to account for variations across studies
  - Return-to-sport rates and recurrent instability rates were summarized as proportions

Results – Biomechanical Studies

- 60 cadaveric shoulder specimens with a glenoid bone loss (GBL) ranging between 10%-20% were included

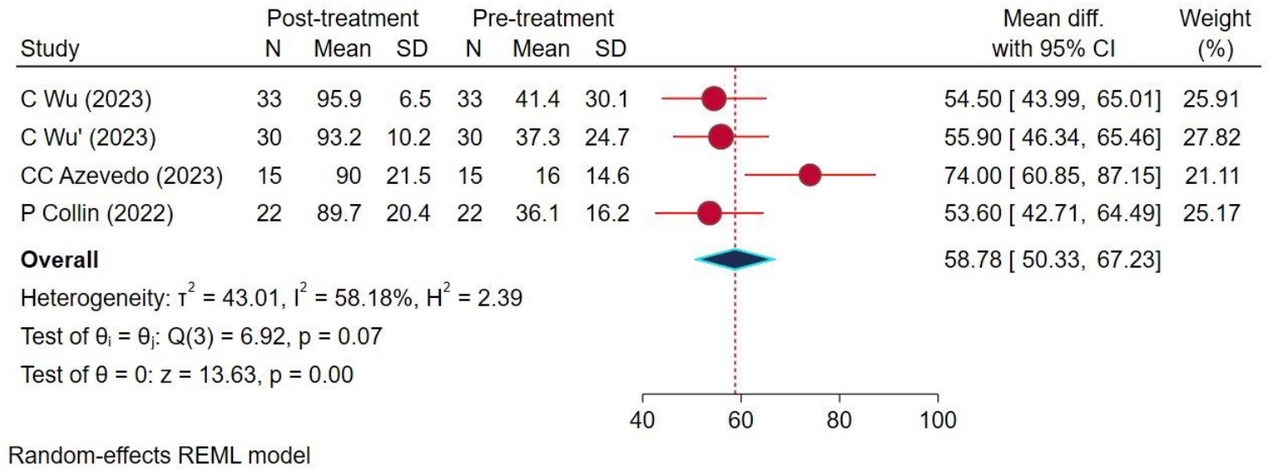
- DAS demonstrated significant improvements in anterior glenohumeral stability and load-to-dislocation compared to isolated BR, particularly in models with < 20% GBL and on-track HS lesion

- DAS was less effective than the Latarjet and Remplissage procedures in scenarios involving GBL of 20% or off-track HSL, respectively

Results – Clinical Studies

- Three clinical studies | 100 shoulders | Age 23.4 to 31 years | Follow up 24 to 45.3 months | Mean GBL ranging between 8.2% to 10.5%

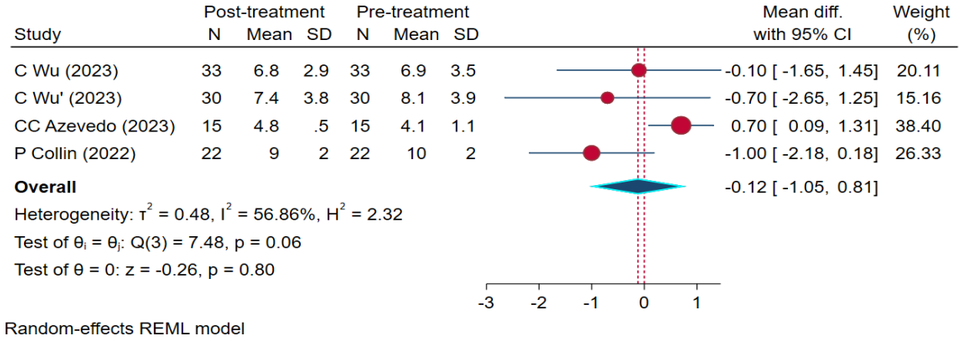
- **All studies reported significant pre-to-post intervention improvements in Rowe scores, with a mean difference of 58.7 points (WMD = 58.7; 95% CI, 50.3-67.2; p < 0.001)**

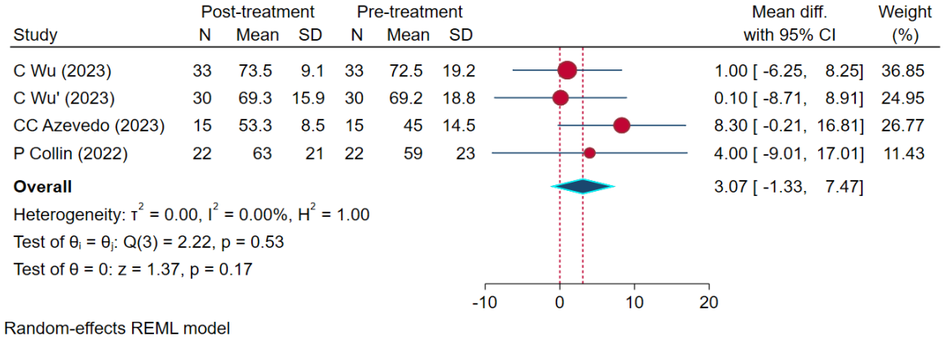


C Wu 2023: had two arms (DAS using the biceps & DAS using the CJT)

Results – Clinical Studies

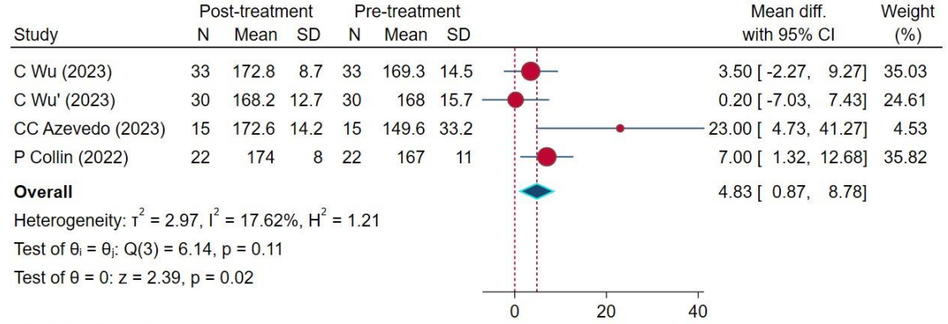
- **No statistical significant difference in internal or external rotation**





C Wu 2023: had two arms (DAS using the biceps & DAS using the CJT)

- **Forward elevation significantly increased (WMD = 4.80; 95% CI, 0.8-8.8; p = 0.02)**



C Wu 2023: had two arms (DAS using the biceps & DAS using the CJT)

Results – Clinical Studies

- **Return-to-sport:**
    - 90% for return to sports at any level at two years,
    - 71% for returning at a similar level.
- **Recurrent instability was reported in 8% (N=8) in the form of:**
    - 3 postoperative apprehension
    - 1 subluxation
    - 4 re-dislocations (of which three were found to have an off-track HS)
- **Reoperations:**
    - 2 Revisions to Latarjet in due to recurrent instability (2%)
    - 1 capsular release due to post-operative stiffness (1%)

Conclusions

- DAS significantly improves PROMs and RTS
- DAS has a low complication rate in GBL ranging between 8.2% to 18.5%
- The current evidence is limited to Level IV studies and lacks direct comparisons to other established stabilization procedures
- Comparative biomechanical studies support its efficacy in reducing glenohumeral translation and increasing load-to-dislocation when compared to BR alone in models with GBL up to 20%
- Biomechanical studies demonstrated that DAS failed to improve glenohumeral biomechanics when GBL excessed 20%

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