# ASSESSING BONE LOSS IN THE UNSTABLE SHOULDER

A Scoping Review

Kyle Gouveia, Syed Fayyaz H. Rizvi, Danielle Dagher, Timothy Leroux, Asheesh Bedi, Rachel Frank, Moin Khan

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# Disclosures

- None

# Background

- Anterior shoulder instability is a common problem, with shoulder dislocations affecting 15.2-24.8 people per 100,000 per year[1,2]

- Shoulder instability also carries a high risk of recurrence, with recurrent dislocations increasing the likelihood of associated bone loss, occurring on both the glenoid and humeral sides of the joint, further predisposing to additional dislocation events[3,4]

- Assessment of this bipolar bone loss is essential for treatment decision making, as increasing bone loss adversely affects the likelihood of success of soft tissue stabilization procedures

- Furthermore, increased understanding of the relationship between humeral- and glenoid-sided bone defects is occurring due to concepts such as the glenoid track[5-7]

Despite the recognized importance of assessing bone loss in patients with recurrent shoulder instability, there remains little consensus regarding the best method.



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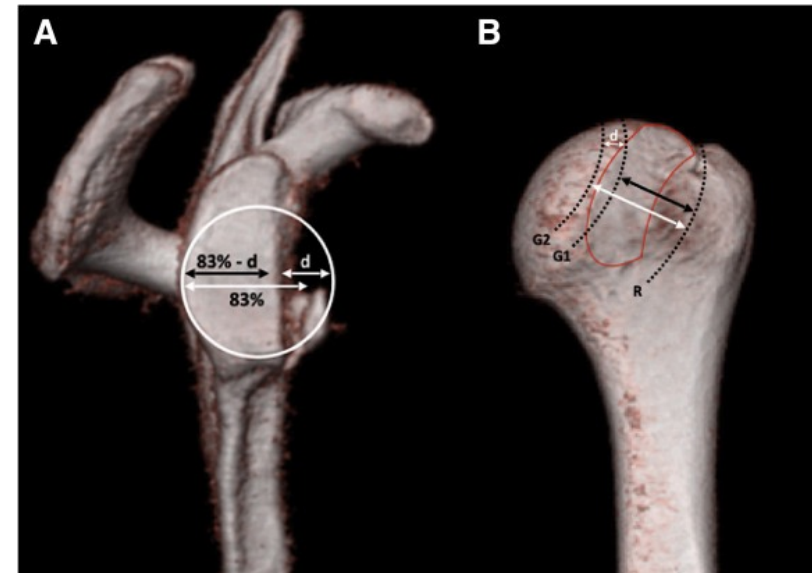
# Purpose

The aim of this scoping review is to identify and summarize findings published in the literature over the past 5 years related to methods for assessment of bone loss in anterior shoulder instability.
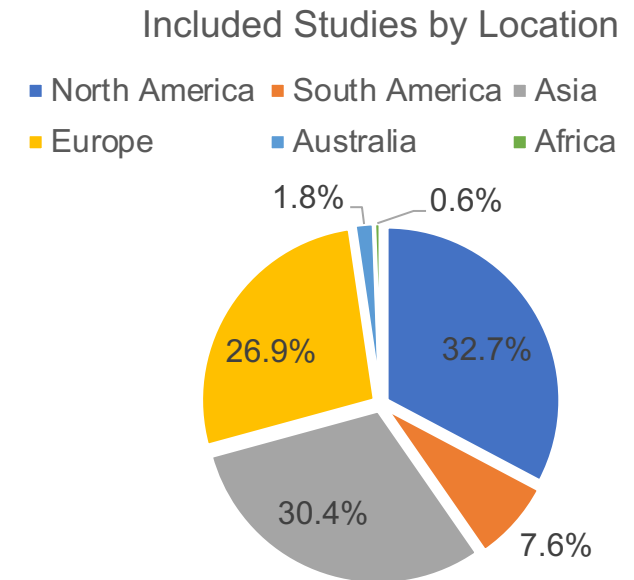
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# Methods
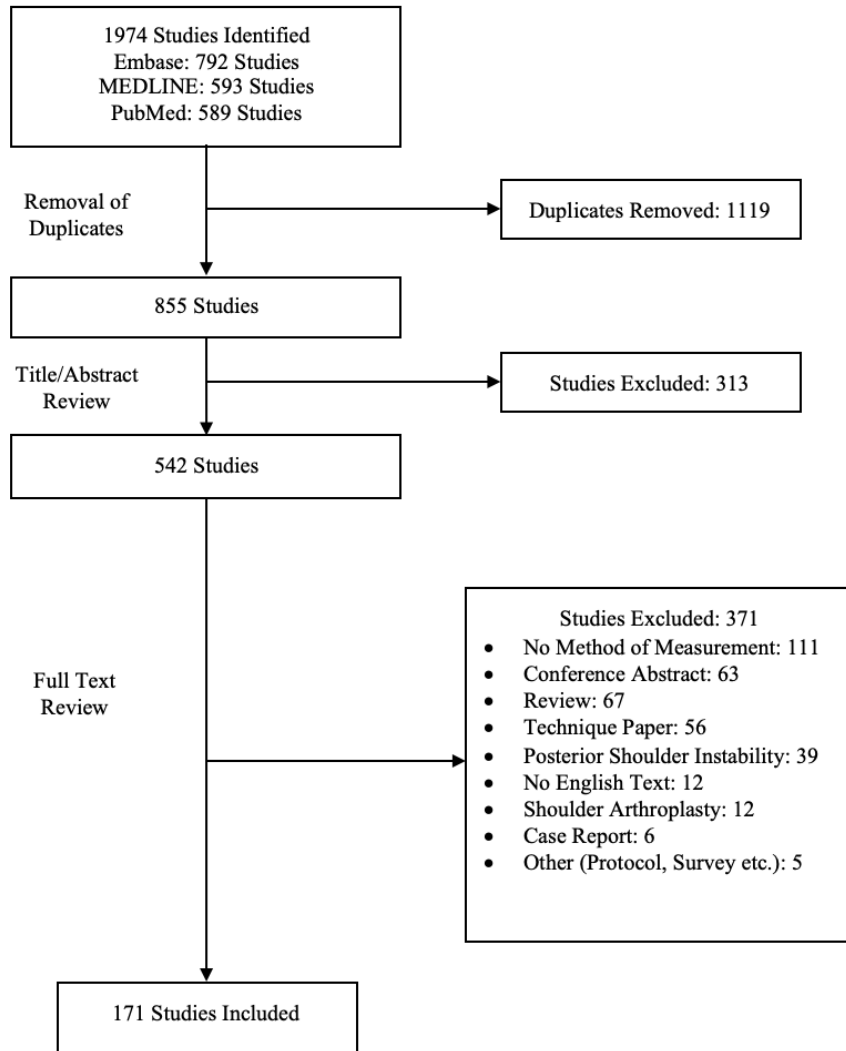


- Medline, Embase, and PubMed searched for relevant studies from the last 5 years

- Search utilized terms such as "shoulder instability", "bony Bankart", "bone defect", and "Hill-Sachs lesion"

- Data extracted from relevant studies included study design, year, and country, as well as patient demographics

- Specific techniques for bone loss assessment were recorded, as well as reporting of bone loss measurements

- Results are presented in a descriptive fashion

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# Results

- 171 studies included from the 5-year time period
  - 113 clinical studies and 58 basic science

- Majority of studies were Level IV evidence (61.9%)

- The most commonly investigated procedure was the arthroscopic Bankart repair (37 studies)
  - Combined with remplissage in an additional 13 studies

- The most common bony procedure investigated was the Latarjet (36 studies)

Included Studies by Location

- North America
- South America
- Asia
- Europe
- Australia
- Africa

1.8%
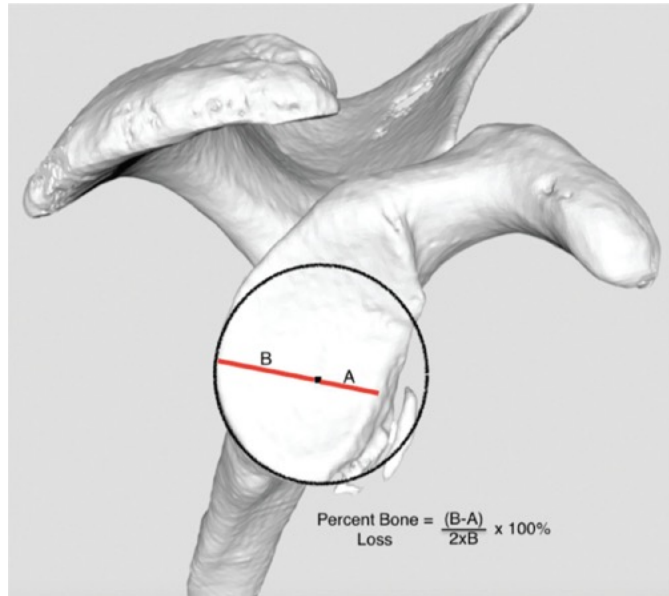0.6%
26.9%
32.7%
30.4%
7.6%

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# Glenoid Bone Defect Assessment

- The most common modality used to assess glenoid bone loss was three-dimensional computed tomography (3D CT)

    - 3D CT was the modality of choice in 51.3% of studies

    - Plain 2D CT was used in an additional 18.6% of studies

- MRI was the method of choice in 15% of studies

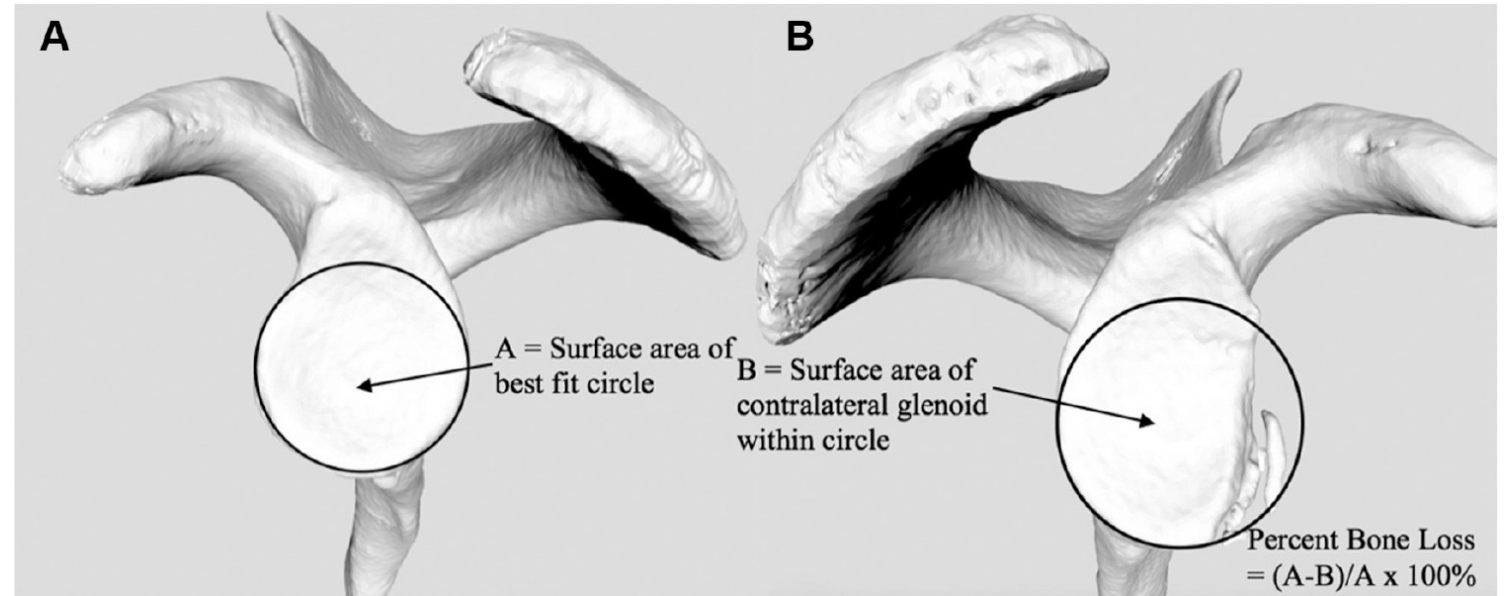    - Recent research would suggest that 3D MRI performs similarly to 3D CT in the assessment of glenoid bone loss[8]

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# Diameter vs Surface Area

Nearly all studies assessed glenoid bone loss using one of two perfect circle based methods:

### Linear-Based Measurement



Percent Bone Loss = $\frac{(B-A)}{2 \times B}$ x 100%

### Surface Area-Based Measurement



A = Surface area of best fit circle

B = Surface area of contralateral glenoid within circle

Percent Bone Loss = (A-B)/A x 100%

- While both methods are effective, they can not be reliably compared and the linear based measurement may overestimate glenoid bone loss[9]

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# Hill-Sachs Assessment

**Assessment of Hill-Sachs defects is not quite as straightforward:**

- Similar to on the glenoid side, studies most commonly used 3D CT (32%), plain CT (29%), or MRI (10%) for assessment of Hill-Sachs defects

- There however was significant variability in the exact measurements used which included

    - Measurement of the Hill-Sachs index as described by Di Giacomo et al[6] (7 studies)

    - Measurement of defect width in millimetres (7 studies)

    - Depth as a percentage of humeral head diameter measured on axial CT (5 studies)

    - Volume measurement determined using 3D CT (3 studies)

- Understandably this led to variable reporting of Hill-Sachs defects in included studies, which could lead to difficulties making comparisons between studies or applying them to clinical practice

# Glenoid Track

- The glenoid track as described by Di Giacomo et al in 2014[6] was most commonly assessed using 3D CT (13 studies), plain CT (7 studies), and MRI (5 studies)

- The glenoid track was reported by 27 of 113 clinical studies overall (23.9%)
  - Notably, it was reported in only 14.9% of studies in the first half of the analyzed period (2017-2019)
  - In the second half (2020-2022), this increased to 30.3% of studies

- This doubling of the rate of reporting may indicate that the glenoid track concept is becoming an increasingly recognized factor in determining optimal treatment

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# Conclusion

1. 3D CT is the method of choice for assessment of glenoid bone loss, combined with a perfect-circle based method to determine percentage bone loss

2. Hill-Sachs lesion assessment is more heterogeneous however, and a consistent and universal method of assessing humeral sided bone loss is needed for accurate assessment

3. The glenoid track is becoming an increasingly important part of bipolar bone loss assessment – as reflected in its increased reporting in literature regarding recurrent shoulder instability

# THANK YOU.

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