Does Loss of Humeral Head Spherical Shape Correlate with Decreased Range of Motion in Glenohumeral Osteoarthritis

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Introduction

- Glenohumeral Osteoarthritis (GHOA) is a prevalent cause of shoulder pain and loss of function.[1]
- Patients most commonly cite pain and function as the primary motivators for undergoing total shoulder arthroplasty (TSA).[2]
- As radiographic arthrosis worsens, the threshold for recommending surgical intervention may be lower.
- Current radiographic grading systems – including the Kellgren-Lawrence, Samilson-Prieto, and Walch classifications – have not been found to correlate with pain or functional scores.[3]
- In advanced GHOA, the spherical contour of the humerus is often lost or severely distorted.
- Humeral head sphericity may serve as a novel, simple radiographic marker of disease severity

Aims

- **Primary Objective:** The primary aim of this study is to determine whether loss of humeral head sphericity correlates with decreased range of motion (ROM) in patients with GHOA.
- **Secondary Objectives:** Secondary aims include examining demographic associations and comparing sphericity with established radiographic grading systems.
- **Hypothesis:** We hypothesize that loss of humeral head sphericity is associated with decreased range of motion in patients with GHOA.

Methods

- **Study Design:** Retrospective chart and radiographic review
- **Inclusion Criteria:** Patients with anatomic TSA for primary GHOA by 3 fellowship-trained shoulder surgeons at the University of Utah between 2017-2025 with documented preoperative ROM measurements
- **Measurement Methods:**
  - Humeral head sphericity using best-fit circle (Youderian et al.)[11]
  - Radiographic grading systems: Kellgren-Lawrence, Samilson-Prieto, Walch.[5,6,7,8]
  - Two independent reviewers (interrater reliability recorded)
- **Clinical Variables:**
  - ROM, pain scores (ASES, VAS), demographics
- **Statistical Plan:**
  - Interrater reliability
  - Correlation analysis
  - Subgroup analyses

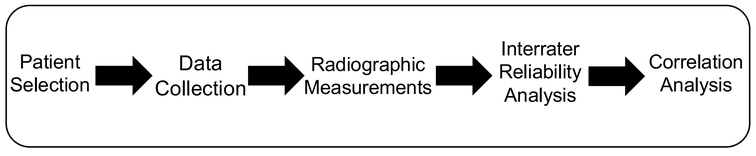

Figure 1. Study Flowchart

Figure 2. Measurement of Humeral Head Sphericity on a Spherical Humeral Head
a. Grashey view radiograph of a shoulder with GHOA
b. The same radiograph demonstrating the best-fit-circle, illustrating a spherical shape
Adapted from Youderian et al., J Shoulder Elbow Surg. 2014;23(7):955-963

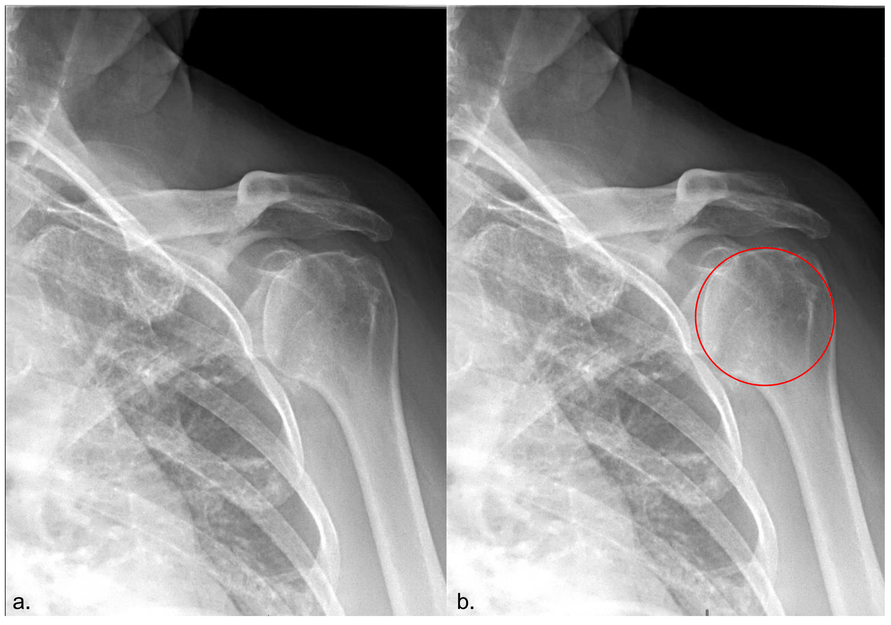

Figure 3. Measurement of Humeral Head Sphericity on a Non-Spherical Humeral Head
a. Grashey view radiograph of a shoulder with GHOA
b. The same radiograph demonstrating the best-fit-circle, illustrating a non-spherical shape
Adapted from Youderian et al., J Shoulder Elbow Surg. 2014;23(7):955-963

Interim Progress

Current Cohort Characteristics

Variable	N (available)	Mean ± SD	95% CI
Demographics			
Sex	32 F, 65 M	-	-
Mean age (years)	100	63.53± 8.72	61.82-65.24
Shoulder Characteristics			
Laterality	32 R, 68 L	-	-
Clinical Variables			
Mean pre-op Forward Elevation	100	123.65± 33.62	117.06-130.24
Mean pre-op External Rotation	100	31.85± 2.33	27.29-36.41
Mean VAS	89	5.45± 2.27	4.98-5.92
Mean ASES	88	44.81± 2.27	41.03-58.59
Radiographic Variables			
Spherical	52	-	-
Non-Spherical	48	-	-

Table 1. Current Cohort Characteristics

Expected Results

- We anticipate decreased sphericity to correlate with reduced ROM and PROs
- If confirmed, this relationship may provide a quantifiable, radiographic parameter to guide treatment and earlier surgical intervention
- This is the first study to systematically examine humeral head sphericity versus ROM in GHOA

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