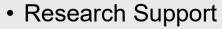


Do Pre-operative CT scans Decrease the Risk of Revision surgery in Total Shoulder Arthroplasty? A Matched Cohort Analysis of a National Claims Database

Mallory B. Lane, BS, Jacob Siahaan, MS, James M. Gregory, MD

# Disclosures (JMG)

- Consulting
  - Stryker
  - Arthrex



- Stryker
- Arthrex
- Board or Committee Member
  - AAOS
  - ASES



FAIN# R01AR083471

#### Introduction

- Successful total shoulder arthroplasty (TSA) relies on appropriate understanding of anatomy.
- Pre-operative CT planning has been shown to increase the accuracy of component placement during TSA. <sup>1-4</sup>
- In limited case series, deviation from this pre-operative plan has been associated with poor clinical outcomes. <sup>5</sup>
- However, even though CT allows for enhanced pre-operative planning and improved component positioning, it remains unclear whether this translates to improved clinical outcomes on a larger scale.
- Consequently, the benefit of pre-operative CT may be challenged within a value-based care setting.

## Purpose

To assess whether pre-operative CT planning translates to improved patient outcomes in TSA.

## Hypothesis

Patients who received a CT scan prior to TSA would have lower revision an complication rates than those who did not

#### Methods

- PearlDiver database was queried for patients who had a TSA from 2015 through the first quarter of 2022
  - Using CPT code 23472
  - Exclusion: Any upper extremity fracture
- Primary outcome was revision rate
- Secondary outcome was post-operative infection
- Outcomes were compared across three diagnostic cohorts defined by the following ICD-10 codes:
  - M19.01- primary osteoarthritis of the shoulder
  - M75.1- rotator cuff tear or rupture
  - M12.8- rotator cuff arthropathy



#### Results – Overall Cohort

- 112,571 patients met inclusion criteria
- · 23,212 received a pre-operative CT
- Overall Data Set
  - · Higher revision and infection rate for CT vs no CT
- M19.01 Matched Cohort Primary osteoarthritis of the shoulder
  - Statistically significant increase in both revision rate and infection rate for CT vs no CT
  - · Difference persisted when analyzed with logistic regression
- M75.1 Cohort Rotator cuff tear or rupture
  - Statistically significant increase in both revision rate and infection rate for CT vs no CT
  - Difference persisted when analyzed with logistic regression only for revision rate
- M12.8 Cohort Rotator cuff arthropathy
  - · No statistically significant differences in revision or infection rate

Overall Cohort			
	CT	No CT	
Total Cohort	n = 23,212	n = 89,359	
Revisions	n = 858	n = 2,739	
Revision Rate	3.7%	3.1%	
p-value	p < .001		
Infections	n = 1,781	n = 5,281	
Infection Rate	7.7%	5.9%	
p-value	p < .001		

# Results – Matched Sub-Groups by Diagnosis

M19.01 Matched Cohort - Osteoarthritis of the Shoulder		
	CT	No CT
Total Cohort	n = 10,130	n = 10,130
Revisions	n = 358	n = 205
Revision Rate	3.6%	2.2%
p-value	p < .001	
Logistic Regression	OR = 1.2	
p-value	p < .001	
Infections	n = 710	n = 560
Infection Rate	7.0%	5.5%
p-value	p < .001	
Logistic Regression	OR = 1.7	
p-value	p < .001	

M75.1 Cohort - Rotator Cuff Tear or Rupture			
	CT	No CT	
Total Cohort	n = 91	n = 1,152	
Revisions	n = 14	n = 31	
Revision Rate	15.4%	2.8%	
p-value	p < .001		
Logistic Regression	OR = 5.6		
p-value	p < .001		
Infections	n = 11	n = 52	
Infection Rate	12.1%	4.5%	
p-value	p = .003		

M12.8 Cohort - Rotator Cuff Arthropathy			
	CT	No CT	
Total Cohort	n = 47	n = 625	
Revisions	n = 2	n = 24	
Revision Rate	4.3%	4.0%	
p-value	p = 1.0		
Infections	n = 3	n = 26	
Infection Rate	7.0%	4.2%	
p-value	p = 0.73		

#### Discussion

- Statistically higher incidence of revision and infection in patients who underwent CT scans prior to TSA
  - Significantly higher revision and infection rate maintained in the pre-operative CT group in the arthritis cohort and the rotator cuff tear cohort
  - Rotator cuff arthropathy cohort showed no significant differences
- Counter to the hypothesis we developed before conducting the study
- · We believe results may reflect selection bias
  - · CT scans were not universally ordered
    - Patients who received CT scans may have had more severe underlying bony deformity or case complexity
    - Patients who were presumably less likely to have glenoid deformity (a diagnosis of rotator cuff tear) were less likely to receive a CT scan.
    - Glenoid deformity has been clearly shown to be associated with a higher rate of component migration post-TSA <sup>6</sup>
- · Above hypothesis could not be further explored within the limitations of a retrospective database study

#### Conclusion

- Patients who received CT scan prior to TSA had increased revision rate and complication rate compared to those who did not.
- We believe the inferior outcomes in patients who received pre-operative CTs likely reflects selection bias more complex cases were more likely to receive a CT scan.
- As policy decisions about value-based care are often made based on clinical outcomes from large databases, our research highlights an important discrepancy between database outcomes and clinical practice
- Further research is needed to define the value of pre-operative CTs by controlling for outcomes based on glenoid deformity.

## References

- 1. Freehill et al. J Shoulder Elb Arthroplast. 2022.
- 2. Lilley et al. J. Shoulder Elbow Surg. 2022.
- 3. Wittmann et al. Arch Orthop Trauma Surg. 2023.
- 4. Gregory et al. PLoS One. 2013.
- 5. Baumgarten et al. J Shoulder Elbow Surg. 2023.
- 6. Ricchetti et al. J. Bone Jt. Surg. 2021.