Trends & Outcomes in Shoulder Arthroplasty: Comparing Anatomic, Reverse, & Hemiarthroplasty

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Introduction

The field of **Total Shoulder Arthroplasty** has evolved greatly in recent years

Three main designs of shoulder arthroplasty exist
- Anatomic (**ATSA**), Reverse (**RTSA**), and Hemi (**HA**)

Changes in usage have been closely documented over the past twenty years[1]
- **ATSA – 12%** yearly growth
- **RTSA – 32%** yearly growth
- **HA** – Proportion of overall volume has fallen from **40%** to just **9%**

Despite clear changes in trends, surgical **outcomes** are **mixed**, such as[2,3]
- **RTSA** carries higher complication rates than **ATSA**
- **HA** carries low complication rates, yet others have documented high revision and readmission rates
- Postoperative hospital stay (LOS) may be longest for **RTSA** patients

Identifying changing surgical trends is important, but to best understand them, we must strive to also characterize the reasons behind them. One place to begin is in postoperative outcomes.

Aims and Hypothesis

Aims
- To document and characterize the changes in shoulder arthroplasty trends at Beaumont hospitals and compare key outcomes variables.

Objective
- Sought to recruit primary arthroplasty patients at Beaumont hospitals from 2016 – 2020 and conduct a chart review for key surgical outcomes.

Hypothesis
- Surgical trends will mirror those seen elsewhere in the United States with increases in RTSA and decreases in ATSA and HA usage.
- Surgical outcomes will be mixed with no clear dominant surgical technique in all key outcomes.

Methods

Procedures

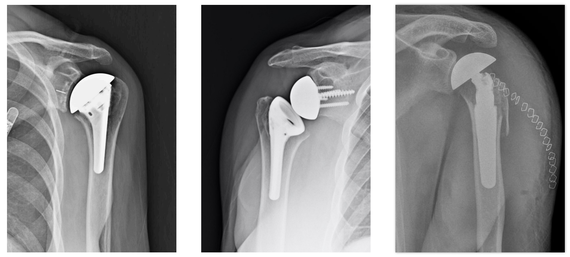


Fig. 1. AP Radiographs demonstrating Anatomic Total Shoulder Arthroplasty (Left), Reverse Total Shoulder Arthroplasty (Center), and Hemiarthroplasty (Right).

Study Design – All patients must have met the following inclusion criteria

Patient Selection
- **Location** – Primary arthroplasty performed at 1 of 3 Beaumont hospitals (Royal Oak, Troy, or Taylor)
- **Surgeon** – Procedure performed by 1 of 8 fellowship-trained orthopaedic surgeons
- **Timeline** – Primary arthroplasty performed between January 1st, 2016 – October 31st, 2020

Data Collection
- Beaumont Epic electronic medical records were queried using all ICD10 Procedure Codes for shoulder arthroplasty

Data Analysis

Surgical Trends – Volume of ATSA, RTSA, & HA tracked year to year from 2016 – 2020.

Surgical Outcomes
- Length-of-Stay Postoperatively (LOS)
- Duration of Surgical Procedure (DOS)
- Charges to Patient
- Revision surgery within 12mo postoperatively

Statistical Analysis
- **Chi-square** used for trends comparison and **Kruskal-Wallis** for LOS, DOS, and charges analysis. **Fisher's Exact** testing used for revision surgery analysis. Significance was defined as ***p<0.05***.

Results

Demographics

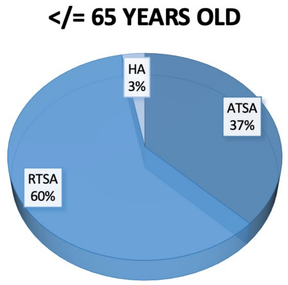
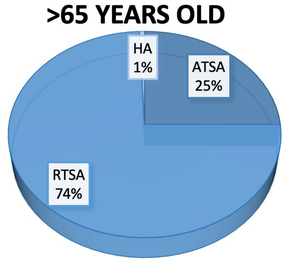


Fig. 2. In the younger age group, RTSA overall was the most used procedure followed by ATSA and lastly HA.

Fig. 3. Similar to the younger demographic, the RTSA overall comprised the largest portion of surgeries for all years. Notably, the proportion of RTSA was significantly higher for the older group compared to the younger, ***p<0.0001.***



Trends

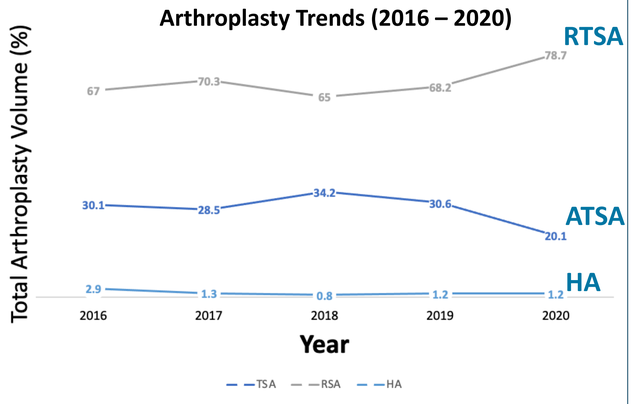


Fig. 4. The RTSA grew to comprise a larger proportion of total arthroplasty volume in 2020 compared to 2016. Both the ATSA and HA fell in use over the same time period, ***p<0.0001.***

Results cont.

Outcomes

Table 1 – Key Surgical Outcomes

	ATSA N=673	RTSA N=1588	HA N=35	Total N=2296	P-Value
LOS (days)	**2.0 (1.2, 2.4)**	2.2 (1.3, 3.2)	2.2 (1.3, 3.4)	2.1 (1.3, 3.1)	<0.0001
DOS (hrs)	**1.9 (1.7, 2.1)**	1.6 (1.4, 1.9)	1.7 (1.4, 2.0)	1.7 (1.5, 2.0)	<0.0001
Charges*	1.63 (1.40, 2.01)	**1.84 (1.63, 2.37)**	1.3 (1.0, 2.04)	1.76 (1.56, 2.31)	<0.0001
Revis.					0.1278
(No)	658 (97.8%)	1563 (98.4%)	33 (94.3%)	2254 (98.2%)	
(Yes)	15 (2.2%)	25 (1.6%)	2 (5.7%)	42 (1.8%)	

Table. 1. In the overall population, the ATSA is associated with significantly longer DOS but shorter postoperative LOS compared to RTSA and HA, ***p<0.0001***. The RTSA was associated with higher patient charges, ***p<0.0001***. No difference in risk of revision surgery within 12 months between procedures, ***p=0.1278***.
*Charges represented as multiples of lowest charge (1.0).

Conclusions

Trends in shoulder arthroplasty at Beaumont hospitals mirror those seen elsewhere, with the RTSA growing to comprise a larger portion of primary arthroplasty.

Outcomes do not reveal a clear superiority of the RTSA over the ATSA and HA.

Study **Limitations** include a shorter timeline compared to similar studies, minimal HA patients comparatively, as well as loss of patients to follow up.

It is possible that reasons beyond the key surgical outcomes studied here are driving the significant rise in popularity of the RTSA.

References

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