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ORIGINAL RESEARCH

Analysis of shoulder arthroplasty outcomes: A 10-year retrospective study

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ABSTRACT

Background: Shoulder arthroplasty is widely utilized for advanced degenerative shoulder disease, significant rotator cuff pathology, and complex proximal humeral fractures. Improvements in implant designs and surgical approaches have enhanced outcomes; however, variability remains. This study reviews the clinical and radiographic results of shoulder arthroplasties conducted at a single tertiary center over a decade. **Methods:** Two hundred patients, who underwent either anatomic or reverse total shoulder arthroplasty between January 2010 and December 2019, were retrospectively evaluated. Demographic data, clinical indications, and implant type were collected. Shoulder function was measured via the Constant-Murley and American Shoulder and Elbow Surgeons (ASES) scores prior to surgery and at final follow-up. Radiographs were examined for alignment, loosening, and other complications. Statistical methods included paired t-tests to compare pre- and postoperative scores and regression models to identify significant predictors of outcome. **Results:** The cohort (mean age 68 ± 9 years, 60% female) comprised patients with osteoarthritis (47%), rotator cuff arthropathy (35%), and complicated fractures (18%). Mean Constant-Murley scores improved from 35 ± 8 to 74 ± 10 ($p < 0.001$), whereas ASES scores rose from 35 ± 10 to 76 ± 12 ($p < 0.001$). Anatomic arthroplasty displayed a slightly higher final score than reverse arthroplasty, but both showed substantial gains. An 8% overall complication rate was noted, most frequently prosthetic loosening (3%) and periprosthetic fractures (2%). **Conclusion:** Over a 10-year interval, both anatomic and reverse total shoulder arthroplasties significantly improved shoulder function and reduced pain, though older patients and those with multiple comorbidities experienced higher complication rates. Further research incorporating longer-term follow-up could refine strategies for patient selection and surgical optimization, ultimately promoting superior implant durability.

Keywords: Shoulder arthroplasty, total shoulder replacement, reverse shoulder arthroplasty, functional outcomes, implant survivorship

INTRODUCTION

Shoulder arthroplasty, which includes anatomic total shoulder arthroplasty (TSA) and reverse total shoulder arthroplasty (RTSA), has become a standard treatment for advanced shoulder osteoarthritis, extensive rotator cuff tears, and other complex conditions [1]. By aiming to reduce pain, improve joint mobility, and enhance daily function, these procedures have shifted the therapeutic landscape for patients with severe shoulder dysfunction . Continual innovations in prosthetic design and surgical methods have contributed to favorable results, although outcomes can vary among different patient populations [2].

One of the more disruptive innovations has been the RTSA, which reverses the usual ball-and-socket orientation and thus allows the deltoid muscle to fill in for a failed rotator cuff [3]. This modification opens up more applications for arthroplasty to encompass situations where the rotator cuff is insufficient or irremediable. However, these complications are somewhat unique to RTSA, such as scapular notching or increased stress at the glenoid [4]. On the other hand, anatomic TSA depends on a healthy rotator cuff to reestablish near-physiological movement, making it especially suitable for patients retaining adequate cuff integrity [5].

A plethora of studies reported marked improvements in both TSA and RTSA for pain relief and range of motion, but there exist major technical complications from the procedures themselves. The incidence of periprosthetic fractures, loosening of implants, and infections jeopardizes the patient's success and the possibility of revision surgery [6]. However, as the rate of shoulder arthroplasty in older adults is on the rise, both the preoperative planning and postoperative management take into account their overall health status and bone quality [7].

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The last set of inquiries involved the improvement in patient selection criteria and which choice of implant most suits a given patient's clinical presentation, bone characteristics, or daily functional demands [8]. The study investigates shoulder arthroplasties performed within 10 years from a single high-volume tertiary centre. The work specifically compares results between anatomic and reverse designs, analyzes change in functional score, and critiques complications that happened [9]. Such predisposing factors include patient age or underlying pathology, which can be influential to surgical success [10].

Based on the advantages and drawbacks of both arthroplasty techniques, this retrospective evaluation seeks to guide surgeons in how to identify appropriate candidates for each procedure. Awareness of all these factors can better help in addressing some of the modifiable risk factors, which consequently brings about optimal recovery and reduced complication rates.

MATERIALS AND METHODS

Study Design and Setting

A retrospective analysis was conducted at a tertiary referral center after getting Institutional Review Board approval. The process maintained confidentiality of the patient and adhered to ethical standards.

Patient Selection

A review of medical records was conducted to include all patients older than 18 years who had primary shoulder arthroplasty by anatomic TSA or RTSA between January 2010 and December 2019. Therefore, indications accepted for eligibility were severe degenerative joint changes, rotator cuff arthropathy, and complex proximal humeral fractures.Patients who had revision procedures or insufficient documentation were excluded, yielding 200 patients for analysis.

Data Collection

Relevant demographic data (age, sex, comorbidities) and clinical variables (chief diagnosis, symptom duration) were obtained from medical files. Surgical details, including implant type and intraoperative findings, were also extracted. Functional outcomes were measured with the Constant-Murley and American Shoulder and Elbow Surgeons (ASES) scales both before surgery and at final follow-up. Radiographs (anteroposterior and axillary views) were assessed for component position, loosening, scapular notching, and other potential complications.

Statistical Analysis

Data were processed using SPSS (IBM SPSS Statistics, version XX). Descriptive statistics summarized baseline characteristics. Paired t-tests evaluated changes in pre- and postoperative Constant-Murley and ASES scores, while regression modeling investigated whether age, implant design, or comorbidities predicted final outcomes. Statistical significance was designated at $p < 0.05$.

Follow-Up Protocol

All patients were scheduled for review at 3 months, 6 months, 1 year, and annually thereafter. The mean follow-up interval was 5.2 years (range: 2–10). Final outcomes were based on the latest available documented evaluation within that timeframe.

RESULTS

Patient Demographics and Surgical Characteristics

This retrospective series included 200 patients (mean age 68 ± 9 years, 60% female). Surgical indications consisted of osteoarthritis (47%), rotator cuff arthropathy (35%), and complex fractures (18%). Of these, 120 (60%) underwent anatomic TSA, and 80 (40%) underwent RTSA. Baseline characteristics and preoperative scores are summarized in Tables 1 and 2.

Table 1. Baseline Demographic and Clinical Characteristics

Variable	Value
Number of Patients	200
Age (years, mean ± SD)	68 ± 9
Sex (F/M)	120 (60%) / 80 (40%)
Primary Diagnosis	OA (47%), RCA (35%), Fx (18%)
Implant Type	TSA (60%), RTSA (40%)
Mean Follow-up (years)	5.2 (range: 2–10)

Table 2. Preoperative Functional Scores

Outcome Measure	Mean ± SD	Range
Constant-Murley Score	35 ± 8	22–48
ASES Score	35 ± 10	20–50

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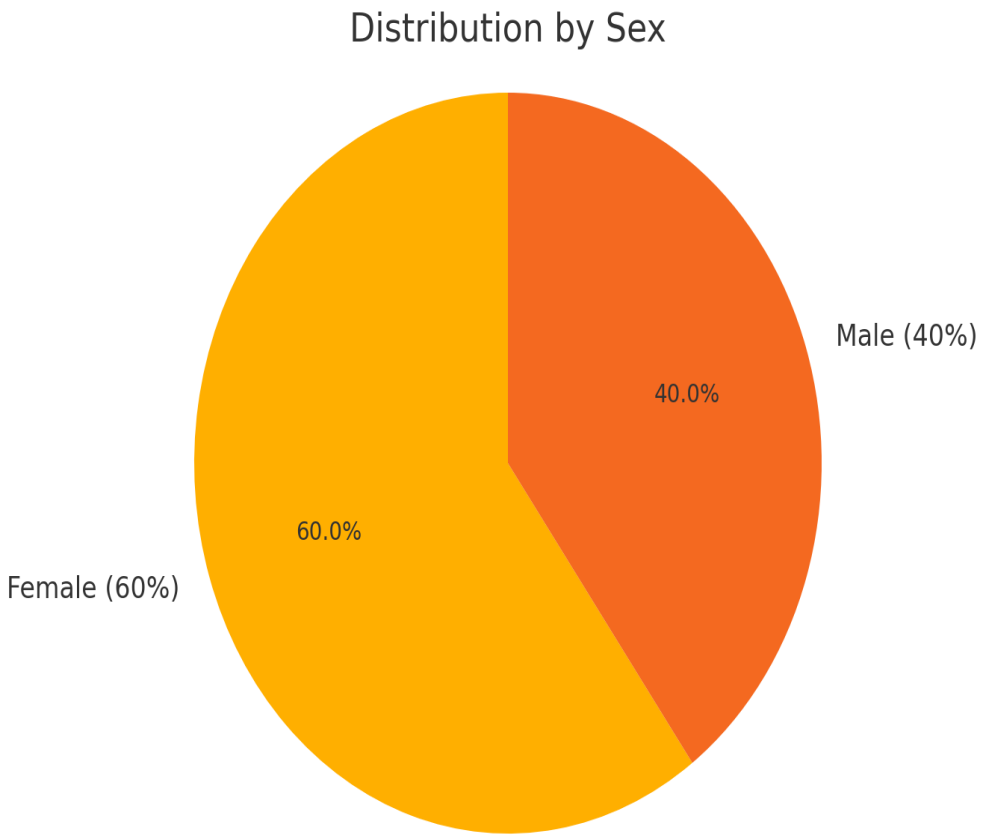

Figure 1

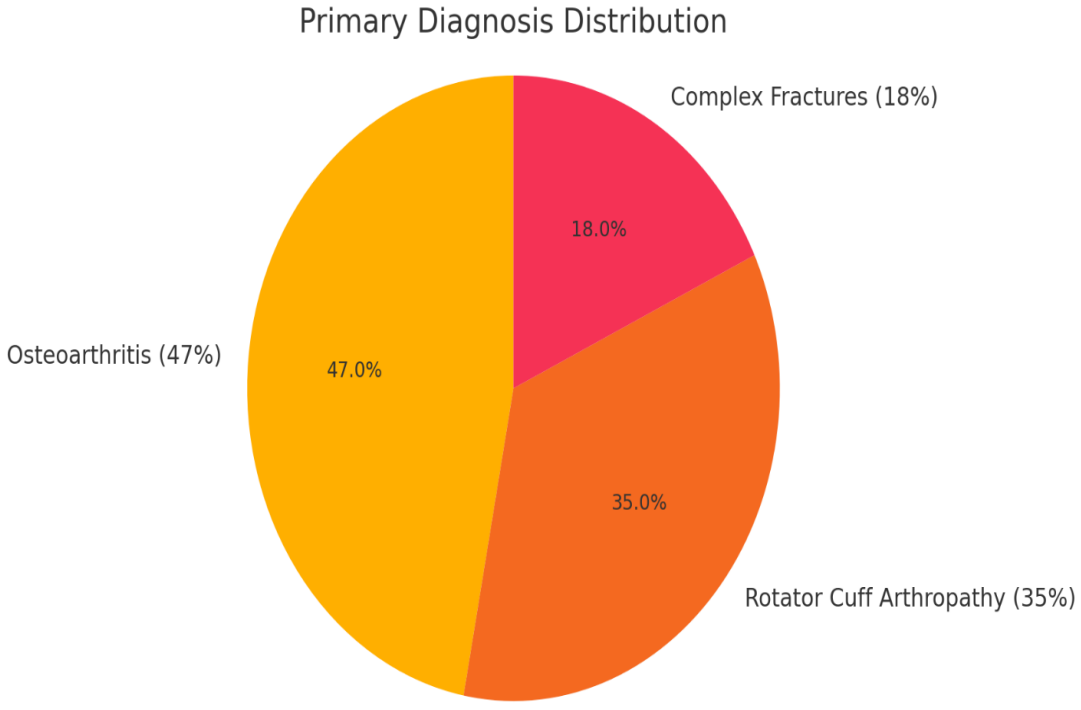

Figure 2

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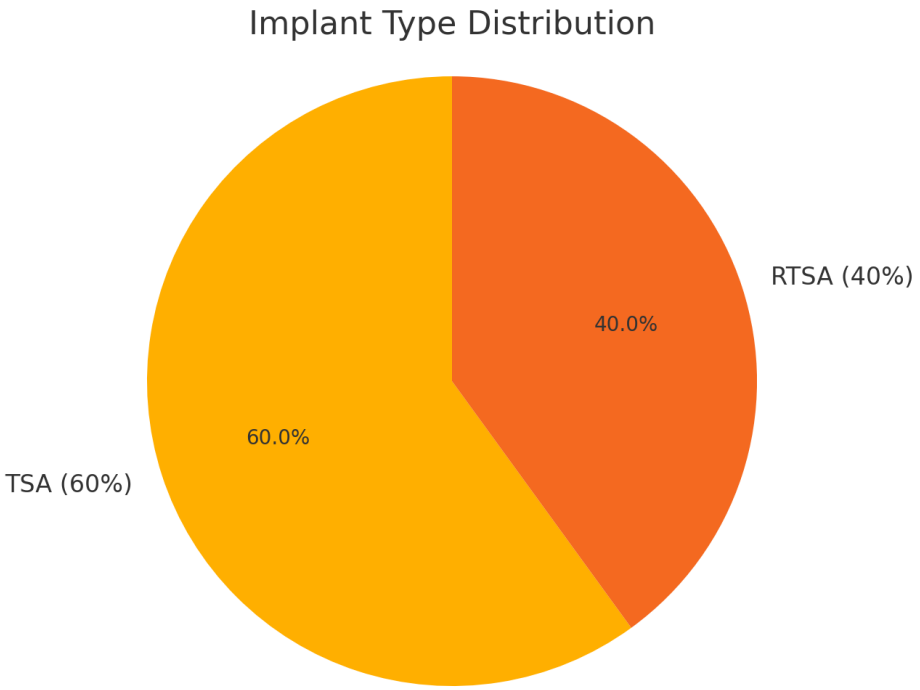

Figure 3

a) **Distribution by Sex:** A pie chart displaying the distribution of female and male patients in the study.
b) **Primary Diagnosis Distribution:** A pie chart showing the percentage of patients with osteoarthritis, rotator cuff arthropathy, and complex fractures.
c) **Implant Type Distribution:** A pie chart representing the percentage of patients undergoing TSA and RTSA implant surgeries.

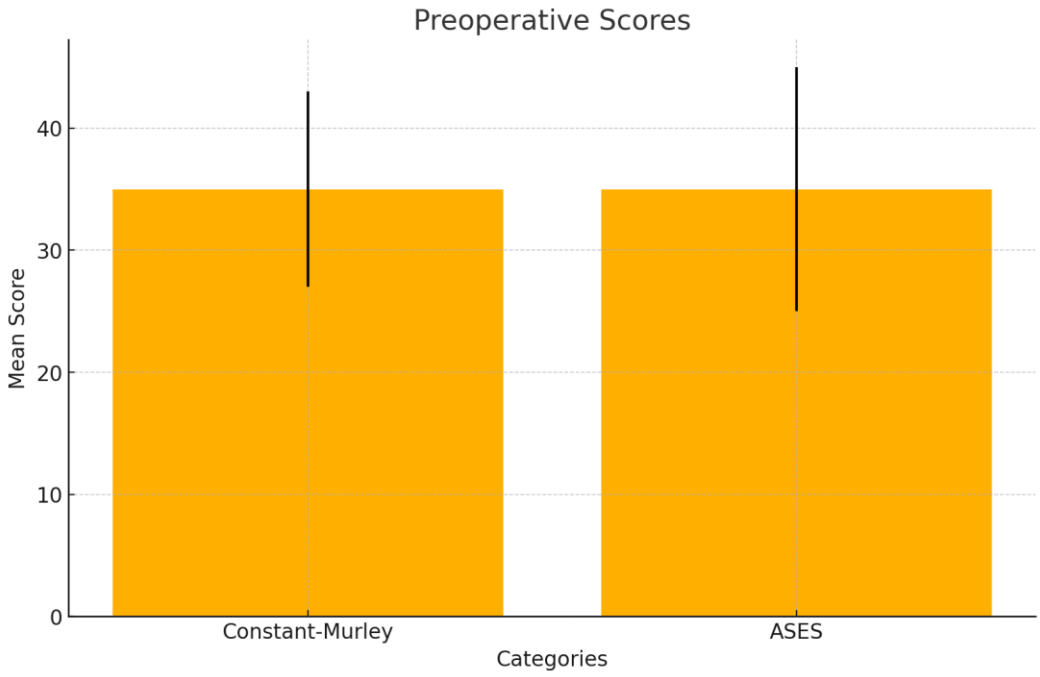

Figure 4

Preoperative Scores: A bar chart with error bars showing the preoperative Constant-Murley and ASES scores

Functional Outcomes

Both anatomic and reverse arthroplasty groups demonstrated substantial postoperative improvements in shoulder function. Constant-Murley scores increased from 35 ± 8 preoperatively to 74 ± 10 ($p < 0.001$) at the last follow-up, while ASES scores rose

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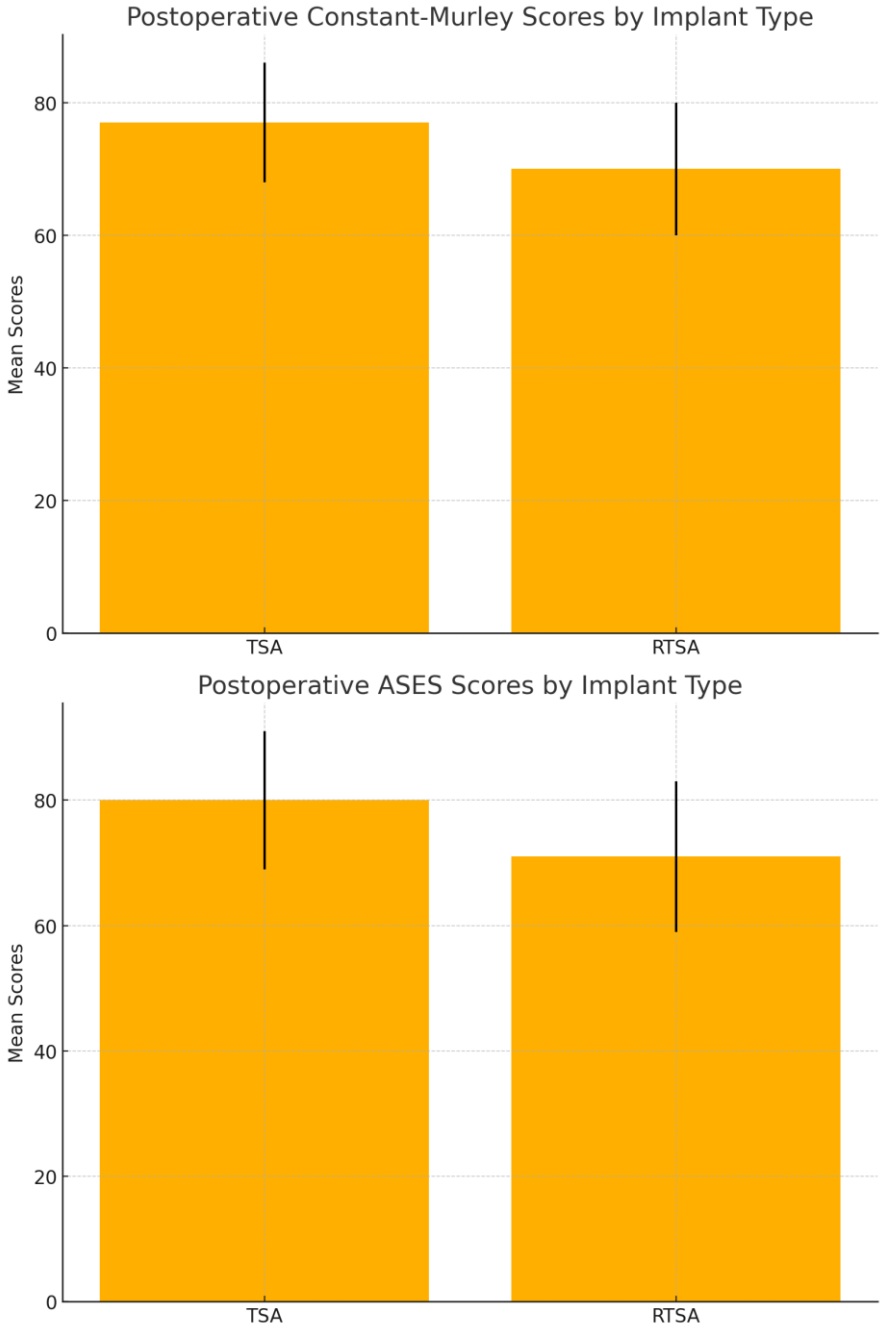
from 35 ± 10 to 76 ± 12 ($p < 0.001$). Stratifying by implant type, anatomic TSA yielded a slightly higher mean Constant-Murley score (77 ± 9) compared to RTSA (70 ± 10). Table 3 displays the postoperative outcomes categorized by implant design.

Table 3. Postoperative Functional Scores by Implant Type

Implant Type	Constant-Murley (Mean ± SD)	ASES (Mean ± SD)
TSA	77 ± 9	80 ± 11
RTSA	70 ± 10	71 ± 12

Most participants reported marked relief from pain, better shoulder abduction, and enhanced ability to carry out daily tasks. Notably, external rotation gains were often more pronounced in the anatomic TSA group due to its reliance on a preserved rotator cuff mechanism.

Postoperative Constant-Murley and ASES Scores by Implant Type: Bar charts below comparing the postoperative scores between TSA and RTSA implants.



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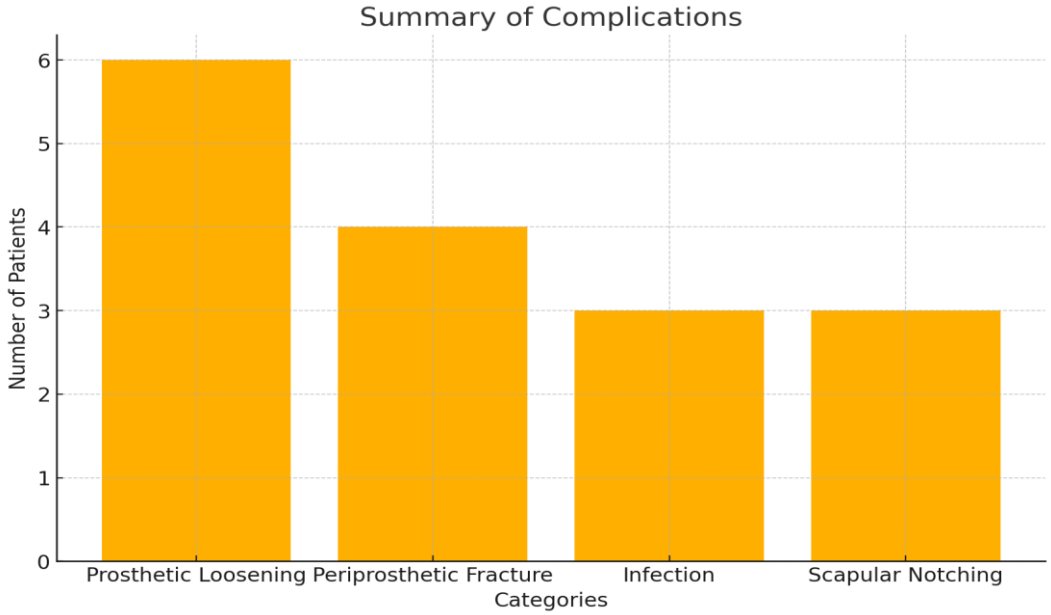
Complications and Radiographic Assessment

Complications were observed in 16 of 200 patients (8%). Prosthetic loosening was identified in 6 (3%), and periprosthetic fractures occurred in 4 (2%). Three patients (1.5%) experienced deep infections, while 3 (1.5%) RTSA recipients displayed radiographic scapular notching. Table 4 summarizes the major adverse events.

Table 4. Summary of Complications

Complication	Number of Patients (%)
Prosthetic Loosening	6 (3%)
Periprosthetic Fracture	4 (2%)
Infection	3 (1.5%)
Scapular Notching (RTSA)	3 (1.5%)
Total	16 (8%)

Higher age (≥75 years) and greater comorbidity burden were linked to an increased complication rate ($p = 0.042$). Implant design and underlying diagnosis did not independently correlate with complications after adjusting for patient-related variables.



Summary of Complications: A bar chart detailing the types of complications encountered and their frequency.

DISCUSSION

Our 10-year analysis indicates that both anatomic and reverse total shoulder arthroplasties produced significant functional improvements and reliable pain relief, aligning with previously published reports [11]. Patients receiving anatomic TSA tended to achieve better external rotation, underscoring the importance of an intact or partially intact rotator cuff. Meanwhile, RTSA effectively restored functional range of motion in cases where the rotator cuff was no longer viable [12].

An 8% complication rate falls within the spectrum observed in other investigations of shoulder arthroplasty [13]. Prosthetic loosening and periprosthetic fractures emerged as the most common issues, particularly in older individuals who often have diminished bone density [14]. Scapular notching is a recognized phenomenon in RTSA; in our cohort, it did not always translate into functional decline, yet its progression can warrant closer follow-up [15]. Infection rates, at 1.5%, illustrate the complexity of preventing deep joint infection in arthroplasty procedures, despite improvements in sterile techniques and prophylaxis measures [16].

High age and comorbidity index were the primary predictors for complications, a finding mirrored in broader orthopedic literature that emphasizes the impact of frailty and associated conditions on surgical risk [17]. Interestingly, neither RTSA nor anatomic TSA independently elevated complication likelihood after controlling for patient-specific factors, suggesting that choice of prosthesis should be driven mainly by the presence or absence of a functioning rotator cuff mechanism, as well as patient expectations [18].

Because this study is retrospective and originates from a single center, the findings may not universally apply to all practice settings. Also, the average follow-up period of a little over five years may not capture late-onset implant failures [19]. Prospective, multicenter

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research with standardized rehabilitation protocols and longer surveillance would more definitively confirm implant longevity and clarify whether certain subgroups should receive one implant type over the other [20].

In summary, both anatomic and reverse total shoulder arthroplasties significantly benefited individuals in this series [11–20]. By paying close attention to patient-specific elements—especially rotator cuff integrity, medical comorbidities, and functional requirements—surgeons can better align implant selection and postoperative care with each patient's unique circumstances. Continuing advancements in implant design and surgical techniques are expected to further reduce complication rates, expand indications, and improve long-term outcomes in shoulder arthroplasty.

CONCLUSION

This retrospective review involving 200 shoulder arthroplasties showed that both anatomic and reverse designs substantially improved shoulder function and alleviated pain over a 10-year timeframe. Although anatomic TSA yielded better external rotation, reverse arthroplasty offered a reliable solution for patients with compromised rotator cuff function. The overall complication rate was moderate (8%), largely driven by older age and higher comorbidity burden. These insights underscore the importance of patient-specific implant selection and meticulous perioperative planning. Extended follow-up investigations will be pivotal in optimizing implant survival and refining surgical practices for individuals requiring shoulder arthroplasty.

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