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Original article

Revisions of total shoulder arthroplasty: Clinical results and complications of various modalities

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ABSTRACT

Introduction: The number of primary total shoulder arthroplasties has increased exponentially in recent years, with a corresponding increase in the number of revision procedures.
Objective: To assess clinical results and complications in a series of shoulder implant replacement, of whatever etiology.
Materials and methods: Thirty-seven patients, with a mean age of 68.3 ± 11.8 years at time of implant replacement, were included in a retrospective study. Mean interval between primary arthroplasty and revision was 78.4 ± 59.7 months (range, 1–200 months). The main assessment criterion was changed in Constant score between preoperative value and follow-up. Secondary criteria were: onset of intra- and postoperative complications, and reoperation related to a complication.
Results: Mean follow-up was 41.5 ± 32.0 months (range, 12–105 months). Absolute Constant score increased by a mean 17.5 ± 15.1 points ($P < 0.001$) and weighted Constant score by 26.3 ± 23.6 points ($P < 0.001$). Intraoperative complications occurred in 24.3% of patients (9/37) and postoperative complications in 29.7% (11/37). Among the patients, 21.6% (8/37) required reoperation for postoperative complications. Overall, 54% of patients (20/37) suffered from intra- or postoperative complications.
Conclusion: Shoulder implant replacement improved function in the present series, but with a high rate of complications and reoperations.
Level of evidence: IV, retrospective case-control study without control group.
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1. Introduction

The number of primary total shoulder arthroplasties has increased exponentially in recent years, with a corresponding increase in the number of revision procedures [1].

At revision, reconstruction is often hampered by local anatomic lesions associating humeral and glenoid bone defect and periarticular soft tissue lesions.

The development of new implants and constantly increasing functional demand, including by elderly patients, have progressively reduced indications for simple implant removal, which tends to show mediocre results [2], in favor of implant replacement, with the hope of better functional outcome.

The literature for shoulder implant replacement reports poorer functional results [3–7] and higher rates of complications (up to 50% of patients) [7–9], compared with primary arthroplasty.

Complications, mainly fractures and instability, cause serious morbidity and often require one or more reoperations [8].

The main objective of the present study was to analyze clinical results in a retrospective series of total shoulder arthroplasty replacement, with whatever etiology. Secondary objectives were to analyze complications and reoperations and to compare results, complications and reoperations according to the type of prostheses removed and implanted.

2. Materials and methods

2.1. Population

All patients undergoing shoulder implant replacement in a specialized shoulder surgery department between January 2004 and

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Table 1a
Patient data for the whole series.

	Whole series
n	37
Gender	
M	14
F	23
Dominant side involvement (%)	70
Age at revision (years)	68.3 ± 11.8
History of shoulder surgery (including primary prosthesis) (number of operations/patient)	2.1
Interval primary-to-revision arthroplasty (months)	78.4 ± 59.7
Follow-up (months)	41.5 ± 32.0

December 2012 and meeting inclusion criteria were retrospectively analyzed.

Inclusion criteria comprised: shoulder implant replacement, defined as surgery to replace, partially or totally, a glenoid and/or humeral component. Minimum follow-up was 1 year, with systematic clinical and radiographic assessment at last follow-up.

Cases of partial or total implant ablation without replacement were excluded, as were patients lost to follow-up or deceased at last follow-up.

A continuous series of 44 patients were operated on during the inclusion period. Four had died at last follow-up, and 3 could not be contacted. Finally, 37 patients (14 males, 23 females; mean age at revision surgery, 68.3 ± 11.8 years) were included for analysis.

Thirty-two patients were retired and 5 working (in non-manual occupations). The dominant side was involved in 26/37 cases (70%).

Indications for primary arthroplasty comprised: superior humeral head or tuberosity fracture ($n = 9$), primary centered shoulder osteoarthritis ($n = 8$), post-traumatic centered shoulder osteoarthritis ($n = 3$), non-centered shoulder osteoarthritis ($n = 7$), idiopathic osteonecrosis ($n = 4$), post-traumatic osteonecrosis ($n = 4$), proximal humeral fracture non-union ($n = 1$), and rheumatoid polyarthritis ($n = 1$).

Included patients had undergone a mean 2.1 shoulder surgeries before the implant replacement.

Mean interval between primary arthroplasty and implant replacement was 78.4 ± 59.7 months (range, 1–200 months).

Three groups were distinguished according to type of prosthesis removed and implanted:

- group 1: anatomic total shoulder prosthesis (ATSP) → ATSP (7 patients);
- group 2: hemi-arthroplasty (HA) or ATSP → reverse total shoulder prosthesis (RTSP) (19 patients);
- group 3: RTSP → RTSP (11 patients).

Baseline patient data are shown in Tables 1a and 1b.

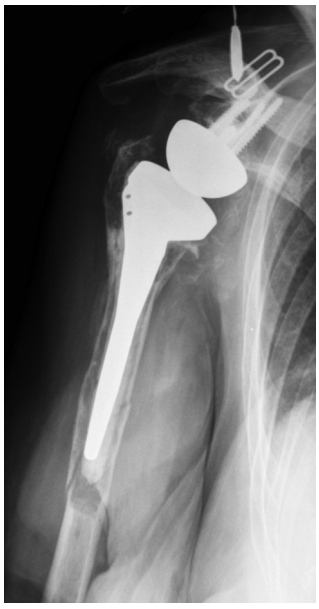

Fig. 1. Chronic periprosthetic infection (note associated humeral fracture).

2.2. Indications for implant replacement

Indications for implant replacement comprised chronic deep infection ($n = 7$) (Fig. 1), isolated glenoid component loosening or wear ($n = 6$), glenoid inflammation associated with rotator cuff deficiency ($n = 5$) (Fig. 2), glenoid component loosening associated with rotator cuff deficiency ($n = 4$) (Fig. 3), tuberosity lysis or malunion following fracture ($n = 4$) (Fig. 4), periprosthetic fracture ($n = 3$), instability ($n = 3$), glenosphere disassembly or migration ($n = 2$), isolated rotator cuff deficiency ($n = 1$), implant screw failure at the stem/metaphysis junction ($n = 1$), and failure of non-cemented humeral component fixation ($n = 1$).

2.3. Surgical revision technique

Surgery involved both components in 27 cases (73%), the glenoid component alone in 5 (13.5%) and the humeral component alone in 5 (13.5%).

The approach was deltopectoral (either to reutilize the primary scar or to expose the humeral diaphysis) in 33/37 cases (89%) or supero-lateral (to reutilize the primary scar) in 4 (11%).

Humerotomy was performed 3 patients to extract the humeral stem.

The glenoid cavity was reconstructed for bone defect in 1 step in 11 RTSP implantations, following Norris et al. [10], and in 2 steps in 2 ATSP implantations with tricortical iliac graft [11].

Table 1b
Patient data by group.

	ATSP → ATSP	HA/ATSP → RTSP	RTSP → RTSP	*P*
n	7	19	11	
Gender				
M	5	3	6	0.014
F	2	16	5	
Dominant side involvement (%)		74	64	0.843
Age at revision (years)		69.53 ± 12.37	72.0 ± 9.1	0.059
History of shoulder surgery (including primary prosthesis) (number of operations/patient)		1.8	2.0	0.488
Interval primary-to-revision arthroplasty (months)		99.05 ± 59.92	29.91 ± 34.89	0.003
Follow-up (months)		41	28.73	0.092

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