

Quality of life evaluation after reverse shoulder arthroplasty: A retrospective case series of 2 and 3 years follow up

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ABSTRACT

Background: The reverse shoulder arthroplasty (RSA) has revolutionized the modern reconstructive shoulder surgery. Initially recommended for rotator cuff arthropathy, its indications have been expanded to massive cuff tears, rheumatoid arthritis and fracture care. The aim of this study was, to evaluate the clinical and radiological results after a reverse shoulder arthroplasty and to assess the impact on quality of life.

Materials and Methods: Retrospective case series evaluating 37 patients undergoing reverse shoulder arthroplasty with at least two years of clinical follow up assessment. The clinical assessment was performed before and after the operation using the Oxford shoulder score, the Visual Analogue Pain score and the Constant-Murley score. Types of complications such as infection and dislocation as well as radiographic appearance of notching were also recorded.

Results: The patients who underwent a reverse shoulder arthroplasty, improved from 15.43 ± 1.864 to 36.08 ± 1.963 , $p < 0.001$ according to the Oxford shoulder score in their 2year post-operative appointment. According to the Constant Murley score, patients also improved significantly from 24.97 ± 2.303 to 46.65 ± 1.874 , $p < 0.001$. The pain was reduced from 8.43 ± 0.26 to 1.99 ± 2.55 , $p < 0.001$.

Conclusion: Patients who underwent a reverse shoulder arthroplasty had a significant improvement in their quality of life, indicating that reverse shoulder arthroplasty improves the range of movement and reduces the amount of pain in the affected shoulder. From our case series, the expanded indications for its use are totally justified, making reverse shoulder arthroplasty a valuable tool in modern orthopaedic practice.

KEY WORDS: Reverse shoulder arthroplasty, Quality of life, Case series, Rotator cuff arthropathy, shoulder arthritis, joint replacement;

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Introduction

In 1985 in France, Paul Grammont was the first who developed the reverse shoulder arthroplasty technique, publishing the first case series in the following decade.(1,2).Initially this technique was developed for the treatment of rotator cuff arthropathy(3,4), but nowadays its use includes complex fractures, proximal humeral fractures, inflammatory arthropathies and arthroplasty revisions.(5-9).

By reversing the normal ball and socket anatomy of the glenohumeral joint, improves the function of the deltoid muscle and compensates a dysfunctional rotator cuff.(10).Several studies indicate that reverse shoulder arthroplasty offers superior clinical results in terms of functional outcome in the treatment of rotator cuff arthropathy to those of total shoulder arthroplasties(3), justifying its widely use. In our case series, the aim is to assess the clinical and radiographic results of reverse shoulder arthroplasty and to assess the impact on the quality of life of the patients.

Patients and Methods

This was a retrospective case series. Patients who underwent reverse shoulder arthroplasty, were included with a minimum of two years follow up, starting from January 2015.The study includes operations until December 2017.Patients who underwent hemiarthroplasty, total shoulder arthroplasty or other types of operations were not included in the study. Indications for reverse shoulder arthroplasty are presented in table 1.All procedures were performed by one of our upper limb specialists of our department and the following data were analyzed: diagnosis, including rotator cuff arthropathy, glenohumeral OA with irreparable rotator cuff, proximal humerus fracture unsuccessful non-surgical treatment or internal fixation failure of proximal humerus fracture., the demographic data of each patient: gender, age at operation, date of operation, date of evaluation prior to operation, date of evaluation post operatively., type of operation, primary arthroplasty, the Oxford Shoulder, Visual Analogue scale(VAS) and Constant-Murley score regarding the pre and post-operative period, the complications noted in each operation: post-operative infec-

tion, deep venous thrombosis, periprosthetic fracture, respiratory infection, acute myocardial infarction and death and the postoperative radiographic appearance, assessing for humeral stem loosening, notching or glenosphere loosening.

Procedures were performed under general anesthesia and interscalene blockade. Antibiotic prophylaxis was given in all patients with a second generation cephalosporin for 24hours, and in those allergic to cephalosporins teicoplanin was given as per our local antibiotic protocols. After typical skin preparation with betadine and alcohol solution and typical preparation deltopectoral approach was conducted in all patients, with removal of the remaining subscapularis tendon when it did not present an extended tear. Joint capsule was widely released in all patients. Delta XTEND(DePuy, Warsaw, USA) prostheses with cementing of the proximal humeral shaft was used in 14 cases, uncemented Equinoxe prosthesis(Exactech, Gainesville, United States in 15 cases and cemented Equinoxe prosthesis in the remaining 8 cases. For the baseplate fixation, the number of screws used was three or four according to patient's bone quality and surgeon's preference. Post operatively, patients used a sling for six weeks, active movements of the wrist elbow and fingers was encouraged from the first post operative day and passive shoulder movements were initiated as early as pain allowed, after the removal of sutures in 2 weeks.

Statistical analysis

During the statistical analysis, we compared the pre-operative Oxford shoulder score,VAS score and Constant-Murley score with the post-operative data at the 2 year and 3 year follow up appointment. The comparison between the pre and post-operative data, regarding the different variables, was made using the t-paired test. Continues variables with parametric distribution were presented as means and standard deviations whereas, non-parametric distributions as medians and percentiles.

Results

Thirty-seven patients underwent a reverse shoulder arthroplasty and the data from the 2 year follow up

TABLE 1.				
Case series demographics				
Sex	Diagnosis		Type of Arthroplasty	Mean Age(years)
Male 24.3%	Rotator cuff arthropathy	37.8%	Primary 100%	74.89±11.5
Female 75.7%	Proximal humerus fracture.	40.5%		79.07±6.22
	Glenohumeral osteoarthritis with irreparable rotator cuff	16.2%		
	Revision of ORIF proximal humerus Fracture	0.05%		

TABLE 2.		
Pre- and post-op assessment		
Mean Oxford shoulder Score	15.43±1.864	36.08±1.963,p<0.001
Mean VAS score	8.43±0.267	1.99±2.55,p<0.001
Mean Constant Murley Score	24.97±2.303	46.65±1.874,p<0.001

TABLE 3.			
Case series follow up at 2 and 3 years post-operatively			
Number of Cases:27	2year follow up Period	3year follow up Period	P
Mean Oxford shoulder score	36.19±2.113	36.56±2.044	>0.5
Mean VAS score	2.11±2.98	1.15±0.1118	>0.1
Mean Constant Murley score	46.81±1.962	57.11±2.172	<0.001

appointment were assessed. Of these, only for twenty seven patients there was a 3 year follow up appointment, either due to a loss of follow up(three patients),death unrelated to the surgery after the 2year follow up appointment(four patients) and inability to attend the orthopaedic clinic for social reasons(three patients).Demographic data and the diagnosis at the time of operation is shown in table 1.

Comparing the pre-operative and 2 year post-operative Oxford shoulder score, the Oxford shoulder score increased from a mean 15.43 with a standard deviation of 1.864 to 36.08 std 1.963, a statistical significant difference(p<0.001).In the Vas score scale, the Vas score decreased from a mean of 8.43 std 0.26 pre operatively to a mean of 1.99 std 2.55 in the

2year follow up appointment, a statistical significant difference(p<0.001).Regarding the Constant Murley score, increased from a mean of 24.97 std 2.303 pre operatively to 46.65 std 1.874, another statistical significant difference(p<0.001),Table 2.

For the twenty-seven patients of the study, for whom a 3 year post-operative assessment was available, we compared the 2year post-operative and 3year post-operative assessment scores. Regarding the Oxford shoulder score, there was no statistical significant difference,2year post-operative score mean 36.19 std 2.113 and 3year post-operative Oxford shoulder score mean 36.56 std 2.044, p>0.5.In the Vas score scale, the comparison between the second and third post-operative year, did not reveal any sta-

tistical significant difference, 2year post op Vas mean score 2.118 std 2.988 and 3year post op Vas mean score 1.159 std 0.11, $p>0.1$. As for the Constant Murley score, the 2year post-operative score increased from a mean of 46.81 std 1.962 to a mean 57.11 std 2.172 in the 3year post-operative appointment, a statistical significant difference, $p<0.001$. Table 3.

Clinical complications were observed in four patients (10.8%); one case of post-operative Deep Venous thrombosis treated with Apixaban post operatively, two cases of infection due to staphylococcus aureus both of them treated by surgical debridement and intravenous antibiotic therapy and one case of dislocation on the 24th post-operative day, treated with reduction under anesthesia and without need for revision until the 3rd year follow up appointment.

The assessment of post-operative radiography did not reveal any periprosthetic, humeral or glenoid fractures. Notching was noted in ten patients (27%).

Discussion

The results of the above study illustrate a significant clinical improvement of patients. Considering the Oxford shoulder score, a significant progression from 15.43 ± 1.864 to 36.08 ± 1.963 in the 2year follow up appointment was noted. Similar significant progressions were also noted in the VAS and Constant Murley score (VAS from 8.43 ± 0.26 to 1.99 ± 2.55 and CMS score from 24.97 ± 2.303 to 46.65 ± 1.874 , respectively). Similar improvement of patients symptoms is also noted by authors using other assessment tools, in patients with at least 2 year follow up (11,12).

In our case series, notching was noted in ten patients (27%), a result which lies within the spectrum of other studies, ranging from 13% to 68%. (4,13-15).

From the comparison of the 2year follow up assessment scores and the 3year follow up scores, only Constant Murley score revealed a statistically significant difference, mean score 46.81 to 57.11, $p<0.001$.

In the study of Ross et al. (8) for reverse shoulder arthroplasty in patients with a proximal humerus fracture and a mean follow up period of 46 months, similar improvement in the post-operative Con-

stant-Murley score was noted and in the study of Gee et al. (11) patients with rheumatoid arthritis undergoing a reverse shoulder arthroplasty had a similar improvement in their post-operative quality of life with a better range of movement post operatively and reduced pain. Interestingly, the complication rate among patients with a rheumatoid arthritis did not appear to be higher than in patients with mixed etiologies, showing that reverse shoulder arthroplasty is a reliable and effective option in patients with RA.

In addition, in 40.5% of our patients who underwent a reverse shoulder arthroplasty, the indication was either a proximal humerus fracture (Nier type 4 and interarticular proximal humerus fractures) or failure of proximal humerus fractures ORIF (0.05%). In patients with proximal humerus fracture, the different treatment options were discussed in a multidisciplinary meeting in our department with our upper limb orthopaedic surgeons specialists and after further discussion with each patient, the decision was taken to proceed with a reverse shoulder arthroplasty. In 2 cases of this study (0.05%), patients (72 and 74 years old, respectively) had already underwent a proximal humerus fixation (Nier 3 and 4), 6 and 8 months ago, respectively and due to avascular necrosis of the humeral head, a decision was taken to proceed with reverse shoulder replacement after the removal of the metalwork.

As noted by Standbury et al. (16), in elderly patients (>70years) fractures precluding internal fixation the option for RSA is reasonable, and in our case series all the above patients 40.5% and 0.05% (72-89 years old), respectively had a quick recovery with functional outcomes comparable to patients who underwent a reverse shoulder arthroplasty with other indications.

Lastly, from the comparison of the 2-year and 3-year follow up assessments scores, surprisingly the Constant Murley score was the only to improve with a statistical significant difference. This could be explained as it includes more parameters in the clinical assessment than other scores, making it easier to detect even small changes;


Limitations

The main limitations of the present study are the

retrospective design and the small sample size. Another limitation was the use of two different implant models and the inclusion of different diagnosis. Moreover, the minimum follow up time of 24 months is not sufficient to assess long-term complications such as loosening of the humeral component. From the comparison though of our postoperative notching rate and postoperative complication rates with similar studies (4,13-15) we strongly believe that our study is reliable as it includes patients of several social groups. Also, its reliability is enhanced from the fact that, all patients had a 2year follow up, decreasing the percentage of bias.

Conclusion

Patients who underwent a reverse shoulder arthroplasty had a significant improvement in their quality of life, as seen from the post-operative comparison of the Oxford shoulder, Vas and Constant Murley score in the 2year and 3year follow up assessment respectively. In our study, patients

with proximal humerus fracture (40.5% of the total) who underwent reverse shoulder arthroplasty, progressed similarly to those who underwent the same operation for different indication (rotator cuff arthropathy).As a result its expand indications are totally justified in our case series, making reverse shoulder arthroplasty a valuable tool in managing patients with highly comminuted proximal humerus fractures. Further follow up of the above patients should continue, in order to assess complication rates at a later stage such as humeral stem loosening and to assess the quality of life in patients in the 5year and 10year post-operative appointment. 

Abbreviations

OSS: oxford shoulder score

VAS: visual analogue scale

CMS: Constant Murley score

OA: osteoarthritis

RSA: reverse shoulder arthroplasty

RA: rheumatoid arthritis

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