Shoulder arthroplasty. Comorbidity as prognostic factor☆

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ABSTRACT

Introduction: Preoperative comorbidity seems to be an important factor for the functional recovery of patients after shoulder replacement, but few studies support this correlation.

The purpose of this study was to clinically evaluate the influence of comorbidity in restoring function after shoulder replacement.

Methods: We performed a retrospective analysis of shoulder replacement accomplished at our institution from 2005 to 2016 (n = 70). Demographic data, number of comorbidities, preoperative drugs, type of arthroplasty, and postoperative complications were collected. Functional results were evaluated according to the QuickDASH questionnaire.

Results: QuickDASH as continuous data was directly correlated with number of drugs prior to the surgical intervention (R = 0.270, p = 0.024) and number of comorbidities (R = 0.280, p = 0,016); especially neurological disorders (R = 0.338, p = 0.004) and osteoporosis (R = 0.0242, p = 0.043). The QuickDASH score is inversely correlated with patient satisfaction (R = −0.621, p < 0.01) and with gender (male) (R = −0.469, p < 0.001).

When the patients were divided into 2 equally sized groups according to the QuickDASH score, statistical significance was found between the group with the worst outcome and female sex (91.2%) (p < 0.001), neurological disorders (p = 0.004), alcohol consumption (p = 0.028) and when shoulder arthroplasty is due to proximal humeral fracture (p = 0.002).

Conclusion: Better functional results are obtained in patients with less comorbidities.

Worse functional results are obtained in patients taking more drugs, in women, alcohol consumers and those after proximal humeral fractures. Preoperative clinical status must be optimized and the patients' comorbidities should be carefully taken into accounting order to ascertain the correct shoulder arthroplasty.

1. Introduction

Shoulder arthroplasty (SA) is an appropriate treatment option for degenerative shoulder disease. Several studies have shown excellent clinical results, with functional improvement and good pain relief.[1–3]

During the last few years there has been a rapid increase in SA, with admissions for SA in the United States having increased fivefold in the last decade.[4]

Results of SA depend on several factors, such as 1/type of implant, 2/surgical technique, and 3/postoperative physiotherapy. Preoperative comorbidity seems to be a key factor for functional recovery after SA, however, few studies have focused on this.

In general, an increase in preoperative comorbidity was directly related to an increase in hospital mortality, postoperative complications, hospital stay and cost.[5–7]

Our hypothesis was that preoperative comorbidities determined the final SA result.

Our objective was to identify these comorbidities and define their influence on the final SA result.

2. Materials and methods

2.1. Patients and study design

This is an observational retrospective cross-sectional study. Data correspond to patients undergoing shoulder replacement in our

Table 1
Inclusion and exclusion criteria.

	No.
Inclusion criteria	
Patient over 18 years operated by SA	106
Exclusion criteria	
Patient not found	16
Patient who died at the time of the study	10
Refusal to participate	4
Cognitive impairment that makes the interview impossible	2
Removal of the prosthesis due to complications	1
Primary prosthesis not performed in our center	3
Total	n = 70

institution from 2005 to 2016, where we obtained 103 patients (106 shoulders).

After applying the exclusion criteria (Table 1) a sample of 70 patients was obtained (n = 70). All replacements were performed by an experienced shoulder surgeon of our institution. The surgical technique was standardized following the principles established by Neer.[8,9] Patients were placed in beach chair position. A deltopectoral approach was performed in most cases. Data were collected from the medical records, analyzing demographic data, type and number of comorbidities (Table 2), type and number of drugs, surgical indication, type of prosthesis, and postoperative complications. We analyzed the relationship between these data and patient satisfaction and functional outcome.

The functional outcome was measured with the QuickDASH questionnaire (Disability of the Arm, Shoulder and Hand Scale), where, in a scoring range from 0 to 100 points, 100 is the worst functional result.

The patient overall satisfaction was categorized as "not satisfied", "satisfied", and "very satisfied".

The radiological assessment was made with true anteroposterior and axial views. A radiolucent line greater than 2 mm at the cement-bone interface was considered to be loosening. Superior migration was determined by the acromio-humeral distance on the AP view, with a distance less than 7 mm indicating superior migration of the prosthesis. Scapular notching was assessed on AP views.[10,11]

In patients undergoing shoulder replacement after proximal humeral fracture, we evaluated the position of the greater tuberosity. We defined tuberosity malposition according to Boileau.[12] Greater tuberosity is well positioned when located 5–10 mm below the upper limit of the prosthetic head. Tuberosity resorption was defined when it is not visible on AP and axial views, and tuberosity displacement was determined comparing its initial and final position.

Table 2
Preoperative comorbidity.

Preoperative comorbidities	No.
Cardiovascular	
Arterial hypertension	47 (67%)
Arrhythmia	5 (7%)
Coronary vascular pathology	4 (5,7%)
Endocrine disorders	
Diabetes mellitus	17 (24,3%)
Hypercholesterolemia	30 (43%)
Thyroid disorders	0
Lung pathology	14 (20%)
Neurological disorders	7 (10%)
Psychiatric pathology	14 (20%)
Osteoporosis (diagnosed before surgery)	9 (13%)
Gastrointestinal pathology	2 (3%)
Rheumatic pathology	6 (8,6%)
Obesity (body mass index > 30 kg/m2)	36 (52,2%)
Smoking	4 (5,7%)
Other cormobilities	15 (21,8%)
Usual alcohol consumption	9 (13%)

2.2. Statistical analysis

The Kolmogorov-Smirnov test was used to determine if the variables follow a normal distribution. The normal distribution variables were expressed as mean ± SEM, while those with abnormal distribution were expressed as median and range. The Spearman or Pearson correlation was used to study the relationship between DASH and the other variables. Patients were divided into two similarly sized groups as a function of the DASH median.

For the quantitative variables, significance was determined by the t-student test for independent samples or the non-parametric Mann-Whitney test U.

Intra-group differences (before and after treatment) were analyzed using the paired sample t-test, or the Wilkoxon test for related samples. Categorical variables were expressed as frequency (percentage) and the chi-square test or Fisher's F test were used to compare groups. Statistical package for Social Sciences (SSPS, v.23) was used for statistical calculations. A value of $p < 0.05$ was considered to be statistically significant.

The study was conducted according to the Good Clinical Practice and Guides of the International Conference of Harmonization, and, even though it is an anonymous study, each participant was asked for their verbal consent. All data were immediately anonymized by eliminating any relationship with the patient's identity, and thus avoiding any risk of loss of confidentiality. The study was approved by the Ethical Research Committee of Hospital Son Llàtzer, Palma de Mallorca.

3. Results

Seventy (66%) of the 106 shoulder arthroplasties were included in the final evaluation. Forty-nine patients were women (70%) and 21 men (30%). The mean follow-up period was 55 months (9–160).

The statistical analysis showed that the QuickDASH score was directly correlated with the male sex (R = −0.469; p < 0.001), indicating a better result in men. Likewise, when the patients were divided into 2 equally-sized groups as a function of the DASH median (36), a statistically significant association was observed between the group with the worst outcome (DASH > 36) and the female group (91.2%) (p < 0.001) (Table 3) (Fig. 1).

The mean age was 71 years (range 39–87 years). Even though no relationship between age and score (QuickDAHS) was found, age, however, is related to the presence of complications (p < 0.01).

In 28 patients (40%) the intervened side was non-dominant, and in 42, the dominant side (60%). No relationship was found between the dominance of the affected side and the functional outcome according to the QuickDASH.

The reasons for the arthroplasty were: proximal humeral fracture (26 patients), cuff arthropathy (18 patients), irreparable rotator cuff tear (15 patients), osteoarthritis (6 patients), necrosis of the humeral head (4 patients), and arthritis of the glenohumeral joint (1 patient).

When the patients were divided into two groups according to the DASH median (36), a statistical association was observed between the

Table 3
Sex and functional results.

		QuickDASH				P
		≤ 36		> 36		
Surgical indication	Fracture	8	22%	18	53%	0,029
	Rotator cuff arthropathy	11	31%	7	21%	
	Massive cuff tear	8	22%	7	21%	
	Degenerative arthritis	5	14%	1	3%	
	Osteonecrosis	4	11%	0	0%	
	Arthristis	0	0%	1	3%	
Sex	Female	18	50%	31	91%	< 0,001
	Male	18	50%	3	9%	