



Original article

Resilience correlates with patient reported outcomes after reverse total shoulder arthroplasty



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ABSTRACT

Background: Personal and social factors may account for much of the variation in patient reported outcome scores, yet little evidence exists on how psychological properties affect patient outcomes following reverse total shoulder arthroplasty (rTSA). The objective of this study is to determine if resilience, characterised by the ability to return to a healthy level of function after experiencing stress, correlates with patient reported outcome scores after rTSA.

Hypothesis: Resilience score will correlate positively with patient reported outcomes after rTSA.

Methods: Seventy-three patients were identified that had undergone primary rTSA with minimum 2-year follow-up (4.7 ± 1.8). These patients completed a phone survey that included the Brief Resilience Scale (BRS), a measure of general resilience in all aspects of life, along with American Shoulder and Elbow Surgeon (ASES), Penn, and Single Assessment Numerical Evaluation (SANE) scores. Mean outcome scores were calculated to identify any correlation between resilience and clinical outcomes.

Results: The mean BRS score was 23.8 ± 4.8 (range 12.0–30.0), with 41 patients classified as normal resilience (NR), 17 patients as low resilience (LR), and 15 as high resilience (HR). Postoperative BRS scores correlated with ASES ($r=0.31$, $p=0.008$), Penn ($r=0.25$, $p=0.03$), and SANE score ($r=0.32$, $p=0.007$). The mean ASES score was 14.0 points lower in the LR group (77.0 points), compared to the HR group (91.0 points; $p=0.04$). Similarly, the LR group had a mean SANE score that was 18.6 points lower than the HR group (73.4 and 91.9 points, respectively; $p=0.021$).

Discussion: The observation that greater general life resilience correlates with lower pain intensity, lesser magnitude of limitations, and perception of greater normality of the shoulder after reverse total shoulder arthroplasty emphasises the importance of addressing personal and social health opportunities along with the physical in musculoskeletal care. Resilience may be a useful predictor of outcomes following rTSA.

Level of evidence: III.

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1. Introduction

Rotator cuff tear arthropathy (RCTA) is characterised by glenohumeral joint degeneration in the setting of a dysfunctional rotator cuff and often antero-superior migration of the humeral head [1]. RCTA affects 4% of patients with rotator cuff tears [1], and approximately 2.5% of the population over 70 years old leaving patients with variable degrees of persistent pain, functional limitations, and lower quality of life [2,3]. The treatment of RCTA presents a

challenge for orthopaedic surgeons due to the destruction of the primary stabilisers of the shoulder joint. Prior to the implementation of reverse total shoulder arthroplasty, there was not a reliable treatment options for patients with RCTA. rTSA is often now the treatment of choice for patients with RCTA that continue to experience symptoms and limitations following conservative treatment [4–6]. Although rTSA is known to be a safe operation with good functional outcomes, some patients continue to experience dissatisfaction and continued symptoms making proper patient selection an important clinical decision in managing patients with this condition [6–8].

Multiple studies have identified the impact pathologic patient-specific factors have upon outcomes and recovery after rTSA [9–11].

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Psychological factors have been shown to correlate with clinical outcomes following anatomic total shoulder arthroplasty (aTSA) [12,13], but little evidence exists on how these properties affect outcomes after rTSA. One such psychological property is resilience, characterised by the ability to return to a healthy level of function after experiencing stress. Patients with higher resilience have a greater ability to recover after stressful events and use health-care less than patients with low resilience [14,15]. Recently, a study by Tokish et al. showed that patients with higher resilience reported better outcomes following aTSA [16]. The Brief Resilience Scale is short survey that has been shown to be a reliable and objective means of assessing resilience in patients dealing with health-related stressors [14]. No studies have examined the correlation between resilience and patient reported outcomes, range of motion, or strength after rTSA.

The primary objective of this project is to examine the relationship between resilience and patient reported outcomes in patients who underwent rTSA. The secondary objective was to assess for any correlation between resilience and ROM and strength after rTSA. We hypothesised that patients with higher resilience would report better outcomes compared to those patients with lower resilience.

2. Materials and methods

Approval for this study was obtained through our Institutional Review Board. We identified 242 patients that underwent primary reverse total shoulder arthroplasty between 2007 and 2016. All surgeries were performed by a single shoulder fellowship trained orthopaedic surgeon using the same brand of shoulder prosthesis (Wright Medical Group, Memphis, TN). Exclusion criteria included less than 2 years follow-up, rTSA for fractures, and non-English speaking patients. After applying these criteria, 73 patients agreed to complete a phone survey that included the Brief Resilience Scale (BRS), the American Shoulder and Elbow Surgeon score (ASES), the Penn shoulder score (Penn), and the Single Assessment Numerical Evaluation (SANE) scores.

2.1. Resilience scores

There are no established population or disease specific normalised values for the BRS score; therefore, we utilised a recently published method of classifying the level of resilience based on the BRS scale [16]. Patients were stratified into low resilience (LR), normal resilience (NR), and high resilience (HR) groups based on deviation from the mean BRS score. These groups were then compared by the mean outcome scores to identify any correlation between resilience and clinical outcomes.

2.2. Statistical analysis

All analyses were performed using SPSS Statistics 25 (IBM Corp., Armonk, NY). Resilience score and patient reported outcome scores were compared using bivariate correlations. After categorising patients into resilience groups, continuous variables were compared using analysis of variance, with a p -value < 0.05 being considered significant.

3. Results

The mean age of the study population was 70.0 ± 12.0 years, with 58.9% female. The mean follow-up was 4.7 ± 1.8 years (range 2.1–9.4 years). The majority of patients had rTSA indicated for cuff arthropathy (83.6%), while the remainder had an indication of osteoarthritis with glenoid bone loss (12.3%) or massive irreparable cuff tear (4.1%). Twenty-five patients (34.2%) had undergone prior

non-arthroplasty surgery on that shoulder. There were no significant differences between outcome scores based upon gender, surgical indication, or prior shoulder surgery (Table 1).

The mean BRS score was 23.7 ± 4.8 , with a range of 12.0 to 30.0. Patients were classified as having low resilience (LR) if the BRS score was 19.0 or less (17 patients), normal resilience (NR) if the BRS score was between 20.0 and 28.0 (41 patients), and high resilience (HR) if the BRS score was 29.0 or greater (15 patients). The mean score for ASES was 79.8 ± 22.2 , for Penn score 77.9 ± 23.9 , and for SANE 77.6 ± 27.5 . Patients classified as higher resilience were more likely to report higher outcomes scores (Fig. 1). The LR group had an ASES score that was 14.0 points lower than the HR group ($p = 0.04$). Additionally, the LR group had a mean SANE score that was 18.6 points lower than the HR group ($p = 0.02$). Similarly, the Penn score was found to be 12.0 points lower in the LR group compared to the HR group; however, this difference was not statistically significant ($p = 0.12$). Furthermore, postoperative BRS scores correlated significantly with ASES score ($r = 0.31$, $p = 0.008$), Penn score ($r = 0.25$, $p = 0.032$), and SANE score ($r = 0.32$, $p = 0.007$).

4. Discussion

There is little evidence about the role that resilience plays in patients undergoing orthopaedic surgery. This is the first study investigating how resilience affects outcomes after rTSA. We found that patients with lower resilience report postoperative outcomes scores that are 12.0–18.5 points lower than patients with high resilience scores. However, our data did not show any correlation between resilience and ROM or strength after rTSA.

Our findings demonstrate that the psychological factor of resilience may have a similar impact on outcomes of rTSA as physical patient specific preoperative risk factors. Wong et al. [17] recently reported on the effects of patient gender on outcomes after rTSA. They found that male patients demonstrated a mean ASES function score that was 10.8 points higher than female patients at two years of follow-up. Shields et al. [18] found that patients that have undergone previous rotator cuff repair had an average ASES score that was 8.5 points lower than patients without a history of prior shoulder surgery, as well as worse pain and less improvement in postoperative forward elevation. Additionally, Morris et al. [19] found that patients with preoperative use of opioids for shoulder pain had postoperative ASES scores 10.5 points lower than patients that did not use opioids prior to surgery. In a study of rTSA outcomes in morbidly obese patients, Statz et al. [20] found that male patients, labourers, patients with less preoperative pain had ASES scores that were 21.6, 16.3, and 19.5 points higher, respectively.

While abundant work has been done investigating the effects of physical properties on outcomes, there remains a paucity of evidence on how outcomes after rTSA are influenced by non-physical attributes. Morris et al. [21] found that patients with a workers' compensation claim had significantly worse Constant, ASES, and Western Ontario Osteoarthritis of the shoulder scores. Additionally, Rauck et al. [22] found there was no association between the total number of high expectations prior to rTSA and postoperative patient reported outcome scores; however, patients with higher expectation of night-time pain relief and return to non-overhead sports did report higher postoperative outcomes scores. There has also been work showing how these non-physical factors affect outcomes after aTSA [13–23].

Recently, a study by Tokish et al. [16] showed that resilience was a predictor of patients' postoperative outcomes scores after aTSA. Such findings are in line with those of our study. However, in the previous study, patients with high resilience reported outcomes after aTSA that are 30 to 40 points higher than that reported by low resilience patients. Based upon these results, resilience appears to influence outcomes of aTSA on a greater magnitude than rTSA.

Table 1
Differences in patient-reported outcomes based on patient specific factors.

Variable	ASES		Penn		SANE	
	Mean ± SD	p-value	Mean	p-value	Mean	p-value
Gender (M/F)						
Male	82.9 ± 19.7	0.83	83.5 ± 22.2	0.65	85.3 ± 17.7	0.37
Female	84.39 ± 19.9		80.0 ± 21.4		77.8 ± 28.7	
Indication for surgery (CA/OA/MCT)						
Cuff arthropathy	82.8 ± 19.7	0.73	81.2 ± 22.3	0.81	81.6 ± 24	0.81
Osteoarthritis	86.7 ± 18.9		91.7 ± 11.8		91.5 ± 9.2	
Massive cuff tear	98.3 ± 0.0		84.5 ± 0.0		75.0 ± 0.0	
Prior surgery (yes/no)						
Yes	85.2 ± 16.8	0.59	86.2 ± 17.4	0.21	86.0 ± 16.9	0.27
No	81.4 ± 23.0		76.5 ± 25.6		76.8 ± 29.1	
Resilience (HR/LR)						
High resilience	91.0 ± 21.0	0.04	88.3 ± 19.0	0.12	91.9 ± 10.9	0.02
Low resilience	77.0 ± 14.9		76.3 ± 22.7		73.5 ± 27.5	

ASES: American shoulder and elbow surgeons; Penn: Penn shoulder score; SANE: Single assessment numeric evaluation.

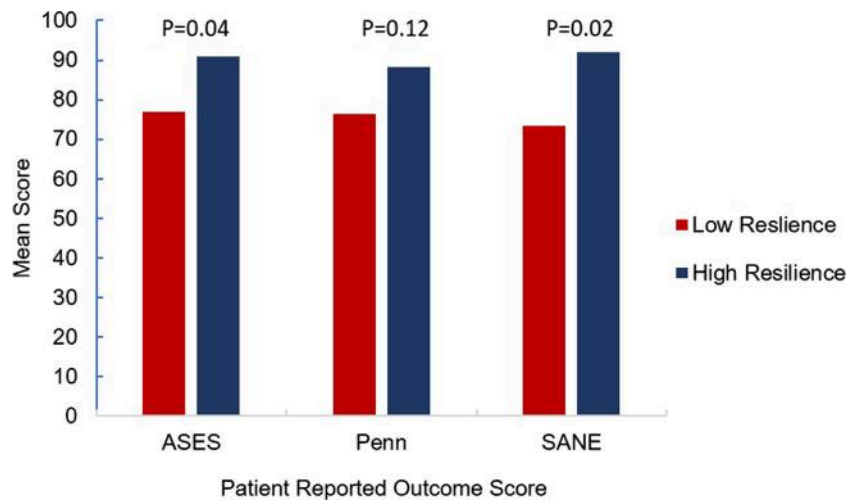


Fig. 1. Mean patient-reported outcome scores in low-resilience vs. high-resilience groups.

Although the exact reason for this difference is unclear, possible explanations include that rTSA patients tend to be lower-demand patients and rTSA may be technically more forgiving, and thus produce more consistent results.

The impact of resilience has been evaluated in a wide-variety of stress-inducing settings, but has only recently been studied in the setting of orthopaedic surgery. Resilience has been shown to protect against emotional distress and aid in better emotional adjustment following a diagnosis of breast cancer [24]. Similarly, patients with higher levels of resilience that have chronic diseases such as heart disease, cancer, and diabetes, as well as patients living with chronic pain, have been shown to maintain a higher quality of life than lower resilience patients [25,26]. Furthermore, resilience has been studied extensively in the military environment and has been shown to be associated with improved mental health and career success in veterans [27,28]. In addition to resilience, there are several other psychological factors that are known to account for variation in symptom intensity and degree of limitation in musculoskeletal illness, such as worst case thinking, fear of painful movement, or symptoms of depression and anxiety. In patients suffering from hip and knee arthritis, patient confidence in being able to function while in pain correlated positively with common patient-reported outcome scores [29]. Our study adds to the existing literature by demonstrating the influence of resilience on outcomes after rTSA.

Interestingly, there have been studies demonstrating that resilience can be improved through structured programs and

increased social support. In the military setting, programs have been designed and implemented to enhance resilience in military families facing a range of types of trauma and have been shown to be effective across a various psychological health and family adjustment measures [30,31]. Additionally, Ishibashi et al. [32] discussed how a positive attitude and sense of purpose, along with support of parents and friends, may contribute to development of resilience in adolescents and young adults with a recent diagnosis of cancer. Furthermore, a recent systematic review of resilience enhancing programs in primary schools found that implementation of various resilience enhancing programs has been shown to have positive outcomes with improvements in student resilience and protective factors [33]. While a substantial amount of work is still required to elucidate the relationship between resilience and outcomes in shoulder surgery, the initial results from our study present the possibility that resilience may potentially be a clinically useful factor that can be modified to improve outcomes of patients undergoing rTSA.

4.1. Limitations

This study is not without limitations. Firstly, this was a retrospective review. It is possible that resilience was affected by the outcome scores of the rTSA. Future studies should look at pre-operative resilience scores and their correlation to postoperative outcome scores. Secondly, this study took place at a single institution, and thus the results may not extrapolate to other geographical

regions. Similarly, all operations were performed by the same surgeon, which may reduce generalisability; however, this does help reduce variability between practice type, surgical technique and implant choice. Additionally, our response rate was low and may not be representative of our patient population. Finally, it is possible that our method of classifying patients into high, normal, and low resilience groups, based on the standard deviation from the mean score, does not accurately characterise a patient's resilience.

5. Conclusion

Patients classified as having low resilience are more likely to report worse outcomes than patients with higher resilience after rTSA. Further prospective work is required to understand the clinical utility of patient resilience and its relation to patient outcomes after shoulder surgery.

Ethical statement

This project was approved by the University of Alabama at Birmingham Institutional Review Board (study number: 300001398).

Disclosure of interest

Dr. Ponce is a consultant for Tornier and receives royalties from Wright Medical Group, Inc. Dr. Tokish is a paid consultant for and receives royalties from Arthrex, Inc.; he is a board or committee member of the Arthroscopy Association of North America, he is a paid consultant for DePuy, he is part of the editorial or governing board of and received publishing royalties, financial or material support from Journal of Shoulder and Elbow Surgery, and he is a paid consultant for Mitek; member of editorial or governing board of Orthopedics Today. The remaining authors declare that they have no competing interest.

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Authors' contribution

Mr. Dombrowsky collected data, performed data analysis, and wrote the manuscript. Mr. Kirchner collected data and contributed to manuscript preparation. Dr. Isbell performed data analysis and contributed to final manuscript. Dr. Brabston was involved with study conception and design and contributed to the final manuscript. Dr. Ponce was involved with study conception and design, data collection, and contributed to the final manuscript. Dr. Tokish was involved with study conception and design and contributed to the final manuscript. Dr. Momaya was responsible for study conception and design, performed data analysis, and contributed to the final manuscript.

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