Machine Learning Can Predict Anterior Elevation After Reverse Total Shoulder Arthroplasty

Abstract ID# 23295
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Summary:
Our machine learning study demonstrates that Machine learning could provide high predictive algorithms for anterior elevation after reverse shoulder arthroplasty. The differential analysis between the utilized techniques showed higher accuracy in score prediction for the Support Vector Regression.

Data:
Background: One of the most frequent concerns of the increasing number of patients undergoing shoulder reverse arthroplasty is the possibility to regain an acceptable and not painful range of motion after surgery. The aim of the present study was to individuate and compare specific Machine Learning algorithms that could predict post operative anterior elevation score after Reverse shoulder arthroplasty surgery at different time points.

Methods: Data from 105 patients who underwent reverse shoulder arthroplasty at the same institute have been collected with the purpose of generating algorithms which could predict the target. 28 features were selected and applied to two different Machine Learning techniques: Linear Regression and Support Vector Regression (SVR). These two techniques were also compared in order to define to most faithfully predictive.

Results: Using the extracted features, the SVR algorithm resulted in a mean absolute error (MAE) of 11.6 and a classification accuracy (PCC) of 0.68 on the test-set. Linear Regression, instead, resulted in a MAE of 13.0 and a PCC of 0.85 on the test-set.

Conclusions: Our machine learning study demonstrates that Machine learning could provide high predictive algorithms for anterior elevation after reverse shoulder arthroplasty. The differential analysis between the utilized techniques showed higher accuracy in score prediction for the Support Vector Regression.

Category: Shoulder - Arthroplasty

Outcomes of Total Shoulder Arthroplasty in Patients with Prior Anterior Shoulder Instability: Minimum 5-year Follow-up

Abstract ID# 22960
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Summary:
This study evaluated clinical outcomes of patients that underwent total shoulder arthroplasty with a history of operatively and nonoperatively managed anterior shoulder instability.

Data:
Background: Patients with a history of anterior shoulder instability (ASI) commonly progress to glenohumeral arthritis or even “dislocation arthropathy” and often require total shoulder arthroplasty (TSA). The purposes of this study were to 1) report patient reported outcomes (PROs) after TSA in patients with a history of ASI, 2) compare TSA outcomes of those whose ASI was managed operatively versus those managed nonoperatively, and 3) report PROs of TSA in patients who previously underwent arthroscopic versus open ASI management.

Methods: Patients were included if they had a history of ASI and were at least 5 years out from TSA performed by a single surgeon between 10/2005 and 01/2017. Exclusion criteria included prior rotator cuff repair, hemi-arthroplasty, or glenohumeral joint infection prior to index TSA. Patients were separated into two groups, those with previous operatively managed ASI and those whose ASI was treated nonoperatively. Prospectively collected demographic, surgical, and subjective data were retrospectively reviewed. PROs utilized were the ASES score, SANE, QuickDASH, SF-12 PCS. Failure was defined as revision TSA surgery, conversion to reverse TSA, or prosthetic joint infection. Kaplan-Meier survivorship analysis was performed. Results: 36 patients (27 male, 9 female) with a mean age of 56.4 years (range, 18.8-72.2) were included. Patients in the operative ASI group were younger than those in the nonoperative ASI group (50.6 vs 64.0 years, p<.001). Operative ASI patients underwent 10 open and 11 arthroscopic anterior stabilization surgeries prior to their TSA (mean, 2; range, 1-4). 6.1 of 21 (28.6%) TSA failed in patients with operative ASI while there were no failures in the nonoperative ASI group (p=0.03). Follow-up was obtained in 28 of 30 (93%) eligible patients at an average of 7.45 years (range, 5.0-13.6). In the collective cohort, ASES, SANE, QuickDASH, and SF-12 PCS scores significantly improved with no differences in the postoperative PROs between the two groups. No significant differences were found when comparing PROs between prior open and prior arthroscopic ASI procedures (p>.162) or when comparing the number of prior ASI procedures (p>.531). Kaplan-Meier analysis demonstrated 79% 5-year survivorship in patients with prior ASI surgery and 100% survivorship in nonoperatively managed ASI patients (p=.030).

Conclusion: TSA survivorship is decreased in patients with a history of ASI surgery compared to those without prior surgery. In those who survive, there is no significant difference in PROs.

Category: Shoulder - Arthroplasty

Reverse Shoulder Arthroplasty With a Preserved Rotator Cuff: A Comparison Of Outcomes After Reverse Shoulder Arthroplasty With a Deficient Rotator Cuff and Anatomical Total Shoulder Arthroplasty

Abstract ID# 22994
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Summary:
Preservation of the rotator cuff in RSA demonstrated similar outcomes at a minimum of 12 months compared to RSA with a deficient rotator cuff and TSA with the exception of slightly greater ER and IR with TSA.

Data:
INTRODUCTION Reverse total shoulder arthroplasty (RSA) has traditionally been utilized with success in the setting of rotator cuff arthropathy. Indications for RSA have expanded beyond the traditional paradigm to include individuals with intact rotator cuffs including elderly patients and those with abnormal glenoid morphology. The purpose of this study was to compare outcomes of RSA with an intact rotator cuff to RSA for cuff arthropathy and anatomical total shoulder arthroplasty (TSA). MATERIALS AND METHODS Patients at a single institution that underwent RSA and TSA between 2015 and 2020 were identified. RSA that was performed with an intact rotator cuff (+rcRSA) was compared to RSA performed without an intact rotator cuff (+rcRSA) and an anatomical TSA cohort (TSA). Patients were included with a minimum of 12 month follow up. Baseline demographics were obtained and glenoid version and inclination were calculated. Preoperative and postoperative range of motion and patient reported outcomes including visual analogue scale (VAS), subjective shoulder value (SSV), and American Shoulder and Elbow Surgeons (ASES) scores were obtained. Postoperative complications were recorded. Paired t-tests and Chi-squared and Fisher’s exact test were utilized for continuous and binary variables, respectively. Statistical significance was set at p < 0.05. RESULTS There were 24 patients in +rcRSA, 69 in RSA, and 93 in TSA cohorts. There were more women in +rcRSA (75.8%) than +rcRSA (37.7%, p=0.001) and RSA (37.6%, p=0.001). Average age was similar between +rcRSA (71.1) and +rcRSA (72.4, p=0.237) cohorts while the TSA cohort was younger (66.0, p=0.21). Preoperative mean glenoid retroversion was significantly higher in the +rcRSA cohort at 18.2° compared to 12.7°.