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Initial medical management of rotator cuff tears: a demographic analysis of surgical and nonsurgical treatment in the United States Medicare population

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Background: Rotator cuff tears have a lifetime incidence between 25% and 40% in the United States, but optimum treatment strategies and protocol have not yet been widely accepted. This study evaluated the proportions of patients treated with nonoperative and operative modalities and how this proportion has changed during an 8-year period (2005-2012) among patients with Medicare.

Methods: Using the PearlDiver patient record database, we identified Medicare patients having been diagnosed with a rotator cuff tear. These patients were then stratified on the basis of treatment with physical therapy, subacromial/glenohumeral injection, or rotator cuff repair. We analyzed the data in regard to standard demographic information, comorbidities, and the Charlson Comorbidity Index.

Results: During the study period, 878,049 patients were identified and 397,116 patients had rotator cuff repair. The proportion of patients treated initially with physical therapy dropped from 30.0% in 2005 to 13.2% in 2012, and the subacromial/glenohumeral injection proportion decreased from 6.00% to 4.19% ($P < .001$). The proportion of patients who had rotator cuff repair increased from 33.8% to 40.4% from 2005 to 2012 ($P < .001$). Charlson Comorbidity Indexes were significantly lower in operative patients compared with each nonoperative treatment examined.

Discussion: This analysis demonstrates a significant decrease in the initial trial of nonoperative treatment and an increase in the rate of surgery. Patients undergoing rotator cuff repair had fewer comorbidities than those undergoing nonoperative treatments. It also demonstrates that patients who had a trial of injection had a higher incidence of eventual rotator cuff repair compared with the patients with an initial trial of physical therapy.

Level of evidence: Large Database Analysis; Epidemiology Study

Keywords: Rotator cuff; rotator cuff repair; subacromial injection; physical therapy; PearlDiver; Charlson Comorbidity Index; rotator cuff tear

Because of the deidentified data found in the PearlDiver database used in this study, no Institutional Review Board approval was required.

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Rotator cuff tears (RCTs) present a significant problem, accounting for approximately 4.5 million visits to physicians each year.[2] Some studies report up to a 60% lifetime incidence of RCTs and that >50% of patients older than 80 years may have full-thickness tears.[5,23] Natural history studies

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suggest that between 49% and 60% of RCTs increase in size after initial presentation.[20] Initially asymptomatic tears can often demonstrate significant increase in size, and this enlargement has been correlated with increasing symptoms.[17]

Rotator cuff repair (RCR) is often used to treat patients with RCT, although there is not a strong current consensus on an appropriate protocol in regard to the decisions for nonoperative vs. operative treatment.[4] A recent randomized controlled trial did not demonstrate a significant difference in outcome at 2-year follow-up among patients having had physical therapy (PT) alone or therapy in conjunction with acromioplasty and RCR.[14] The American Academy of Orthopaedic Surgeons has recommended against surgery for asymptomatic, full-thickness tears, but their recommendations on PT, corticosteroids, and surgery are "inconclusive" or at most "limited" in symptomatic patients.[19] Previous literature suggested that nonoperative measures could lead to clinical improvement of RCT in many patients.[13,15] Other studies indicate that although many patients improve with nonsurgical management, final outcome scores may be better with RCR.[22,24]

With a growing focus on value-based health care, identifying utilization of treatments and relative effectiveness is becoming increasingly important. Recent large studies demonstrated a decrease in the incidence of open RCR and a corresponding increase in the number of arthroscopic cases in relatively young patients with private insurance.[26] Currently, there are no published data on the rates of surgical and nonsurgical management of RCT in a large cohort in the United States. This study aimed to identify trends within RCT management using data obtained through Medicare databases to determine if there has been a significant change in the proportion of patients receiving initial nonoperative or operative management of RCT. In addition, this study analyzed whether the rate of operative treatment is different in those patients who had an initial trial of either PT or injection. With subgroup analysis, we also examined whether the presence of comorbidities has any correlation with the rate of operative treatment. We hypothesized that the rates of PT and injection have decreased during the period studied and that the rate of surgical management will have increased significantly.

Materials and methods

This is a retrospective cohort study evaluating the changes in management of RCT in Medicare patients using data available in the PearlDiver database (West Conshohocken, PA, USA). The PearlDiver database contains orthopedic billing data for a variety of insurance providers, including Medicare. The database includes 49,550,651 individual Medicare patients from 2005 to 2012 along with their associated diagnoses and procedure codes. All patient records are devoid of any individual identifiers and are grouped to prevent individual patients from being isolated for analysis.

Data from 2005 to 2012 were available for examination. Using proprietary coding techniques, we queried the database for patients diagnosed with a full- or partial-thickness RCT using *International Classification of Diseases, Ninth Revision* (ICD-9) codes 726.13, 727.61, and 840.4. To avoid including repeated PT visits and subacromial or glenohumeral injection (SAI/GHI), we sorted for the first instance of the *Current Procedural Terminology* (CPT) codes for PT (CPT-97001) or SAI/GHI (CPT-20610) associated with a diagnosis of RCT. We further stratified these data by assessing whether patients had either their first instance of PT or SAI/GHI without RCR or before RCR. We included patients who met these criteria as having a trial of nonoperative treatment.

Our study grouped patients with an open RCR (CPT-23412, CPT-23410, CPT-23420) and arthroscopic repair (CPT-29827). We then selected only the first instance of RCR among this cohort to avoid including contralateral procedures or revision surgery. Once these patients were identified, the demographics data were extracted for each year, and each subgroup was examined. We then examined time point coding to find patients who had RCR after either PT or SAI/GHI.

The Charlson Comorbidity Index (CCI) is an analytic measure used to quantify and to stratify comorbidities of patients for comparison in longitudinal studies.[7] This metric has been validated in multiple studies and is a predictive measure of comorbid burden, with lower scores suggesting fewer comorbidities.[6] The CCI was calculated for each cohort within the study using the PearlDiver database. In addition, comorbidities including diabetes (ICD-9 codes 250.00 to 250.93) and coronary artery disease (414.00 to 414.90) were evaluated specifically for effect on rates of RCR.

Statistical calculations were performed using SPSS 22.0 (SPSS Statistics for Windows, version 22.0; IBM Corp, Armonk, NY, USA). Statistical testing was performed with linear regression for evaluation of rate of operative fixation each year and χ^2 analysis for variables such as age and sex. Fit analysis was also performed for linear regressions to determine if modeling was appropriate. Mann-Whitney *U* test was used for CCI scores as they were non-normally distributed. Statistical significance was set to $P < .05$ for all calculations.

Results

Between 2005 and 2012, 40,338,193 patients were identified in the database as having all available demographic data available. Of these, 878,049 patients were identified as having RCT diagnosed for the first time. The basic characteristics of these patients are documented in Table I. Overall, the diagnosis of RCT was made in more women than men (55% vs. 45%; $P < .001$).

PT was prescribed overall in 22.8% of patients with an initial diagnosis of RCT, and the proportion of patients with PT as their initial treatment decreased from 30.0% to 13.2% ($P < .001$) during the study period (Fig. 1). With their initial diagnosis of RCT, 5.16% of all patients had an SAI/GHI ($P < .001$; Table II). The proportion of patients receiving SAI/GHI in this manner decreased from 2005 to 2012 from 6.00% to 4.19% ($P < .001$; Fig. 2). The rate of decrease in modeling was −2.79% per year for PT and −0.37 for SAI/GHI (Table III).