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The rising incidence of rotator cuff repairs

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Background: Rotator cuff repairs (RCRs) have become increasingly common. Several studies have shown variation in the indications for this procedure. We chose to track the incidence of RCRs in New York State (NYS) from 1995 to 2009. We hypothesized that after the introduction of the Current Procedural Terminology (CPT) code 29827 for arthroscopic RCR, there would be a significant increase in the rate of RCRs performed in NYS.

Materials and methods: The NYS Department of Health's Statewide Planning and Research Cooperative System (SPARCS) database was queried for reported RCRs between the years 1995 and 2009. Using the *International Classification of Diseases, Ninth Revision, Clinical Modification* procedural code 83.63 and CPT codes 23410, 23412, 23420, and 29827, we collected and analyzed data on RCR procedures.

Results: A total of 168,780 RCRs were performed in NYS from 1995 to 2009. In 1995, the population incidence of RCRs was 23.5 per 100,000. In comparison, in 2009, the population incidence was 83.1 per 100,000, an increase of 238% ($P < .0001$). The percentage of individuals aged between 45 and 65 years undergoing RCR increased from 53.0% to 64.2% during this same period.

Conclusions: There has been a notable increase in the volume of RCRs performed in NYS. In addition, after the introduction of CPT code 29827 in 2003, the increase in the incidence of RCRs became significantly more pronounced.

Level of evidence: Level III, Cross-Sectional Design, Epidemiology Study.

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Keywords: RCR; rotator cuff repair; incidence; SPARCS; CPT code; ICD code; New York

Rotator cuff pathology is considered one of the most common causes of disability related to the shoulder.[23,38] Patients who have rotator cuff disease can present with symptoms ranging from minimal discomfort without functional deficits to severe pain, weakness, and marked disability.[31] Surgical repair of rotator cuff tears is well documented and has been considered an effective treatment since described by Codman over 100 years ago.[6,7] Improved patient outcomes with technical advancements of the mini-open and all-arthroscopic approaches have helped to maintain the popularity of rotator cuff repair procedures.[9,25,35,36,38] Recently, several studies have commented on the apparent broadening of indications for this intervention.[14,22,34,35] These reports show a considerable variation in the management of rotator cuff disease and the conditions requiring surgical repair.

Although previous studies have shown an increase in the utilization of orthopaedic surgical procedures overall, including those specific to the shoulder,[10,19-21,24,33,34] we sought to analyze the increase in rotator cuff repair procedures in relation to the introduction of a new

This study was exempt from Investigational Review Board approval.

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arthroscopic rotator cuff repair Current Procedural Terminology (CPT) code. We hypothesized that after the introduction of the CPT code for arthroscopic rotator cuff repair, 29827, in 2003, there would be a significant increase in rotator cuff repair procedures performed in the state of New York. To test this theory, the New York Statewide Planning and Research Cooperative System (SPARCS) database was queried to evaluate the volume of rotator cuff procedures from 1995 to 2009.

Materials and methods

SPARCS database

The SPARCS database was established by the New York State Department of Health in 1979.[26] After the passage of the New York State Public Health Law in 1986, all New York State nonfederal, licensed hospitals were mandated to report data on all discharges at their facilities.[12] Subsequent regulations expanded these requirements to include freestanding, licensed ambulatory surgery facility procedures and emergency department admissions. These archives document information on the sex, age, race, reimbursement, procedures, and diagnoses for all individuals who have undergone treatment at one of the aforementioned locations. Diagnoses and procedures are recorded by the use of Current Procedural Terminology, fourth edition (CPT-4),[1] and *International Classification of Diseases, Ninth Revision, Clinical Modification* (ICD-9-CM)[5] descriptive terms and identification codes.

Patients were identified from the SPARCS database as having undergone rotator cuff repair procedures if they were assigned an ICD-9-CM code for ''rotator cuff repair'' or CPT-4 codes 29827, 23410, 23412, and 23420, indicating ''arthroscopy, shoulder, surgical; with rotator cuff repair,'' ''repair of ruptured musculotendinous cuff (eg, rotator cuff) open; acute,'' ''repair of ruptured musculotendinous cuff (eg, rotator cuff) open; chronic,'' and ''reconstruction of complete shoulder (rotator) cuff avulsion, chronic (includes acromioplasty),'' respectively, from 1995 to 2009. To avoid duplication, all individuals who met the inclusion criteria were assigned identification numbers to account for patients whose procedures were recorded with CPT-4, ICD-9-CM, or both coding systems. Demographic data including age and sex were collected. Race and ethnicity were excluded from our investigation because this information was not uniformly collected by the Department of Health until 2002. Population incidence was calculated based on estimates published by the US Census Bureau for New York State.[32]

Statistical Methods

Descriptive statistics were reported on all demographic variables, procedure volumes, and incidence rates. Statistical analysis was performed with MATLAB software, version R2012a (The MathWorks, Natick, MA, USA). The Pearson χ^2 test was used to compare proportional differences between 1995 and 2009. The unpaired Student t test was used for comparison of means. A critical P value $<.05$ was considered statistically significant. Confidence intervals of 95% were reported for all linear regression analyses. CPT codes were paired with ICD-9-CM codes based on the Craneware Online Reference Toolkit (Craneware, Atlanta, GA, USA).

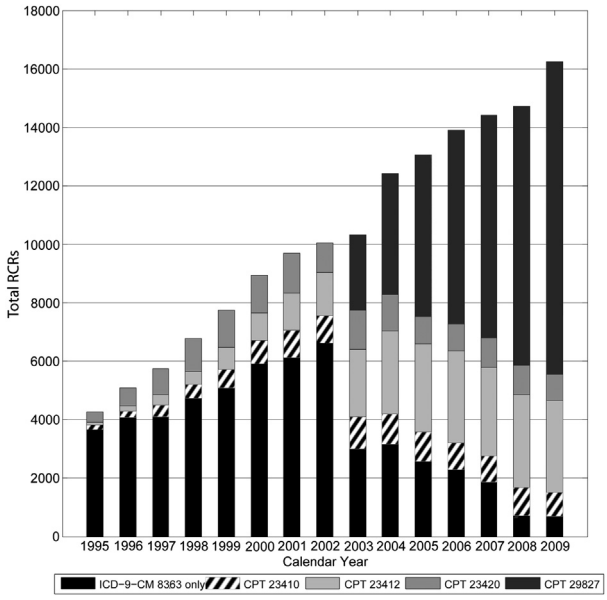

Figure 1 Volume of rotator cuff repair (*RCR*) procedures by CPT-4 code. Each *bar* represents the total number of rotator cuff repairs performed in a given year from 1995 to 2009. Each *colored region* represents a different CPT-4 code. If no CPT code was indicated, then the ICD-9-CM code for rotator cuff repair, 83.63, was used. The represented procedures are ''reconstruction of complete shoulder (rotator) cuff avulsion, chronic (includes acromioplasty)'' (23420); ''repair of ruptured musculotendinous cuff (eg, rotator cuff) open; acute'' (23410); ''repair of ruptured musculotendinous cuff (eg, rotator cuff) open; chronic'' (23412); and ''arthroscopic rotator cuff repair'' (29827).

Results

The volume of rotator cuff repair procedures performed in the state of New York from 1995 to 2009 identified with the SPARCS database are summarized in Figure 1 and Table I. In total, 168,780 patients were reported as having undergone rotator cuff repair surgery between the years 1995 and 2009. In 1995, a total of 4,265 rotator cuff repair procedures were performed. On the basis of population estimates for New York State, this correlated with an incidence of 23.5 procedures per 100,000.[32] In 2009, 16,240 surgical repairs of the rotator cuff were reported, correlating to a population incidence of 83.1 per 100,000. This represented a 281% increase in the volume of rotator cuff cases and a 238% increase in the population incidence of rotator cuff repairs ($P < .0001$).

From 1995 to 2003, before the introduction of the CPT code for arthroscopic rotator cuff repair, linear regression analysis showed that the volume of rotator cuff repair procedures increased by an average of 820 cases per year (95% confidence interval, 803 to 837 cases). After the