

RESEARCH ARTICLE

Trends Related to the Treatment of Superior Labral Tears at a Single Institution

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Received: 15 February 2020

Accepted: 17 March 2020

Abstract

Background: As preferred treatment options for superior labral tears continue to evolve, this study aims to describe the recent longitudinal trends in the treatment of SLAP tears in a sub-specialized practice at a single institution. We hypothesized that there was a trend toward biceps tenodesis over repair for Type II SLAP lesions.

Methods: A retrospective review was performed using an institutional billing database to identify all patients with a SLAP tear who underwent surgical intervention between January 2002 and January 2016. Procedural codes associated with the surgery were analyzed to determine type of treatment each patient received.

Results: Of the 6,055 patients who underwent surgery for a SLAP tear during the study period, 39.1% (2,370) underwent labral repair, 15.4% (930) underwent tenodesis without repair, and 45.5% (2,755) underwent arthroscopy without tenodesis or repair. Labral repair made up a significantly higher proportion of surgical interventions in 2002 (82.2%) compared to in 2015 (21.8%; $P < 0.001$). Surgeon experience did not impact trends. Over the study period, the mean age of patients receiving labral repair decreased from 40.4 years (range: 16.2 – 63.9) to 32.6 years (range: 14.0 – 64.7; $P < 0.001$).

Conclusion: This study demonstrates that over the 14-year study period the rate of labral repairs for SLAP tears has decreased significantly and that these repairs have been directed towards a younger patient population.

Level of evidence: III

Keywords: Arthroscopy, Biceps tenodesis, Databases, Labral repair, Trends

Introduction

Injuries to the superior labrum have an incidence ranging from 6% to 29% and are a cause for shoulder pain and disability (1–3). Lesions of the superior labrum were originally described by Andrews et al. with further classification added by Snyder et al (4, 5). The commonly used superior labrum anterior to posterior (SLAP) tear was coined along with the classification system of four types. Subsequent studies have added onto this classification, including that by Morgan et al., which created subtypes to the Type II injury (biceps anchor detachment) to describe the direction of the

labral tear as anterior, posterior, or both (6).

While this injury pattern was originally described in overhead athletes, it has since been recognized in larger segments of patients and a great deal of research has focused on the appropriate treatment for differing patient populations. Successful clinical results have been shown at two to three year follow up for repair of Type II SLAP tears in patients under 40 years old (7, 8). However, others have questioned the success of the direct repair of SLAP tears both in terms of return to sports as well as in older, active populations (9, 10). Therefore,

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multiple studies have proposed performing primary biceps tenodesis in this patient population and found encouraging results (11–14). This has led to a trend in treating SLAP tears with tenodesis or tenotomy over repair as was evidenced in the report by Patterson et al. of Part II of the American Board of Orthopaedic Surgeons (ABOS) Certification exam through the early 2000's (15).

In this study, we aimed to investigate the treatment trend of Type II SLAP tears within a large, sub-specialized orthopaedic practice. The purpose was to identify the incidence of repair versus primary tenodesis or tenotomy versus debridement for the treatment of SLAP tears at our institution, which has a variety of surgeons in terms of practice experience as well as subspecialty training (shoulder/elbow and sports medicine). We hypothesized that there was a trend toward biceps tenodesis over repair for Type II SLAP lesions treated in our practice.

Materials and Methods

Following local institutional review board approval, this retrospective review of surgical practices for management of SLAP tears was undertaken. Using the institutional billing database, all patients diagnosed with a SLAP tear (International Classification of Diseases, ninth version, [ICD-9] 840.7) between January 2002 and January 2016 were identified. The surgical interventions for these patients were then investigated using Current Procedural Terminology (CPT) codes. Only those cases performed by surgeons with a minimum of 25 cases over the study period were included. At this large volume practice, two separate divisions are responsible for management of shoulder pathologies: sports medicine and shoulder and elbow surgery (S&E). During the study period, the sports division consisted of 14 surgeons, one of whom did not complete a fellowship, and the S&E division consisted of eight fellowship trained surgeons. These surgeons had an average of 19 and 17 years of practice at the end of the study period for sports and S&E divisions, respectively.

The cohort was formed from patients in the practice who had an ICD-9 diagnosis code of 840.7 that was associated with one of following surgical procedural codes: 29807

(labral repair), 23430 (open biceps tenodesis), 29828 (arthroscopic biceps tenodesis), 29822 and 29823 (arthroscopic debridement), and 29805 (diagnostic arthroscopy). It is possible that patients who underwent arthroscopy without tenodesis or repair had a biceps tenotomy, but it is not possible to elucidate that from the procedural codes. After identifying each case's type of surgical treatment, the differences in surgical management were studied. The impact of the treating surgeon's years in practice and department; patient's age, gender, and workers' compensation (WC) status; and year of surgery were investigated.

Descriptive statistics were used to report changes in procedure proportions over time and by specialty. Procedures were defined as either labral repair, biceps tenodesis without repair, or arthroscopy without tenodesis or repair. To assess differences of continuous variables between two groups, a Student's t-test was utilized. For association of two continuous variables, a Pearson's correlation coefficient was calculated. A p value of less than 0.05 was considered significant. To confirm data normality prior to testing, a skewness and kurtosis was calculated with an acceptable threshold less than two and 12, respectively.

Results

Over the study period, 6,055 patients underwent a related surgery for a diagnosis of SLAP tear by one of the included surgeons. These patients had an average age of 46.4 years (Range 14-90; Standard Deviation [SD]: 15.0). A majority of the patients were men with 4,571 (75.5%) and 1,484 (24.5%) were women. Worker's compensation patients made up 18.3% of the population (1,108).

During this time, 39.1% (2,370) of patients underwent labral repair, 15.4% (930) tenodesis without repair, and 45.5% (2,755) underwent arthroscopy without tenodesis or repair. These proportions shifted dramatically over the span of the study: labral repair made up 82.2% (83/101) of surgical interventions in 2002 compared to 21.8% (153/702) in 2015 [$P < 0.001$; Figure 1].

From 2002 to 2015, patient age increased from a

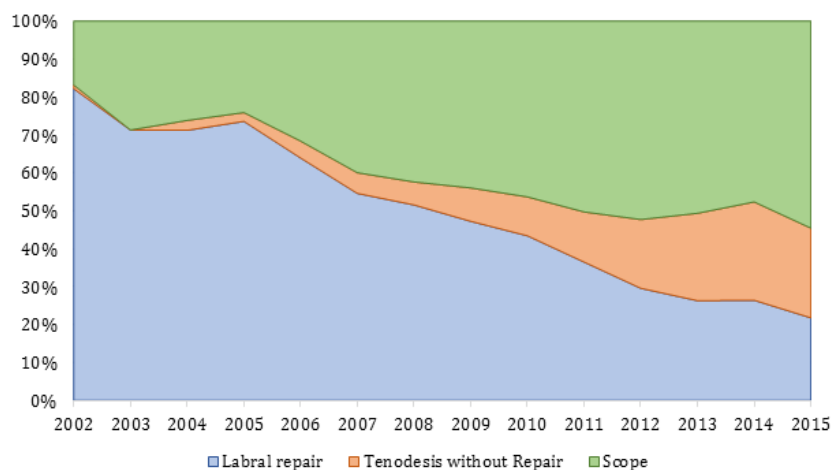


Figure 1. Trends in surgical management of SLAP tears over time.

mean of 42.0 (range: 16.2 – 72.2) to 48.6 (range: 14.0 – 78.6) years ($P<0.001$). The proportion of patients that were men decreased from 78.2% (79/101) to 69.7% (489 / 702; $P=0.08$) and the proportion of worker's compensation patients increased from 11.9% (12/101) to 22.2% (156/702; $P=0.01$). However, these demographic changes were surgery dependent. Over the study period, the mean age of patients receiving labral repair decreased from 40.4 (range: 16.2 – 63.9) years to 32.6 years (range: 14.0 – 64.7; $P<0.001$).

When assessing the impact of surgeon characteristics on their patient demographics and treatment choices, it was found that in the final year of study (2015), surgeon case volume was positively correlated with patient age [$R=0.38$; $P=0.13$; Table 1]. Over the period of the study, women were less likely to be treated with repair than male counterparts (25.2% versus 43.7%; $P<0.001$) and more

likely to be treated with arthroscopic debridement (62.9% versus 39.9%; $P<0.0001$). To evaluate whether surgeon experience had any impact on changing trends, surgeons were split into two groups (i.e. those that had over 20 years of experience and those that had 20 or less at the end of the study period), and mean proportion of each procedure by year was calculated [Figure 2]. Changes in trends are similar between both groups for all surgery types. Strong correlations were found: 0.952, 0.804 and 0.876 for labral repairs only, biceps tenodesis only and arthroscopy only, respectively. Additionally, surgeon's decreased time in practice was not correlated with a decreased proportion of labra repair, biceps tenodesis, nor arthroscopy ($R=-0.010$, $R=0.156$, $R=-0.120$, respectively) during the last year of this study [Table 2]. Lastly, worker's compensation patients were less likely to be treated with labral repair

Table 1. Association between surgeon characteristics and patient's demographics in the final study year

	Mean Patient Age		Male Proportion of Patients		WC Proportion of Patients	
	Value	P	Value	P	Value	P
Annual Case Volume (SLAP tear)	R=0.38	0.13	R=-0.31	0.23	R=-0.01	0.97
Medical School Graduation Year	R=0.05	0.85	R=-0.03	0.90	R=0.36	0.15
Division						
Sports	45.2 y	0.16	69.1%	0.19	20.5%	0.44
S&E	50.4 y		75.8%		26.2%	

WC= Workers' Compensation; S&E=shoulder and elbow; p=p-value; R=Pearson's correlation coefficient; y=years

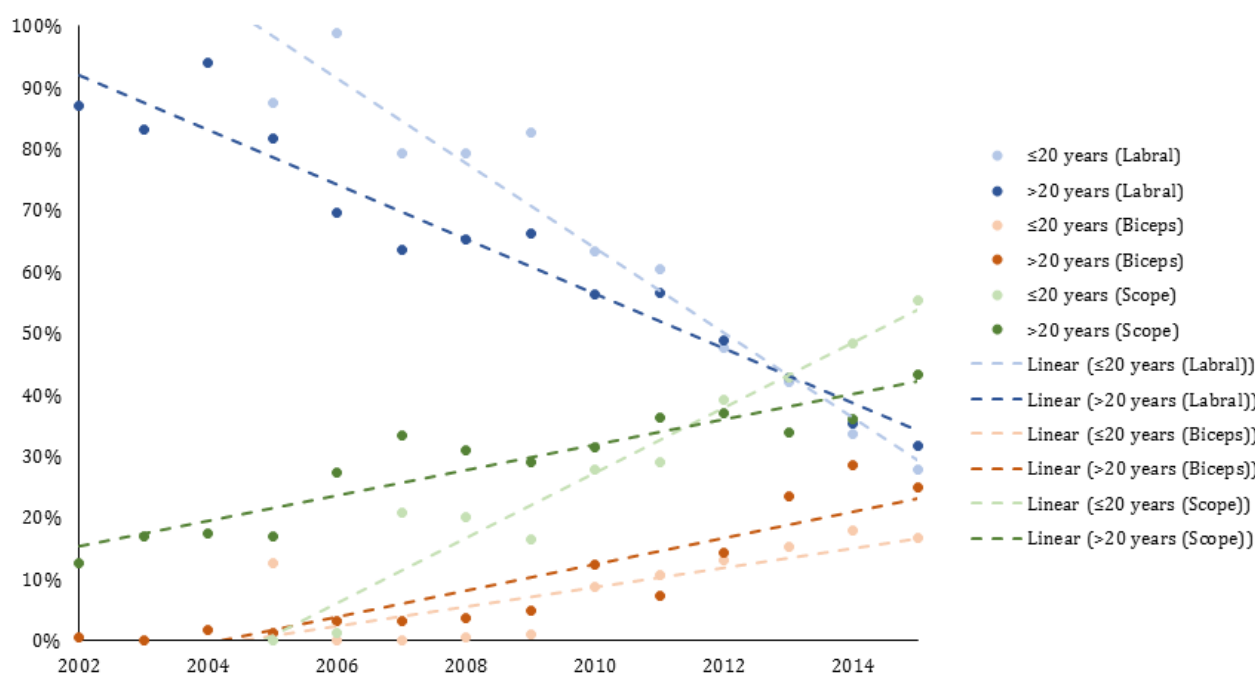


Figure 2. Trends in surgical management of SLAP tears over time, separated by those surgeons that had twenty or less years of experience and those that had more at the end of the study period. Best fit linear lines are plotted as well.

Table 2. Association between surgeon characteristics and selected treatment method in the final study year

	Proportion of Treatment Selection					
	Repair	<i>p</i>	BT	<i>p</i>	Debri.	<i>p</i>
Annual Case Volume (SLAP tear)	R=-0.190	0.47	R=-0.130	0.62	R=0.270	0.29
Medical School Graduation Year	R=-0.010	0.97	R=0.156	0.50	R=-0.120	0.60
Division						
Sports	26.3%	0.39	27.0%	0.92	46.8%	0.45
S&E	17.3%		25.7%		57.0%	

WC= Workers' Compensation; S&E=shoulder and elbow; *p*=*p*-value; BT=Biceps tenodesis alone; Debri=Debridement without repair or tenodesis; R=Pearson's correlation coefficient

(29.6% versus 42.1%; $P<0.001$).

Discussion

This study confirms the hypothesis that over the 14-year study period there was a significant decrease in the percentage of patients with SLAP tears treated with labral repair and significant increase in the percentage of biceps tenodesis. This study joins two other studies in evaluating the trend of management of SLAP tears in a single practice with two large sports and shoulder and elbow divisions with a wide range of surgeon experience (15, 16). Interestingly, while the overall trend found an increase in biceps tenodesis and decrease in repair, the younger surgeons were more likely to drive this movement, likely secondary to the evolving literature that has been published in favor for biceps tenodesis over SLAP repair in the past decade. While there were trends seen towards differences in treatment between subspecialties, there was not a significant difference observed.

Since the description of superior labral tears both in the throwing athlete and general patient populations, the best treatment of this pathology has been debated. When initially described in the throwing population, primary repair of the lesion was advocated (4). Snyder et al. analyzed 140 patients who had undergone arthroscopic treatment for SLAP lesions and had 18 patients who underwent second look arthroscopy, finding a majority of the repaired lesions had healed. Furthermore, a study by Friel et al. which included non-overhead throwing athletes found a significant improvement in outcomes with 2-year follow up (8).

Conversely, Boileau et al. reported on overhead athletes treated with biceps tenodesis had improved patient reported outcomes and greater return to sport when compared to those undergoing SLAP repair (11). However, there was a large difference in average age in the repair group versus the tenodesis group, 37 versus 52 years old, respectively. Similar to our findings in this study, in which over the study period, the average age of patients receiving labral repair decreased from 40 to 33 years. In fact, a study performed by Wang et al. in 2018, in which they asked shoulder surgeons how they would manage SLAP tears, surgeons preferred SLAP repair in younger patients (age <35 years old) and biceps

tenodesis in older patients (17).

Further support of tenodesis was reported in a recent systematic review and meta-analysis, which revealed improved patient satisfaction and return to sport for patients undergoing biceps tenodesis versus repair of a SLAP lesion. Additionally, they found no significant trend towards increased reoperation rates for patients undergoing biceps tenodesis (18). Pogorzelski et al. reviewed 20 patients with a mean age of 38 who underwent an open biceps tenodesis for a type II SLAP tear found significant improvement in outcomes and return to sport for 73% of all patients and 80% of overhead athletes (19). Chalmers et al. evaluated 86 patients treated with either a combined labral repair and biceps tenodesis, labral repair alone or tenodesis alone for SLAP lesions. They found significantly worse outcome scores in patients that underwent the combined procedure compared to those that had an isolated labral repair or tenodesis (20). A randomized control trial by Schröder et al. in 2017 randomized patients with Type II SLAP tears into either labral repair, biceps tenodesis or sham surgery. They found that neither tenodesis nor labral repair had any clinically significant benefit over sham surgery in terms of outcomes at 2 years (21).

Given these newer findings and further understanding of the outcomes for each treatment type, trends towards increased biceps tenodesis has been noted. In 2014, Patterson et al. reviewed treatment trends for SLAP lesion diagnosis in those physicians sitting for Part II of the ABOS Certification Exam. Similar to the findings of this current study, there was a demonstrated increase in biceps tenodesis in patients with SLAP tears versus repair. This current study found an overall decreased rate in SLAP repair and increased rate of tenodesis. However the change was similar between younger and older surgeons at this practice. This is inconsistent with the findings from the ABOS review and interesting that established surgeons are as likely to change their management as younger surgeons (15).

While this study demonstrates a very large patient population and trends from a large number of surgeons with varying experience and training, it does have limitations. The most notable limitation was the lack patient reported outcomes. Due to the very large number of patients reviewed and the extreme variability

in outcomes reported over the study period, it was determined to be too challenging to report meaningful results in the current evaluation. Further studies will be aimed at reviewing a subgroup of this population to evaluation outcomes. Additionally, due to the nature of the review in collecting data via coding and billing information, the study was limited in its ability to identify laterality and to completely define the treatment code of biceps tenotomy due to limits in coding. Finally, the search was limited to those patients with only a diagnosis of a SLAP tear and not those with concomitant rotator cuff tear diagnosis to avoid confounding in treatment decision in terms of biceps management. This may also limit the study by missing patients who were also treated for a SLAP lesion in the practice over the study period.

This study is unique in that it highlights treatment trends over a consistent group of surgeons in a single practice for the management of SLAP tears. The rates of repair have decreased significantly and also trended to being

focused in a younger patient population. Further studies will plan to focus on treatment outcomes, especially in those patients in the older proportion of the population who undergo tenodesis or tenotomy. It is clear that the understanding of the diagnosis of SLAP tears and the treatment of them is continually evolving.

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