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Current trends in the evaluation and treatment of SLAP lesions: analysis of a survey of specialist shoulder surgeons

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Background: Controversies exist in the classification and management of superior labral anterior and posterior (SLAP) lesions. Our aims were to assess the concordance rate of a group of specialist shoulder surgeons on the diagnosis of SLAP types and to assess the current trends in treatment preferences for different SLAP types.

Methods: Shoulder surgeons (N = 103) who are members of the Shoulder and Elbow Society of Australia were invited to participate in a multimedia survey on the classification and management of SLAP lesions. Response rate was 36%. The survey included 10 cases, each containing a short clinical vignette followed by an arthroscopic video depicting varying types of SLAP lesions. Surgeons were asked to classify the lesions and to recommend treatment.

Results: There is low interobserver agreement in classifying SLAP lesions. The most common misdiagnosis of type I lesion was as a type II, and vice versa. Surgeons preferred to treat type II SLAP lesions in younger patients (<35 years) with labral repair and in older patients with biceps tenodesis. The most commonly preferred repair technique for type II lesion was with suture anchors placed both anterior and posterior to the biceps tendon. For all lesion types, biceps tenotomy was a far less commonly preferred procedure than biceps tenodesis.

Conclusion: There is poor agreement between contemporary surgeons in the classification and treatment of SLAP lesions. The age of the patient appears to play a significant factor in the surgeons' deciding to treat a SLAP lesion with repair vs. biceps tenodesis.

Since being first described by Andrews et al[1] in 1985, there has been increasing recognition and understanding of superior labral anterior-posterior (SLAP) lesions as a cause of shoulder pain. As the literature on this condition has expanded, our understanding of SLAP lesions remains imperfect, and controversies continue to exist on its diagnosis, classification, treatment options, and techniques of repair.

An initial classification system of SLAP lesions was proposed by Snyder[16] in 1990 and consisted of 4 types. This system, however, was not inclusive of some SLAP morphologic appearances, and soon an expanded system was introduced by Maffet et al[12] that incorporated types V-VII. Several studies have investigated the reliability of the Snyder classification system and reported only low to moderate interobserver and intraobserver reliability.[9,10] Limitations exist with these studies; 1 study was performed >10 years ago,[9] and increasing understanding of SLAP lesions among shoulder surgeons in the last decade may affect interobserver concordance today. Another study investigated reliability between only 5 very experienced shoulder surgeons,[10] and so findings cannot be generalized to the broader community of shoulder surgeons who may use the classification. Moreover, no study has investigated the reliability of a system that includes Maffet's expansion of Snyder's classification, which is often used in practice today.

Surgical management of SLAP lesions also remains controversial. Whereas débridement is generally advocated in the treatment of type I and type III lesions, there is less consensus for the treatment of the more common type II lesions.[3] Management options include débridement, SLAP repair, biceps tenodesis or tenotomy, and a combination of these. Some authors advocate superior labral repair for type II lesions,[11,14] whereas others advocate judicial discrimination of patients who will benefit from a tenodesis more than from labral repair.[2,7] In particular, 2 subgroups of type II lesions may derive

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The Avenue Hospital Institutional Ethics Review Board approved this study: No. 207.

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greater benefit from tenodesis over labral repair—an older group of patients with poorer quality, degenerate labrum; and a younger group with high overhead functional demands.

Given the current controversies, this study aimed to assess the concordance rate of a group of shoulder surgeons of the Shoulder and Elbow Society of Australia on the diagnosis of SLAP types, as defined by Snyder and Maffet; to assess the current trend in treatment preference among shoulder surgeons for different SLAP types; and to assess surgeons' preferences for either SLAP repair or biceps tenodesis, based on clinical setting.

Materials and methods

The study was conducted using a multimedia online survey format. Members of the Shoulder and Elbow Society of Australia (N = 103) were contacted by e-mail inviting participation. All surgeons, by virtue of their membership in this Society, have a subspecialty practice in shoulder and elbow surgery and have undergone fellowship training in this area. Thirty-seven of the surgeons surveyed gave complete responses that were used for analysis (36% response rate).

The cases of 10 patients were presented to surgeons. A short hypothetical vignette with the patient's age and presenting complaints was included together with an arthroscopic video of approximately 40 seconds in duration. Videos were carefully selected from the 2 senior surgeons' cases and were chosen and edited to clearly demonstrate the full extent of the involved lesions. The view was with the arthroscope in the posterior portal and the probe through the anterior portal. All lesions were probed thoroughly during the video, and an attempt to demonstrate a "peel-back" sign[4] was performed in all cases. The average hypothetical age of the patients was 32 years, with a range of 15-47 years.

Surgeons were told that other than the SLAP and labral pathologic processes depicted in the videos, there were no other diseases in or around the shoulder. The options were per Maffet's expansion of Snyder's classification (types I-VII). Shoulders with Buford complex were excluded to minimize variables. On each page of the survey, a pictorial description of the 7 SLAP types was provided for reference. Surgeons were then asked to select their treatment of choice for each hypothetical case. More type II SLAP lesions were included than other lesions, as this was deemed to be the most common type.

"True diagnosis" is defined as the SLAP classification type that is agreed on between the 2 senior authors. In every case, 1 of the senior authors was the operating surgeon who took the video and therefore had an intimate intraoperative knowledge of the nature of the SLAP lesion.

Statistics

Interobserver variability (concordance) of the 37 different observers was calculated using chance-corrected Fleiss κ. Difference in treatment by age group of the patients was calculated using χ^2 contingency test. Difference in continuous variables, such as the surgeon's years of practice, were calculated using 2-tailed Student *t*-test, whereas ordinal variables were compared with Wilcoxon ranked sum. Correlation testing between nonparametric ordinal variables was performed using Spearman rho.

Results

Practice details of surgeons who responded are presented in Table I. There is a wide range of experience among participants, with most surgeons (54%) performing >200 shoulder arthroscopies per year.

Table I
Characteristics of 37 participating surgeons

Characteristic	No. (%)
Years in practice	
<5	6 (16)
5-10	8 (22)
11-20	15 (41)
>20	8 (22)
Scope volume per year	
1-50	2 (5)
50-100	6 (22)
100-200	9 (24)
>200	20 (54)

Interobserver variability on classification system (concordance)

The surgeons' diagnosis and treatment decision choices are displayed in Table II. Concordance rate is relatively low for classification of lesions, with an overall κ value of 0.26 (fair agreement). Concordance rate for agreeing on a type IV diagnosis is highest with a κ value of 0.49 (moderate agreement), whereas concordance rate is lowest for type V (κ = 0.09, slight agreement).

Misdiagnosis often occurred between type I and type II lesions. For example, in a case with a type II lesion, the most common alternative choice made by surgeons was type I, and vice versa.

Treatment preference

Treatment options are divided into 4 categories: débridement/nonspecific treatment; tenotomy or tenodesis alone; SLAP repair alone; or both tenotomy/tenodesis and SLAP repair. Débridement/nonspecific treatment was the most common choice for type I lesion, whereas SLAP repair was the most common choice for all other lesion types in this study (Table II).

Table II
Diagnosis and treatment decisions

Type of lesion	Diagnosis	%	Treatments	%
SLAP I (1 case)	**SLAP I**	**49**	**Débridement/nonspecific**	**54**
	SLAP II	**49**	Tenotomy/tenodesis	0
	SLAP III	0	SLAP repair	43
	SLAP IV	0	Tenotomy/tenodesis and	3
	SLAP V	3	SLAP repair	
	SLAP VI	0		
	SLAP VII	0		
SLAP II (6 cases)	SLAP I	20	Débridement/nonspecific	22
	SLAP II	**70**	Tenotomy/tenodesis	29
	SLAP III	0.5	**SLAP repair**	**42**
	SLAP IV	0.5	Tenotomy/tenodesis and	7
	SLAP V	4	SLAP repair	
	SLAP VI	1		
	SLAP VII	4		
SLAP IV (2 cases)	SLAP I	0	Débridement/nonspecific	14
	SLAP II	5	Tenotomy/tenodesis	31
	SLAP III	15	**SLAP repair**	**42**
	SLAP IV	**57**	Tenotomy/tenodesis and	14
	SLAP V	8	SLAP repair	
	SLAP VI	3		
	SLAP VII	12		
SLAP V (1 case)	SLAP I	3	Débridement/nonspecific	11
	SLAP II	16	Tenotomy/tenodesis	27
	SLAP III	3	**SLAP repair**	**46**
	SLAP IV	22	Tenotomy/tenodesis and	16
	SLAP V	**30**	SLAP repair	
	SLAP VI	0		
	SLAP VII	27		

Response of 37 surgeons to 10 cases. Overall concordance rate for diagnosis: κ = 0.26 (fair agreement), $P < .001$. Overall concordance rate for treatment: κ = 0.09 (slight agreement), $P < .001$.

Concordance rate is low for agreement about treatment, with an overall κ of 0.09 (slight agreement).

Treatment by surgeon's diagnosis

Choice of treatment was then analyzed according to what the surgeons believed the diagnosis was rather than the true diagnosis (Fig. 1). The κ value for treatment concordance increased from 0.09 (slight agreement) to 0.20 (fair agreement). This indicates that surgeons are more likely to agree on the treatment on the basis of what their concept of the lesion is rather than on the basis of what they are diagnosing on the video vignettes. Treatment decision was most clear-cut for a surgeon's diagnosis of type I lesion, with débridement/nonspecific management being the treatment of choice in 81% of cases when a type I lesion was diagnosed.

Type II SLAP lesions and treatment

Particular controversies exist in the literature about the management of type II lesions; hence, surgeons' responses to these were analyzed in further detail. Of the 10 cases presented, 6 were type II lesions. When these cases were separated into 2 groups based on age, it was clear that the surgeons' management differed by age. In the group younger than 35 years (3 cases), surgeons were much more likely to choose débridement or SLAP repair, whereas in the group older than 35 years, surgeons were more likely to choose tenotomy/tenodesis ($P < .0001$, χ^2 test; Fig. 2).

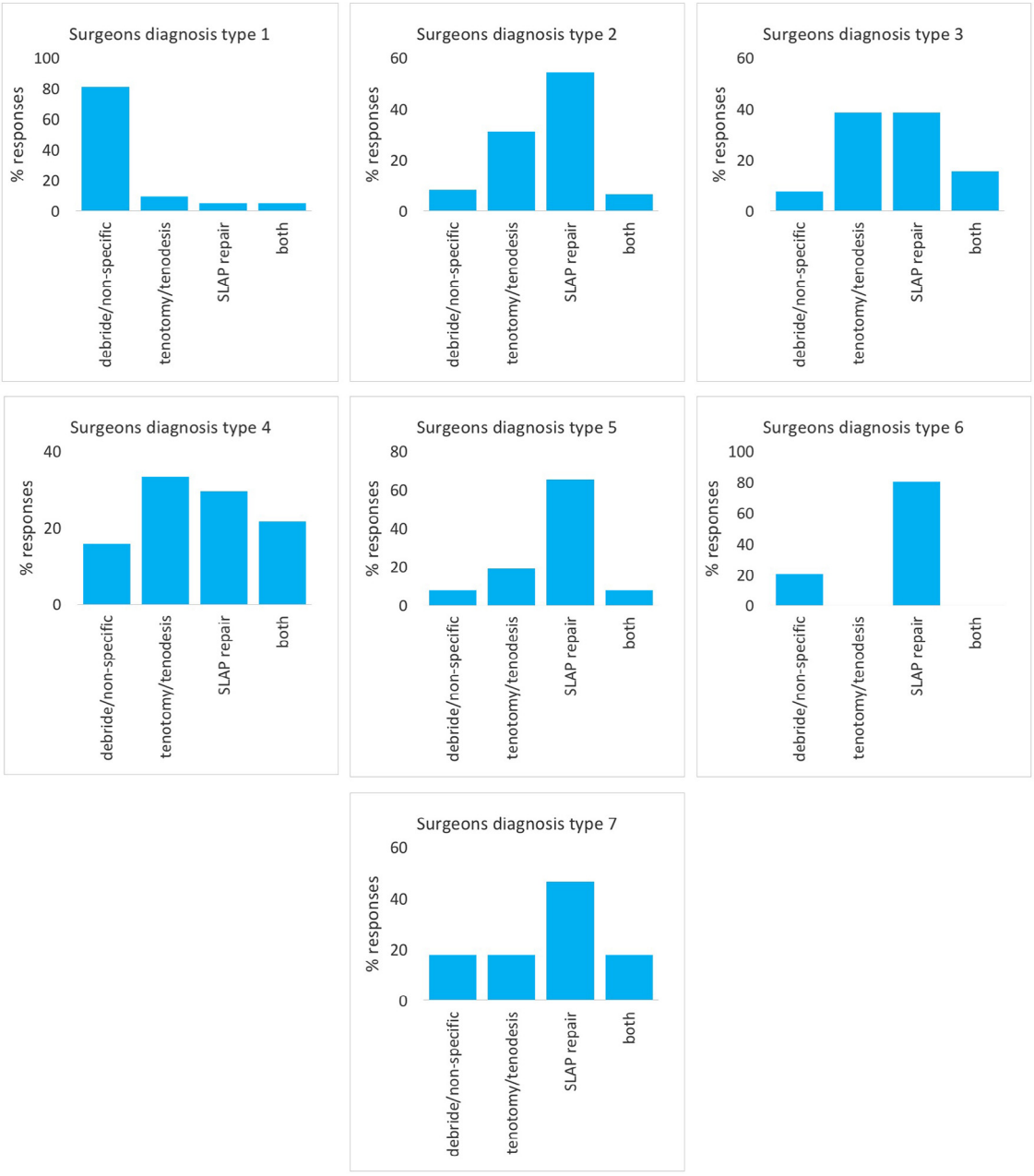

Figure 1 Treatment choice by surgeons' diagnosis. Choice of treatment analyzed according to what the surgeons believed the diagnosis was. The κ value for treatment concordance was 0.20 (fair agreement). *SLAP*, superior labral anterior-posterior lesion.

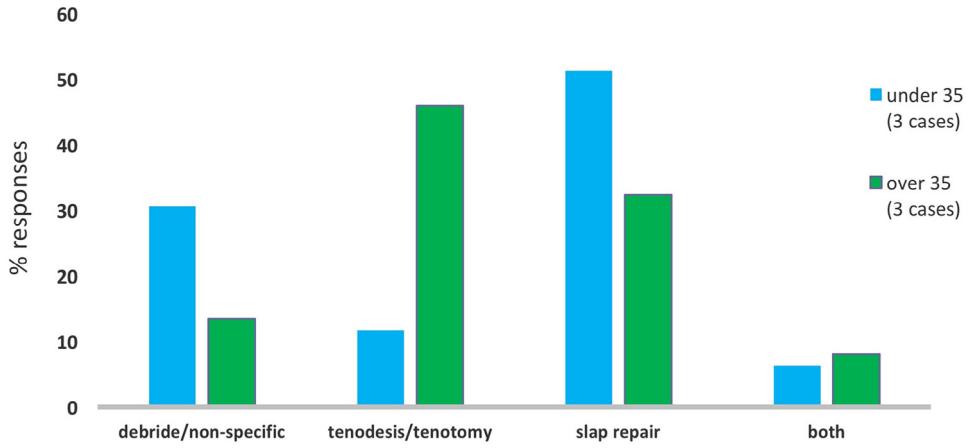

Figure 2 Treatment choice in type II superior labral anterior-posterior (*SLAP*) lesions, by age of the patient. Surgeons were more likely to choose débridement or SLAP repair in patients younger than 35 years, whereas biceps tenotomy/tenodesis was more popular in patients older than 35 years ($P < .0001$, χ^2 test).

When a SLAP repair was selected as the surgeon's choice of treatment in type II lesions, further analysis was performed on the preferred location of anchors; 66% of surgeons (72 responses) selected both anterior and posterior anchors. This was followed by posterior anchors only, then anterior anchors only (Fig. 3).

Biceps tendon treatment choice

When a biceps tendon procedure was selected for treatment of any SLAP type (n = 130), it was far more common for a surgeon to elect for tenodesis than for tenotomy (88% vs. 12%; Fig. 4). Surgeons who chose tenodesis over tenotomy were more likely to have been in practice longer ($P = .007$). However, there was no association with the surgeon's case volume or the patient's age. Open suprapectoral tenodesis was the most common choice of biceps tenodesis (42%).

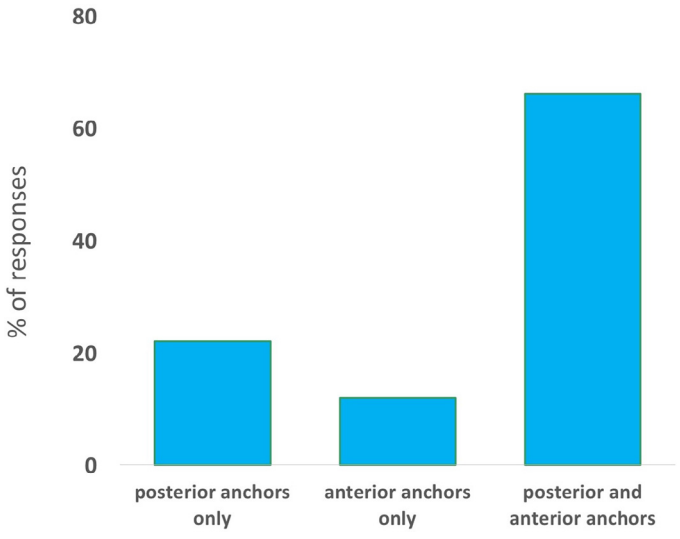

Figure 3 Superior labral anterior-posterior (SLAP) repair choice in type II lesions. In type II lesions, surgeons preferred to use both anterior and posterior anchors (66% of responses). This was followed by posterior anchors only, then anterior anchors only.

Correct diagnosis by surgeon's experience

When the percentage of "correct" diagnoses was analyzed according to the surgeon's level of experience, there was no correlation with either years in practice ($P = .246$) or shoulder arthroscopy volume ($P = .844$, Spearman rho correlation). This suggests that experience does not necessarily correlate with higher accuracy in differentiating between SLAP lesion types.

Discussion

This study demonstrates an Australian perspective on classification and treatment decisions of SLAP lesions. Our results provide an update on the interobserver concordance of the Snyder and Maffet classifications and give some insight into the current preferences of contemporary specialist shoulder surgeons in managing superior labral lesions.

The interobserver concordance level on the classification of SLAP lesions was low in our study. Whereas previous studies on the reliability of the Snyder classification have also concluded a low to moderate interobserver reproducibility, the κ value obtained in those studies was still higher than that seen in our results (0.39-0.8 vs. 0.26).[9,10,17] There are several possible explanations for this. First, this study includes Maffet's expansion of Snyder's classification, and more

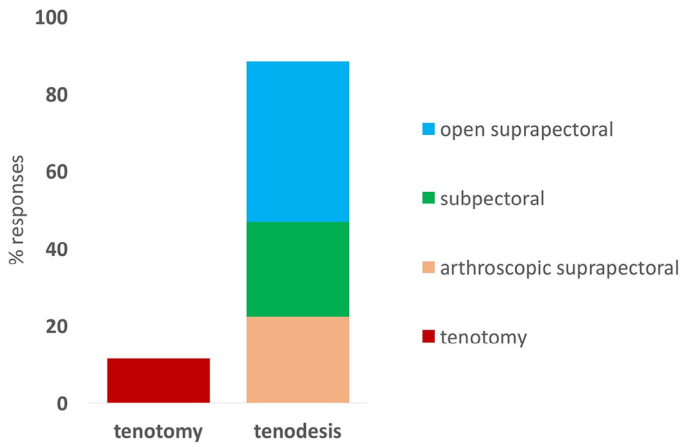

Figure 4 Biceps tendon treatment choice.

options will result in greater interobserver variability. Second, compared with studies by Jia et al[10] and Wolf et al,[17] this investigation included a greater number of surgeons with a broader range of experience. Third, statistically, there are several different methods of calculating the κ values for concordance, and although we used a robust multirater κ calculation method as defined by Fleiss,[8] other studies are less clear in the exact type of κ calculation used.

Our study also shows treatment preference of SLAP lesions among a large group of contemporary shoulder surgeons. Whereas treatment agreement is low between surgeons for each individual vignette, agreement increases when this is analyzed on the basis of what the surgeons thought the SLAP classification type was. This suggests that surgeons are more likely to agree on the treatment for each defined SLAP type than the classification of a particular lesion. For instance, if a surgeon thought a lesion was type I, in 81% of the cases, débridement only was selected as the treatment, whereas if a surgeon thought a lesion was type II, in 91% of cases, a repair or tenodesis/tenotomy procedure (or both) was selected. The low agreement rate among surgeons in classifying between type I and type II lesions therefore raises some concern, as misclassification of type I as type II appears to happen frequently, and unnecessary treatment of type I lesions may result.

Much controversy surrounds the optimal surgical management of type II SLAP lesions. Traditionally, type II lesions were treated with SLAP repair in younger patients and tenodesis/tenotomy in older patients. Recent evidence has suggested that even in younger patients, there is a significant failure rate, with a substantial proportion of patients unable to return to preinjury sporting level.[6,15] Boileau et al[2] directly compared the outcomes of primary biceps tenodesis vs. SLAP repair for type II lesions. Higher rates of satisfaction and return to sports were seen in the tenodesis group. Our survey shows that surgeons still had a slight preference for repair over tenodesis in the group younger than 35 years (Fig. 2), reflecting the ongoing controversy in this issue.

A variety of repair techniques have been described for type II lesions. Some authors warn against placement of anchors anterior to the biceps tendon to avoid tightening of the middle glenohumeral ligament or closure of a sublabral foramen.[18] This may lead to restricted external rotation of the shoulder. Others, however, advocate sutures both posterior and anterior to the biceps tendon to provide a more anatomic repair.[5] This study shows a preference of surgeons for use of >1 anchor for type II lesions, placed both anterior and posterior to the biceps tendon. Biomechanically, anterior and posterior anchors have not been shown to be superior to posterior anchors alone in resisting the peel-back mechanism of failure.[13] It remains to be seen whether the current trend of using both anterior and posterior anchors will continue or change. Further clinical research is required in this area.

Biceps tenotomy is a far less commonly selected procedure than tenodesis in our survey. This may reflect the nature of the clinical vignettes that were presented, as traditionally, tenotomy has been advocated for older, lower demand patients who are not likely to be concerned by the possible cosmetic deformity. However, our data show that the age of the patient does not appear to affect the surgeon's choice of tenotomy vs. tenodesis. Rather, the only factor associated with a higher preference for selecting tenotomy appeared to be the number of years the surgeon has been in practice. This may reflect a change in surgeons' training in recent years.

One weakness of this study is that we did not have a vignette for each of the 7 types of SLAP lesions. However, we believe our selection of cases is representative of how common each SLAP type is in practice—with types III, VI, and VII being far rarer, for example, than a type II lesion. Concerns about surgeons' response rate to the survey limited us from including more clinical vignettes. Other weaknesses of this study include lack of intraobserver variability and lack of a normal shoulder video as control. There are several strengths of our study. These include the fact that this is the first study to assess reliability of Maffet's expansion of Snyder's classification. Second, a broad group of specialist shoulder surgeons were surveyed, and therefore our results are more generalizable and provide insight into contemporary surgeons' preferences in the treatment of SLAP lesions, particularly the controversial type II lesion, which to our knowledge has not been reported before.

Conclusion

In this study, we demonstrate that the interobserver concordance is low when Maffet's extension of the SLAP classification is included with Snyder's classification system. Furthermore, we show that there is still a wide range of preferences in the treatment of SLAP lesions. Surgeons are more likely to treat type II lesions in younger patients with a SLAP repair, whereas in older patients, the treatment of choice is generally a biceps tenodesis.

Disclaimer

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