Systematic Review

Similar outcomes between biceps tenodesis and SLAP repair for SLAP tears in younger patients – A meta-analysis


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ABSTRACT

Objectives: The purpose of this study is to systematically review the comparative studies in the literature to ascertain if biceps tenodesis or superior-labrum anterior to posterior (SLAP) repair results in superior clinical outcomes in the treatment of type II SLAP tears in patients under 40.

Methods: A systematic search of articles in Pubmed, EMBASE and The Cochrane Library databases was carried out according to the PRISMA guidelines. Cohort studies comparing biceps tenodesis to repair in type II SLAP tears in patients under 40 were included. Clinical outcomes were extracted including return to play, reoperations, ASES, and VAS for pain. All statistical analysis was performed using Review Manager. A p-value of <0.05 was considered to be statistically significant.

Results: Five studies were included. Biceps tenodesis resulted in comparable rates of return to play compared to SLAP repair (78.5% vs 67.7%, p = 0.33), and there was no significant difference in return to play in overhead athletes (83.6% vs 74%, p = 0.82). There was no significant difference in ASES score (87.2 vs 86.2, p = 0.27) or VAS score for pain (1.8 vs 2.1, p = 0.48). There was no significant difference in re-operation rates (2.9% vs 10.8%, p = 0.22).

Conclusion: This study found that biceps tenodesis has no significant difference in rates of return to play in athletes, as well as in functional outcome scores and rates of revision surgery in younger patients compared to SLAP repair.

Level of evidence: Level III, Systematic review of Level III studies.

What is already known:

- A systematic review by Hurley et al. found that biceps tenodesis resulted in higher rates of patient satisfaction and return to play with comparable rates of reoperations to SLAP repair.
- They noted a limitation was a lack of comparison in younger patients with their cohort primarily comprised of older patients.
- There has been a recent shift in performing more primary biceps tenodesis in younger patients.

What are the new findings:

- Biceps tenodesis resulted in no difference in rates of return to play in athletes to SLAP repair.
- There are no differences in functional outcome scores and rates of revision surgery between biceps tenodesis and SLAP repair in younger patients primarily in their twenties.
- There is a dearth of literature on the topic and more higher-level research is needed on this topic.
1. Introduction

Superior-labrum anterior to posterior (SLAP) tears are common injuries in athletes, present in up to 26% of shoulder arthroscopies [1,2]. They often occur due to trauma in athletes, or secondary to overuse among overhead athletes. Among young athletes, type II SLAP tears are the most common subtype, and are characterized by superior labral fraying with a detached biceps anchor [2]. The treatment of these in younger patients is controversial, with SLAP repair and biceps tenodesis being the most common surgical options [3–6].

Arthroscopic SLAP repair is the most commonly performed procedure for type II SLAP tears in younger patients [4]. However, a systematic review by Hurley et al. [3] found that biceps tenodesis resulted in higher rates of patient satisfaction and return to play with similar rates of reoperations. Although, they noted a limitation was a lack of comparison in younger patients with their cohort primarily composed of older patients, with a mean age of 38 for those undergoing repair and 45 for those undergoing biceps tenodesis. Nonetheless, there has been a recent shift in performing primary biceps tenodesis in younger patients. Cvjetanovich et al. [4] examined the ABOS database and found that between 2012 and 2017 there was a decrease in the frequency of SLAP repairs being performed, but when they are performed that it was primarily in younger patients.

As SLAP tear treatment in younger patients remains controversial, an updated systematic review focussing on the treatment of younger patients is needed. The purpose of this study is to systematically review the comparative studies in the literature to ascertain if biceps tenodesis or SLAP repair results in superior clinical outcomes in the treatment of type II SLAP tears in patients under 40. Our hypothesis was that biceps tenodesis would result in superior clinical outcomes with higher rates of return to play and a lower reoperation rate.

2. Methods

2.1. Search strategy & study selection

Two independent reviewers (EH & RB) performed a literature search following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines and reviewed the search results, with a senior author arbitrating in the event of a disagreement (BL). The following search terms were used in Pubmed, EMBASE and The Cochrane Library, databases from their inception to January 2023: (tenodesis AND repair) AND (SLAP OR superior labral anterior–posterior). The title and abstract were reviewed for all of the studies identified by the search strategy and then the full texts were reviewed. Additionally, the references of all included studies and all of the literature reviews found were subsequently screened for additional articles meeting the inclusion criteria.

2.2. Eligibility criteria

The inclusion criteria were: 1) cohort studies comparing biceps tenodesis to SLAP repair in type II SLAP tears, 2) under 40 years old, 3) published in a peer-reviewed journal, 4) published in English or full translation freely available, and 5) full text of studies available. All other studies were excluded.

2.3. Data extraction

All relevant information was collected by two independent reviewers using a predetermined data sheet on Microsoft Excel. When required information was not available in the text, the authors were contacted via email. The level of evidence (LOE) was assessed using the criteria from the Oxford – Centre for Evidence Based Medicine. The methodological quality of the evidence (MQOE) was assessed using the Newcastle–Ottawa scale, a 9-point scale where studies with 7–9, 5–6, 4, and 0–3 points were identified as very good, good, satisfactory and unsatisfactory, respectively. Clinical outcomes were extracted including return to play, reoperations, ASES, and VAS for pain.

2.4. Outcomes analysed & statistics

All statistical analysis was performed using Review Manager (RevMan) [Macintosh]. Version 5.3. Copenhagen: The Nordic Cochrane Centre, The Cochrane Collaboration, 2014.). Heterogeneity between studies was quantified using the $I^2$ statistic. Random effects models were used. Results were expressed as risk ratio (RR) for dichotomous outcomes and mean difference (MD) for continuous outcomes, with a 95% confidence interval (95% CI). A p-value of <0.05 was considered to be statistically significant.

3. Results

3.1. Literature search

The initial literature search resulted in 341 total studies. Once duplicates were removed 212 studies were assessed for eligibility and full texts were reviewed. Five studies were included in this review (Fig. 1).

3.2. Study characteristics & patient demographics

There were 5 studies included (all LOE III) [7–11]. One study set a higher limit of 25-year olds, 1 set a higher limit of 30-year olds, 2 set a higher limit of 35-year olds and 1 study set a higher limit of 40-year olds for inclusion. In all of the studies, the SLAP repair was performed arthroscopically. In 3 of the studies the biceps tenodesis was performed via an open approach, and in 2 studies it was performed arthroscopically (Table 1).

3.3. Clinical outcomes

3.3.1. Return to play

Return to play was reported in 5 studies, with 107 patients treated with biceps tenodesis and 158 with SLAP repair. Overall, 78.5% of patients treated with biceps tenodesis and 67.7% of patients treated with SLAP repair returned to play. There was no statistically significant difference (RR: 0.94, 95% CI: 0.84–1.06, $I^2 = 3\%$, $p = 0.33$) (Fig. 2).

3.3.2. Return to play in overhead athletes

Return to play in overhead athletes was reported in 4 studies, with 104 patients treated with biceps tenodesis and 73 with SLAP repair. Overall, 83.6% of patients treated with biceps tenodesis and 74.0% of patients treated with SLAP repair returned to play. There was no statistically significant difference (RR: 0.99, 95% CI: 0.88–1.11, $I^2 = 0\%$, $p = 0.82$) (Fig. 3).

3.3.3. Reoperation

Reoperations were reported in 3 studies with 68 patients treated with biceps tenodesis and 131 patients treated with SLAP repair. With biceps tenodesis, reoperations were reported in 2.9% of patients, compared with 10.7% of patients treated with SLAP repair. There was no statistically significant difference between the treatments (RR: 0.93, 95% CI: 0.81:1.06, $I^2 = 54\%$, $p = 0.28$) (Fig. 4).

3.3.4. ASES score

The ASES score was reported in 4 studies with 86 patients treated with biceps tenodesis and 160 patients treated with SLAP repair. With biceps tenodesis, the mean ASES score was 87.2, compared with 86.2 in patients treated with SLAP repair. There was no statistically significant difference between the treatments (MD: −2.66, 95% CI: −7.40 to 2.09, $I^2 = 27\%$, $p = 0.27$) (Fig. 5).
3.3.5. VAS score for pain

The VAS score for pain was reported in 3 studies with 72 patients treated with biceps tenodesis and 166 patients treated with SLAP repair. With biceps tenodesis, the mean VAS score for pain was 1.8, compared with 2.1 in patients treated with SLAP repair. There was no statistically significant difference between the treatments (MD: 0.28, 95% CI: −5.21 to 1.08, $I^2 = 48\%$, $p = 0.48$) (Fig. 6).

Table 1

<table>
<thead>
<tr>
<th>Author</th>
<th>LOE</th>
<th>MQOE</th>
<th>Biceps tenodesis</th>
<th>SLAP repair</th>
<th>Follow-up (mo.)</th>
<th>Outcomes collected</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dunne et al., 2021</td>
<td>III</td>
<td>7</td>
<td>26.9 ± 5.9</td>
<td>30.4 ± 7.4</td>
<td>41 (24–78)</td>
<td>RTP, RTP Overhead, ASES, VAS</td>
</tr>
<tr>
<td>Hurley et al., 2021</td>
<td>III</td>
<td>7</td>
<td>26 ± 4</td>
<td>24.3 ± 4</td>
<td>60 (18–120)</td>
<td>RTP, RTP Overhead, Resoperation, ASES, VAS</td>
</tr>
<tr>
<td>Lacheta et al., 2022</td>
<td>III</td>
<td>7</td>
<td>28.6 ± 6.1</td>
<td>24.4 ± 5.7</td>
<td>39 (24–72)</td>
<td>RTP, RTP Overhead, Resoperation, ASES</td>
</tr>
<tr>
<td>Parnes et al., 2021</td>
<td>III</td>
<td>7</td>
<td>23</td>
<td>27.8 ± 4.3</td>
<td>83 (&gt;60)</td>
<td>RTP, Resoperation, ASES, VAS</td>
</tr>
<tr>
<td>Rothermich et al., 2022</td>
<td>III</td>
<td>7</td>
<td>17.4 ± 2</td>
<td>17.4 ± 8.8</td>
<td>&gt;24</td>
<td>RTP, RTP Overhead,</td>
</tr>
</tbody>
</table>

M/F: male/female ratio, Mo.: months, MQOE: methodological quality of evidence, N: number, N/R: not reported, Yrs: years.

Age is presented as mean ± standard deviation.
Follow-up is presented as mean (range).

4. Discussion

The most important finding from this study was that biceps tenodesis has no significant difference in rates of return to play in athletes, as well as in functional outcome scores and rates of revision surgery in younger patients, rates of return to play in athletes, as well as functional outcome scores and rates of revision surgery in younger patients primarily in their twenties. However, this systematic review does highlight the dearth of
literature on the topic and the fact that more higher-level research is needed on this topic.

As a result of discouraging results with SLAP repair in the literature, there has been a recent shift towards performing a primary biceps tenodesis and not reserving it solely for revision settings. The percentage of patients treated with SLAP repair decreased from 69.3% in 2002 to 44.8% in 2011, and those treated with biceps tenodesis rose from less than 2% in 2002 to close to 20% in 2011 [12,13]. A further study by Cvetanovich et al. [4] found that between 2012 and 2017, there was a further decrease in the frequency of SLAP repairs being performed, and that when they were performed, it was primarily in younger patients.

It should be noted that some studies have reported good results in appropriately indicated patients, but the majority of the literature on athletes has focused on lower-than-expected rates of return to play with...
the current study also finding 1/3rd being unable to return to play [8,14,15]. Boileau et al. [5] originally described biceps tenodesis as an alternative treatment and also reported the largest difference in rates of return to play between biceps tenodesis and SLAP repair in their cohort of patients in their late thirties and forties. They found that 87% returned to their pre-injury level of play with biceps tenodesis and only 20% returned following SLAP repair. However, no other individual study has found a difference in rates of return to play.

The findings in the current study were similar to those in the systematic review by Hurley et al. [3], despite their study primarily including patients in their forties, whereas the mean age for all patients in this study was in their twenties with no patients included older than forty. Furthermore, there was no overlap in inclusion criteria with all five of our included studies not being present in the study by Hurley et al. [3], and all of the studies in this systematic review being published in the last two years. Neither the previous systematic review nor our study found a significant difference in patient-reported outcomes or re-operation rates. Although Hurley et al. [8] did find a difference in rate of return to play in their systematic review, they did not find any difference when they evaluated younger patients in their institution in rates of return to play, return among overhead athletes or timing of return to play.

Further study is still needed on the optimal treatment of SLAP tears in young patients, with no prospective studies identified in the current search, although, there is one currently registered on clinicaltrials.gov. Ultimately, this will be needed to determine the optimal treatment as well as whether certain subgroups of patients such as collision or overhead athletes should have different treatment algorithms. There may be concern in performing a non-anatomical procedure in overhead athletes as control of the pitching may be affected, as the biceps is the chief elbow supinator and secondary elbow flexor [13,16,17]. Furthermore, Chalmers et al. [18] found that following SLAP repair baseball pitchers demonstrated altered trunk biomechanics in comparison to those players who underwent biceps tenodesis. In contrast, in collision athletes, biceps tenodesis has been shown to be more reliable than repairing SLAP tears in those with concomitant shoulder instability [19,20]. Finally, in those with traumatic rotator cuff tears, there is a lack of comparative studies in performing a SLAP repair or biceps tenodesis.

4.1. Limitations

There are several limitations and inherent biases in our study, firstly the limitations inherent in the included studies are present in this study as this is a systematic review. Firstly, there were no randomized controlled trials in the literature, with all of the included studies being retrospective in nature. There was moderate heterogeneity in some of the outcomes measured. Furthermore, there were several different fixation methods utilized for biceps tenodesis, although these have been shown not to affect the outcome.

5. Conclusion

This study found that biceps tenodesis has no significant difference in rates of return to play in athletes, as well as in functional outcome scores and rates of revision surgery in younger patients compared to SLAP repair.

References


