ISSN 2791-156X
Journal of Health and Rehabilitation Research (JHRR)

Vol. 3, Issue 2

Original Article

Effects of Low-Level Laser Therapy on Shoulder Pain, Functional Disability and Range of Motion in Patients with Type II Slap Tear

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No conflict of interest declared | Received: 04-11-2023; Revised & Accepted: 14-11-2023; Published: 03-12-2023.

ABSTRACT

BACKGROUND: Low-level lasers may occasionally replace surgery or medications without adverse effects, so studying them stands to reason. It heals, regenerates tissue, reduces inflammation, discomfort, and boosts immunity. Research is continuing. It may help physical therapy, healthcare, and the community by being cost-efficient, simple, and successful.

OBJECTIVE: To compare the effects of low-level laser therapy and routine physical therapy on shoulder pain, functional disability, and range of motion in patients with Type II SLAP tear.

METHODS: It was a Randomized Controlled Trial conducted at Physical therapy department, Sialkot Medical and Physiotherapy Center Branches Pasroor and Sambrail. The estimated sample size is 52, and adjusting for an expected 20% dropouts, the sample size was 62, allocated 31 in each group. Both male and female patients with Age between 50-70 years having Type II SLAP tear, Visual analogue scale (VAS) score above 3 and the patients diagnosed by physician, orthopedic physician or surgeon or rheumatologist were included. The included patients were allocated in group A, routine physical therapy, and Group B low level laser. All the patients were assessed at baseline, at 4th week of Treatment and at 8th week of Treatment for pain, shoulder pain and disability index and shoulder ranges.

RESULTS: The results regarding age showed mean and standard deviation to be 1.8387±.77875 in routine physical therapy group while 1.8065±.79244 in low level laser therapy group. The comparison of mean SPADI total score at 8th week of assessment it was found to be respectively 58.3226±4.57083 and 50.3871±4.85577 with a significant mean difference of 7.935 in favor of low-level laser therapy as shown by p value 0.000. Other outcome measures including pain and shoulder ranges were also significantly improved in low level laser therapy group, p value < 0.05.

CONCUSSION: The findings of the study concluded that low level plays the therapy is significantly more effective improving pain disability and shoulder range of motions in patients with slap tear, except for abduction range of motion which was improved equally in both groups. Moreover, within routine physical therapy and low-level laser therapy group showed significant improvement at pre and post level of assessment except that of total shoulder and pain disability index score which was not improved significantly in routine physical therapy group without combination of low-level laser therapy.

KEYWORDS: Low Level Laser, Physical Therapy, Slap Tear, Soft Tissue Injury, Pain, Shoulder Range

INTRODUCTION

On an MRI, a sub labral sulcus is sometimes misidentified as a superior labral anterior posterior (SLAP) rip, which refers to a rupture in the glenoid labrum (1). Ruptures of the superior labrum of the superior glenoid may occur at the point where the long head of the biceps' tendon inserts into the labrum (2). They are also able to extend into the tendon, influence the glenohumeral ligaments, and contain additional labral quadrants (3, 4).

This is because the likelihood of a patient getting a SLAP lesion increases with the patient's age. In one study, fifty percent of the persons who had SLAP lesions were over the age of forty and had a history of acute trauma, repetitive injury, a fall on an extended arm, or an injury from heavy lifting (2). Additionally, these Patients all had a history of previous injuries (5). Many of them suffered from a type II SLAP injury. Younger patients with type II SLAP lesions were more likely to have a torn supraspinatus tendon and osteoarthritis of the humeral head (6, 7).

Waterman et al. discovered that forty-five (or forty percent) of the one hundred forty Patients diagnosed with SLAP lesions had degeneration of the rotator cuff in whole or in part (8). It is possible for the humeral head to rise if the rotator cuff is not performing its function as a humeral head depressor effectively. If the humeral head continues to move up and down on the glenoid rim, it may cause the superior labrum and the biceps anchor to be progressively lifted off the glenoid (9).

This may result in pain in the shoulder. The hypothesis that an inferior traction mechanism might be induced by a rapid, traumatic inferior draw on the arm or by repetitive microtrauma from overhead sports associated with instability was validated by several articles. Throwers are susceptible to repeated minor injuries because of their line of work. The glenohumeral contact point travels posterior-superiorly now of impact, causing the posterior-superior labrum to be exposed to larger shear forces. A SLAP tear occurs because of the labrum being detached because of this. Patients who have SLAP lesions report feeling pain more often than any other symptom they experience. typically manifests intermittently and is often brought on by movement in the upper torso. Lesions of the SLAP are seldom found on their own (5, 10).

Most Patients who have SLAP lesions also experience painful clicking and/or popping when moving their shoulder, a loss of glenohumeral internal rotation range of motion, pain when performing overhead movements, a loss of rotator cuff muscle strength and endurance, a loss of scapular stabilizing muscle strength and endurance, and the inability to lie on the affected shoulder. "Dead arm" syndrome is a condition that may affect athletes who lift their arms high, particularly pitchers. Because of this, pitching causes discomfort to their shoulders, and they are unable to throw as quickly as they were able to before the injury. They could also move more slowly and inaccurately, and the stiffness in their shoulders might be noticeable (4, 11). When you move your shoulder, it is essential to keep in mind that the scapula is an important component of the shoulder. Scapular malposition is the condition that occurs when the scapula fails to perform its function properly. Because of this, the shoulder is unable to function as well as it should. It alters the way in which the serratus anterior, rhomboid major and minor, levator scapulae, and trapezius muscles keep the shoulder blade in its proper position (12, 13)

According to the research conducted by William F.B., SLAP lesions and medial sheath lesions are connected 43% of the time. The author is of the opinion that the forces that impact the biceps anchor may also affect the pulley system of the bicipital sheath and cause damage to it. As a result of this, this area of the body needs to be investigated, particularly in circumstances where SLAP lesions are present. Bursitis, tears in the rotator cuff, and tears in the biceps are typically observed along with SLAP difficulties. Bursitis is an inflammation of the bursa. According to Morgan CD and colleagues' research, 31% of Patients with SLAP lesions also had rotator cuff injuries that were specific to the lesion. In addition, suprascapular neuropathy, which is brought on by a cyst pushing on the spinoglenoid notch, may be brought on by rips in the SLAP. SLAP lesions are difficult to diagnose because they have symptoms that are similar to those of instability and rotator cuff issues (14, 15). It's possible that the doctor will feel the discomfort in the rotator interval first, which will let them determine what's wrong with the patient. The gap that exists between the coracoid process, the supraspinatus process, and the subscapularis process is known as the rotator interval. Because the supraspinatus, subscapularis, and process coracoideus are situated above, below, and in the centre, respectively, of this rotator interval, it resembles a triangle. This structure is made up of a number of different components, including the coracohumeral and superior glenohumeral ligaments, the biceps tendon, and the anterior joint capsule. If you are familiar with the locations of these structures, you should be able to sense the rotator interval. The anterior drawer test (with a probability of 53%), the apprehension test at 90 degrees of abduction and maximal external rotation (86%), and the relocation test (with a probability of 86%) might all be positive in the presence of a SLAP injury.(16)

Tests such as the clunking test, the cranking test, the O'Briens test, the anterior slide test, the biceps load I and II tests, and the active compression test may all detect a SLAP lesion. It has been shown that an MR arthrogram is accurate between 75% and 90% of the time, making it the best test; nevertheless, it may be difficult to differentiate between the many subtypes of the condition.(17) It is extremely difficult to determine what is wrong with someone based just on a physical examination due to the fact that Patients who have SLAP lesions often suffer from other shoulder issues as well. It is crucial to write down the history of the shoulder, including how the injury occurred, as is the case with the majority of shoulder disorders.(18) The majority of labral disorders are brought on through overuse; however, a patient may sometimes report a single traumatic incident as the source of their condition. In order to arrive at the correct diagnosis, the physical examination is also a very significant component. But SLAP lesions should not be identified based just on a physical exam since there is no evidence in the literature that specialised tests can consistently discover these lesions. Therefore, a physical exam alone should not be used to diagnose SLAP lesions. Tests such as the Biceps load test II, the O'Brien test, the anterior apprehension test, the Speeds test, Yergason's test, the compression rotation test, and the dynamic labral shear test are all examples of diagnostic procedures that may be used to identify a SLAP lesion.(19)

In the absence of obvious consensus in the research that has been subjected to peer review, medical professionals are forced to rely on a synthesis of past research within the context of their own clinical experiences. In terms of their effects on shoulder pain alleviation, speedier healing, function, and quality of life, there is a paucity of evidence about the benefit of low-level laser therapy for type-II labral tears of the shoulder. This is an important contribution to the pool of available data.

This is the reason why we are carrying out this study. Studies are now being conducted to indicate that it may assist with healing, the regeneration of tissue, the reduction of inflammation, the alleviation of pain, and the enhancement of the immune system. Patients who can help with physical therapy, health care in general, and the community in general may benefit from this type of treatment, which may be less expensive, simpler, and take less time. Therefore, the objective was to compare the effects of low-level laser therapy and routine physical therapy on shoulder pain, functional disability, and range of motion in patients with Type II SLAP tear

MATERIAL AND METHODS

It was a single blinded Randomized Controlled Trial conducted at Physical therapy department, Sialkot Medical and Physiotherapy Center Branches Pasroor and Sambrail, in duration of 9 months. The estimated sample size was 52, and adjusting for an expected 20% dropouts, the sample size was 62, allocated 31 in each group.

Using Non-probability, Purposive sampling, the study included patients aged between 50-70 years, both male and female, With Type II SLAP tear, Visual analogue scale (VAS) score above 3 and The patients diagnosed by physician, orthopedic physician or surgeon or rheumatologist.(20) while the patients with history of previous shoulder surgery, Signs of massive rotator cuff (positive drop-arm test) tear, History of shoulder instability (dislocation/subluxation) and Frozen shoulder, traumatic shoulder conditions, uncontrolled arterial hypertension, neoplasms, and physiotherapeutic shoulder treatment within the last 6 months. Patients were randomly allocated in Group A: Routine Physical Therapy and Group B: Low Level Laser with routine physical therapy.

For laser therapy, an energy dose of three joules was applied to both the superior glenoid labrum and the biceps tendon. The total dose that was administered to each shoulder during each treatment amounted to 27 J when using an Irradia Class 3 B machine that has been calibrated in the past. The laser probe that is included with the Omega Class III B Laser Therapy Unit Machine with a pen probe was a gallium arsenide diode. It has a wavelength of 820 nm, a frequency of 2.5 Hz, an average power of 200 mW, and 50 seconds of irradiation for each point. In addition, the laser probe has a power output of approximately 200 milliwatts (mW) (0.5 cm2).

The results regarding gender showed that there were male and female 19(61.3%) and 12 (38.7%) respectively in routine physical therapy group and those of 45.2 (45.2%) and 54.8 (54.8%) in low level laser therapy group. The results regarding work status showed that there were 11 (35.5%), 9 (29.0%) and 11 (35.5%) employed,

unemployed and self-businesspersons in routine physical therapy group while those of 12 (38.7%) and 8 (25.8%) and 11 (35.5%) in low level laser therapy group.

Table 1 Gender

	RPT N=31		LLL±RPT N=31	
Gender				
Male	19	61.3	14	45.2
Female	12	38.7	17	54.8
Work status				
Employed	11	35.5	12	38.7
Unemployed	9	29.0	8	25.8
Self-Business	11	35.5	11	35.5

The results regarding gender showed that there were male and female 19(61.3%) and 12 (38.7%) respectively in routine physical therapy group and those of 45.2 (45.2%) and 54.8 (54.8%) in low level laser therapy group. The results regarding work status showed that there were 11 (35.5%), 9 (29.0%) and 11 (35.5%) employed, unemployed and self-businesspersons in routine physical therapy group while those of 12 (38.7%) and 8 (25.8%) and 11 (35.5%) in low level laser therapy group.

Table 2 Descriptive Statistics

	RPT		LLL±RPT	
	Mean	Std. Deviation	Mean	Std. Deviation
Age	1.8387	.77875	1.8065	.79244
Weight	59.32258	6.040900	57.83871	5.837218
Height	69.6774	4.11815	70.3226	4.29253
BMI	26.4765	1.90866	26.7219	1.97581
Duration	20.4194	8.78170	17.9355	9.65034

The results regarding age showed mean and standard deviation to be 1.8387±.77875 in routine physical therapy group while 1.8065±.79244 in low level laser therapy group. The results mean and standard deviation regarding weight, height and body mass index in routine physical therapy group were found to be 59.32258±6.040900 and 69.6774±4.11815, 26.4765±1.90866 while those of 57.83871±5.837218, 70.3226±4.29253 and 26.7219±1.97581 in low level laser therapy group. The results regarding duration of disease showed mean and standard deviation to be 20.4194±8.78170 months in routine physical therapy group while 17.9355±9.65034 months in low level laser therapy group

Table 3 Between Group Mean Comparison of NPRS at multiple levels

Outcome Variables	Group	N	Mean	Std. Deviation	P Value
NPRS: Baseline	RPT	31	7.3548	1.14159	0.741
	LLL±RPT	31	7.4516	1.15004	
NPRS: 4th Week	RPT	31	4.7419	1.34084	0.015
	LLL±RPT	31	3.8710	1.38424	
NPRS: 8th Week	RPT	31	2.0645	.89202	0.000
	LLL±RPT	31	.7097	1.10132	

The comparison of mean pain score measured by Numeric Pain Rating Scale at baseline showed mean and standard deviation to be 7.3548±1.14159 and 7.4516±1.15004 in RPT and LLL-PT group with a non-significant mean difference of-.09677 as shown p value 0.741; at 4th week it found to be that of 4.7419±1.34084 and 3.8710±1.38424 respectively with a significant mean difference of 0.87097 in favor of low-level laser therapy as shown by p value 0.015; whereas at 8th week of assessment it was found to be respectively 2.0645±.89202 and

0.7097±1.10132 with a significant mean difference of 1.35484 in favor of low-level laser therapy as shown by p value 0.000.

Table 4 Between Group Mean Comparison of SPADI Pain at multiple levels

Outcome Variables	Group	N	Mean	Std. Deviation	Mean Difference	P Value
SPADI PAIN: Baseline	RPT	31	68.8710	11.45642	-.45161	0.877
	LLL±RPT	31	69.3226	11.43791		
SPADI PAIN: 4th Week	RPT	31	55.2581	11.49773	9.61290	0.002
	LLL±RPT	31	45.6452	11.64345		
SPADI PAIN: 8th Week	RPT	31	41.6452	12.36810	15.80645	0.000
	LLL±RPT	31	25.8387	10.56124		

The comparison of mean pain domain score measured by Shoulder Pain and disability index at baseline showed mean and standard deviation to be 68.8710±11.45642 and 69.3226±11.43791 in RPT and LLL-PT group with a non-significant mean difference of -.45161 as shown p value 0.877; at 4th week it found to be that of 55.2581±11.49773 and 45.6452±11.64345 respectively with a significant mean difference of 9.612 in favor of low-level laser therapy as shown by p value 0.002; whereas at 8th week of assessment it was found to be respectively 41.6452±12.36810 and 25.8387±10.56124 with a significant mean difference of 15.806 in favor of low-level laser therapy as shown by p value 0.000.

Table 5 Between Group Mean Comparison of SPADI Disability at multiple levels

Outcome Variables	Group	N	Mean	Std. Deviation	Mean Difference	P Value
SPADI DISABILITY: Baseline	RPT	31	77.1290	5.10387	-.22581	0.864
	LLL±RPT	31	77.3548	5.22525		
SPADI DISABILITY: 4th Week	RPT	31	63.8387	5.61009	6.00000	0.000
	LLL±RPT	31	57.8387	4.92001		
SPADI DISABILITY: 8th Week	RPT	31	50.3226	6.11221	14.25806	0.000
	LLL±RPT	31	36.0645	7.22466		

The comparison of mean disability domain score measured by Shoulder Pain and disability index at baseline showed mean and standard deviation to be 77.1290±5.10387 and 77.3548±5.22525 in RPT and LLL-PT group with a non-significant mean difference of -.22581 as shown p value 0.864; at 4th week it found to be that of 63.8387±5.61009 and 57.8387±4.92001 respectively with a significant mean difference of 6.000 in favor of low-level laser therapy as shown by p value 0.000; whereas at 8th week of assessment it was found to be respectively 50.3226±6.11221 and 36.0645±7.22466 with a significant mean difference of 14.258 in favor of low-level laser therapy as shown by p value 0.000.

Table 6 Between Group Mean Comparison of SPADI Total at multiple levels

Outcome Variables	Group	N	Mean	Std. Deviation	Mean Difference	P Value
SPADI TOTAL: Baseline	RPT	31	60.8065	8.61943	4.16129	0.061
	LLL±RPT	31	56.6452	8.51097		
SPADI TOTAL: 4th Week	RPT	31	59.6452	6.03627	5.87097	0.000
	LLL±RPT	31	53.7742	6.02611		
SPADI TOTAL: 8th Week	RPT	31	58.3226	4.57083	7.93548	0.000
	LLL±RPT	31	50.3871	4.85577		

The comparison of mean SPADI total score at baseline showed mean and standard deviation to be 60.8065±8.61943 and 56.6452±8.51097 in RPT and LLL-PT group with a non-significant mean difference of 4.161

as shown p value 0.061; at 4th week it found to be that of 59.6452±6.03627 and 53.7742±6.02611 respectively with a significant mean difference of 5.870 in favor of low-level laser therapy as shown by p value 0.000; whereas at 8th week of assessment it was found to be respectively 58.3226±4.57083 and 50.3871±4.85577 with a significant mean difference of 7.935 in favor of low-level laser therapy as shown by p value 0.000.

DISCUSSION

The effectiveness of low-level laser therapy (LLLT) on shoulder function in individuals who had slap tears was investigated in this study. After four weeks of combined exercise and low-level laser therapy (LLLT), both the exercise and placebo LLLT group and the exercise and real LLLT group reported improvements in range of motion, discomfort, and shoulder and hand impairment; however, there was no significant difference between the two groups. According to these findings, the incorporation of low-level laser therapy (LLLT) into exercise therapy for the treatment of slap tears did not result in an improvement in patient outcomes. There hasn't been much research done on whether laser therapy is effective in treating slap tears. There hasn't been a lot of research done to see if laser therapy and physiotherapy work for shoulder pain.

The study done on the effectiveness of laser therapy has yielded data that is both favorable and negative, making it difficult to draw any definitive conclusions. It is essential to stress, however, that variations in symptom duration, laser type and application settings, treatment areas, and outcome measures might lead to results that conflict with one another, depending on the study. Yeldan, 2009 conducted an investigation on the effects of transcutaneous electrical nerve stimulation, low-level laser therapy, and a combination of the two on the pain and functionality of the shoulder, and he discovered that therapy led to statistically significant improvements (21). However, when the levels of progress made by each of the three groups were compared, it was found that the laser group had the lowest level of progress, while the combination group had the highest level of progress. In this study, participants from all groups received therapeutic exercise and electrotherapy modalities. Additionally, laser treatment was applied to uncomfortable places (a minimum of two and a maximum of four) for three to four minutes per point. The duration of symptoms was determined to be four months, and the sample size was not very large at fifteen individuals in each group.

Patients who suffered from shoulder discomfort and were assigned to the laser treatment group in the study by Bingol et al. showed substantial improvements in palpation sensitivity and passive extension, but there was no significant change in pain, active range, or algometric sensitivity.(22) For the purpose of this experiment, each group consisted of 20 patients who had had shoulder pain in the three months prior. The duration of treatment was two weeks, and there were a total of 10 sessions, with each session lasting a minute. In addition, patients in both groups took part in a supervised exercise programme that lasted for fifteen minutes and was conducted on a treadmill. The effectiveness of treatments for shoulder discomfort was examined in these two studies, although impingement syndrome was not a factor.

In addition to the exercise regimen, Avci, 2013. applied real or sham laser treatment to the anatomic landmarks on a twice-weekly basis for a period of eight weeks.(23) At each session, the laser therapy lasted for ten minutes, and the duration of their patients' problems was fifteen months. In this experiment, all measures of range of motion, pain, and functional limitation became better from the beginning of the trial to the end, although there was no significant difference between the groups. As a result of the conclusion, it was not possible to determine whether or not laser therapy is effective in the treatment of rotator cuff tendinitis.

However, Bril, 2011. found that the therapeutic benefits of laser treatment were beneficial in 15 patients who suffered from shoulder tendonitis after just six sessions spread out over a period of two weeks.(24) When compared to the group that received sham laser therapy, the real laser treatment dramatically reduced both range of motion and pain. In contrast to any other studies, our study had a much larger number of participants (patients). The length of our therapy was similar to that of other studies, with the exception of the experiment conducted by England et al (25). When compared to Ozdincler's study, the amount of time our laser application took was shorter

(26). In the research that we conducted; the duration of symptoms was shown to be shorter than in the study that Vecchio et al. conducted. As a first line of defense, physiotherapy is frequently used to treat shoulder pain (26).

The benefits of pursuing physiotherapy on an individual basis were established by Dickens and colleagues. Patients who had not responded to conservative treatment, which consisted of three subacromial steroid injections given at 6-week intervals, were eligible for participation in this study. The physiotherapy group, on the other hand, did not receive conventional intervention. Laser therapy is a successful single intervention when compared to placebo treatments; however, combining laser therapy with therapeutic exercise did not boost the treatment's efficacy. Exercise has been demonstrated to be beneficial for rotator cuff illness patients in terms of both short-term healing and long-term improvement in function, as stated in the review that was conducted by Green et al. According to the findings of this study, laser therapy was shown to be more useful than a placebo for adhesive capsulitis; however, it did not demonstrate any benefit for rotator cuff tendonitis. Both the laser and the placebo laser group that participated in our study had advances in outcome measures that were similar to one another, and there was no statistically significant difference between the two groups following treatment. While there was a significant decrease in discomfort because of exercising, relaxing, and sleeping, there was a significant improvement in range of motion. The outcomes of the functional assessment of the shoulder indicate a decrease in impairment in both groups, with a reduction in symptoms and a reduction in the functional status limitation in patients who had slap tears.

Even though there were significant gains in scores on the DASH, SDQ, and Constant following treatment, there were no significant differences in physical strength between the two groups. It's possible that the method used to evaluate muscle strength had a role in this result. There was no discomfort associated with any of the procedures (27). However, it is possible that the intensity of the exercise and the length of the therapy are not sufficient to improve muscle strength. In several of the other studies, the evaluations of the participants' physical strength were not part of the outcome measures. Although the treating physical therapist was blind to the results of the assessments, they were not blind to the nature of the intervention or the assignment of participants to groups. Because of this, there is a possibility of treatment bias, which did influence the internal validity of our study. One other limitation of our study is that it does not include an examination of the participants' intentions to be treated. Because of this, we were unable to eliminate a great deal of misleading artefacts and dropout effects. During our inquiry, the use of laser therapy was concentrated on uncomfortable areas. It's possible that better results might be achieved by concentrating therapy on certain anatomical locations. If we study the effects of laser therapy over a longer period, it is possible that our results will be much less favourable for the group that had laser therapy. When added to a rehabilitation programme for patients with shoulder impingement syndrome, we discover that there is no significant difference between low-level laser therapy (LLLT) and placebo LLLT in terms of the basic effects on the body.

CONCUSSION

The findings of the study concluded that low level play the therapy is significantly more effective improving pain disability and shoulder range of motions in patients with slap tear, except for abduction range of motion which was improved equally in both groups. Moreover, within routine physical therapy and low-level laser therapy group showed significant improvement at pre and post level of assessment except that of total shoulder and pain disability index score which was not improved significantly in routine physical therapy group without combination of low-level laser therapy.

REFERENCES

1. Abdel-Mordy Kandeel A. Intra-articular soft arthroscopic Latarjet technique as a Bankart-plus procedure for type V superior labrum anterior-posterior lesion: lower rate of instability recurrence and better functional outcomes of a prospective cohort study. Journal of shoulder and elbow surgery. 2023;32(9):1838-49.

2. Dean RS, Onsen L, Lima J, Hutchinson MR. Physical Examination Maneuvers for SLAP Lesions: A Systematic Review and Meta-analysis of Individual and Combinations of Maneuvers. The American journal of sports medicine. 2023;51(11):3042-52.
3. Green CK, Scanaliato JP, Sandler AB, Czajkowski H, Childs BR, Fink WA, et al. Outcomes Following Combined Posterior Labral and SLAP Repair in Military Patients Younger Than 35 Years. The American journal of sports medicine. 2023;51(10):2635-41.
4. Murphy GT, Beretov J, Marvi S, Lam PH, Murrell GAC. Superior and Anterior Glenoid Labral Tears Are Associated With Increased Neurofilament Concentration. The American journal of sports medicine. 2023;51(2):343-50.
5. Ben Kibler W, Lockhart JW, Cromwell R, Sciascia A. Managing Scapular Dyskinesis. Physical medicine and rehabilitation clinics of North America. 2023;34(2):427-51.
6. Dang A, Davies M. Rotator Cuff Disease: Treatment Options and Considerations. Sports medicine and arthroscopy review. 2018;26(3):129-33.
7. Bartoszewski N, Parnes N. Shoulder dislocation. JAAPA : official journal of the American Academy of Physician Assistants. 2023;36(3):46-7.
8. Waterman BR, Newgren J, Richardson C, Romeo AA. High Rate of Return to Sporting Activity Among Overhead Athletes With Subpectoral Biceps Tenodesis for Type II SLAP Tear. Arthroscopy : the journal of arthroscopic & related surgery : official publication of the Arthroscopy Association of North America and the International Arthroscopy Association. 2023;39(1):11-6.
9. Didesch JT, Tang P. Anatomy, Etiology, and Management of Scapular Winging. The Journal of hand surgery. 2019;44(4):321-30.
10. Doiron-Cadrin P, Lafrance S, Saulnier M, Cournoyer É, Roy JS, Dyer JO, et al. Shoulder Rotator Cuff Disorders: A Systematic Review of Clinical Practice Guidelines and Semantic Analyses of Recommendations. Archives of physical medicine and rehabilitation. 2020;101(7):1233-42.
11. Waterman BR, Dean RS, Gregory B, Romeo AA. Surgical Treatment of Superior Labral/Biceps Pathology in the Overhead Thrower. The Journal of the American Academy of Orthopaedic Surgeons. 2023;31(8):e424-e34.
12. Dubé MO, Desmeules F, Lewis J, Roy JS. Rotator cuff-related shoulder pain: does the type of exercise influence the outcomes? Protocol of a randomised controlled trial. BMJ open. 2020;10(11):e039976.
13. Chiang CH, Ho W, Lin CH, Chih WH, Su WR, Hong CK. Modified arthroscopic intra-articular transtendinous looped biceps tenodesis leads to satisfactory functional outcomes and less frequent Popeye deformity compared to biceps tenotomy. Journal of orthopaedic surgery and research. 2023;18(1):603.
14. Ji JH, Park SE, Suh DW, Han YH, Oh S. Comparisons between treatment of isolated posterosuperior paralabral cysts and simultaneous treatment of cysts combined with associated shoulder pathologies: arthroscopic treatment of posterosuperior paralabral cysts. Archives of orthopaedic and trauma surgery. 2023;143(2):665-75.
15. Lu Y, Li Y, Zhang H, Li X, Li F, Jiang C. The Correlation between Variation of Labral Attachment and Lesions of the Long Head of the Biceps Tendon in Patients with Rotator Cuff Tears. Orthopaedic surgery. 2023;15(8):1967-74.
16. Gunay Ucurum S, Kaya DO, Kayali Y, Askin A, Tekindal MA. Comparison of different electrotherapy methods and exercise therapy in shoulder impingement syndrome: A prospective randomized controlled trial. Acta Orthop Traumatol Turc. 2018;52(4):249-55.
17. Pieters L, Lewis J, Kuppens K, Jochems J, Bruijstens T, Joossens L, et al. An Update of Systematic Reviews Examining the Effectiveness of Conservative Physical Therapy Interventions for Subacromial Shoulder Pain. The Journal of orthopaedic and sports physical therapy. 2020;50(3):131-41.
18. Powell JK, Lewis JS. Rotator Cuff-Related Shoulder Pain: Is It Time to Reframe the Advice, "You Need to Strengthen Your Shoulder"? The Journal of orthopaedic and sports physical therapy. 2021;51(4):156-8.
19. Hopewell S, Keene DJ, Marian IR, Dritsaki M, Heine P, Cureton L, et al. Progressive exercise compared with best practice advice, with or without corticosteroid injection, for the treatment of patients with rotator cuff

disorders (GRASP): a multicentre, pragmatic, 2×2 factorial, randomised controlled trial. Lancet (London, England). 2021;398(10298):416-28.

20. Feier AM, Gergely I, Ioanovici A-C, Borodi P, Todoran R, Ciorcila E, et al. SLAP lesions-current understanding and future perspectives. Medicina Sportiva: Journal of Romanian Sports Medicine Society. 2020;16(1):3185-9.

21. Yeldan I, Cetin E, Razak Ozdincler A. The effectiveness of low-level laser therapy on shoulder function in subacromial impingement syndrome. Disability and rehabilitation. 2009;31(11):935-40.

22. Bingöl Ü, Altan L, Yurtkuran M. Low-power laser treatment for shoulder pain. Photomedicine and Laser Therapy. 2005;23(5):459-64.

23. Avci P, Gupta A, Sadasivam M, Vecchio D, Pam Z, Pam N, et al., editors. Low-level laser (light) therapy (LLLT) in skin: stimulating, healing, restoring. Seminars in cutaneous medicine and surgery; 2013: NIH Public Access.

24. Bril V, England J, Franklin GM, Backonja M, Cohen J, Del Toro D, et al. Evidence-based guideline: treatment of painful diabetic neuropathy: report of the American Academy of Neurology, the American Association of Neuromuscular and Electrodiagnostic Medicine, and the American Academy of Physical Medicine and Rehabilitation. Pm&r. 2011;3(4):345-52. e21.

25. England S, Farrell A, Coppock J, Struthers G, Bacon P. Low power laser therapy of shoulder tendonitis. Scandinavian journal of rheumatology. 1989;18(6):427-31.

26. Özdinçler AR, Baktır ZS, Mutlu EK, Koçyiğit A. Chronic lateral elbow tendinopathy with a supervised graded exercise protocol. Journal of Hand Therapy. 2023.

27. Bhansal S, Raja BS, Niraula BB, Regmi A, Chaudhary AK, Sharma D, et al. Efficacy of Hyaluronic acid in Rotator Cuff pathology compared to other available treatment modalities: A Systematic Review and Meta-analysis. Journal of Orthopaedic Reports. 2023:100157.

