ISSN: 2321-5690
IJOPT
INDIAN JOURNAL OF PHYSICAL THERAPY
AN INTERNATIONAL JOURNAL
INDIAN JOURNAL OF PHYSICAL THERAPY
AN INTERNATIONAL JOURNAL
editor.ijopt@gmail.com

COMPARISON OF LOW LEVEL LASER THERAPY VERSUS ULTRASOUND THERAPY COMBINED WITH MULTIDIRECTIONAL STRETCHING IN PATIENTS WITH ADHESIVE CAPSULITIS

Dr. A.K. Vijaya Krishna Kumar[1*], Shreshta L S[2]
[1*] Principal, Dr. B. R. Ambedkar College of Physiotherapy
[2] BPT Intern, Dr. B. R. Ambedkar College of Physiotherapy

***Corresponding Author:** hoddrbracp@gmail.com
DOI: https://doi.org/10.63299/ijopt.070100

ABSTRACT

Background: Frozen shoulder (adhesive capsulitis) is characterized by pain and progressive restriction of active and passive shoulder movements due to capsular fibrosis. It affects 2–5% of the general adult population and up to 20% of individuals with diabetes, with higher prevalence in women aged 40–60 years. Heat-based modalities targeting collagen tissues are commonly used in its management.

Objective: To compare the effects of Low-Level Laser Therapy (LLLT) and Ultrasound Therapy (UST), both combined with multidirectional stretching, on pain, shoulder range of motion, and functional disability in patients with adhesive capsulitis.

Methodology: A comparative study was conducted on 20 patients diagnosed with adhesive capsulitis, randomly allocated into two groups ($n = 10$ each). Group A received LLLT with multidirectional stretching, while Group B received UST with multidirectional stretching. Interventions were administered five sessions per week for two weeks. Outcome measures included the Numerical Pain Rating Scale (NPRS), Shoulder Pain and Disability Index (SPADI), and shoulder range of motion assessed using a goniometer. Pre- and post-treatment data were statistically analyzed.

Results: Both groups demonstrated significant improvements in pain, functional ability, and shoulder range of motion ($p < 0.001$). However, the LLLT group showed significantly greater pain reduction ($p = 0.003$), greater improvement in functional disability ($p = 0.043$), and superior gains in shoulder range of motion compared to the UST group ($p < 0.05$).

Conclusion: Both LLLT and UST combined with multidirectional stretching were effective in managing adhesive capsulitis; however, LLLT demonstrated superior outcomes and may be considered a more effective adjunct in rehabilitation.

Keywords: Adhesive capsulitis, Low level laser therapy, Ultrasound therapy, Multidirectional stretching, Shoulder pain disability and index, Numerical Pain Rating Scale, Range of Motion.

INTRODUCTION

The shoulder is a biomechanically complex joint, functioning as a ball-and-socket articulation that permits extensive mobility while maintaining functional stability. This stability is provided by static structures, including the coracohumeral ligament and the superior, middle, and inferior glenohumeral ligaments connecting the scapula to the humerus.

The term ‘scapulohumeral periarthritis’ was first introduced by Duplay in 1872. Subsequently, Codman in 1934 described frozen shoulder as a progressively painful condition associated with increasing stiffness,

nocturnal discomfort, and difficulty sleeping on the affected side, along with reduced forward elevation and external rotation. Later, Neviaser (1945) coined the term
adhesive capsulitis after observing capsular thickening and adhesions during surgical exploration of affected shoulders.[1]

Adhesive capsulitis is characterized by fibrosis and thickening of the joint capsule, particularly involving its inferior recesses, resulting in restricted shoulder mobility. The condition typically occurs between 40 and 65 years of age and develops gradually. Secondary adhesive capsulitis may arise following trauma, prolonged immobilization, rheumatoid arthritis, osteoarthritis, or systemic conditions such as diabetes mellitus and thyroid dysfunction.[2]

Epidemiological studies report a prevalence of 2–5% in the general population, with higher occurrence in women. In the Indian population, prevalence has been reported to range from 7% to 20%.[3] Clinically, adhesive capsulitis progresses through three stages: freezing, frozen, and thawing.The freezing stage is marked by progressive onset of pain and stiffness, often exacerbated at night and during arm movements, lasting approximately 10–36 weeks. The frozen stage is characterized by pronounced restriction of movement in all planes, with functional limitations and pain at end-range movements, typically persisting for 4–12 months. During the thawing stage, pain gradually subsides and shoulder mobility improves, with near-normal range of motion returning over 5–26 months depending on individual recovery and rehabilitation.[4]
Rehabilitation strategies commonly include active and active-assisted exercises such as pendulum movements, wand exercises, wall climbing, ladder exercises, and capsular stretching to restore joint mobility. Joint mobilization techniques are frequently employed to enhance capsular extensibility. Electrotherapy modalities including ultrasound, interferential therapy, short-wave diathermy, and low-level laser therapy are often used adjunctively to reduce pain, facilitate tissue healing, and improve the effectiveness of stretching interventions.[5]
Low-Level Laser Therapy (LLLT), also referred to as photobiomodulation, exerts its effects through non-thermal mechanisms by enhancing mitochondrial activity, modulating inflammatory mediators, and improving microcirculation. These effects contribute to pain reduction and tissue repair. Previous studies have demonstrated sustained improvements in pain and shoulder function following LLLT in patients with adhesive capsulitis.[6]

Ultrasound therapy (UST) produces both thermal and mechanical effects, including increased tissue temperature, enhanced blood flow, improved collagen extensibility, and metabolic facilitation.[7] While some studies report enhanced outcomes when ultrasound is combined with stretching[8], others suggest minimal additional benefit compared to exercise alone.[9]

Multidirectional stretching involves stretching the shoulder capsule and surrounding musculature across multiple planes, including flexion, abduction, internal rotation, and external rotation. This technique aims to improve capsular extensibility, restore balanced mobility, and reduce compensatory movement patterns.Stretching may help elongate contracted tissues, enhance viscoelastic properties, and improve the tolerance to stretch, thereby increasing range of motion.[10] Evidence suggests that dynamic multidirectional stretching may be superior to static stretching for improving rotational movements in adhesive capsulitis.[11]
When combined with modalities such as UST or LLLT, stretching may yield synergistic therapeutic effects.
Therefore, the present study aims to compare the effectiveness of Ultrasound Therapy combined with Multidirectional Stretching and Low-Level Laser Therapy combined with Multidirectional Stretching in patients with adhesive capsulitis, focusing on pain reduction, improvement in range of motion, and enhancement of functional ability.

OBJECTIVE

The aim of this study was to compare the effectiveness of low-level laser therapy and ultrasound therapy in reducing pain in patients with adhesive capsulitis. It also aimed to evaluate improvements in shoulder range of motion and functional ability when these therapies were combined with multidirectional stretching.

METHODOLOGY

1. STUDY DESIGN: Comparative study
2. STUDY SETTING: Dr. BR Ambedkar College of Physiotherapy, Bangalore 560045
3. SAMPLE SIZE: 20 Participants
4. SAMPLING METHOD: Convenient sampling method
5. TREATMENT DURATION: 5 sessions were conducted per week over a 2-week period.

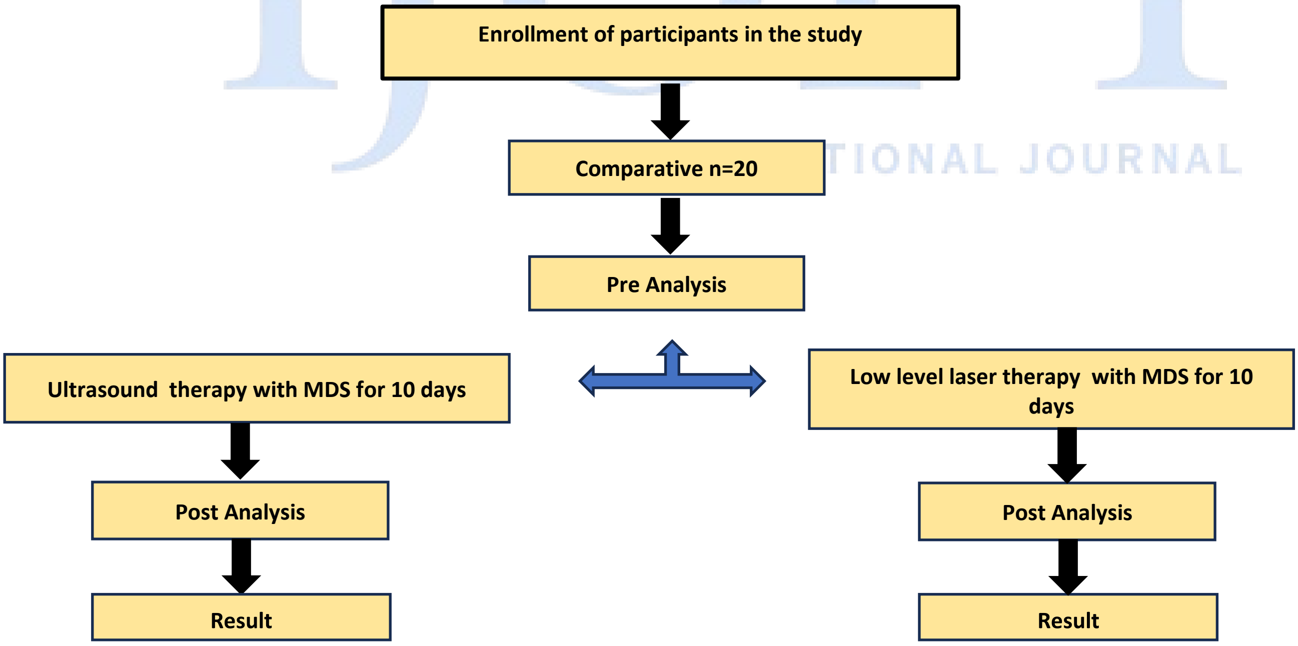
INCLUSION CRITERIA:

- Patients clinically diagnosed with adhesive capsulitis
- Male and female patients with diabetes mellitus aged between 45 and 60 years
- Patients presenting with shoulder pain and stiffness for a minimum duration of three months
- Patients with unilateral adhesive capsulitis
- Patients demonstrating a positive Apley scratch test
- Individuals able to understand instructions and willing to participate in the study

EXCLUSION CRITERIA:

- History of recent surgical intervention involving the affected shoulder
- Post-traumatic shoulder pain and stiffness
- Presence of cervical radiculopathy
- Previous fracture involving the shoulder complex
- Diagnosed rotator cuff pathology or tendon calcification
- Contraindications to laser or ultrasound therapy, including malignancy or pacemaker implantation

OUTCOME MEASURES: SPADI, NPRS, ROM
MATERAIALS: Chair, Goniometer, Ultrasound Therapy Machine, Coupling gel, Cotton, Terraquant laser machine, laser goggles.



PROCEDURE

A total of 20 participants were recruited from Dr. B. R. Ambedkar College of Physiotherapy and were randomly allocated into two groups, with 10 participants in each group. All participants received treatment five sessions per week for a duration of two weeks. Initial screening was performed, and individuals not fulfilling the inclusion criteria were excluded.

Group A: Low-Level Laser Therapy (LLLT) with Multidirectional Stretching

Participants in Group A received low-level laser therapy using the TerraQuant laser machine (Program 2). LLLT was applied for 5 minutes per point over 2–3 points around the shoulder capsule, targeting areas of maximum pain and stiffness. Treatment was administered five times per week for two weeks. During therapy, participants were seated comfortably with the affected shoulder exposed. The skin was inspected and cleaned prior to application. The laser probe was held perpendicular to the skin at a distance of 0.5–2 cm without direct contact, and patients were monitored for any discomfort.

Immediately following LLLT, multidirectional stretching exercises were performed, including shoulder flexion, extension, abduction, and horizontal adduction. Each exercise was performed for three sets of ten repetitions, with a stretch hold of 20–30 seconds, under physiotherapist supervision. Outcome measures—Numerical Pain Rating Scale (NPRS), Shoulder Pain and Disability Index (SPADI), and shoulder range of motion using goniometry—were recorded before and after the intervention. Safety precautions were strictly followed, including the use of laser safety goggles by both therapist and patient.

Group B: Ultrasound Therapy with Multidirectional Stretching

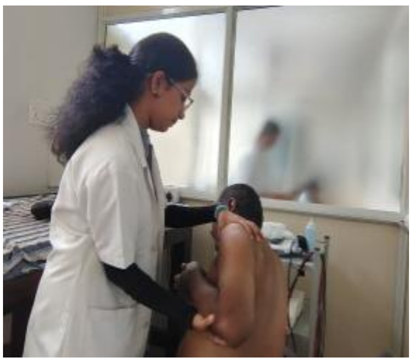
Participants in Group B received therapeutic ultrasound using a standard physiotherapy ultrasound unit. The patients were positioned comfortably with the affected shoulder exposed, and the treatment area was inspected and cleaned. A coupling gel was applied to ensure optimal transmission of ultrasound waves. Ultrasound was delivered using a frequency of 1 MHz in continuous mode at an intensity of 1.0–1.5 W/cm² for 10 minutes. Treatment sessions were conducted five times per week for two weeks.

Following ultrasound therapy, multidirectional stretching exercises for shoulder flexion, extension, abduction, and horizontal adduction were performed using the same protocol as Group A. Outcome measures (NPRS, SPADI, and goniometric ROM) were assessed pre- and post-intervention. Participants were continuously monitored for any adverse reactions, and all safety measures were maintained throughout the study.

LLLT for Right Shoulder

UST for Right Shoulder

MDS for Shoulder Flexion



MDS for ShoulderExtension

MDS for Shoulder ABD

MDS for Shoulder horizonal adduction

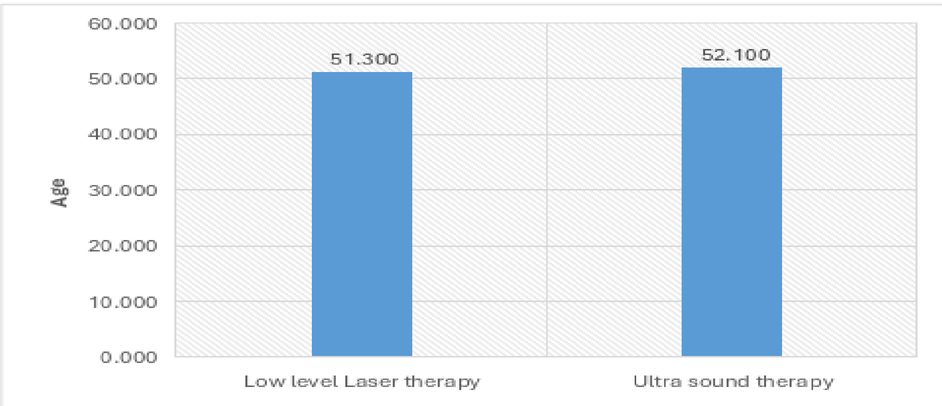
DATA ANALYSIS

The statistical analysis was performed using SPSS version 23.0. Continuous variables were summarized as mean ± standard deviation, while categorical variables were expressed as frequencies and percentages. Comparisons between the groups performed using the unpaired t-test, and Pre –post comparison was done using paired t test. A p-value of <0.05 was considered statistically significant.

Table 1: Comparison based on age

		N	Mean	Std. Deviation	t value	p value
Age	Low level Laser therapy	10	51.300	5.458	0.36100	0.722
	Ultra sound therapy	10	52.100	4.383		

The mean age of participants in the Low Level Laser Therapy group was 51.3 ± 5.46 years, while in the Ultrasound Therapy group it was 52.1 ± 4.38 years. The difference between the groups was not statistically significant ($t = 0.361$, $p = 0.722$).

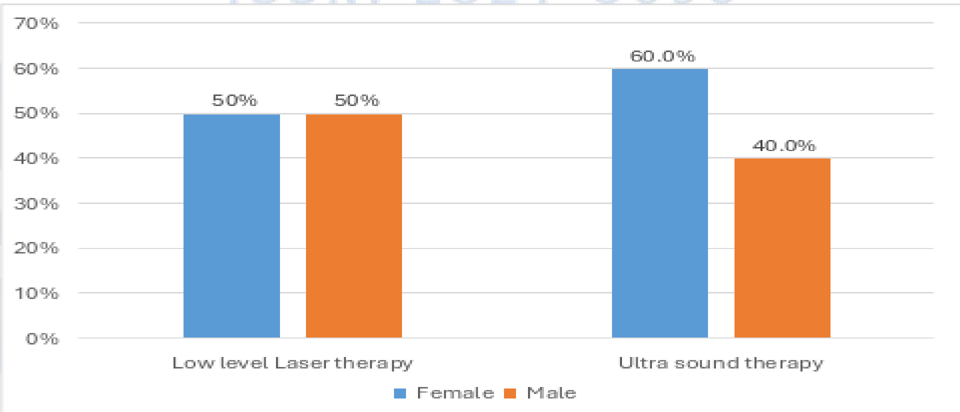


Graph 1: Representing based on age

Table 2: Comparison based on gender

Gender	Group		Chi square	p value
	Low level Laser therapy	Ultra sound therapy		
Female	5	6	0.202	0.653
	50.0%	60.0%		
Male	5	4		
	50.0%	40.0%		
Total	10	10		
	100.0%	100.0%		

Among the participants, 50% of the Low Level Laser Therapy group and 60% of the Ultrasound Therapy group were females, while 50% and 40% were males, respectively. The difference in gender distribution between the two groups was not statistically significant (Chi-square = 0.202, p = 0.653).

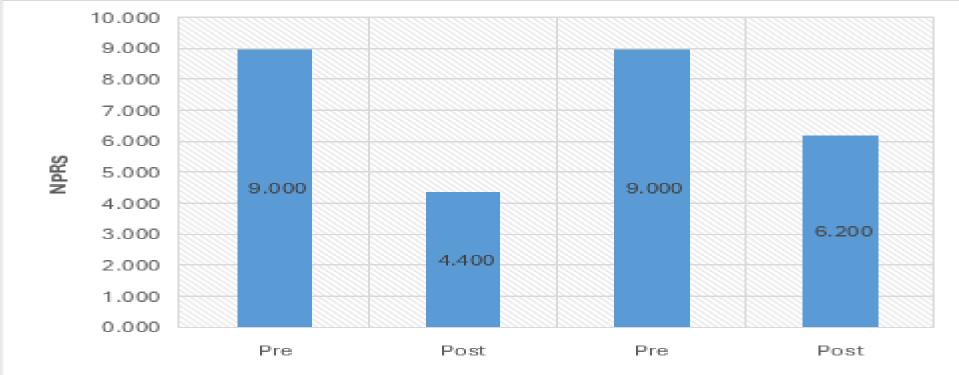


Graph 2: Representation based on gender

Table 3: Comparison based on NPRS

NPRS		Mean	Std. Deviation	Mean difference	t value	p value
Low level Laser therapy	Pre	9.000	1.054	4.6	12.393	p<0.001
	Post	4.400	1.578			
Ultra sound therapy	Pre	9.000	1.054	2.8	7.799	p<0.001
	Post	6.200	1.619			

The mean NPRS score in the Low Level Laser Therapy group decreased significantly from 9.00 ± 1.05 at baseline to 4.40 ± 1.58 after treatment, with a mean difference of 4.6 (t = 12.393, p < 0.001). In the Ultrasound Therapy group, the mean NPRS score reduced from 9.00 ± 1.05 pre-treatment to 6.20 ± 1.62 post-treatment, with a mean difference of 2.8 (t = 7.799, p < 0.001). Both therapies were effective in reducing pain scores

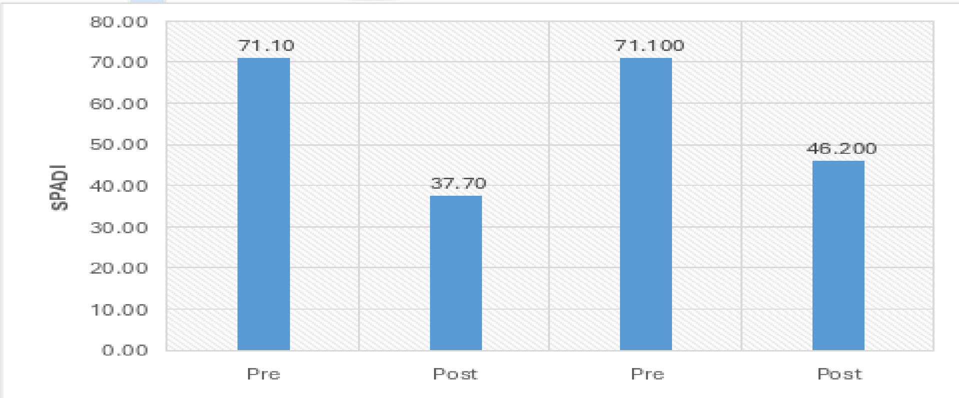


Graph 3: Representing pre-post comparison of NPRS

Table 4: Comparison based on SPADI

SPADI		Mean	Std. Deviation	Mean difference	t value	p value
Low level Laser therapy	Pre	71.10	15.044	33.4	11.55163	p<0.001
	Post	37.70	11.982			
Ultra sound therapy	Pre	71.100	15.044	24.9	9.4648	p<0.001
	Post	46.200	12.408			

In the Low Level Laser Therapy group, the mean SPADI score decreased significantly from 71.10 ± 15.04 before treatment to 37.70 ± 11.98 after treatment, with a mean difference of 33.4 ($t = 11.55$, $p < 0.001$). In the Ultrasound Therapy group, the mean SPADI score reduced from 71.10 ± 15.04 at baseline to 46.20 ± 12.41 following treatment, with a mean difference of 24.9 ($t = 9.46$, $p < 0.001$). Both treatment modalities produced statistically significant improvements.

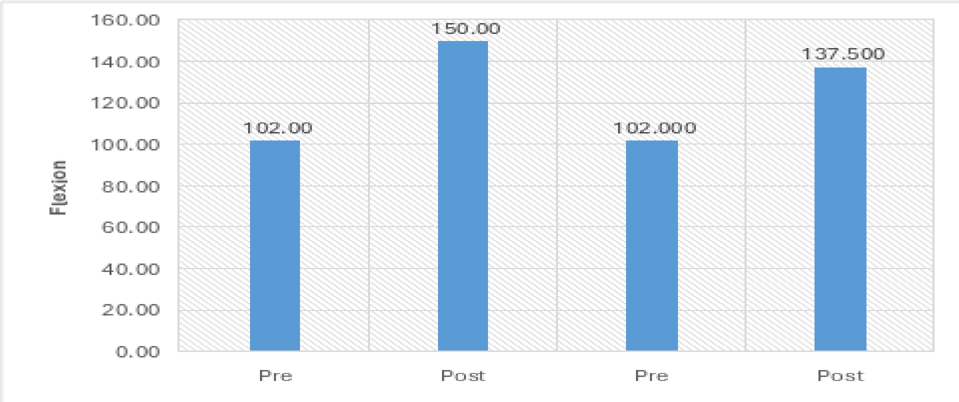


Graph 4: Representing pre-post comparison of SPADI

Table 5: Comparison based on FLEXION

FLEXION		Mean	Std. Deviation	Mean difference	t value	p value
Low level Laser therapy	Pre	102.00	28.402	48	7.06	p<0.001
	Post	150.00	16.997			
Ultra sound therapy	Pre	102.000	28.402	35.5	5.933	p<0.001
	Post	137.500	19.329			

n the Low Level Laser Therapy group, the mean shoulder flexion improved significantly from 102.00 ± 28.40° before treatment to 150.00 ± 17.00° after treatment, with a mean difference of 48° ($t = 7.06$, $p < 0.001$). In the Ultrasound Therapy group, mean flexion increased from 102.00 ± 28.40° pre-treatment to 137.50 ± 19.33° post-treatment, showing a mean difference of 35.5° ($t = 5.93$, $p < 0.001$). Both therapies were effective in enhancing flexion.

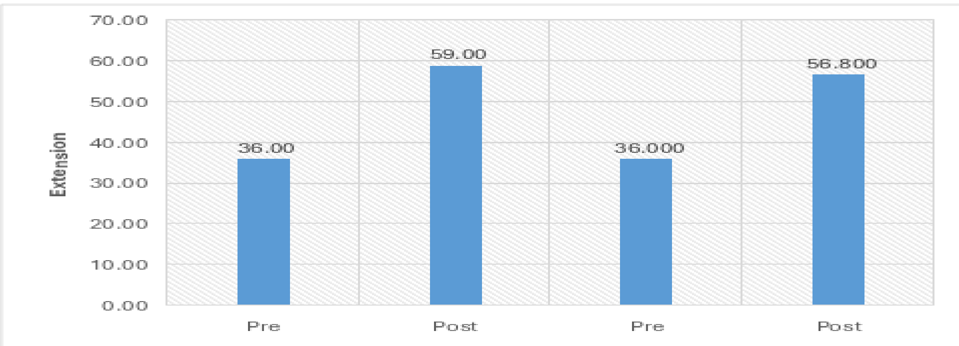


Graph 5: Representing pre-post comparison of FLEXION

Table 6: Comparison based on EXTENSION

EXTENSION		Mean	Std. Deviation	Mean difference	t value	p value
Low level Laser therapy	Pre	36.00	16.125	23	6.412	p<0.001
	Post	59.00	18.523			
Ultra sound therapy	Pre	36.000	16.125	20.8	5.542	p<0.001
	Post	56.800	19.269			

In the Low Level Laser Therapy group, the mean shoulder extension improved from 36.00 ± 16.13° at baseline to 59.00 ± 18.52° after treatment, with a mean difference of 23° ($t = 6.41$, $p < 0.001$). In the Ultrasound Therapy group, the mean extension increased from 36.00 ± 16.13° pre-treatment to 56.80 ± 19.27° post-treatment, showing a mean difference of 20.8° ($t = 5.54$, $p < 0.001$). Both therapies resulted in statistically significant improvements in shoulder extension

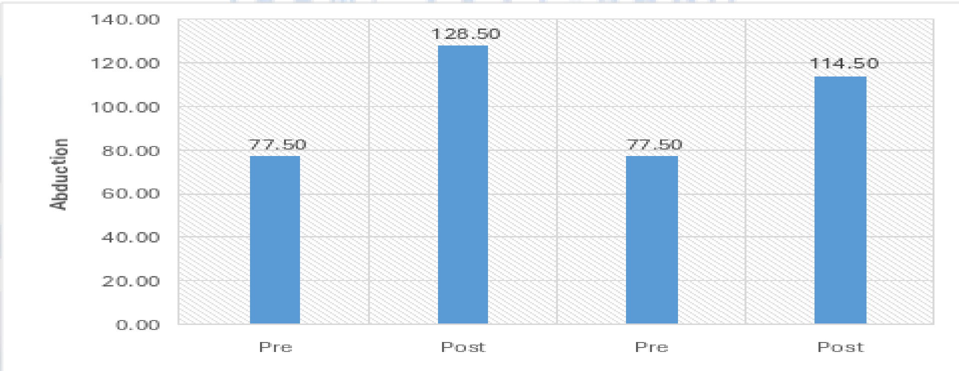


Graph 6: Representing pre-post comparison of EXTENSION

Table 7: Comparison based on ABDUCTION

ABDUCTION		Mean	Std. Deviation	Mean difference	t value	p value
Low level Laser therapy	Pre	77.50	32.766	51	7.911	p<0.001
	Post	128.50	27.593			
Ultra sound therapy	Pre	77.50	32.77	37	19.936	p<0.001
	Post	114.50	31.84			

In the Low Level Laser Therapy group, the mean abduction improved significantly from 77.50 ± 32.77 at baseline to 128.50 ± 27.59 following treatment, showing a mean difference of 51, which was statistically significant ($t = 7.911$, $p < 0.001$). Similarly, in the Ultrasound Therapy group, the mean abduction increased from 77.50 ± 32.77 pre-treatment to 114.50 ± 31.84 post-treatment, with a mean difference of 37, which was also statistically significant ($t = 19.936$, $p < 0.001$).

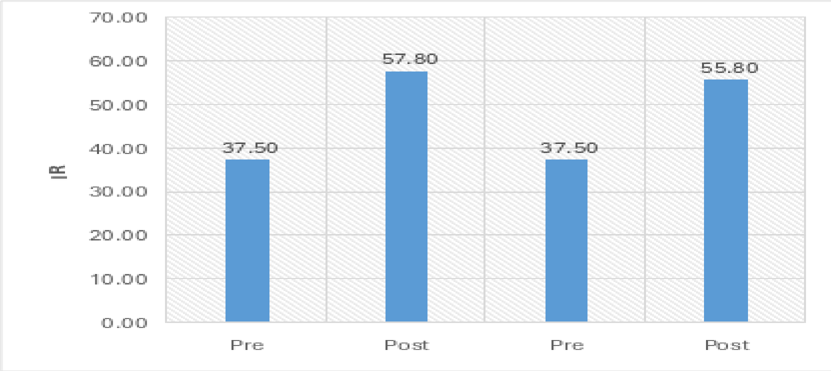


Graph 7: Representing pre-post comparison of ABDUCTION

Table 8: Comparison based on IR

IR		Mean	Std. Deviation	Mean difference	t value	p value
Low level Laser therapy	Pre	37.50	18.893	20.3	4.895	p<0.001
	Post	57.80	17.210			
Ultra sound therapy	Pre	37.50	18.89	18.3	3.962	p<0.001
	Post	55.80	19.40			

In the Low Level Laser Therapy group, the mean internal rotation improved from 37.50 ± 18.89 at baseline to 57.80 ± 17.21 post-treatment, with a mean difference of 20.3, which was statistically significant ($t = 4.895$, $p < 0.001$). Similarly, in the Ultrasound Therapy group, the mean internal rotation increased from 37.50 ± 18.89 pre-treatment to 55.80 ± 19.40 after intervention, showing a mean difference of 18.3, which was also statistically significant ($t = 3.962$, $p < 0.001$).

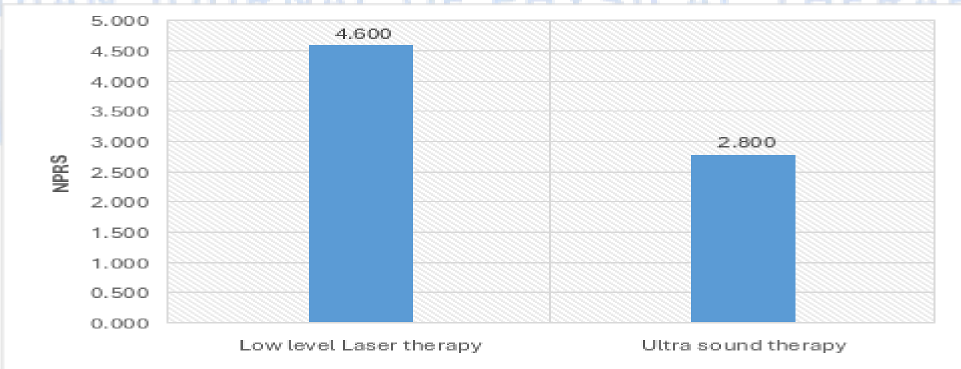


Graph 8: Representing pre-post comparison of IR

Table 9: Comparison of improvement in NPRS

		Mean	Std. Deviation	t value	p value
NPRS	Low level Laser therapy	4.600	1.174	3.486	0.003
	Ultra sound therapy	2.800	1.135		

For pain reduction (NPRS), the Low Level Laser Therapy group showed a mean score of 4.60 ± 1.17, while the Ultrasound Therapy group had a lower mean score of 2.80 ± 1.13. The difference was statistically significant ($t = 3.486$, $p = 0.003$), indicating that Low Level Laser Therapy was more effective in reducing pain.

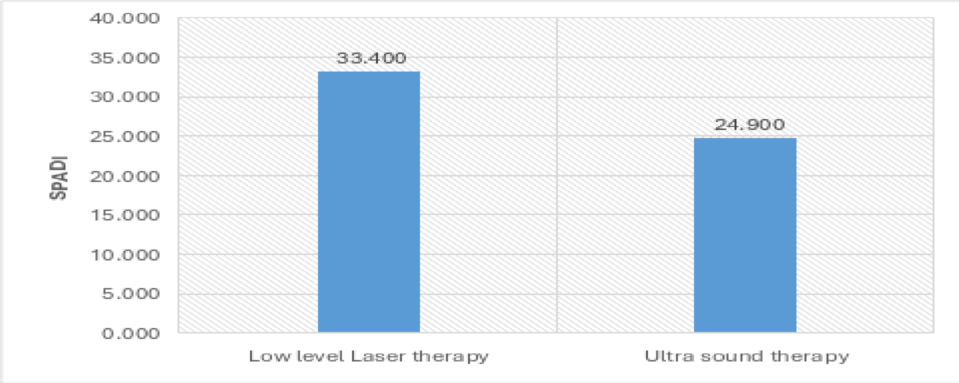


Graph 9: Representing improvement in group - NPRS

Table 10: Comparison of improvement in SPADI

		Mean	Std. Deviation	t value	p value
SPADI	Low level Laser therapy	33.400	9.143	2.174	0.043
	Ultra sound therapy	24.900	8.319		

For disability (SPADI), the mean score was 33.40 ± 9.14 in the Low Level Laser Therapy group and 24.90 ± 8.32 in the Ultrasound Therapy group. The difference was significant ($t = 2.174$, $p = 0.043$), suggesting that Low Level Laser Therapy was superior in improving shoulder-related disability.

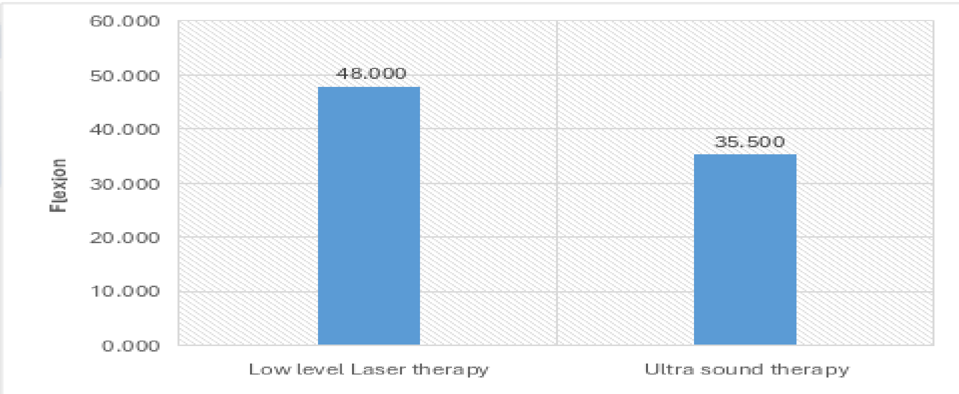


Graph 10: Representing improvement in group - SPADI

Table 11: Comparison of improvement in FLEXION

		Mean	Std. Deviation	t value	p value
FLEXION	Low level Laser therapy	48.000	21.499	2.38	0.035
	Ultra sound therapy	35.500	18.922		

With respect to flexion, the Low Level Laser Therapy group achieved a mean of 48.00 ± 21.50, compared to 35.50 ± 18.92 in the Ultrasound Therapy group. The difference was statistically significant ($t = 2.38$, $p = 0.035$), indicating that Low Level Laser Therapy was more effective in improving shoulder flexion.

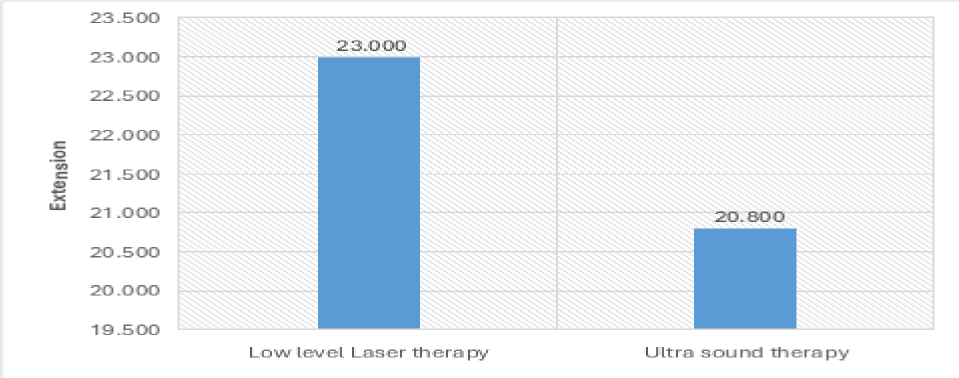


Graph 11: Representing improvement in group - FLEXION

Table 12: Comparison of improvement in EXTENSION

		Mean	Std. Deviation	t value	p value
EXTENSION	Low level Laser therapy	23.000	1.343	4.10.	p<0.001
	Ultra sound therapy	20.800	1.868		

For extension, the Low Level Laser Therapy group showed a higher mean (23.00 ± 1.34) than the Ultrasound Therapy group (20.80 ± 1.87), and the difference was highly significant ($t = 4.10$, $p < 0.001$). This demonstrates that Low Level Laser Therapy produced greater improvement in extension.

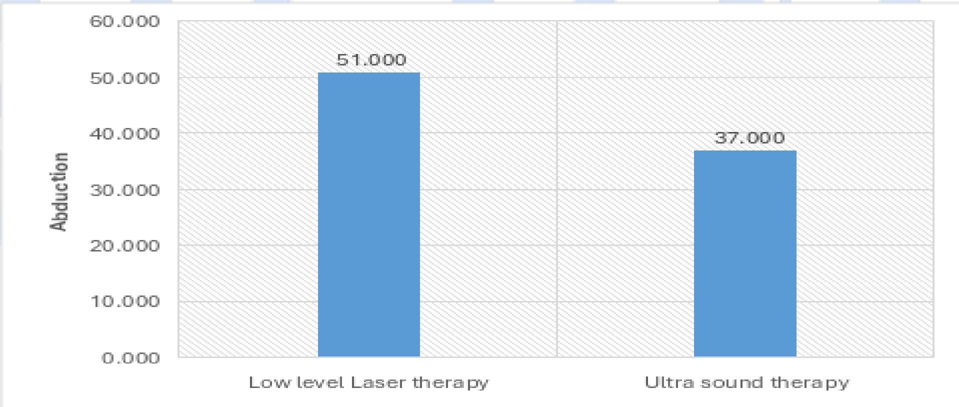


Graph 12: Representing improvement in group - EXTENSION

Table 13: Comparison of improvement in ABDUCTION

		Mean	Std. Deviation	t value	p value
ABDUCTION	Low level Laser therapy	51.000	20.385	2.187	0.042
	Ultra sound therapy	37.000	5.869		

Regarding abduction, the Low Level Laser Therapy group had a mean of 51.00 ± 20.39, whereas the Ultrasound Therapy group recorded 37.00 ± 5.87. The difference was statistically significant (t = 2.187, p = 0.042), suggesting that Low Level Laser Therapy was more effective in enhancing abduction.

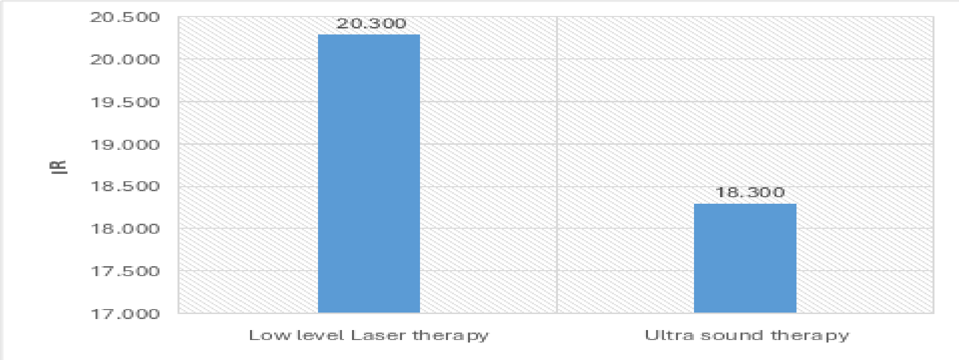


Graph 13: Representing improvement in group - ABDUCTION

Table 14: Comparison of improvement in IR

		Mean	Std. Deviation	t value	p value
IR	Low level Laser therapy	20.300	3.115	3.222	p<0.001
	Ultra sound therapy	18.300	4.606		

For internal rotation (IR), the Low Level Laser Therapy group had a mean improvement of 20.30 ± 3.12, while the Ultrasound Therapy group showed a mean of 18.30 ± 4.61. The difference was significant (t = 3.222, p < 0.001), indicating that Low Level Laser Therapy was superior in improving internal rotation.



Graph 14: Representing improvement in group - IR

RESULT:

A total of 20 participants with adhesive capsulitis were included in the study and randomly allocated into two groups: Group A (Low-Level Laser Therapy with multidirectional stretching) and Group B (Ultrasound Therapy with multidirectional stretching), with 10 participants in each group.

Both groups demonstrated statistically significant improvements in pain intensity, functional ability, and shoulder range of motion following the intervention ($p < 0.001$). The LLLT group showed a greater reduction in pain scores on the Numerical Pain Rating Scale compared to the ultrasound group (mean difference: 4.6 vs. 2.8; $p = 0.003$). Functional disability, assessed using the Shoulder Pain and Disability Index (SPADI), improved significantly in both groups, with a greater reduction observed in the LLLT group (33.4) compared to the ultrasound group (24.9) ($p = 0.043$).

Shoulder range of motion improved significantly in both groups; however, the LLLT group demonstrated superior gains in flexion, extension, abduction, and internal rotation compared to the ultrasound group ($p < 0.05$). Overall, Low-Level Laser Therapy combined with multidirectional stretching produced better outcomes than Ultrasound Therapy combined with multidirectional stretching in patients with adhesive capsulitis.

DISSCUSSION

The present study compared the effectiveness of Low-Level Laser Therapy (LLLT) and Ultrasound Therapy (UST), both combined with multidirectional stretching, on pain, functional disability, and shoulder range of motion in individuals with adhesive capsulitis. Although both treatment approaches produced statistically significant improvements across all outcome measures, LLLT demonstrated superior outcomes when compared to UST.

Pain Reduction (NPRS)

Both groups showed a significant reduction in pain intensity following intervention. The LLLT group demonstrated a greater reduction in NPRS scores (from 9.00 ± 1.05 to 4.40 ± 1.58) compared to the UST group (from 9.00 ± 1.05 to 6.20 ± 1.62). The between-group difference was statistically significant ($t = 3.486$, $p = 0.003$), indicating enhanced pain relief with LLLT.

These findings support earlier research suggesting that LLLT produces analgesic effects through photobiomodulation mechanisms, including stimulation of mitochondrial activity, increased ATP synthesis, and modulation of inflammatory mediators such as cytokines and prostaglandins (Page et al., 2014[12]; Dundar et al., 2015[13]). In contrast, UST primarily exerts its effects through thermal and mechanical mechanisms, which may result in comparatively slower pain reduction.

Functional Disability (SPADI)

Significant improvements in shoulder function were observed in both groups, as reflected by reductions in SPADI scores. The LLLT group demonstrated a greater mean reduction (33.4 points) compared to the UST group (24.9 points), with a statistically significant between-group difference ($t = 2.174$, $p = 0.043$). These findings suggest that LLLT may be more effective in improving functional outcomes.

The enhanced functional recovery associated with LLLT may be attributed to its ability to promote collagen synthesis, improve microcirculation, and reduce capsular inflammation. Similar findings have been reported by Ozkan et al. (2016)[14] and Dogru et al. (2018)[15], who demonstrated superior improvements in pain and function with LLLT compared to UST in shoulder disorders.

Range of Motion (ROM)

Both treatment groups exhibited statistically significant improvements in shoulder ROM, including flexion, extension, abduction, and internal rotation. However, the LLLT group consistently achieved greater gains (48°, 23°, 51°, and 20.3° respectively) compared to the UST group (35.5°, 20.8°, 37°, and 18.3°). All between-group differences were statistically significant ($p < 0.05$).
LLLT is believed to enhance tissue extensibility by stimulating fibroblast activity and increasing local vascularity, thereby reducing capsular stiffness and facilitating improved joint mobility. These results are consistent with findings reported by Choi et al. (2017)[16] and Page et al. (2014)[12], who emphasized the role of LLLT in restoring joint biomechanics in adhesive capsulitis.
Multidirectional stretching played a crucial role in improving outcomes in both groups. Given the global capsular restriction characteristic of adhesive capsulitis, stretching in multiple planes facilitates collagen remodeling, reduces adhesions, and restores normal glenohumeral movement. This supports existing evidence that stretching and mobilization are fundamental components of adhesive capsulitis rehabilitation.[17,18] The superior outcomes in the LLLT group suggest that laser therapy enhances tissue responsiveness to stretching.

Clinical Significance

The statistically and clinically significant improvements observed across all outcome measures highlight the effectiveness of LLLT as a valuable adjunct in the management of adhesive capsulitis. Its non-invasive nature, combined with its ability to reduce pain, enhance tissue healing, and improve functional recovery, makes LLLT a clinically advantageous modality for physiotherapy practice.

CONCLUSION

Based on the outcomes measured using NPRS, SPADI, and shoulder range of motion, both Low-Level Laser Therapy and Ultrasound Therapy combined with multidirectional stretching were effective in reducing pain, improving functional ability, and enhancing shoulder mobility in patients with adhesive capsulitis. However, Low-Level Laser Therapy demonstrated superior effectiveness across all outcome measures, suggesting it may be a more advantageous adjunct in the rehabilitation of adhesive capsulitis.

LIMITATIONS AND RECOMMENDATIONS:

This study was limited by a small sample size, restricted age range, short intervention duration, absence of a stretching-only control group, and reliance on manual outcome measurements. Future research should include larger samples, longer follow-up periods, and appropriate control groups to determine the sustained and independent effects of the interventions.

IMPLICATIONS TO PRACTICE:

Incorporation of Low-Level Laser Therapy into routine physiotherapy practice may facilitate faster recovery, reduce functional disability, and improve patient satisfaction in individuals with adhesive capsulitis. When combined with stretching, mobilization, and strengthening exercises, LLLT can enhance overall rehabilitation outcomes. These findings support the use of evidence-based and technologically advanced modalities in clinical practice. Standardization of LLLT parameters within treatment protocols may further ensure consistent and high-quality care for patients with shoulder dysfunction.The experimental group could be included in the treatment protocol for low back pain because the study concluded that the participants got better in terms of pain and range of motion. It can also improve patient-caregiver compliance and adherence to treatment.

ACKNOWLEDGMENT: I Thank Almighty God, sincere gratitude to my guide and all my friends. Last but not least, I would like to thank all the subjects of my study without whom this task would have been impossible. My sincere thanks to all the contributors whose names I have not mentioned but they all deserve my gratitude.

BIBLIOGRAPHY

1. Contractor ES, Agnihotri DS, Patel RM. Effect of spencer muscle energy technique on pain and functional disability in cases of adhesive capsulitis of shoulder joint. IAIM.2016;3(8):126-31

2. Kisner C, Colby L, Borstad JD. The Shoulder and Shoulder Girdle. In: Kisner C, Colby L. eds. Therapeutic Exercise: and Techniques, ; 2012. Accessed June 12, 2023.

3. Phansopkar P, Qureshi MI. Evaluation of Efficacy of Spencer Technique, Kaltenborn, Mulligan, and Maitland mobilization on Pain, Range of Motion and Functional Disability in Patients with Frozen Shoulder.Journal of medical pharmaceutical and allied sciences.2022; 11(2): 4693 – 4696

4. Shah KA, Zore L, Kumar A. Effect Of Muligan Mobilization with Movemment versus Kinesiotaping in frozen shoulder. International Journal of Health Sciences and Research. 2021;20211105

5. Haveela B, Dowle P, Chandrasekhar P. Effectiveness of Mulligan's Technique and Spencer's Technique in Adjunct to Conventional Therapy in Frozen Shoulder: A Randomised Controlled Trial. International Journal for Advance Research and Development. 2018;3(1):253-60

6. David Ip, Nga-Yue Fu. Two-year follow-up of low-level laser therapy for elderly with painful adhesive capsulitis of the shoulder. Journal of Pain Research. (2015).

7. Sung, J.-H., Lee, J.-M., & Kim, J.-H. (2022). The Effectiveness of Ultrasound Deep Heat Therapy for Adhesive Capsulitis: A Systematic Review and Meta-Analysis.International Journal of Environmental Research and Public Health.

8. Safrin Arifin. Effectiveness of Ultrasound and Stretching on Ability to Raise Hands in Right Shoulder Stiffness. 2022

9. Safoora Ebadi , Bijan Forogh , Ehsan Fallah ,Arash Babaei Ghazani. Does ultrasound therapy add to the effects of exercise and mobilization in frozen shoulder? A pilot randomized double-blind clinical trial. 2017

10. Safrin Arifin. Effectiveness of Ultrasound and Stretching on Ability to Raise Hands in Right Shoulder Stiffness. 2022

11. Jeong-Min Choi, Eun-Young Cho, Byoung-Hee Lee. Effects of Dynamic Stretching Combined with Manual Therapy on Pain, ROM, Function, and Quality of Life of Adhesive Capsulitis. 2023

12. Page, M. J., et al. (2014). Electrotherapy modalities for adhesive capsulitis (frozen shoulder): A systematic review. Cochrane Database of Systematic Reviews, 10, CD009317.

13. Dundar, U., et al. (2015). Effectiveness of laser therapy in subacromial impingement syndrome: A randomized controlled trial. Journal of Back and Musculoskeletal Rehabilitation, 28(1), 83–89

14. Ozkan, Y., et al. (2016). Comparison of the effects of laser therapy and ultrasound therapy in the treatment of shoulder disorders. Pain Physician, 19(4), 273–282.

15. Dogru, H., et al. (2018). Comparison of low-level laser therapy and ultrasound therapy in the treatment of shoulder impingement syndrome. Clinical Rehabilitation, 32(4), 543–550.

16. Choi, J. H., et al. (2017). Effectiveness of low-level laser therapy in adhesive capsulitis:A randomized controlled trial. Journal of Physical Therapy Science, 29(7), 1234–1240.

17. Celik D, Mutlu EK. Does adding mobilization to stretching improve outcomes for people with frozen shoulder? A randomized controlled clinical trial. Clin Rehabil. 2015;30(8):786–94.

18. Challoumas D, Biddle M, McLean M, Millar NL. Comparison of treatments for frozen shoulder: a systematic review and meta-analysis. JAMA Netw Open. 2020;3(12):e2029581.