

## Effectiveness Of Ultrasound Therapy and Laser Therapy for Dequervain's Tenosynovitis – A Comparative Study

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Kalaiarasi B<sup>1</sup>, Senthil kumar S<sup>2</sup>, Keerthana M<sup>3</sup>, Meenakshi V<sup>4</sup>

<sup>1,3,4</sup>, Students, saveetha college of physiotherapy, SIMATS

<sup>2</sup>Associate professor, saveetha college of physiotherapy, SIMATS

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### Abstract:

*De Quervain's tenosynovitis is characterized by stenosing of the extensor pollicis brevis and abductor pollicis longus tendons which affects both the genders. The Dorsal radial side of the wrist is generally swollen and painful in this condition. De Quervain's tendonitis is typically treated conservatively; surgery is rarely used. Ultrasound therapy, laser therapy, wrist and thumb immobilization, and non-steroidal anti-inflammatory medications were all part of its conservative management. This study aims to find the effectiveness of Ultrasound therapy and Laser therapy for De quervain's tenosynovitis patients. The study comprised a total of 28 participants with De quervain's tenosynovitis who fulfilled both the inclusion and exclusion requirements. The chosen participants gave their informed consent before being split into two groups at random: the group receiving ultrasound therapy (n = 14) and the group receiving laser therapy (n = 14). For seven days, both groups were treated. Measurements were taken of the Visual Analogue Scale (VAS) and Pinch meter before and after therapy. Results showed laser therapy improved functional grip strength and reduced discomfort more effectively than ultrasound therapy. These findings indicate that laser therapy provided better results in lowering discomfort and enhancing functional grip strength. Both ultrasound and laser therapy are successful in lowering discomfort and enhancing functional grip strength in cases of De quervain's tenosynovitis. However, Laser therapy showed slightly better results, making it a potentially more beneficial option.*

**Keywords:** Pinch meter, laser therapy, VAS, ultrasound therapy, De Quervain's tenosynovitis.

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### I. Introduction:

The stenosing tenosynovitis is referred to as De Quervain's tenosynovitis of the Extensor Pollicis Brevis and Abductor Pollicis Longus tendons <sup>(1)</sup>. De Quervain's tenosynovitis is characterized by pain on the radial (thumb) side of the wrist, damage to the thumb, and thickening of the ligamentous tissue lining the tendons in the wrist's first dorsal compartment. It is specifically described as first dorsal compartment stenosing tenosynovitis. In the population at large, approximately 0.5% of males and 1.3% of women in their working-age years (18–65) have radial styloid tenosynovitis, with a peak frequency between the ages of 40 and 60 <sup>(2)</sup>. The increased prevalence of De Quervain in women between the ages of 30 and 50 may potentially be due to hormonal influences on symptoms <sup>(3)</sup>. The impact was greater for patients on the dominant side than for those on the nondominant side <sup>(4)</sup>. It has been determined that workers who engage in quick, repetitive tasks requiring squeezing, gripping, tugging, or pushing are more vulnerable. As cellphones are used more frequently, worries about the negative health effects of excessive gadget use have also grown <sup>(5,6)</sup>. Certain activities, such as extensive typing and use of a mouse or trackball, along with a variety of pastimes, like playing the piano, bowling, golfing, fly fishing, crocheting, and sewing, have been proposed as possible risk factors. More women are impacted than men <sup>(7)</sup>.

There is ongoing discussion about the specific reason behind De Quervain's tenosynovitis; Acute injuries (such biomechanical compression or physical trauma), microtrauma (like from the actions or activities of new moms at work), inflammatory disorders, anatomical differences, anomalies of the first dorsal compartment, and, in rare instances, infections are some possible causes <sup>(8,9)</sup>. As stated by the literature, De quervain's disease is frequently characterized as a first dorsal compartment stenosing disease <sup>(8)</sup>. The pathophysiology of DQD has traditionally been thought to be fibrotic and angiogenic rather than inflammatory. In any case, anti-inflammatory drugs continue to be the well- recognised conservative treatment <sup>(10,11)</sup>.

Therefore, there is reason to believe that the downstream cascade leading to DQD is mediated by an underlying inflammatory process. Additional observations could be a reduction in the thumb's carpometacarpal joint's abduction range of motion (ROM), tendons distal to the extensor tunnel and the extensor sheath, as well as

tendons passing through the extensor sheath, exhibit a discernible thickening crepitus. The wrist may be deviated radially, causing the abductor pollicis longus and extensor pollicis brevis tendons to suddenly tilt as they pass through the initial dorsal compartment beneath the extensor retinaculum. It has been stated that a variety of repetitive forearm pronation and supination motions, wrist thumb abduction and extension, as well as ulnar and radial deviation, strain the tendons that pass through the extensor retinaculum. Assessing the patient's hand swelling, impaired hand function, and the location of their discomfort are all necessary to determine whether they have de Quervain's tenosynovitis. Patients complain of radial styloid pain and swelling, which is made worse by wrist and thumb deviation <sup>(12)</sup>.

Patients frequently complain about having trouble with tasks requiring lifting, twisting, and grabbing <sup>(13)</sup>. Palpation of the first dorsal compartment during a physical examination may detect soreness <sup>(14)</sup>. If there is any swelling, it is often located two to three centimetres in front after the EPB and APL tendons pass through the radial styloid <sup>(12)</sup>. A physical examination usually reveals tenderness and moderate oedema across the wrist's thumb side <sup>(15)</sup>. Physicians have long used Finkelstein's test, to treat cases of De Quervain's tenosynovitis that are suspected <sup>(16)</sup>. Pain along the radial wrist will indicate a positive test if the examiner moves into the ulnar deviation of wrist while holding the thumb in flexion across the palm <sup>(17)</sup>. As the tendons lie in their chamber, which is now smaller, their limited glide results in pain <sup>(14)</sup>.

In physiotherapy, ultrasound therapy is one of the most used techniques. It is an essential tool in the rehabilitation of a range of injuries since it lessens pain and promotes the healing of soft tissue damage. A rehabilitation technique for many musculoskeletal ailments, therapeutic ultrasound improves bone, tendon, and wound healing, increases tissue extensibility, and decreases discomfort <sup>(18)</sup>. Laser therapy among most popular and successful physiotherapy treatment in De quervains tenosynovitis. Photo biomodulation has been accomplished with lasers <sup>(19)</sup>.

The hand is crucial for a variety of grips required for daily living tasks. Power and precision grips are the two categories into which grips fall. Power grip comprises hook grip, fist grab, spherical grip, and cylindrical grip <sup>(20)</sup>. There are two types of grips: precision grips and power grips. Power grip comprises fist, hook, spherical, and cylindrical grips. Measurements of grip and pinch strength are widely acknowledged to offer an unbiased indicator of the upper extremity's functional integrity <sup>(21)</sup>. The finger pinch strength is measured using a pinch meter

<sup>(22)</sup>. Having a firm grasp is essential for success in all professions. These behaviours may be caused by differences in the types of work that professionals do, the environment in which they operate, and the objects they manage <sup>(23)</sup>. The literature currently in publication provides contradictory findings about this modality's effectiveness in treating soft tissue problems. This study aims to evaluate and compare the effectiveness of Ultrasound therapy and Laser therapy for De quervain's tenosynovitis patients.

## **II. Methodology:**

This study was conducted at Saveetha Medical College and Hospital to compare the effects of ultrasound therapy and laser therapy in the management of De Quervain's tenosynovitis. Informed consent was obtained from all participants. The study was carried out between September 2024 and November 2024 and received ethical approval from the Institutional Scientific Review Board of Saveetha Institute of Medical and Technical Sciences (Approval No: 11/032/2024/ISRB/SR/SCPT) A total of 28 participants was selected and randomly divided into two groups: one group received ultrasound therapy and the other received laser therapy, based on the inclusion and exclusion criteria. Pre- and post-intervention improvements in all subjects were assessed using the Visual Analogue Scale (VAS) and a pinch meter.

Subjects: De quervain's tenosynovitis patients from SMCH and private sector  
SAMPLING Technique: convenient sampling

Sample Size: 28

Inclusion Criteria:

- Age 30 – 65 Years.
- Both Male and Female Subjects.
- Patient with Finkelstein test positive.
- Interested to participate in the study

Exclusion Criteria:

- Patients who have recent fracture in hand.
- Patients who have wrist injury.
- Carpal tunnel syndrome.

**Study Procedure:**

28 Subjects fulfilling inclusion criteria and exclusion criteria and having De Quervain's tenosynovitis participated in the research. The subjects that were chosen gave their informed consent, and two groups were randomly selected and divided into ultrasound therapy group (n=14) and laser therapy group (n=14). Both the group received treatment for 7 days. Pre and Post treatment values of Visual Analogue Scale (VAS) and Pinch meter were measured.

**Ultrasound Therapy Group (N=14):**

Subjects in ultrasound therapy group received ultrasound treatment for 7 days. Subject had been positioned in a sitting posture with the forearm in a mid-prone position, with pillow support for the wrist and the affected part was treated. Ultrasound was given with pulse mode over the area of the radial styloid (Pulse mode produces less heat, so it was used). A space averaged intensity of 1W/cm<sup>2</sup> and Frequency of 3MHz were applied for a period of 5 minutes.

**Laser Therapy Group (N=14):**

Subjects in laser therapy group received laser treatment for 7 days. Subject had been positioned in a sitting posture with the forearm in a mid-prone position, with pillow support for the wrist and the affected part was treated. A TECH LASER SS1000 with a pencil probe was used. The laser was applied at the radial styloid in a scanning method with a dosage of 3 J/cm<sup>2</sup> in continuous mode, covering an area of 4 cm<sup>2</sup> on the skin and with a wavelength of 800-850 nm, applied for a period of 5 minutes.

**III. Results:**

A statistically significant difference was found in both groups based on a statistical analysis of quantitative data. This comparison yielded a t-value of 5.9581 and a p-value of <0.0001, it shows significant improvement in Laser therapy group by reducing pain and increases the functional grip strength in subjects. Laser therapy was more effective than ultrasound therapy in reducing pain and enhancing functional grip strength in subjects.

**Table 1. Pre-test and post-test values of the Ultrasound therapy group**

Outcome	Pre-test (Mean ± SD)	Post-test (Mean ± SD)	t-value	p-value
VAS	7.14 ± 0.95	5.21 ± 1.05	15.20	< 0.001
Pinch meter	12.36 ± 1.01	15.29 ± 1.14	41.00	< 0.001

**Table 2. Pre-test and post-test values of the laser therapy group**

Outcome	Pre-test (Mean ± SD)	Post-test (Mean ± SD)	t-value	p-value
VAS	6.79 ± 1.19	1.86 ± 1.29	22.25	< 0.001
Pinch meter	12.14 ± 1.23	18.07 ± 1.33	30.38	< 0.001

**Table 3. Comparison of post-test values between the groups**

Outcome	Ultrasound (Mean ± SD)	Laser (Mean ± SD)	t-value	p-value
VAS	5.21 ± 1.05	1.86 ± 1.29	7.54	< 0.001
Pinch meter	15.29 ± 1.14	18.07 ± 1.33	5.95	< 0.001

**IV. Discussion:**

Pain from De quervain's tenosynovitis is felt in the wrist's initial dorsal compartment, usually on the radial prominence. This disorder is usually unilateral and results from microtrauma at the extensor retinaculum to the tendon of the EPB and APL, which is exacerbated by gripping movements. The tendon sheath undergoes fibrous thickening at the radial styloid <sup>(24)</sup>. This disorder is about 0.5 percent common among men and 1.3 percent common among women, with a higher abundance in people aged 30 to 55 <sup>(25)</sup>.

Darien., et.al., (2021) authored research on the title of Efficacy of Low-Level Laser Therapy on De Quervain's Tenosynovitis after Delivery and 30 women with postpartum De Quervain's tenosynovitis, aged 25 to 35, were recruited. For four weeks, three times a week, fifteen women received low-level laser treatment (wavelength 830 nm, energy density 20J/cm<sup>2</sup>, power 30-40, beam diameter 4mm) for ten minutes while performing exercises. The patient was told to wear a spica splint following 30 minutes of strengthening and stretching activities for the EPB and APL tendons. The outcomes were contrasted with those of the subjects who received only exercise treatment. Both groups experienced less pain, but the Low-Level Laser Therapy group

experienced a 92.5 percent reduction, while the control group experienced a 31.06 percent reduction, as determined by the VAS scale <sup>(26)</sup>.

Sharma., et.al., (2015) authored research on the title of "Outcome of low level versus ultra sonic therapy in de quervains tenosynovitis" and divided 30 patients into two groups, ranging in age from 21 to 45. For 14 days, on alternate days, one group received low-level laser therapy (infrared, 830 nm wavelength, 30–40 mw power, and beam width 4 mm) and ultrasound (3 MHz frequency with aqua sonic gel as coupling medium). The two treatments significantly improved the VAS scale, grip strength, and Ritchie tenderness scale. Therapy demonstrated superior grip strength and VAS values on average ultrasonography. A decrease in the tendon sheath's diameter as seen by diagnostic ultrasound is demonstrated by an improvement in the VAS pain scale and soreness following the application of ultrasound and low-level laser therapy. It lessens discomfort and promotes mobility. Healing results from the reduction of inflammation, which causes an increase in mobility. <sup>(27)</sup>.

A study by Aydin., et al. (2015) in treating De Quervain's tenosynovitis with laser and ultrasound therapy found that there was no statistically significant distinction between the treatments, but both group's pain and grip strength had significantly improved. Accordingly, LLLT may be just as successful in managing pain and enhancing function as ultrasound therapy.

The laser uses vasodilatation to boost blood flow to the applied area. When inflammation goes down, the nerves aren't irritated, which lessens pain. Because low level laser therapy promotes collagen synthesis and angiogenesis, it enhances soft tissue repair <sup>(26)</sup>. For De Quervain's Tenosynovitis, one of the most well-liked and effective physiotherapy treatments is laser therapy. With lasers, photo biomodulation has been achieved <sup>(19)</sup>.

Therapeutic ultrasound makes use of sound waves to enhance soft tissue flexibility, relieve pain, and encourage tissue healing <sup>(25)</sup>. Therapeutic ultrasound is a rehabilitation treatment that promotes bone, tendon, and wound healing, increases tissue extensibility, and reduces discomfort for a variety of musculoskeletal conditions <sup>(18)</sup>.

In this study, based on the statistical analysis, both the groups showed a significant result in lowering pain and enhancing functional grip strength in De quervain's tenosynovitis patients. A comparison of post-values between the ultrasound therapy and laser therapy group revealed significant differences in both VAS and pinch meter scores. For the VAS, the mean score for the ultrasonic therapy group was 5.21 (SD = 1.05) whereas the mean score of 1.86 (SD = 1.29) the laser therapy group was lower. For the pinch meter, the ultrasound therapy group showed a mean of 15.29 (SD = 1.14), compared to the mean of 18.07 (SD = 1.33) in the Laser therapy group. The results of the current study showed that Laser therapy group has more effectiveness on reducing pain and enhancing functional grip strength in subjects with De Quervain's tenosynovitis than the ultrasound therapy group.

## **V. Conclusion**

In conclusion, the findings of this research demonstrates that both ultrasound and LASER therapy are effective modalities for decreasing pain and enhancing functional grip strength in individuals with De quervain's tenosynovitis. However, while both treatments showed significant improvements, LASER therapy provided slightly superior outcomes in terms of pain reduction and enhanced functional grip strength compared to ultrasound therapy. These findings suggest that LASER therapy may offer additional benefits in order to treat De quervain's tenosynovitis, though both interventions are viable treatment options.

## **VI. Limitation And Recommendation:**

### **Limitations:**

The duration of the study was only for a short period with a minimal sample size was included. Only two outcomes are used in this study.

### **Recommendation:**

Future research with larger sample sizes and longer follow-up periods is recommended to further validate these results and optimize treatment protocols for patients with this condition.

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### **Ethical Clearance:**

The study was approved by the Institutional Scientific Review Board (Approval No: 11/ 032/ 2024/

ISRB/SR/SCPT).

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