Efficacy of Kinesio taping and low-level laser therapy versus conventional therapy for De Quervains's tenosynovitis

Kamalakannan M.[1], Neelavathi D. [2], Mahedran P.[2], Ebenezer Charles I.[2], Sherwin David[2]

[1]Assistant Professor, [2]Physiotherapy Undergraduate, Saveetha College of Physiotherapy, SIMATS Chennai, Tamil Nadu, India

(*Received: August 2019 Revised: December 2019 Accepted: February 2020)*

Corresponding author: **Kamalakannan M**. Email: kamal1712@gmail.com

ABSTRACT

Introduction and Aim: De Quervain's tenosynovitis is a disorder characterized by pain, tenderness, and edema over the lateral side of the wrist and caused by mechanical impingement between the tendons of abductor pollicis longus (APL), extensor pollicis brevis (EPB) and narrowed fibrosseous tendon sheet. To determine the efficacy of kinesiotaping and low-level laser therapy in De Quervain's tenosynovitis to reduce pain and improve quality of life. To determine the efficacy of conventional therapy in De Quervain's tenosynovitis to reduce pain and improve the quality of life.

Materials and Methods: 30 subjects were selected using non- probability convenient sampling technique based on inclusion and exclusion criteria and were explained about the procedure with written consent obtained from the subjects. Subjects were allocated into two groups using the lottery method of sampling. Experimental (A) and control group (B), the experimental group was treated with kinesiotaping and low-level laser therapy and control group was treated with conventional therapy (ultrasound and strengthening exercises) for 2 weeks.

Result: Statistical analysis of both pre-test and post-test, VAS and PRWE score revealed that there is a statistically significant difference seen between group A and group B with the p-value of ($P<0.0001$).

Conclusion: Low-level laser therapy along with kinesiotaping (Group A) proved to be effective treatment than conventional therapy (Group B) in the management of De Quervain's tenosynovitis, however, subjects improved significantly with both treatment strategies.

Keywords: De Quervain’s disease; low-level laser therapy; kinesiotaping; ultrasound; PRWE.

INTRODUCTION

De Quervain's tenosynovitis is a disorder characterized by pain, tenderness and edema over the lateral side of the wrist and caused by mechanical impingement between the tendons of abductor pollicis longus (APL), extensor pollicis brevis (EPB) and narrowed fibrosseous tendon sheet (1-3). Thus, mechanical impingement of the ACL and EPB tendon stimulus of nociceptors and pain. This resulting in impairment of wrist, hand and thumb function with daily living activities like lifting, gripping, etc. The term "tenosynovitis" implies the presence of an infla-mmatory condition. However, the patho-physiology does not involve inflammation (4-6). De Quervain's tenosynovitis symptoms result from a fibrous thickening of the tendon sheath of the first dorsal compartment of the wrist and the thickening is usually associated with acute or repetitive trauma and restrains the gliding of the tendons through the sheath.

The prevalence of De Quervain's tenosynovitis in the United Kingdom was about 0.5% in men and 1.3% in women. Among those, the highest prevalence was reported between the age group of 30 to 55 yrs. It is potentially more common in the women; the speculative rationale for this is that women have a great styloid process angle of the radius (7-9). Finkelstein's test is pathognomonic for the diagnosis of this disease. The test involves thumb metacarpo-phalangeal (MP) joint flexion with a closed fist combined with active or passive ulnar deviation, which can result in a painful response over the styloid process. Conservative management of de Quervain's tenosynovitis differs based on the severity of the condition. The common treatment includes anti-inflammatory medication, corticosteroid injections and electrotherapeutic treatment, exercise therapy, spica splint, etc. if symptoms persist surgical intervention may be initiated (10, 11).

Kinesio taping is a therapeutic tool has been used for the prevention and treatment of sports injuries. It improves the healing of the soft tissue, facilitates proprioception, reduces muscle fatigue and delayed onset muscle soreness, acts as a pain inhibitor (12-14). It is characterized by the ability to stretch the particular muscle to 120-140% of its length and recoil back to its primary length following the application. In recent years, the application of the Kinesio tape has emerged as an interesting and relatively novel method for treating musculoskeletal conditions (15-17). One of the

properties of the kinesiotaping is increasing blood circulation and lymphatic drainage leading to a reduction in pain. Recently kinesiotaping is suggested for this condition and this type of treatment does not have any sort of contraindications. According to previous studies, kinesiotaping would be effective to reduce pain and inflammatory of APL and EFB. Hence, in this study, kinesiotaping has been chosen as the conservative management for De Quervain's disease (18, 19).

LASER (light amplification by stimulated emission of radiation) is a non-invasive light source treatment that generates a single wavelength of light. Low-level laser therapy is the application of red and near-infrared light over the injuries or lesions to improve wound, soft tissue healing and provide relief for both acute and chronic pain. Low-level laser therapy (LLLT) has shown positive effects on the reduction of inflammation, increases in collagen synthesis, and angiogenesis. This type of treatment does not have any sort of contraindications. Even in acute cases, this treatment can be incorporated. It has a therapeutic effect on DeQuervain's tenosynovitis that has been shown by a reduction in anterior-posterior and mediolateral diameter of the tendon sheaths (20).

Ultrasound therapy for De Quervain's tenosynovitis, a non-thermal therapeutic ultrasound has been used for its healing effects of tendon injuries in previous studies. Therapeutic ultrasound is a modality used for the various musculoskeletal injuries to improve tissue extensibility, assist with pain relief and also promote wound healing through high-frequency sound waves. Thus, the study has treatment management using ultrasound for De Quervain's disease (21). De Quervain's tenosynovitis rehabilitation exercises consist of activity modification and minimizing repetitive and sustained loading of the wrist and thumb regions. Conventional exercise can prevent ongoing injury and decrease pain levels. The active conventional exercise includes thenar muscle stretches, forearm extensor and flexor stretch, eccentric thumb extension and abduction exercises with an elastic band and eccentric wrist flexion and extension with a dumbbell, grip strengthening using rubber ball. This active exercise protocol played an important role in the resolution of radial wrist pain in a referred study. Hence rehabilitation exercises have been taken to resolve this condition.

Therefore, this study was discussed about the efficacy of the low-level laser therapy and kinesiotaping and efficacy of ultrasound with active rehabilitative exercises in treating De Quervain's tenosynovitis. And also comparing the effectiveness of these protocols significantly.

MATERIALS AND METHODS

Thirty subjects were selected using non- probability convenient sampling technique based on inclusion and exclusion criteria and were explained about the procedure with written consent obtained from the subjects. Subjects were allocated into two groups (group A-15; group B-15) using the lottery method of sampling. Experimental (A) and control group (B), the experimental group was treated with kinesiotaping and low-level laser therapy and control group was treated with conventional therapy (ultrasound and strengthening exercises). As a pre-test protocol and the same were repeated in post-test measures following 2 weeks of treatment procedures. The outcome measures used in the study for pain are the visual analog scale (VAS) and the quality of the life is patient-rated wrist evaluation (PRWE). Those subject's pre and post-test values were calculated.

Kinesio taping: The method of taping is used was one piece of the long strip and one piece of a short strip. The first strip was used to unload from abductor pollicis longus, extensor pollicis brevis tendons. The tape placed on the insertion of EPB the base of the thumb was stretched approximately 70 percent over the original length applied along the radial aspect of the wrist and on the extensor surface ending at the mid-forearm. The second and third type strips with two inches width and four inches length have correction roles. The second strip is named as "function correcting tape" with the wrist extended. By putting the end of the tape at the dorsum of the hand and another end at the distal forearm 1 inch upper the styloid. Then by flexing the wrist, the tape was fixed. The third strip which is called "space correcting" originates from the volar side of the distal radius and stretched obliquely to the dorsum of the hand with the light tension. Patients were suggested not to use water for 6 hours in the tape applied area. This procedure of taping is continued for two weeks. The average amount of the tension applied ranged from 12.5% to 70% stretch, while the average duration of each tape worn in the site range from 45 min for 2 weeks.

Low-level laser therapy: The patient was made to sit in a relaxed position with the elbow resting on the table. Before the application of laser treatment, the area was cleaned with spirit. I gave instructions to all patients who stated that they would not be able to feel anything like warmth or any other sensation such as rubbing, tingling or discomfort and also informed that if you feel any of these sensations let me know it immediately and I'll discontinue the treatment. Safety precautions were placed in effect to minimize the risk of exposure of the retina of the eye to laser light by using goggles. Both clinicians and the subject wore specifically

designed safety goggles provided by the manufacturer to shield against laser light. Jewelry and other reflective surfaces were removed from the treatment area. The subject's hand which was resting on the table with pillow support and the knob was directed near the painful area and the laser light was pointed over that area. The treatment protocol was as follows:

Table 1: Treatment protocol for laser therapy

Total sessions	6 sessions (3 days/ week for 2 weeks)
Wavelength	904nm
Energy density	0.25 and 1.3 Jcm^2 of the energy Density to each point
Point area	Painful area

Ultrasound therapy: Position of the patient: The patient was made to sit in a well-supported chair in a comfortable manner and arms were supported on a pillow. Position of the therapist: Standing behind the subject. The patient was asked to keep the part to be treated relaxed, and instrument to report if any inappropriate sensation or excess heat or pain is felt. Pulsed ultrasound was applied in such a way that the ultrasound waves strikes the patient's skin at right angles to ensure the deep penetration. A probe can be continuously rotated as a concentric circle to avoid cavitation. The water-based gel used as a coupling medium for better transmission of waves.

Table 2: Treatment parameter for ultrasound therapy

Total sessions	6 sessions (3 days/week)
Intensity	0.8Wcm2
Duration	8-10 minutes
Layer	Superficial
Frequency	3Mhz
Mode	Pulsed (1:1)

De Quervain's Tenosynovitis rehabilitation exercises:

Opposition stretch: Rest your hand on a table, palm up. Touch the tip of your thumb to the tip of your little finger. Hold this position for 6 seconds. Repeat 10 times.

Wrist stretch: With one hand, help to bend the opposite wrist down by pressing the back of your hand and holding it down for 15 to 30 seconds. Next, stretch the hand back by pressing the fingers in a backward direction and holding it for 15 to 30 seconds. Keep your elbow straight during the exercise. Do 3 sets of 10 repetitions on each hand.

Wrist flexion: Hold a can or hammer handle in your hand with your palm facing up. Bend your wrist upward. Slowly lower the weight down into the starting position. Do 3 sets of 10 repetitions. Gradually increase the weight of the object you are holding.

Wrist extension: Hold a soup can or hammer handle in your hand with your palm facing down. Slowly bend your wrist upward. Slowly lower the weight of the object you are holding.

Wrist radial deviation strengthening: Put your wrist in the sideways position with your thumb up. Hold a can of soup or a hammer handle and gently bend your wrist up, with the thumb reaching toward the ceiling. Slowly lower to the starting position. Do not move your forearm throughout the exercise. Do 3 sets of 10 repetitions.

Grip strengthening: Squeeze a rubber ball and hold for 5 seconds. Do 3 Sets of10 repetitions.

Finger spring: Place a large rubber band around the outside of your thumb and the rest of your fingers. Open your fingers to stretch the rubber band. Do 3 sets of 10 repetitions.

Statistical analysis

The collected data were tabulated and analyzed using descriptive & inferential statistics. To all parameters mean and standard deviation (SD) was used. A paired t-test was used to analyze significant changes between pre-test and post-test measurements. An unpaired t-test was used to analyze significant changes between post-test measurements of both groups. P-value < 0.001 is considered as statistically significant.

Table 3: Between-group comparison of VAS

VAS		MEAN	SD	T	P
GROUP A	Post-test	4.07	0.80	9.4479	0.0001
GROUP B	Post-test	5.67	0.62	1.8708	

Table 4: Between-group comparison of PRWE SCORE

PRWE SCORE		MEAN	SD	T	P
GROUP A	Post-test	56.00	7.73	2.00	0.0001
GROUP B	Post-test	73.13	4.16	1.07	

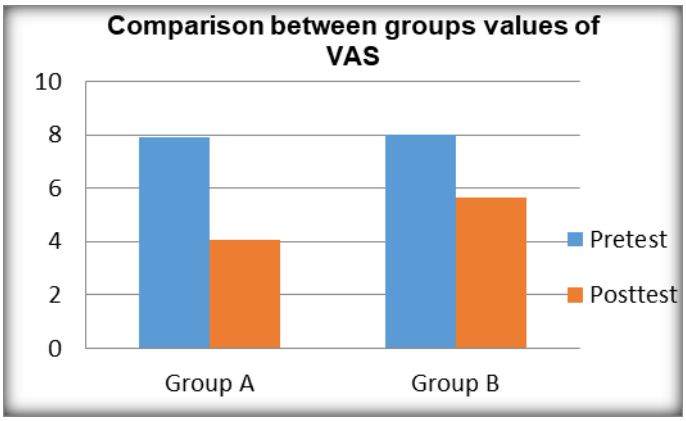

Fig. 1: Between-groups- Pre and Post-test comparison of VAS

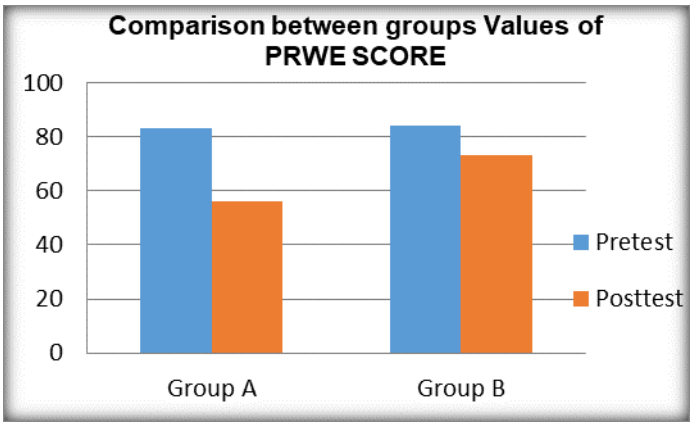

Fig. 2: Between groups Pre and Post-test comparison of PRWE SCORE

RESULTS

The result showed that the pre-test and post-test for VAS and PRWE scores revealed that there is a statistically significant difference seen between group A and group B with the P-value (P<0.0001).

DISCUSSION

Kinesiotaping and physiotherapy treatment for De Quervain's disease concluded that the result was greater than the physiotherapy group by 80% versus 30%. In the kinesiotaping group, 23 patients had wrist swelling along with wrist pain. After the treatment duration, all the patients had significant pain reduction and swelling improved in 17 out of 23. Hence it has an 80% success rate. In the physiotherapy treatment group, all the participants had wrist pain and swelling. After the treatment duration, wrist swelling remained in 21 patients and they did not have significant pain reduction. So, it has a success rate of 30%. Hudak *et al.* revealed that patients respond more favorable to Kinesio taping rather than the Physiotherapy treatment. A prospective study explained the outcome of Low-Level Laser Therapy versus Ultrasonic therapy in De Quervain's disease. Nemati *et al.*, assessed that there was a significant improvement seen within both the group and there was no statistically significant difference was found in comparing both the groups. However, the mean values of grip strength and VAS showed better improvement in the Ultrasound Therapy group as compared to the laser therapy group.

Keynoosh *et al.*, have discussed and described that the Low-Level Laser therapy can potentially be effective in treating tendinopathy when recommended dosages are used. Dangelo *et al.*, provide strong evidence that positive outcomes are associated with the use of current dosage recommendations for the treatment of tendinopathy. This study is so ascertaining whether a combination of Low-Level Laser therapy along with kinesiotaping for two weeks for subjects with De Quervain's disease would indicate any effects on functional activities of the wrist and hand. The outcome parameters followed were a pain at rest measured by the Visual Analogue scale and disability by Patient Rated Wrist Evaluation Questionnaire. In group A pre-intervention mean of VAS is 6.07 (0.80) PPRWE 76.13 (5.13) after training the subject with laser therapy with kinesiotaping, the mean value of VAS and PREE improved to 3.20 (0.86) and 56.00 (7.73), which shows a statistically significant difference within the group. In group B pre-

intervention mean of VAS is 5.667 (0.62) and PRWE is 73.13 (4.16) which shows no statistically significant difference within the group. After 2 weeks of the treatment, all the above parameters showed significant improvement in the experimental group (EG) than the Control group (CG), with a more marked improvement in the EG group. Hence, this study shows that the Low-Level Laser Therapy and Kinesio taping has reduced the progression of De Quervain's disease and improved the quality of life and functional ability to use the hand when compared to the ultrasound and conventional Exercises in 2 weeks treatment duration.

CONCLUSION

From the result, it has been concluded that low-level laser therapy along with kinesiotaping shows a more significant effect than conventional exercise with ultrasound therapy for patients with De Quervain's disease.

CONFLICT OF INTEREST

There is no conflict of interest from other authors.

REFERENCES

1. Papa, J. A. Conservative management of De Quervain's stenosing tenosynovitis: a case report. The Journal of the Canadian Chiropractic Association. 2012; 56 (2): 112-113.
2. Goel, R., Abzug, J. M. De Quervain's tenosynovitis: a review of the rehabilitative options. Hand. 2015; 10(1): 1- 5.
3. Sharma, R., Aggarwal, A. N., Bhatt, S., Kumar, S., Bhargava, S. K. Outcome of Low-Level Lasers versus Ultrasonic Therapy in De Quervain's tenosynovitis. Indian journal of orthopedics. 2015; 49(5): 542.
4. Bjordal, J. M., Lopes-Martins, R. A., Iversen, V. V. A randomized, placebo-controlled trial of Low-Level Laser Therapy for activated Achilles tendinitis with microdialysis measurement of peritendinous prostaglandin E2 concentrations. British journal of sports medicine. 2006; 40(1): 76- 80.
5. Reddy, G. K., Stehno-Bittel, L., Enwemeka, C. S. Laser photostimulation of collagen production in healing rabbit Achilles tendons. Laser in Surgery and Medicine. The official Journal of the American Society for Laser Medicine and Surgery. 1998; 22(5): 281- 287.
6. Dolislager, C., Krenselewski, B., Oosting, K., Phillips, T., Leiras, C. Effective Conservative Treatments for De Quervain's Tenosynovitis: A Retrospective Study, Journal of Hand Therapy. 2016; 29(3): 379.
7. Lim, E. C., Tay, M. G. Kinesio taping in musculoskeletal pain and disability that lasts for more than 4 weeks: is it time to peel off the tape and throw out with sweat? A systematic review with meta-analysis focused on pain and also methods of tape application. Br J Sports Med. 2015; 49(24): 1558-1566.
8. Sharma, R., Thukral, A., Kumar, S., Bhargava, S. K. Effect of low-level lasers in De Quervain's tenosynovitis: Prospective study with an ultrasonographic assessment. Physiotherapy. 2002; 88(12): 730- 734.
9. Hartzell, T. L., Rubinstein, R., Herman, M. Therapeutic modalities- an updated review for the hand surgeon. The Journal of hand surgery. 2012; 37(3): 597- 621.
10. Clarke, M. T., Lyall, H. A., Grant, J.W., Matthewson, M. H. The histopathology of De Quervain's disease. Journal of Hand Surgery. 1998; 23(6): 732- 374.
11. Jaworski, C. A., Krause, M., Brown, J. rehabilitation of the wrist and hand following a sports injury. Clinics in sports medicine. 2010; 29(1): 61- 80.
12. Salate, A. C., Barbosa, G., Gaspar, P., Koeke, P. U., Parizotto, N. A., Benze, B. G., Foschini, D. Effects of IN-Ga-A1-P diode laser irradiation on angiogenesis in partial ruptures of Achilles tendon in rats. Photomedicine and laser therapy. 2005; 23(5): 470- 475.
13. Avci, S., Yilmaz, C., Sayli, U. Comparison of nonsurgical treatment measures for de Quervain's disease of pregnancy and lactation. J Hand Surg Am. 2002; 2(7): 322- 324.
14. Peters-Veluthamaningal, C.,Winters, J.C., Groenier, K.H., Meyboom DeJong, B. Randomised controlled trial of local corticosteroid injections for de Quervain's tenosynovitis in general practice. BMC Musculoskelet Disord. 2009; 10(10: 131- 132.
15. Dawson, C., Mudgal, C. S. Staged description of the Finkelstein test. J Hand Surg Am. 2010; 3(5): 1513-1515.
16. Harvey, F. J., Harvey, P. M., Horsley, M. W. De Quervain's disease: surgical or nonsurgical treatment. J Hand Surg Am. 1990; 1(5): 83- 87.
17. Weiss, A. P., Akelman, E., Tabatabai, M. Treatment of de Quervain's disease. J Hand Surg Am. 1994; 1(9): 595- 598.
18. Hsu, Y. H., Chen, W. Y., Lin, H. C., Wang, W. T., Shih, Y. F. The effects of taping on scapular kinematics and muscle performance in baseball players with shoulder impingement syndrome. J Electromyogr Kinesiol. 2009; 1(9): 1092- 1099.
19. Lee, J. H., Yoo, W. G. Application of posterior pelvic tilt taping for the treatment of chronic low back pain with sacroiliac joint dysfunction and increased sacral horizontal angle. Phys Ther Sport. 2012; 1(3): 279- 285.
20. Tsai, H. J., Hung, H. C., Yang, J. L., Huang, C. S., Tsauo, J. Y. Could Kinesio tape replace the bandage in decongestive lymphatic therapy for breast cancer-related lymphedema? A pilot study. Support Care Cancer. 2009; 1(7): 1353- 1360.
21. Williams, S., Whatman, C., Hume, P. A., Sheerin, K. Kinesio taping in treatment and prevention of sports injuries: a meta-analysis of the evidence for its effectiveness. Sports Med. 2012; 42(3): 153- 164.
22. Hudak, P. L., Amadio, P. C., Bombardier, C. Development of an upper extremity outcome measure: the DASH (disabilities of the arm shoulder and hand) The Upper Extremity Collaborative Group (UECG) Am J Ind Med. 1996; 29(2): 602- 608.
23. Nemati, Z., Javanshir, M. A., Saeedi, H., Farmani, F., Aghajani, F. S. The effect of the new dynamic splint in pinch strength in De Quervain syndrome: a comparative study. Disability Rehabil Assist Technol. 2017; 1(2): 457- 461.
24. Keynoosh, H., Elaheh, M. Comparison between Kinesio Taping and Physiotherapy in the Treatment of De Quervain's Disease. J Musculoskeletal Research. 2013; 16(1): 6- 8.
25. Dangelo, K., Sutton, D., Cote, P., Dion, S., Wong, J. J. The effectiveness of passive physical modalities for the management of soft tissue injuries and neuropathies of the wrist and hand: a systematic review by the Ontario Protocol for Traffic Injury Management (OPTIMa) Collaboration. J Manipulative Physiol Ther. 2015; 38(2): 493- 506.