

A Comparative Review on Various Therapeutic Interventions Used for Treating Tendinopathies

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Abstract: ***Introduction:** Tendinopathy is pain in the tendon commonly as a resultant of overuse, seen commonly in rotator cuff, wrist, Patella, Gluteal region and calf, having close association of extrinsic factors like sports and physical activity. Aim of the study: To understand the effect of various therapeutic interventions and review by comparing interventions in improving dysfunction in tendinopathies. **Methodology:** Using key terms across databases, included 27 studies (only level I or II) published between 2018-2024 on different tendinopathies and analysed scientifically and independently extracted. **Results & Discussion:** Manual techniques like Manual mobilization, Myofascial trigger point therapy, Transverse Friction Massage, Therapeutic interventions like ESWT, Ultrasound, Laser, IFT, Heat and Cold therapy and minimally invasive techniques like Dry needling, Corticosteroids and Platelet rich plasma, percutaneous needle electrolysis and active exercise and strengthening have shown variability in short term and long-term benefits. **Conclusion:** Appropriate Load management and progressive Tendon loading, Eccentric exercises and Extra corporeal shockwave therapy is accurate in long-term positive outcomes and combination of various interventions proved to be more effective than single intervention in effective management of tendinopathy.*

Keywords: Tendinopathy, Physiotherapy interventions on tendinopathy, Eccentric exercise, Electrotherapy for Tendinopathy. Management of Tendinopathy

1. Introduction

Tendinopathy is pain in the tendon and causing dysfunction and also referred as tendinitis or tendinosis⁽¹⁾. Commonly as a resultant of overuse, seen in tendons of various regions like rotator cuff, wrist, Patella, Gluteal region and calf, having close association of extrinsic factors like sports and physical activity intrinsic factors include diabetes, menopause, obesity, genetics, thyroid diseases, high cholesterol^{(2) (3)}. Tendon injuries occur 30%-50% in sports increases in young and old age people who participate in recreational activities⁽³⁾. Upper limb tendinopathy, occurrence of rotator cuff varied between 0.35- to 5.5%, lateral elbow between 1-10%, medial elbow tendinopathy is less common than lateral elbow with prevalence of 0.3-1.1%^{(4) (5) (6)}. Lower limb tendinopathy has been found to have incidence 11.83% and prevalence 10.52%, patellar associated with 11.8%-14.4% among basket and volley ball players, Achilles tendinopathy has 6.2-9.5% in athletes and 11.83 in non-athletes⁽¹⁾.

Patho mechanics is due to overloading of tendon it undergoes changes in three phases reactive tendinopathy, tendon disrepair, degenerative tendinopathy⁽⁷⁾. Localized pain, swelling, stiffness, weakness, tendon thickening, decreased strength, flexibility and overall activity is reduced in tendinopathy⁽⁸⁾. Risk factors are associated due to excessive drugs intake like quinolones, statins, glucocorticoids and bony spurs, improper foot wear⁽⁹⁾. Clinical examination by palpation of tendon for nodules, tenderness, warmth and also inspection for muscle atrophy, erythema, asymmetry. Ultrasound (US) and magnetic resonance imaging (MRI) are

accurately measuring tendinopathy by imaging^{(1) (10) (11)}. Therapeutic interventions like eccentric exercise, myofascial trigger point therapy, platelet rich plasma, corticosteroid injections, extra corporeal shockwave therapy, ultrasound, Kinesio taping, dry needling, movement with mobilisation, deep friction massage, percutaneous needle electrolysis, low level laser therapy have been studied and shown prognosis of the condition^{(2) (12) (13) (14) (15)}.

By carefully managing the amount of stress and strain on tendons during sports and activity, control of systemic diseases can reduce prevalence of TP⁽¹⁾. If the tendinopathy left untreated it can lead to chronicity, tendon rupture, adhesive capsulitis (shoulder), contractures, decreased tendon liability, adhesions of tendon, atrophy of muscles, it can lead to even more disability⁽¹⁶⁾. Pharmacological agents such as NSAID's (non-steroidal anti-inflammatory drugs), nitric oxide, botulinum, hyaluronic acid, sclerosing agents as polidocanol there is no evidence any additional benefits with these drugs along with physiotherapy^{(17) (18)}. If the conservative treatment fails the surgery is indicated to treat the condition, the surgical procedures include minimally invasive stripping, radiofrequency micro tenotomy, neo vessel destruction, percutaneous longitudinal tenotomy, percutaneous ultrasonic tenotomy, arthroscopic surgery^{(8) (19) (20) (21)}. Purpose of my comparative review is by utilizing the available literature on various therapeutic interventions used for treating tendinopathies and analysing the data and formulate a descriptive guideline for the better clinical decision making in the management of various tendinopathies.

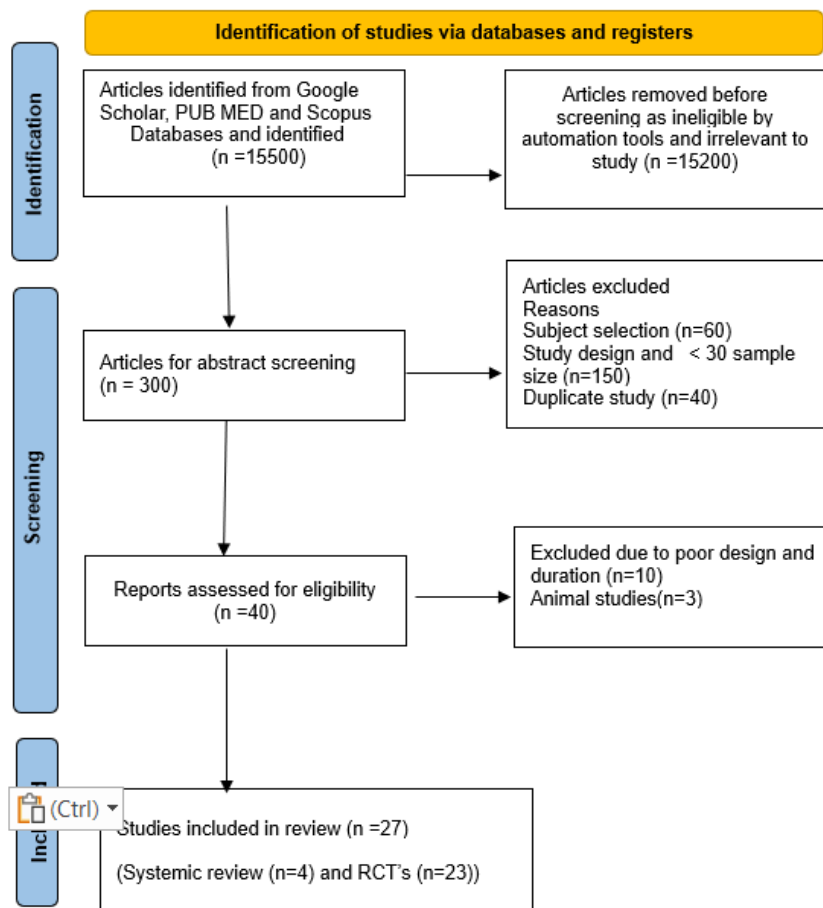


Figure 1: Prisma Study Flow Chart.

2. Methodology

Only Randomized controlled trials (RCTs), systemic reviews and meta-analysis published between 2018-2024 on **different** tendinopathies like Rotator cuff, lateral elbow, gluteal, patellar, Achilles and shoulder tendinitis **and use of any** Exercise-based interventions, Therapeutic modalities and Minimally Invasive techniques, If study used any two of outcomes below VAS or NPRS, Disability by VISA (Victorian institute of sports assessment) questionnaire and DASH (Disability of arm shoulder hand), ROM, Pain Pressure Threshold, FADI (foot ankle disability index). **Excluded Studies** with sample size < 30, other than RCTs and Systemic reviews and Subjects associated with Co-existing ligament injuries like other lower limb injuries or

running related injuries and Patients with heart conditions, Parkinson's, and pregnant females.

Data selection: A total of 15500 studies were identified from the literature, of which 15200 were excluded as irrelevant. 300 articles were selected for further screening based on inclusion and exclusion criteria, and only 27 recent studies with level I and II evidence were included for the final review. Data from 27 studies were analysed and extracted the following data from each include study under Author and year of publication, Type of study, population, Intervention, outcome measures, conclusion and level of evidence. Used simple statistical analysis of all the studies using parameters like assessment methods, various interventions, outcome measures and prognosis observed across the studies and results was obtained and used to formulate a comparative review of various Interventions on tendinopathy.

Table 1: Data and Characteristics of Studies included

Author & Year	Study design	Area	Population (n=4110)	Intervention	Outcome Measures	Conclusion	LE
Teresa villa Muñoz, 2024. ⁽²²⁾	RCT	Rotator cuff	72	Group a (n=36) EE Group b (n=36) Myofascial trigger point therapy (MFTT)	Pain [NPRS], ROM [Goniometer].	Isolated improvement is seen in both groups but Eccentric exercises are more effective.	II
Magdalena, 2024. ⁽²³⁾	RCT	Achilles	39	Group a (n=13) ESWT Group b (n=13) US Group c (n=13) placebo US	Disability [VISA], Petrographic measurements of step initiation on force platforms	ESWT showed more effective than the US	II

Surabhi shriya, 2024. (24)	RCT	Achilles	60	Group a (n=30) EE with LLLT Group b (n=30) EE with placebo LLLT	Pain [VAS], Disability [VISA-A]	Adding LLLT to EE did not provide any benefits compare to EE alone.	II
Muhammed Sufyan Karamat, 2024. (25)	RCT	Achilles	72	Group a (n=36) MFTT Group b (n=36) MFTT with EE	Pain [NPRS], ROM [goniometer], Foot ankle Disability index [FADI]	Both groups show effective results but MFTT with EE improves pain, ROM & functional disability	II
Liufeng Xiao, 2024.(26)	RCT	Patellar	51	Group a (n=17) HSRT with US Group b (n=17) HSRT training alone Group c (n=17) US alone	VISA-P FOR patella function, pain (VAS), Y-balance test Modified Thomas Test (MTT), maximum isometric muscle strength Test.	All groups showed better improvements but combined group shows more effective results.	II
Yinghao Li, 2024. (27)	systemic and meta-analysis	lateral elbow	11 RCTs 562	Group a- KT Group b- control groups	Pain (VAS), DASH, PRTEE, pain pressure threshold	Evidence shows that KT group improved pain and elbow functionality	I
Emine Esra Bilir, 2024. (28)	RCT	Lateral elbow	47	Group a (n=24) HILT Group b (n=23) ESWT	Pain (VAS), Quick disabilities of the arm, shoulder, and hand (QDASH) Hand grip strength test	Both treatment effects were found to be effective.	II
Stefanos, 2024.(29)	systemic	Lateral elbow	RCTs 1871	Group a- ESWT Group b- control group received US, Laser	pain, grip strength, disability	ESWT shows better improvement than US, laser	I
Aanayat ullah syed 2024 (30)	RCT	Lateral elbow	30	Group a (n=15) MWM with EE Group b (n=15) EE	Pain [VAS] [PRTEE]	At the end of 4 weeks, improvements seen in both groups but more effective who are received MWM and EE	II
Elif Durgut, 2024. (31)	RCT	Rotator cuff	52	Group a (n=26) KT Group b (n=26) CT	pain (NPRS), upper extremity functionality (DASH) and SPADI, ROM (goniometer) , grip strength (dynamometer)	KT is more benefitted than Cold therapy	II
Sarah El-Bably, 2023. (32)	RCT	Supraspinatus	60	Group a (n=20) PRP Group b (n=20) CS Group c (n=20) ESWT	Pain [VAS] US examination, (ASES-p)	Comparison to CS and ESWT, PRP shows more benefit	II
Muhammed Salman, 2023. (33)	RCT	Rotator cuff tendinopathy	40	Group a(n=20) KT + IFT and moist heat Group b(n=20) DN + IFT and moist heat	Pain [NPRS] Quality of life questionnaire	KT with IFT and Moist heat is more Effective than DN with IFT and moist heat.	II
Smiksha vinod sonone, 2023. (34)	RCT	Rotator cuff tendinopathy	80	Group a (n=40) Maitland mobilisation with exercise Group b(n=40) Mulligan Mobilization with exercise.	Pain (VAS), ROM, shoulder functionality(DASH), (QOL)	Both groups show significant benefits.	II
Korleen Brock-Jones, 2023. (35)	Systemic review	Achilles	7 articles	Compared on LASER and PRP	Pain (VAS/NPRS), Disability (VISA A)	Laser shown better results than PRP	I
Rehman M Abd Elrahim, 2022. (36)	RCT	Lateral elbow	40	Group a (n=20) MWM with US Group b (n=20) DFM with US	Pain (VAS), ROM (dynamometer), Grip strength	DFM is more effective than MWM	II
Raheela kousar, 2022 (37)	RCT	Achilles	76	Group a (n= 38) TFM with EE Group b (n=38) US with EE	Pain [NPRS], ROM [Goniometer], Severity [VISA]	TFM was more effective than US when combined with EE in improving pain, disability and ROM	II
Farek Ammar, 2021 (38)	RCT	Lateral elbow	72	Group a (n=24) ESWT with exercises Group b (n=24) IFT with exercises Group c (n=24) exercises	pain (VAS) disability of arm (DASH), hand questionnaire& hand dynamometer	Group who received ESWT with exercises shows significant benefit than other groups.	II
Thoger Persson Krogh, 2021 (39)	RCT	Patellar	36	Group a (n=18) ESWT Group b (n=18) placebo ESWT	pain (NPRS) ultrasound examination.	ESWT group shows improvement regarding pain than the placebo group.	II

Maria pilar lopez-royo, 2021 (40)	RCT	Patellar	48	Group a (n=16) DN and EE Group b (n=16) PNE Group c(n=16) EE as control group	Disability (VISA) Pain [VAS] Qol [short form – 36]	Compare with EE group, DN and PNE groups doesn't show any benefits.	II
Vasileios Dedes, 2020 (41)	RCT	Achilles	130	Group a (n=65) ESWT Group b(n=52) US Group c (n=13) control group	Pain [university of peloponnese pain] Functionality and quality of life questionnaire	ESWT group shows more effective outcome measures than US	II
Stephan J Breda, 2020 (42)	RCT	Patellar	76	Group a(n=38) PTLE Group b(n=38) EE	Disability (VISA-P)	Patients with PTLE group shows significant outcomes than EE group.	II
Manuel Rodriguez-Huguet, 2020 (43)	RCT	Supraspinatus	36	Group a(n=18) PNE with EE Group b(n=18) trigger point DN with EE	Pain (NPRS), ROM (digital inclinometer), pressure pain threshold	PNE with exercises shows improvement in supraspinatus tendinopathy.	II
Manuel Rodriguez-Huguet, 2020 (44)	RCT	Lateral elbow	32	Group a (n=16) PNE with EE Group b (n=16) trigger point by DN with EE	pain (NPRS), ROM (digital inclinometer), pressure pain threshold	PNE with exercises shows improvement in lateral elbow tendinopathy.	II
Rebecca Mellor, 2018 (45)	RCT	Gluteal	204	Group a (n=69) exercise Group b (n=66) CS Group c (n=69) wait and see approach	Improvement on health (global rating of change score) pain (NPRS), Disability (VISA-G)	Exercise is more effective than CS.	II
Ettore carlisi, 2018 (46)	RCT	Gluteal	50	Group a (n=26) ESWT Group b (n=24) US	Hip pain and upper limb function assessed by NPRS, lower extremity functional scale	ESWT group Shows more effective outcome measures than US.	II
Jane Fitzpatrick, 2018 (47)	RCT	Gluteal	80	Group a (n=40) PRP Group b (n=40) CS	pain and functional assessment were performed by MHHS	Greater improvement with PRP than those with CS.	II
Punam patel, 2018 (48)	Meta analysis	Lateral elbow	5 RCTs (194)	- ESWT with TE	Pain (VAS), Grip strength	ESWT with EE shows benefits for reduction of pain but not grip strength.	II

Abbreviations: Level of evidence (LE), Numeric pain rating scale (NPRS), Range of motion (ROM), Extracorporeal shockwave therapy (ESWT), Ultrasound (US), Victorian institute of sports assessment (VISA), Eccentric exercises (EE), Low level laser therapy (LLLT), Myofascial trigger point therapy (MFTT), High slow resistance training (HSRT), Kinesio taping (KT), visual analogue scale (VAS), Patient rated tennis elbow evaluation (PRTEE), High intensity Laser therapy (HILT), Movement with mobilisation (MWM), Cold therapy (CT), Shoulder pain and disability index (SPADI), platelet rich plasma (PRP), corticosteroid injections (CS), Interferential therapy (IFT), Dry needling (DN), Deep friction massage (DFM), Transverse friction massage (TFM), Percutaneous needle electrolysis (PNE), quality of life questionnaire (QOL), Progressive tendon loading exercises (PTLE), Therapeutic exercises (TE), Modified Harris Hip Score (MHHS).

3. Results

Out of 27 studies 23 are Randomized controlled trails and 4 are systemic reviews and study population from all the studies is approximately 4110(n) and studied on manual therapy techniques like Manual mobilization, Myofascial trigger point therapy, Transverse Friction Massage, Therapeutic interventions like ESWT, Ultrasound, Laser, IFT, Heat and Cold therapy and also minimally invasive techniques like

Dry needling, Corticosteroids and Platelet rich plasma, percutaneous needle electrolysis even included active exercise and strengthening.

Strengthening of affected tendon was primarily considered as important across the studies and different types exercises like Eccentric exercises (EE), Progressive Tendon Loading exercise (PTLE), High-slow resistance exercise (HSRT) was extensively studied and shown significant improvement in outcome measures across all the studies. Use of Eccentric exercises as most effective intervention to implement in treatment of tendinopathy in all the stages with appropriate loading techniques when it combined with Extra corporeal shockwave therapy seen highly positive outcomes, when used along with Mulligan Mobilization with Movement (MWM), Transverse friction massage, Dry needling, percutaneous needle electrolysis, myofascial trigger point therapy, Low level laser therapy proved its effectiveness in management of pain, function and Disability.

Extra corporeal Shock Wave Therapy for tendinopathy is most effective it was studied that the results obtained in all studies shows best results and some studies found that use of ESWT with exercises in that with eccentric exercises shows more accurate results but there is a study reported that ESWT not shown benefits, To relieve the pain of the affected tendon Ultrasound is considered as important modality and was extensively studied in comparison with other modalities like

Laser, Transverse friction massage, Movement with mobilisation, exercises studies reported that shows more benefits. Laser also when it combined with exercise shows additional benefits. Interferential currents relieve pain and their studies reported that it combined with exercises and Platelet rich plasma it shows positive outcomes

Myofascial trigger point therapy is a manual technique that has shown benefits for tendinopathy. Studies indicate that while it may not provide much benefits on its own, its effectiveness is significantly enhanced when combined with eccentric exercises. Movement with mobilization is a manual technique which important to relieve stress on tendons shows positive outcomes when it combined with eccentric exercises shows accurate results. With the usage of transverse friction massage studies concluded that it shows significant results and it also combined with exercises shows more benefits.

Platelet- rich plasma studies concluded that it is more effective for affected tendon as it shows more significant results for tendinopathy. Corticosteroid injections are helpful but not shown benefits for the tendinopathy the studies reported that instead they cause affects for tendon. Dry needling is not much effective for tendinopathy studies concluded that combined with Extra corporeal shockwave therapy, Interferential current, moist heat shows effective. Percutaneous needle electrolysis studies concluded that it alone does not shows benefits but there is a study when it combined with exercises shows positive outcomes.

4. Discussion

Studies are less on upper limb tendinopathies than lower limb, extensively studies are reported on Achilles tendon. In eccentric exercise the tendon will be loaded longitudinally and causes elongation of the active and passive tendon structures which can stimulates the activation of tenocytes like tenacin and type 1 collagen fibrils leads to Morphological and biomechanical adaption of tendon and overall increase in tensile strength. While contracting in lengthening it can pause blood flow to area and helps in reducing pain and inflammation. In contrast to this Stephan v et, al, (2020) seen progressive tendon loading exercises (PTLE) superior to EE in patellar tendinopathy.

Teresa v et., al, (2024), Aanayat v et, al, (2024) and Raheela v et, al, (2022) compared EE with manual therapy like MFTT, MWM and TFM in rotator cuff tendinopathy, Lateral elbow tendinopathy and achilles tendinopathy respectively and achieved added benefits and even when it was used with modalities like ESWT and IFT by Tarek v et, al, (2021) in lateral elbow tendinopathy, Laser in achilles tendinopathy by Surabhi v et, al, (2024) and Raheela v et, al, (2022) with ultrasound in achilles tendinopathy and produced effective results. Even with minimally invasive techniques like Dry needling and percutaneous needle electrolysis in patellar and supraspinatus tendinopathy and in a study by Rebecca v et, al, (2018) even when used corticosteroid injections in gluteal tendinopathy have similar effects.

The application of modalities increases the blood supply to the tendon and it leads to more oxygen results in exchange of nutrients, stimulating the metabolic cells results in the tendon

cells migrate into affected area cause proliferation of the tendon cells leads to healing and repair of the tendon and inhibiting the pain pathway results in reducing the pain. Out of 7 studies ESWT shows more effective form of technique to treat tendinopathies compare with ultrasound by (41) (46) (29) (23). But there is a study by Sarah v et, al, (2023) studied that ESWT is effective but PRP shown better improvements for supraspinatus tendinopathy Liufeng v et, al, (2024).

Manual therapy mainly stimulates the mechanoreceptors and there by activation of descending inhibitory pathway reduces the pain and effective in releasing tightness of tendons and healing in tendinopathies. Myofascial trigger release techniques like Deep Transverse friction massage, Ischemic compression have shown positive results in Achilles tendinopathy and LET Muhamed v et, al, (2024), Rehman v et, al, (2022). MWM and Maitland Mobilization both have mixed effects on pain and improving function in tendinopathies⁽³⁴⁾.

From Studies of Elif Durgut v et, al, (2024), Muhamed v et, al, (2023) it is clear that Kinesiotaping increases interstitial space and stimulating proprioception may helpful for nerve tendon integrity. Dry needling is more effective when used adjacent to therapeutic modalities. Literature recommends the use of minimally invasive treatments like PRP, PNE, CS promotes healing of the tendon by increased collagen and endothelial growth factor which results in removal of damaged tissue with collagen and disruption of chronic degeneration. PRP is more beneficial than the corticosteroid injections for supraspinatus and gluteal tendinopathy and PNE guided with ultrasound also effective in supraspinatus, gluteal and lateral elbow tendinopathy.

5. Conclusion

Based on my study it is identified that various interventions are helpful in effective management of tendinopathies. Short term benefits can be achieved by using Dry needling, Electrotherapy and Platelet Rich Plasma are having minimal long-term benefits. Appropriate Load management and progressive Tenon loading, Eccentric exercises and Extra corporeal shockwave therapy is accurate in long-term positive outcomes. And combination of various interventions proved to be more effective than single intervention in effective management of tendinopathy.

6. Limitations & Future Considerations

This review has few limitations as it doesn't consider the age of the study population and also as many studies have less sample size, short term follows up and insufficient observing in long term effects. Less studied on the psychological factors on tendinopathies. The placebo effects were not assessed because few studies only included control groups and heterogenous population and outcome measures and overall, no distinction of athletes and general population in a study which can limit the applicability of its results which is suggestive of more objective and randomized controlled trails specifically addressing the various interventions with appropriate study design.

References

- [1] Cardoso TB, Pizzari T, Kinsella R, Hope D, Cook JL. Current trends in tendinopathy management. *Best Pract Res Clin Rheumatol*. 2019 february.
- [2] Challoumas D, Biddle M, Millar. 2. Recent advances in tendinopathy. 2020 Nov 19.
- [3] Lipman K, Wang C, Ting K, Soo C, Zheng Z. Tendinopathy: injury, repair, and current exploration. 2018 march 20.
- [4] Littlewood C, May S, Walters S. Epidemiology of Rotator Cuff Tendinopathy: A Systematic Review.. 2013.
- [5] Yanai K, Tajika T, Arisawa S, Hatori Y, Honda A, Hasegawa S, Nakajima I, Goto W, Chikuda H. Prevalence and factors associated with lateral epicondylitis among hospital healthcare workers. 2024 february 8.
- [6] Brady C, Dutta A. (2016) Medial Epicondylitis and Medial Elbow Pain Syndrome: Current Treatment Strategies. *J Musculoskelet Disord Treat* 2:014. 2016.
- [7] Lorena Canosa-Carro, María Bravo-Aguilar, Vanesa Abuín-Porras, Jaime Almazán-Polo, Guillermo García-Pérez-de-Sevilla, Isabel Rodríguez-Costa, Daniel López-López, Emmanuel Navarro-Flores, Carlos Romero-Morales. Current understanding of the diagnosis and management of the tendinopathy: An update from the lab to the clinical practice. ; 68(10).
- [8] Mead MP, Gumucio JP, Awan TM, Mendias CL, Sugg KB. Pathogenesis and Management of Tendinopathies in Sports Medicine. *Transl Sports Med*. 2018 Jan;1(1):5-13. january 1st.
- [9] Kirchgesner T, Larbi A, Omoumi P, Malghem J, Zamali N, Manelfe J, Lecouvet F, Vande Berg B, Djebbar S, Dallaudière B Drug-induced tendinopathy: from physiology to clinical applications. *Joint Bone Spine*. 2014 Dec;81(6):485-92. doi: 10.1016/j.jbspin.20. Drug-induced tendinopathy: from physiology to clinical applications. 2014 december.
- [10] Kaux JF, Forthomme B, Goff CL, Crielaard JM, Croisier JL.. Current opinions on tendinopathy. 2011 june 1st.
- [11] John J. Wilson, M.D., And Thomas M. Best, M.D., Ph.D. Common Overuse Tendon Problems: A Review and Recommendations for Treatment. 2005.
- [12] Teresa Villa Muñoz, Jorge Velázquez Saornil, Zacarías Sánchez Milá, Carlos Romero-Morales, Jaime Almazán Polo, Luis Baraja Vegas, Jorge Hugo Villafaña, Vanesa Abuín-Porras. Comparative evaluation of the efficacy of therapeutic exercise versus myofascial trigger point therapy in the treatment of shoulder tendinopathies: a randomised controlled trial. 2024.
- [13] Kousar R, Sanaullah M, Ikram M, Aleem A, Memon AG, ur Rehman SS.. Effects of ultrasound therapy versus transverse friction massage along with eccentric exercise program on chronic achilles tendinopathy.. *The Rehabilitation Journal*.. 2022.
- [14] Salman MO, Khan SU, Shrahili M.. Comparison of Kinesio Tape and Dry Needling in the Management of Rotator Cuff Tendinopathy: A Randomized Control Trial. *Journal of Disability Research*.. 2023 november 2nd.
- [15] Savva C, Karagiannis C, Korakakis V, Efstathiou M. The analgesic effect of joint mobilization and manipulation in tendinopathy: a narrative review. *Journal of Manual & Manipulative Therapy*. 2021 september 3rd.
- [16] Merolla G, Bhat MG, Paladini P, Porcellini G.. Complications of calcific tendinitis of the shoulder: a concise review. *Journal of Orthopaedics and Traumatology*.. 2015 september 16.
- [17] Aicale R, Bisaccia RD, Oliviero A, Oliva F, Maffulli N. Current pharmacological approaches to the treatment of tendinopathy. 2020 august 21.
- [18] Lewis T, Cook J. Fluoroquinolones and tendinopathy: a guide for athletes and sports clinicians and a systematic review of the literature. *Journal of athletic training*.. 2014 june 1st.
- [19] Maffulli N, Longo UG, Loppini M, Spiezia F, Denaro V.. New options in the management of tendinopathy. *Open access journal of sports medicine*. 2010 march 31.
- [20] Aicale R, Tarantino D, Maffulli N. Surgery in tendinopathies. *Sports Medicine and Arthroscopy Review*.. 2018 december 1.
- [21] Maffulli N, Longo UG, Loppini M, Denaro V. Current treatment options for tendinopathy. *Expert opinion on pharmacotherapy*. 2010 september 1.
- [22] Muñoz TV, Saornil JV, Milá ZS, Romero-Morales C, Polo JA, Vegas LB, Hugo-Villafaña J, Abuín-Porras V. Comparative evaluation of the efficacy of therapeutic exercise versus myofascial trigger point therapy in the treatment of shoulder tendinopathies: RCT. *BMJ Open Sport & Exercise Medicine*. 2024 october 1.
- [23] Stania M, Słomka KJ, Juras G, Król T, Król P.. Efficacy of shock wave therapy and ultrasound therapy in non-insertional Achilles tendinopathy: a randomised clinical trial. *Frontiers in Neurology*. 2024 july 10.
- [24] Shriya S, Arya RK, Kushwaha S, Chahar S, Manikandan P, Mehra P.. Effectiveness of Low-Level Laser Therapy Combined With Eccentric Exercise in Treating Midportion Achilles Tendinopathy: A Randomized Controlled Trial. *Cureus*. 2024 june 22.
- [25] Karamat MS, Jamil A. Comparative effects of myofascial release with and without eccentric resistance on pain, range of motion, and functional disability in patients with Achilles tendinopathy. *J. journal of Bodywork and Movement Therapies*. 2024 october 1.
- [26] Xiao L, Zhou H, He J, Liu H, Li Y, Liu Z, Hu H. Comprehensive assessment of heavy slow resistance training and high-dose therapeutic ultrasound in managing patellar tendinopathy, a randomized single-blind controlled trial. *BMC Sports Science, Medicine and Rehabilitation*. 2024 october 10.
- [27] Li Y, Mei L, Rahat S, Pang L, Li R, Xiong Y, Li J, Tang X. The efficacy of kinesio tape in patients with lateral elbow tendinopathy: A systematic review and meta-analysis of prospective randomized controlled trials. *Heliyon*. 2024 february 4.
- [28] Bilir EE, Atalay SG, Tezen Ö, Karaköseoğlu İ. Comparison of high intensity laser therapy and extracorporeal shock wave in treatment of lateral epicondylitis: a randomized controlled study. *Lasers in Medical Science*. 2024 november 8.

- [29] Karanasios S, Tsamasiotis GK, Michopoulos K, Sakellari V, Gioftos G. Clinical effectiveness of shockwave therapy in lateral elbow tendinopathy: systematic review and meta-analysis. *Clinical Rehabilitation*. 2021 october.
- [30] Syed AU, Darain H, Rana M. The effects of the addition of Mulligan mobilization with movement to exercise on elbow pain and function associated with lateral elbow tendinopathy. *Journal of Bodywork and Movement Therapies*. 2024 october 1.
- [31] Durgut E, Gurses HN, Bilsel K, Alpay K, Hosbay Z, Uzer G, Yıldız F, Elmalı N. Short-Term Effects of Cold Therapy and Kinesio Taping on Pain Relief and Upper Extremity Functionality in Individuals with Rotator Cuff Tendinitis: A Randomized Study. *Medicina*. 2024 July 23.
- [32] El-Bably S, Ganeb S, El-Shambaky A, Hassan W. Extracorporeal Shock Wave Therapy versus Local Corticosteroid Injection and Platelet-Rich Plasma in The Treatment of Supraspinatus Tendinopathy. *Egyptian Journal of Hospital Medicine*. 2023 July 1.
- [33] Salman MO, Khan SU, Shrahili M. Comparison of Kinesio Tape and Dry Needling in the Management of Rotator Cuff Tendinopathy: A Randomized Control Trial. *Journal of Disability Research*. 2023 november 2.
- [34] Sonone SV, Patil D. Effect of Maitland and Mulligan mobilization on pain, range of motion and disability in patients with rotator cuff syndrome: a randomized clinical trial protocol. *F1000Research*. 2023 Aug 23;12:1027. 2023 august 23.
- [35] K. BJ. The Effects of Low-Level Laser Therapy Versus Platelet Rich Plasma Therapy on Pain and Function in Patients with Achilles Tendinopathy: A Meta-Analysis (Doctoral dissertation, California State University, Fresno). .
- [36] Abd Elrahim RM, Ali MF, Elwerdany SH, Salama AM, Elsayed. M. Mulligan Mobilisation With Movement Versus Deep Friction Massage In Patients With Lateral Epicondylitis. *Journal of Pharmaceutical Negative Results*. 2022 december 12.
- [37] Kousar R, Sanaullah M, Ikram M, Aleem A, Memon AG, ur Rehman SS. Effects of ultrasound therapy versus transverse friction massage along with eccentric exercise program on chronic achilles tendinopathy. *The Rehabilitation Journal*. 2022.
- [38] T A.. Extracorporeal Shock Wave Versus Interferential Current in Tennis Elbow. *Biomed. J. Sci. Tech. Res*. 2021.
- [39] Persson Krogh T, Kaae Astrup J, Kyed C, Fredberg U. Extracorporeal shockwave therapy in the treatment of patellar tendinopathy: A randomized, double-blind, placebo-controlled trial. *Translational Sports Medicine*. 2021 July 4.
- [40] López-Royo MP, Ríos-Díaz J, Galán-Díaz RM, Herrero P, Gómez-Trullén EM. A comparative study of treatment interventions for patellar tendinopathy: a randomized controlled trial. *Archives of physical medicine and rehabilitation*. 2021 may 1.
- [41] Dedes V, Mitseas A, Polikandrioti M, Dede AM, Perrea A, Soldatos T, Panoutsopoulos GI. Achilles tendinopathy: Comparison between shockwave and ultrasound therapy. *Int J Phys Educ Sports Health*. 2020.
- [42] Breda SJ, Oei EH, Zwerver J, Visser E, Waarsing E, Krestin GP, de Vos RJ. Effectiveness of progressive tendon-loading exercise therapy in patients with patellar tendinopathy: a randomised clinical trial. *British journal of sports medicine*. 2021 may 1.
- [43] Rodríguez-Huguet M, Góngora-Rodríguez J, Rodríguez-Huguet P, Ibañez-Vera AJ, Rodríguez-Almagro D, Martín-Valero R, Díaz-Fernández Á, Lomas-Vega R. Effectiveness of percutaneous electrolysis in supraspinatus tendinopathy: a single-blinded randomized controlled trial. *Journal of Clinical Medicine*. 2020 June 12.
- [44] Rodríguez-Huguet M, Góngora-Rodríguez J, Lomas-Vega R, Martín-Valero R, Díaz-Fernández Á, Obrero-Gaitán E, Ibañez-Vera AJ, Rodríguez-Almagro D. Percutaneous electrolysis in the treatment of lateral epicondylalgia: A single-blind randomized controlled trial. *Journal of Clinical Medicine*. 2020 July 1.
- [45] Mellor R, Bennell K, Grimaldi A, Nicolson P, Kasza J, Hodges P, Wajswelner H, Vicenzino B. Education plus exercise versus corticosteroid injection use versus a wait and see approach on global outcome and pain from gluteal tendinopathy: prospective, single blinded RCT. 2018 may 2.
- [46] Carlisi E, Cecini M, Di Natali G, Manzoni F, Tinelli C, Lisi C. Focused extracorporeal shock wave therapy for greater trochanteric pain syndrome with gluteal tendinopathy: a randomized controlled trial. *Clinical Rehabilitation*. 2019 april.
- [47] Fitzpatrick J, Bulsara MK, O'Donnell J, McCrory PR, Zheng MH. The effectiveness of platelet-rich plasma injections in gluteal tendinopathy: a randomized, double-blind controlled trial. *The American journal of sports medicine*. 2018 march.
- [48] P. P. The Effectiveness of Extracorporeal Shockwave Therapy Compared to Therapeutic Exercise on Pain and Grip Strength in Adults with Lateral Epicondyle Tendinopathies: A Meta-Analysis (Doctoral dissertation, California State University, Fresno).