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PHYSIOTHERAPY MANAGEMENT IN COMMON TENDON INJURIES: REVIEW OF REVIEWS

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ABSTRACT

Background: Numerous systematic reviews have been published on tendinopathies that deals with specific therapies on a specific location. Clinical therapists find it difficult to synthesize these results into their practice as evidence is conflicting between the sites of tendinopathy. The objective of this systematic review is to see the effectiveness of physiotherapy interventions (both active- exercise and passive- physical agents) in the management of tendinopathies.

Methods: Articles were selected from Web of Science (WoS) by entering keywords in mid-December 2017. Articles published in the English language, between 2000 and 2017 were selected. The author selected 14 reviews from 31 possible reviews for this article and all, but one was indexed in PubMed too. Seven, 1, 3 and 3 were the number of articles that were carried treatment, physiotherapy, exercise and physical agents in their titles. Shoulder, hip or knee, ankle locations were dealt in 6, 4 and four articles respectively.

Results: Current evidence-based literature shows that exercise especially eccentric one is the definite physiotherapy treatment option for treating lower limb and some upper limb tendinopathies. However, reviews show that other forms of exercises particularly stabilization as a promising option in upper limb conditions. Physical agents (Ultra Sound [US], Transcutaneous electrical nerve stimulation [TENS] are showing conflicting results hence not recommended at this point. The LASER can be used in Shoulder tendinopathies.

Conclusion: The traditional concept of eccentric training in tendinopathies is challenged by recent reviews which show stabilization and other types of exercises also improving pain and function in tendinopathies. Well-designed large RCT trials are required to see the effectiveness of physical agents, different types of exercise training on tendinopathies.

Keywords: Physical Therapy, Evidence-Based Medicine, Exercise, Physical agents, Systematic review.

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INTRODUCTION

Tendinopathy or tendinosis is a type of chronic, over-use soft tissue injury that results from wear and tear due to repetitive movements with a painful presentation at middle or old age. It may happen at a young age in athletes after poorly rehabilitated acute injury or improper biomechanics. Various intrinsic and extrinsic factors predispose the tendinopathy in an individual [1-4]. Achilles tendinopathy and patellar tendinopathy are common in runners [5-7], jumpers [8, 9]. Shoulder tendinopathies are common in swimmers [10] and throwers [11].

Early rehabilitation is important; if not done properly, it may lead to deterioration of performance in athletes sometimes it may even rupture of tendons. Conservative management is the first line of treatment, and several physiotherapy interventions are used to rehabilitate the individuals with tendinopathies [12-15]. They are broadly classified into active exercises including stretching exercise [16, 17] and application of passive modalities like ultrasound (US), transcutaneous electrical nerve stimulation (TENS), LASER, etc [18].

Several RCTs examined the effect of various physiotherapy interventions, either alone or in combination, on reducing pain and improving functions, in common tendinopathies. Based on the results of these studies, many systematic reviews and meta-analysis have been published in peer-reviewed journals in recent times. These reviews are based on either specific conditions or specific treatment techniques as reviewed by Alfredson and Cook (2007), Wu et al. (2017) [19,32]. Holistic, evidence-based physiotherapy treatment is currently lacking in the rehabilitation of tendinopathies. Hence the objective of this review is to systematically review these reviews, consolidate and synthesize the results so as physiotherapists can use them in their future clinical practice.

METHODOLOGY

Search Methodology:

Search period for this review was done between 2000 and 2017 on 19th December 2017 in Web of Science (WoS) search engine (advanced search option). Total of three steps involved in selecting all articles in English for this review. Step one, we entered terms "TS= (Physical Therapy OR Physiotherapy OR Conservative)" which yielded 165398 results. Step two, we entered terms "TS=(Sprain OR Strain OR Tendin* OR Soft Tissue" which yielded 977033 results. Step three, we added both the above searches by "#1 AND #2" which yielded 5652 results. Then we added two filters, i.e. 1. 'reviews' document type only 2. ' orthopedics, sports sciences, rehabilitation' categories only. This yielded 601 and 270 results respectively. Finally, 270 titles were screened, and 31 full-text articles were selected for the review. 17 articles were excluded after reading their text as they are not useful for this review. The whole process ended with selecting 14 articles that were found useful to write this review.

Selected article's characteristics:

This review included 14 articles [19-32]. All, but one [31], were indexed in PubMed. Five [19, 22-24, 32] titles carried the term 'treatment or management' in their titles. Similarly, one [31], three [26-28] titles carried the term 'physiotherapy,' 'exercise' in their titles. Three articles, one each for the ultrasound (US) [20], transcutaneous electrical nerve stimulation (TENS) [21], LASER [25], used physical agents name in their titles. Six articles [20, 21, 25, 27, 28, 32] dealt with Shoulder conditions. Similarly, four [22-24, 30], four [19, 26, 29, 31] articles dealt the conditions that were hip or knee, ankle locations respectively. Selected reviews with their author name, its location focus, search engines used, the period covered and final included articles (Table 1).

Table 1: Meta-synthesis of selected articles in this review.

Study	Location	Search engines used	Search period	Total included articles
Desmeules et al. [20]	Shoulder	PubMed, EMBASE, PEDro, CINAHL (04)	Up to December 2013	11 out of 17
Desmeules et al. [21]	Shoulder	PubMed, EMBASE, PEDro, CINAHL (04)	Up to April 2015	06 out of 19
Haslerud et al. [25]	Shoulder	PubMed/Medline, EMBASE, PEDro, CINAHL, Cochrane reviews (06)	Up to May 2013	17 out of 23
Littlewood et al. [27]	Shoulder	Medline, PEDro, CINAHL, Cochrane, AMED, SPORTDiscus (06)	Up to November 2010	05 out of 30
Ortega-Castillo and Medina-Porqueres [28]	Shoulder	Medline, PEDro, CINAHL, SPORTDiscus (04)	NA	12 out of 18
Wu et al. [32]	Shoulder	PubMed, EMBASE, Cochrane reviews (03)	Up to August 2016	03 out of 14
Everhart et al. [22]	Knee	CINAHL, Up to Date, GoogleScholar, Cochrane, SPORTDiscus (05)	Up to January 2013	15
Frizziero et al. [23]	Hip	PubMed, PEDro, GoogleScholar (03)	Up to April 2016	03 out of 16
Gaida and Cook [24]	Knee	EMBASE, Medline, Scopus, SPORTDiscus, Web of Science (05)	2001-February 2011	13 out of 32
Startzman et al. [30]	Hip	PubMed, Medline (02)	1985-2015	08 out of 21
Kingma et al. [26]	Ankle	PubMed/Medline, EMBASE, PEDro, CINAHL, Cochrane, GoogleScholar (07)	1966-2005	09 out of 19
Scott et al. [29]	Ankle	Medline, EMBASE, CINAHL, SPORTDiscus, Current contents (05)	Up to May 2014	12 out of 25
Sussmilch-Leitch et al. [31]	Ankle	Medline, EMBASE, WoS, CINAHL, AMI, PEDro, AUSPORT (07)	Up to September 2011	19 out of 23

RESULTS

Based on locations

Shoulder

Desmeules et al. (2015) reviewed 11 articles from 4 databases to see the effect of US in shoulder tendinopathy [20]. They found the US was not superior to both placebo/ advise and combined with exercise/other physical agents in these patients. Desmeules et al. (2016) reviewed six articles from 4 databases to see the effect of TENS in shoulder tendinopathy [21]. They found that TENS is not effective intervention to treat shoulder tendinopathy conditions. Haslerud et al. (2015) reviewed 17 articles, 13 high and 04 moderate methodological RCTs, and found LASER is an effective tool to relieve pain but not function both alone and in combination with other physiotherapy interventions in shoulder tendinopathy condition [25]. Littlewood et al. (2012) in a review based on five studies from 6 search engines showed that loaded (against gravity or resistance) exercise (either supervised or home exercise) is either superior to no intervention, placebo, or equal to surgery, orthotics, multimodal physiotherapy [27]. Based on reviewing 12 articles from 4 databases Ortega-Castillo and Medina-Porqueres (2016) concluded that eccentric training could be used to relieve pain, improve function in upper limb tendinopathies; but their superiority against other methods needs to be examined further [28].

Hip and Knee

Everhart et al. (2017) reviewed 15 articles from 5 databases for selected treatment options for patellar tendinopathy which included five articles for the eccentric training and 1 article for US [22]. The eccentric training showed strong improvement in patellar tendinopathy symptoms [22]. Gaida and Cook (2011) reviewed 13 articles from 5 databases for treating patellar tendinopathy in which ten articles (12 groups) on eccentric training, five articles on concentric training, two each on US and friction massage, one on a structured combination of physiotherapy interventions [24]. The results showed eccentric training is beneficial in reducing pain (2 studies), symptoms (9 studies); concentric training is beneficial in reducing pain (2 studies), symptoms (3 studies) in patellar tendinopathy [24]. Startzman et al. (2017) reviewed eight articles from 2 databases in which four articles used eccentric training, two articles used hamstring stretching, two articles used trunk stabilization with agility training in proximal hamstring tendinosis condition [30]. Their results showed eccentric training reduced hamstring re-injury rate (3 studies), reduced return to sports time (RTS) (2 studies); trunk stabilization exercise with agility training is superior to eccentric training (1 study) as well as stretching along with hamstring resistance training (1 study) in terms of hamstring re-injury rate [30].

Ankle

Kingma et al. (2007) reviewed nine articles from 7 databases to see the effectiveness of eccentric training on pain in Achilles tendinopathy condition [26]. Three articles compared eccentric training with concentric training, 1 with surgery, 1 with a night splint. All but one reduced pain in favor of the eccentric training group. Sussmilch-Leitch et al. (2012) reviewed 19 articles from 7 databases to see the effect of physiotherapy interventions in Achilles tendinopathy [31]. They concluded that eccentric training either alone or with LASER or with microcurrent could be used in Achilles tendinopathy [31]. Scott et al. (2015) reviewed 12 articles from 5 databases to see the effect of orthotics in Achilles tendinopathy and concluded that adding orthotics to eccentric training is not improving pain or function hence eccentric training should be the first line treatment of choice in this condition [29].

Based on treatment options

Exercise

Eccentric training reduced pain either significantly (3 studies) or insignificantly (1 study) compared to concentric training; reduced pain significantly (1 study each) compared to surgery and night splint in Achilles tendinopathy [26]. Eccentric training (5 studies) showed strong improvement in patellar tendinopathy symptoms with additional benefit by adding stretching (1 study) [22]. Ortega-Castillo and Medina-Porqueres (2016) reviewed 12 articles to see the effect of eccentric exercise on pain, function, strength in upper limb tendinopathies [28]. 11 articles that used eccentric exercise showed significant intra-group (pre-post) reduction in pain whereas 1 showed insignificant reduction [28]. When eccentric exercise group was compared with other groups (inter-group- total 14 groups), five results showed in favor of eccentric; 2 against eccentric and seven insignificant difference between groups [28]. Amongst nine articles that evaluated function, 7 showed significant eccentric intra-group functional improvements and 2 showed insignificant improvements. The Inter-group comparison showed four studies in favor of the eccentric exercise, three studies insignificant difference and two against the eccentric exercise group [28]. Amongst nine articles that evaluated strength, 7 showed significant improvements and two insignificant improvements in favor of the eccentric group [28]. Inter-group analysis showed five results in favor of the eccentric exercise; 4 insignificant differences and one against eccentric exercise group [28]. Eccentric training reduced the hamstring re-injury rate (3 studies) and was superior to conventional concentric exercise (2 studies) but inferior to agility training with trunk stabilization exercise (1 study) in proximal hamstring tendinosis [30]. Alfredson and Cook (2007) proposed heel-drop (eccentric) exercise that elicits pain as the first-line conservative intervention for 6-12 weeks in chronic Achilles tendinopathy with possible mechanisms for its efficacy [19].

Gaida and Cook (2011) reviewed five studies that compared eccentric training with concentric one in patellar tendinopathy [24]. The results showed 3 in favor eccentric (2 significant and one insignificant), 1 in favor of concentric (insignificant) and one comparison of two type of exercises [24]. Eccentric training is superior to corticosteroid

injection (1 study), US (1 study) but equal to surgery (1 study) heavy, slow resistance training (1 study) in patellar tendinopathy condition [24]. Eccentric exercise reduced the RTS time after injury compared to conventional exercise (2 studies) but increased RTS time compared to agility training with trunk stabilization exercise (1 study) in proximal hamstring injury [30].

Frizziero et al. (2016) recommended the use of exercise therapy in long-term relief of tendinopathies around hip (3 articles) [23]. However, they questioned the type of exercise, dose, and intensity of exercise that could be used in hip tendinopathies [23]. Loaded exercise, exercise either against gravity or resistance, is recommended in shoulder tendinopathy (5 articles) [27]. Stabilization with agility training is superior to hamstring stretching with resistance training (1 study) regarding re-injury rate in proximal hamstring tendinosis [30]. 9 studies that used eccentric exercise as primary intervention in Achilles tendinopathy showed eccentric training is superior to wait-and-see control (1 study); cryotherapy (1 study); concentric exercise (1 study); multi-model physiotherapy intervention (1 study) and no significant difference with heel brace (1 study); US (1 study); shock wave therapy (2 studies) [31].

Adding the US to exercise is not superior to exercise alone (3 articles) [20]; whereas adding the LASER to exercise is superior to exercise with placebo LASER (2 studies) on pain reduction (VAS) [25] in shoulder tendinopathy. Adding night splint to eccentric training not increase the pain reduction as compared to eccentric exercise (1 study) [26] but the improved function (2 studies) [31] in Achilles tendinopathy. Adding analgesics (NSAIDs) to exercise are not superior to exercise with placebo drugs in reducing pain on VAS scale one week after severe proximal hamstring injury (1 study) [30]. Adding microcurrent to eccentric training improved pain, stiffness and function outcome (1 study) in Achilles tendinopathy [31].

Orthotics

Application of night splint either alone or in combination with eccentric training is inferior to eccentric exercise alone on pain (1 study) in Achilles tendinopathy [26]. A Later study showed night splint with eccentric training is superior to eccentric training alone in function (2 studies), and heel brace with eccentric training is superior to eccentric training alone on VAS pain (2 studies) in Achilles tendinopathy [31]. Scott et al. (2015) reviewed 12 articles-2 on foot orthosis alone, three taping alone, 1-foot orthosis with taping, two heel braces and 4-night splint. Four articles compared orthotics with eccentric training with eccentric training alone and found no difference between groups hence eccentric training was recommended in conclusion [29].

Physical agents

Ultrasound (US)

12 weeks of US application produced similar symptoms improvement to that of placebo (1 study) in patellar tendinopathy [22]. Wu et al. [32] showed an insignificant reduction of pain (VAS), functional improvement and low resorption of calcification in calcific tendinitis of shoulder (1 study). Desmeules et al. (2015) reported that the US is not superior to neither exercise nor other physical agents in shoulder tendinopathy (total ten studies) [20]. They advised the therapists not to use the US in shoulder tendinopathy until high quality-studies report its effectiveness in future.

Adding the US to eccentric training is not improving symptoms (1 study) in patellar tendinopathy [24]. Treatment duration of 8 minutes is superior to 4 minutes when 1.5 W/cm-2 intensity, continuous mode US (along with TENS, infrared and exercises) was applied in shoulder tendinopathy for three weeks [20].

Transcutaneous electrical stimulation (TENS)

Desmeules et al. (2015) reported conflicting results (one in favor and one against) for TENS when it was compared with the US in shoulder tendinopathy [20]. TENS may be superior to placebo (1 study) in shoulder tendinopathy [21]. Wu et al. (2017) showed an insignificant reduction of pain (VAS), functional improvement and low resorption of calcification in calcific tendinitis of shoulder (1 study) [32]. Desmeules et al. (2016) in their systematic review based on six high-risk bias studies concluded that TENS is not an effective tool to treat shoulder tendinopathy [21]. They recommended the physiotherapists to use other evidence-based rehabilitative tools to treat shoulder tendinopathy instead of TENS [21].

LASER

The LASER is superior to US (2 articles) on VAS pain reduction in shoulder tendinopathy [20, 25]. Haslerud (2015) et al. found 11 out of 15 trails reported that the LASER is superior in shoulder pain reduction using VAS [25]. They compared the LASER with placebo (2 studies) or no treatment (1 study) or exercise (2 studies) or other physiotherapy intervention combination (5 studies), and five studies used inadequate intensity [25]. The LASER improved shoulder function compared to placebo (2 studies) in shoulder tendinopathy but not in other physiotherapy interventions combination (3 studies) or inadequate LASER intensity (4 studies) [25]. They concluded that LASER could be used as monotherapy or as an adjunct to gold standard exercise or physiotherapy treatment regimens [25]. Adding the LASER with the eccentric exercise shows conflicting VAS pain reduction (1 significant and one insignificant) compared to eccentric exercise with placebo LASER in Achilles tendinopathy [31].

Others

Hyperthermia is superior to US (1 article) in shoulder tendinopathy [20]. Single session heat application is superior to TENS (1 article) in shoulder tendinopathy [21]. Adding the LASER to other combined physiotherapy interventions (3 studies) produced conflicting results (one significant and two insignificant reductions) on VAS pain reduction in Shoulder tendinopathy [25]. Deep friction massage improves pain (1 study) and superior to US (1 study) in

patellar tendinopathy [24]. There is no difference between structured physiotherapy and conservative injection therapy (1 study) in VAS patellar tendinopathy pain [24].

DISCUSSION

The objective of this review is to see the effectiveness of physiotherapy interventions in common tendinopathies. To reduce pain and improve function in common tendinopathies, initial physiotherapy treatment of choice is exercise, especially eccentric type. The LASER is another promising option to treat them conservatively. Other physical agents (like US, TENS) are not used to treat tendinopathies.

All three reviews on physical agents have applied in shoulder tendinopathy [20, 21, 25]. Two reviews advised against the use of physical agents [20, 21] and LASER can be used as monotherapy in shoulder tendinopathy [25]. One review advised against the use of orthotics in Achilles tendinopathy [29].

Eccentric exercise is gold standard form of exercise therapy in Achilles tendinopathy [26], patellar tendinopathy [22, 24], proximal hamstring tendinosis [30] and upper limb tendinopathies [28]. Loaded exercise is recommended for shoulder (rotator-cuff) tendinopathies [27]. Other forms of exercises such as heavy slow resistance (HSR) training in patellar tendinitis [24], two different advanced mobilization techniques in upper limb tendinopathies [28], agility training with trunk stabilization exercise in proximal hamstring tendinitis [30] have shown to be equal to or superior than eccentric training in relieving pain and improving function. Concentric exercise may be useful in Achilles tendinitis [26] and patellar tendinitis [24]. There is no evidence regarding the type of exercise, dose, an intensity in tendinopathies around hip joint [23]. These points are emphasizing the need for further studies to find out the optimal type of exercise to be used in tendinopathies.

Recommended volume of eccentric exercise is three sets with 15 repetitions each set or the minimum of 45 repetitions [22, 28]. The Minimum frequency is twice weekly [22] to twice a day [28]. Static stretching of the hamstring (30s hold, four times) for four sessions per day is superior, regarding improved ROM and reduced RTS time, to 1 session per day after proximal injury (1 study) [30].

The main limitation of this review is that I have included the reviews that have tendinopathy in title or abstract, but articles included in this review also dealt with the painful-arc syndrome, sub-acromial impingement syndrome, greater trochanter pain syndrome, trochanteric bursitis, jumper's knee, patellofemoral syndrome, etc. The present study did not include the above conditions in the search which might have resulted further potential reviews to be added. De Quervain's disease is another common tendinopathy in the wrist which is not included in this review.

CONCLUSION

Exercises especially eccentric one is a gold standard option, but recent studies show that other stabilization/ exercise techniques are equal or sometimes superior to eccentric exercise. One review on LASER shows that it is a promising option to treat shoulder tendinopathies. Results on other physical agents such as the US, TENS are conflicting and are not recommended at this point. Well-designed large RCT trials are needed to see the effectiveness of physical agents, different types of exercise training on tendinopathies.

Abbreviation list

WoS	Web of Science
US	Ultra Sound
TENS	Transcutaneous electrical nerve stimulation
RCT	Randomised control trial
LASER	Light amplification by stimulated emission of radiation
RTS	return to sports time
VAS	Visual Analog scale
NSAIDs	Non-steroidal anti-inflammatory drugs

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