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Epicondylitis lateralis: physiotherapy vs corticosteroid injection: a systematic review

Master Thesis proposed to achieve the degree of master general practioner by

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ABSTRACT

Introduction: Epicondylitis lateralis, or tennis elbow, is a common overuse syndrome of the elbow, characterized by pain around the lateral epicondyle radiating towards the wrist and exacerbating during wrist extension against resistance. This systematic review aims to investigate the effectiveness of physiotherapy and corticosteroid injections in treating epicondylitis lateralis.

Materials and methods: This systematic review is performed according to the PRISMA guidelines. Medline, Embase and Cochrane Library are scrutinized for trials on treatment of frozen shoulder. Limitations are the restriction to the English language and human subjects only. The SIGN50 is used to assess methodological quality.

Results: A total of 177 articles are identified. For qualitative synthesis, there are 3 RCTs with a total of 338 patients. For pain and functionality, 2 RCTs show a significant improvement in favor of CS at short term, but a significant improvement on long term for physiotherapy. The third RCT observes no differences at all between the groups.

Discussion: There is a lot of heterogeneity between the trials. Physiotherapy shows better results on long term than CS, but after one year epicondylitis lateralis spontaneously resolves. Further studies with standardized protocols comparing wait-and-see, corticosteroid injection alone and physiotherapy are needed to make an evidence based decision in the general practice on what to do with a patient with lateral epicondylitis.

INTRODUCTION

Epicondylitis lateralis (EL), also commonly known as tennis elbow, is a prevalent overuse syndrome of the elbow. This condition is generally seen in the general practice. Yearly 1-3% of the adults are suffering from epicondylitis lateralis. It is a work-related disorder, associated with manual labor, the use of vibrating tools and arm dominance. Most of the patients are 40 to 50 years old. Despite the other name 'tennis elbow', only 10% of the patients are playing tennis.[1, 2] In tennis players the condition is caused by an improper backhand technique.[3]

The pathophysiology has not been well identified, but they assume that it is related with repetitive microtraumata to the tendon insertion on the lateral epicondyle due to frequently lifting or forearm pronation. Epicondylitis lateralis is defined as a enthesopathy/tendinosis of primarily the extensor carpi radialis brevis (ECRB).[1, 2]

Based on the clinical history and examination the diagnosis can be made. EL presents itself by pain around the lateral epicondyle radiating towards the wrist and exacerbating during wrist extension against resistance. There are a lot of diagnostic tests for EL. Common and easily executable tests are the Thomson maneuver[4] and the chair test[5]. The Thomson test is positive when the patients experience pain while extending the wrist against resistance with a fully extended elbow and pronated forearm.[4] When the patient has pain by attempting to lift a chair with an extended elbow and pronated forearm the chair test is positive.[5] Radiological examinations are not necessary for diagnosis, unless there are arguments for other diagnoses such as radial nerve entrapment, cervical radiculopathy or osseous pathology including osteoarthritis, inflammatory arthritis, osteochondritis dissecans or a loose body.[1]

The treatment of epicondylitis lateralis is much discussed. In the data available it is suggested that EL is a self-limiting disease within 1-2 years.[2] Although it resolves spontaneously, the pain can be disabling and causing long-term absence from work. So a lot of studies are executed to determine which treatment could resolve the problem and relieve pain on short-term. Treatments for EL go from wait-and-see, NSAID, physiotherapy, bracing, ESWT, dry needling, injections with CS or other substances to surgery. There is no consensus in which treatment is best.

Two of the most commonly used treatments for epicondylitis lateralis are corticosteroid injection and physiotherapy. Corticosteroid injections are commonly used for a variety of inflammatory conditions, including epicondylitis lateralis. They have been shown to provide short-term relief of symptoms, but there is a concern about potential long-term side effects such as tendon weakening and rupture.[6] In contrast, physiotherapy aims to improve strength and flexibility and has been shown to have a positive effect on pain and function in patients with epicondylitis lateralis.[7]

This systematic review will handle about physiotherapy (PT) and corticosteroid (CS) injection. These commonly known treatment options are easy to execute in the general practice or in a basic physiotherapeutic practice. The aim of this paper is to perform a systematic review to investigate the evidence which therapeutic modality is preferred. The primary outcomes are pain and functionality.

METHODS

This systematic review is performed according to the guidelines recommended by the Preferred Reporting Items of Systematic reviews and Meta-Analyses (PRISMA).[8] An approval of an Ethics committee and a patient written or oral informed consent were not needed for the reason that this was a systematic review of previously published studies. The databases Medline (PubMed) and Embase were scrutinized for records related to the treatment of epicondylitis lateralis with physiotherapy or corticosteroid injection. A search through Clinicaltrials.gov was also executed for ongoing trials concerning the subject. The search term used for the 3 databases was "(tennis elbow) AND (corticosteroid) AND (physiotherapy)". No Medical Subject Headings (MESH) terms were used. Language restrictions were imposed: only articles in the English language were included. We also limited our search to the studies from 2007 until 2022. An additional filter was applied, namely only human trials were searched for. No preclinical and no animal studies were included. The data search was ended the 4th of November 2022. The search term as well as the used inclusion and exclusion criteria are thoroughly discussed with 2 other reviewers. Articles with terms in their title as 'ultrasound', 'extra-corporeal shock wave therapy (ESWT)', 'PRP', 'TENS' and 'disinsertion' were excluded. After having removed the duplicates across the different databases, the records selected by title were screened for their relevance by means of reading the abstracts. Then records were sought for retrieval. The retrieved records were also screened for eligibility by the same independent authors. When disagreements between these two reviewers occurred, it was resolved by consensus after discussion. If no consensus could be reached a third independent reviewer was consulted. This screening resulted in a list of articles worth reading full-text.

Out of the screened articles, only primary literature was included to review, which left us with 3 randomized controlled trials (RCTs). The selected RCTs were evaluated for their methodological quality using the SIGN50 (Scottish Intercollegiate Guidelines Network) for randomized controlled trials. SIGN50 evaluates the methodological quality of randomized controlled trials by scoring 10 items that represent internal validity. An item can get a score from 1 to 4. 1 meaning the item is well covered, 2 meaning the item is adequately addressed, 3 meaning the item is poorly addressed and 4 meaning the item is not reported, not addressed or not applicable. 'Not applicable' can only be assigned to items 4, 6 and 10. When each item has been scored, an overall assessment is made. Each RCT that has an overall assessment of '+' or '++' will be included in this review. The '++' means that none of the criteria are poorly addressed. The '+' means that 1 to 3 criteria are poorly addressed. If the overall assessment is '-', it means that more than 3 criteria are scored as poorly addressed and the study will not be included in this review.[9-11]

RESULTS

Literature search

The flow diagram of our search strategy is illustrated in Figure 1. The systematic search following the guidelines of PRISMA identified 177 unique articles in total. Of these 177 articles we excluded 140 records, based on their title and abstract. Of those 37 articles we could not retrieve 4 records. So, 33 publications underwent a full-text review. At the end, only 3 articles (RCTs) could be included for qualitative synthesis. The results of the quality assessment are illustrated in table 1. The analysis consists of three randomized controlled trials, with a total of 338 patients. Table 2 summarizes the selected articles.[10-11]

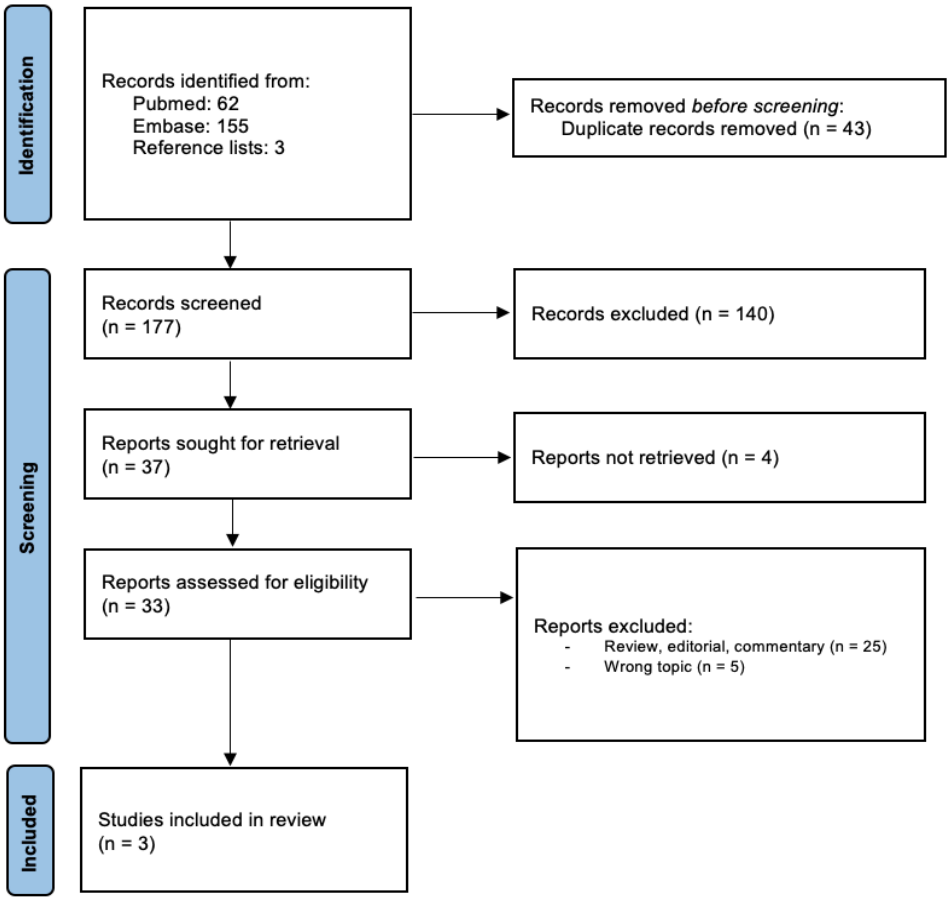


Figure 1: PRISMA flowchart

Internal validity	**Yi et al[8]**	**Olaussen et al[9]**	**Coombes et al[10]**
1.1 The study addresses an appropriate and clearly focused question	1	1	1
1.2 The assignment of subjects to treatment groups is randomized	1	1	1
1.3 An adequate concealment method is used	2	1	1
1.4 Subjects and investigators are kept 'blind' about treatment allocation	2	1	2
1.5 The treatment and control groups are similar at the start of the trial	3	1	2
1.6 The only difference between groups is the treatment under investigation	2	1	2
1.7 All relevant outcomes are measured in a standard, valid and reliable way	1	1	1
1.8 What percentage of the individuals or clusters recruited into each treatment arm of the study dropped out before the study was completed?	1	1	1
1.9 All the subjects are analyzed in the groups to which they were randomly allocated (often referred to as intention to treat analysis)	3	1	1
1.10 Where the study is carried out at more than one site, results are comparable for all sites	4	4	4
Overall assessment of the study	+	++	++

Table 1: Quality assessment selected RCTs according to SIGN50

First author	Publication year	N	Drop-outs	Groups (n)	Interventions	Outcome measures	Results	Inclusion criteria
Yi[12]	2018	34	6	Splinting + stretching (SS) (6wk = 11; 26wk = 5)	cock-up wrist splint full time during 6 weeks + stretching and reconditioning protocol after 2 weeks	VAS	SS vs CS vs DF: - Baseline (n=34): 6.7 vs 7.9 vs 7.3 - 6 weeks (n=34): 4.5 vs 3.7 vs 4.1 - Baseline (n=17): 7.1 vs 8.0 vs 6.7 - 26 weeks (n=17): 3.0 vs 7.0 vs 1.3	- Symptoms > 6 weeks - > 18 years old - Tenderness to palpation anterior + distal to lateral humeral epicondyle or pain with provocative testing of resisted wrist extension with extended elbow and pronated forearm
			6	CS injection (CS) (6wk = 11; 26wk = 5)	20mg methylprednisolone with 1% lidocaine, 10ml solution; cock-up wrist splint during 3-5 days + stretching and reconditioning protocol after 1-2 weeks	DASH	SS vs CS vs DF: - Baseline (n=34): 43.7 vs 45.4 vs 48.3 - 6 weeks (n=34): 36.0 (ns) vs 32.4 (s) vs 32.7 (s) - Baseline (n=17): 42.2 vs 35.4 vs 48.6 - 26 weeks (n=17): 32 (ns) vs 37.1 (ns) vs 10.3 (s)	
			5	Lidocaine injection + deep friction massage (DF) (6wk = 12; 26wk = 7)	10 ml 1% lidocaine + deep friction massage; cock-up wrist splint during 3-5 days + stretching and reconditioning protocol after 1-2 weeks	Grip strength	SS vs CS vs DF: - Baseline (n=34): 39.8 vs 46.7 vs 46.9 - 6 weeks (n=34): 48.0 (ns)5 vs 60.5 (s) vs 60.0 (s) - Baseline (n=17): 42.5 vs 47.5 vs 46.8 - 26 weeks (n=17): 76.1 (ns) vs 64.6 (ns) vs 79.5 (s)	
Olaussen[13]	2015	157	7	CS injection + PT (CSPT) (59)	1ml 10 mg triamcinolone acetonide, 0.5ml lidocaine 2% at 0 and 3 wk + 2x/wk deep friction, Mills manipulation, stretching + daily home eccentric exercises during 6 weeks + naproxen 500mg 2x/d during 2 weeks	VAS	CSPT vs PPT vs WAS: - Baseline: 56 vs 53 vs 48 - 6 weeks: 29 vs 45 vs 44 - 12 weeks: 41 vs 33 vs 33 - 26 weeks: 38 vs 21 vs 19 - 52 weeks: 19 vs 19 vs 19	- Symptoms 2 weeks to 3 months - 18 -70 years old - Pain increase on resisted wrist dorsiflexion with extende elbow and flexed fingers, resisted radial wrist deviation or resisted third finger extension
			5	Placebo injection + PT (PPT) (58)	1ml 0.9% isotonic saline, 0.5ml lidocaine 2% at 0 and 3 wk + 2x/wk deep friction, Mills manipulation, stretching + daily home eccentric exercises during 6 weeks + naproxen 500mg 2x/d during 2 weeks	PFFI	CSPT vs PPT vs WAS: - Baseline: 5.5 vs 5.3 vs 5.4 - 6 weeks: 2.78 vs 4.40 vs 4.82 - 12 weeks: 3.42 vs 3.62 vs 3.37 - 26 weeks: 2.97 vs 1.83 vs 2.00 - 52 weeks: 1.64 vs 1.03 vs 1.40	

			8	Wait-and-see (WAS) (60)	naproxen 500mg 2x/d during 2 weeks	Grip strength	CSPT vs PPT vs WAS: - Baseline: 70 vs 77 vs72 - 6 weeks: 87 vs 80 vs 74 - 12 weeks: 83 vs 88 vs 89 - 26 weeks: 89 vs 99 vs 99 - 52 weeks: 96 vs 102 vs 104	
Coombes [14]	2013	164	2	CS injection (CS) (43)	1ml 10 mg triamcinolone acetonide, 1ml lignocaine 1% + gradual return to activity after 2 weeks of rest	VAS (worst)	CS vs CSPT vs P vs PPT: - Baseline: 62.0 vs 59.0 vs 62.4 vs 63.2 - 4 weeks: 5 vs 1 vs 56 vs 35 - 26 weeks: 10 vs 2 vs 5 vs 5 - 52 weeks: 0.5 vs 5 vs 0 vs 0	- Symptoms > 6 weeks - > 18 years old - Pain over lateral humeral epicondyle with VAS > 30 mm, provoked by at least 2 of the following: gripping, palpation, resisted wrist/third finger extension, or stretching of forearm extensor muscles with reduced pain-free grip.
			6	CS injection + PT (CSPT) (40)	1ml 10 mg triamcinolone acetonide, 1ml lignocaine 1% + individualized physiotherapy during 8 weeks after 2 weeks of rest			
			3	Placebo injection (P) (41)	0.5ml 0.9% isotonic saline, 1ml lignocaine 1% + gradual return to activity after 2 weeks of rest	PRTEE	CS vs CSPT vs P vs PPT: - Baseline: 42.0 vs 38.1 vs 41.6 vs 36.4 - 4 weeks: 6.5 vs 7.0 vs 31.8 vs 22.5 - 26 weeks: 10.5 vs 7.5 vs 6.5 vs 3.5 - 52 weeks: 3.0 vs 3.0 vs 0.5 vs 1.0	
			2	Placebo injection + PT (PPT) (41)	0.5ml 0.9% isotonic saline, 1ml lignocaine 1% + individualized physiotherapy during 8 weeks after 2 weeks of rest			

Table 2: Overview selected RCTs.

Pain

All selected trials investigated the effect of corticosteroid injection or physiotherapy on pain. [table 2] All groups measured this outcome parameter through the visual analogue scale (VAS). The group of Yi measured the pain at 6 weeks and at 26 weeks. At early follow-up there was a significant improvement in all three groups. At the 6-month follow-up there was only a significant improvement in the group with deep friction massage compared to baseline values. There was no significant difference between the groups at the 6-week follow-up, but at 6 months the deep friction massage group showed a significant improvement compared to the 2 other intervention groups and to the baseline values.[12] Olaussen et al. measured the VAS at baseline and 4 different time points, namely 6, 12, 26 and 52 weeks. At all time points there was no significant difference between groups.[13] The RCT of 2013 compared 4 groups with each other and measured the VAS of the worst pain. They found a significant interaction at 4 weeks between corticosteroid injection and physiotherapy. When comparing the placebo alone and corticosteroid alone injection group there was a significant improvement on the VAS for worst pain in favor of the CS group at week 4. No differences were found comparing PPT and CSPT. When CSPT compared with CS no effect was found on the VAS (worst) score. The PPT group had significant better scores on the VAS (worst) then placebo injection alone. At the 26-week follow-up the CS group showed significant higher VAS scores then the P group. Further no differences were found at this time point. After 1 year there were similar results with the CS group showing significantly higher VAS (worst) scores compared to the P group.[14]

Functionality

The three trials investigated the functionality differently. [table 2] Yi et al. measured functionality through the Disabilities of the Arm, Shoulder and Hand (DASH) questionnaire. A significant improvement was observed the CS and DF groups at 6 weeks and in the DF group at 26 weeks compared with baseline functionality. There was no significant difference between the groups at the 6-week follow-up, but at 6 months the deep friction massage group showed a significant improvement compared to the 2 other intervention groups and the baseline values.[12] The Norwegian group functionality was registered using the Pain Free Function Index (PFFI). At all time points there was no significant difference between groups.[13] The third investigation group with Coombes functionality was measured by the Patient-Rated Tennis Elbow Evaluation (PRTEE) score range. They found a significant interaction at 4 weeks between corticosteroid injection and physiotherapy. When comparing the placebo alone and corticosteroid alone injection group there was a significant improvement on the PRTEE in favor of the CS group at week 4. Also a significant improvement was found comparing PPT and CSPT in favor of the CSPT group. When CSPT compared with CS no effect was found on functionality. The PPT group had significant better scores on the PRTEE then placebo injection alone. At the 26-week follow-up the CS group showed significant higher PRTEE scores then the P group. Further no differences were found at this time point. After 1 year there were no differences in PRTEE scores found between injection types and whether physiotherapy was associated or not.[14]

Grip strength

Only two studies reported results of grip strength. [table 2] The RCT of 2018 found at early follow-up a significant improvement in the groups of CS and DF. No significant difference was found in the stretching group. After 6 months of follow-up only in the DF group there was still a significant improvement in comparison to the other groups and to the baseline grip strength.[12] Olaussen et al. found again no significant difference between groups at all follow-up time points.[13]

DISCUSSION

This review aims to summarize the findings of three randomized controlled trials that compared corticosteroid injection with physiotherapy in the treatment of lateral epicondylitis. The three included studies suggest that both corticosteroid injection and physiotherapy are effective treatments for epicondylitis lateralis, with similar outcomes in pain relief and functional improvement. Two other articles, published before 2007, described randomized controlled trials with the ideal comparison of the treatment options of interest for lateral epicondylitis, namely physiotherapy and corticosteroid injection. The studies evaluated corticosteroid injections, physiotherapy, or wait-and-see policy. Both studies found that corticosteroid injections provided short-term pain relief, but the benefits did not last in the long-term. In contrast, exercise and physiotherapy provided longer-lasting pain relief and improved function compared to wait-and-see policy. Therefore, the studies suggest that exercise and physiotherapy should be considered as a first-line treatment option for lateral epicondylitis, while corticosteroid injections may have a role in short-term pain relief but should not be relied upon as a long-term solution.[15, 16] So we expected to see the same findings in this systematic review.

All the three trials in this systematic review used VAS scores to measure pain, but Coombes et al. was the only trial to use different types of VAS scales, specifically the VAS of worst pain and VAS in resting state.[10] We chose to report the VAS of worst pain because it is likely the pain patients experienced most acutely. However, this makes analyzing and comparing the different trials more complicated. Yi et al. found a significant decrease in pain across all intervention groups at 6 weeks follow-up, but only the VAS in the deep friction group was significantly lower at 26 weeks follow-up.[12] Olaussen found no significant differences between groups.[13] The RCT of 2013 showed short-term advantage for physiotherapy and CS injection, but worse pain in the CS injection group at longer term, likely due to recurrence commonly seen in studies with CS injections.[14, 17-19]

The functionality was measured using different scales or questionnaires in the three trials. In the RCT of 2018, significant improvements in functionality were found in the CS and DF groups at 6 weeks, but only in the DF group at 26 weeks.[12] This may be due to the splinting during 6 weeks, which makes it difficult to function properly. The Norwegian investigation group again found no significant differences between groups.[13] Coombes et al. found that CS with or without physiotherapy was superior to placebo injection and physiotherapy alone in the short term. Physiotherapy with placebo injection had a significantly better result than placebo injection alone, suggesting that physiotherapy is useful for the short term recovery phase. Similarly, CS injection resulted in lesser functionality at 26 weeks compared to placebo injection, likely due to the negative effect of CS after a longer period, but this difference disappeared after 1 year.[14, 17-19]

Grip strength showed a similar evolution to functionality in the study with splinting, possibly due to muscle deconditioning caused by splinting.[12] Olaussen found no significant differences again.[13]

Olaussen et al. found no significant differences, possibly because the interventions were both combined with physiotherapy.[13]

Other than the above mentioned limitations, there are several other to this systematic review. Firstly, the inclusion criteria differ in terms of the duration of complaints. Olaussen et al. included patients when symptoms were present for two weeks, while in the other trials, the cut-off was six weeks. Additionally, only Olaussen used a limitation of three months, thus excluding chronic epicondylitis lateralis, while the others did not have a limitation on the duration of complaints. Other inclusion criteria were very similar between the different studies, resulting in a homogenous patient population. However, another element complicating the comparison of the studies was that they all compared the outcome parameters differently. In the study of 2018, the parameters at 6 and 26 weeks were compared to the baseline outcome and between groups, while in the study of Olaussen et al., only differences between groups at each time point were analyzed.[12, 13] The third RCT investigated the different interactions between injection types (corticosteroid or placebo) and the presence or absence of physiotherapy at different moments of follow-up.[14]

The interventions between the trials are so different that an objective comparison is difficult. The type and the

amount of corticosteroid used in the studies are different. In the first study, methylprednisolone (Depo-Medrol) was used, while the others used triamcinolone (Kenacort). Studies suggested that methylprednisolone gives better initial pain relief on short-term than triamcinolone, but after a longer period, both corticosteroid types had the same effect. [20] Another study found no difference between the two types of corticosteroids, although both studies were intra-articular injections. [21] So, the difference in the type of corticosteroid might have a different effect on the outcome parameters. The amount of injected corticosteroid, the total volume of injection, the percentage, type, and volume of local anesthetic also vary between the studies. In the study of 2018 with methylprednisolone, 20 mg with 1% lidocaine in a solution of 10 ml was injected. In the studies of Olaussen and Coombes, they used 1 ml 10 mg of triamcinolone and respectively 0.5 ml of 2% lidocaine and 1 ml of 1% lignocaine. The volume of injection is possibly also a factor that can influence the outcome of the studies. The more volume is injected, the more it disperses to the affected location, so the greater the chance of a positive effect. On the other hand, the more volume is injected into a location where there is no space for extracorporeal fluid like a between or in the tendons, the more stretching of the surrounding tissues, and possibly pain, are caused.

The study of Yi had a high drop-out rate at the 26-week follow-up, limiting the impact of the findings after 26 weeks. Additionally, splinting was used in the study after injection and in the splinting group, while the other trials did not splint the patients.[12] This makes it difficult to compare the interventions between the trials.

The results differ a lot between the different studies, but the main conclusion is that CS quickly relieves the symptoms of pain, dysfunction and lesser grip strength. Although this effect disappears over time and sometimes worsens the complaints in comparison with physiotherapy. Physiotherapy or deep friction can also relieve the symptoms effectively, but in general after a period of a year we see that every group has a spontaneous resolution.

In conclusion corticosteroid injection can be used for a short term relief, but with keeping in mind the slightly negative effects on a long time period and the possible adverse effects of the medication itself. Physiotherapy is a useful alternative, as well as deep friction massage without the adverse effects. It is clear that further and more recent research is needed with randomized controlled trials with a standardized protocol comparing wait-and-see, corticosteroid injection alone and physiotherapy to make an evidence based decision in the general practice on what to do with a patient with lateral epicondylitis.

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