

# Systematic review and meta-analysis on steroid injection therapy for de Quervain's tenosynovitis in adults

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## Abstract

**Background** de Quervain's tenosynovitis is a painful condition of the wrist which leads to difficulties in performing activities of daily living.

**Aims** This systematic review was conducted to examine the effectiveness of steroid injection therapy as compared to splinting for treatment of de Quervain's tenosynovitis in adults.

**Methods** The following databases were searched for relevant studies, MEDLINE, EMBASE, CINAHL, AMED and PsycINFO (via NHS Evidence), and Cochrane Library (via Cochrane Collaboration). Synonyms and free texts were used to locate studies. The reference lists of articles were checked for related papers. Hand searching was performed for important relevant journals. All searches found 89 studies, out of which 14 were relevant. Two studies were selected according to the inclusion criteria of the systematic review. Data were extracted and analysed for the two selected randomised trials using a fixed effect model at 95 % confidence intervals.

**Results** The meta-analysis demonstrated that the total effect estimate was 3 with a narrow 95 % confidence interval (1.89, 4.77).  $z$  score for overall effect was 4.66 which was highly significant ( $p < 0.01$ ). Moderate heterogeneity with  $I$ -square test was found to be 64 % but was not significant ( $p > 0.05$ ). Number needed to treat was 2, which showed that for every two persons treated with steroid injections, one person gets the benefit.

**Conclusion** Steroid injection is an effective form of conservative management for de Quervain's disease although more research is needed to establish the full benefits of the treatment.

**Keywords** de Quervain's disease · Tenosynovitis · Steroid injections · Systematic review

## Introduction

de Quervain's tenosynovitis is a painful wrist condition causing difficulties in daily activities. It is a stenosing tenosynovitis of the first dorsal compartment of the wrist. The pain, which is the presenting complaint, gets worse with abduction of thumb, grasping action of hand and ulnar deviation of the wrist [1]. There is inflammation of the tendon sheaths of abductor pollicis longus and extensor pollicis brevis resulting in thickening and swelling of the compartment. This leads to abnormal gliding of these tendons in the tight fibro-osseous first dorsal compartment of the wrist [2, 3]. It is thought to be due to repetitive overuse of the wrist in ulnar deviation when the thumb is extended or abducted. It is also associated with pregnancy and rheumatoid arthritis [4].

A Swiss physician Fritz de Quervain described it in 1895 and again in 1912 [5]. Finkelstein [6] described a physical examination test for diagnosis of the condition, which is still used today. The first person to name this disease as de Quervain's disease was Patterson [7]. Several names have been given to this disease such as stenosing tendinitis, stenosing tenosynovitis, styloid tenovaginitis and stenosing tendovaginitis [1]. All these terms are just denoting inflammation of the tendon whereas de Quervain's disease signifies a degenerative disease of the first dorsal compartment of the wrist [8].

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It is common in active adults who are 30–50 years old and affects the dominant hand. It is 6–10 times more prevalent in females than in males [9]. Walker-Bone et al. [10] conducted a large study and found that the prevalence of de Quervain's disease was 1.3 % in women and 0.5 % in men. It was commonly attributed to overexertion during household duties but other occupations including repeated typing or lifting were also known to cause de Quervain's disease [1]. It is the most common tendon disorder of the hand and wrist in female workers who perform repetitive jobs [11]. It is also noted to be a self-limiting disease in pregnant and lactating women [2, 12].

There are a number of treatment options available for de Quervain's disease, which includes both conservative and surgical treatments. Conservative options include ice therapy, use of splints to rest the affected wrist and thumb, concomitant use of non-steroidal anti-inflammatory drugs, physiotherapy modalities and corticosteroid injection to the first dorsal compartment, with or without local anaesthetic medication [13]. There is, however, no consensus on the length of splinting therapy [14]. It is suggested that corticosteroids exert their anti-inflammatory action to settle the condition but the exact mechanism is unknown [15]. Other conservative options like heat induction, cold application, strapping or resting the wrist, application of irritant ointments or oral medications were not found to be useful as a form of treatment [16].

Surgical treatment involves decompression of the first dorsal compartment of the wrist and is usually reserved for those patients in which conservative measures have failed or the symptoms have been going on for more than 9 months [17]. In operative treatment, a part of tendon sheath is excised to decompress the tendon, which results in 91 % cure rate. There are however, higher financial costs and possible surgical complications associated with this invasive procedure [18].

## Literature review

Single group studies, which observed the effect of steroid injection for de Quervain's disease, have been published. In a study conducted by Witt et al. [19], steroid and local anaesthetic injection were given to 87 wrists and were immobilised with a splint. There was 62 % success rate after a follow-up period of 18 months. McKenzie [20] observed effect of steroid and local anaesthetic injection to his thirty patients and noted a 93 % cure rate after a follow-up period of 18 months. Anderson et al. [21] observed effect of steroid injection for his 55 patients and noted a 90 % cure rate after a period of 4 years. Zingas et al. [22] studied the accuracy of steroid injection in 19 patients and found that 11 patients (58 %) were cured at 3 months

follow-up. All these studies did not have comparison or control group for comparison of treatments.

There are comparative studies in literature that explore the effectiveness of steroid injection. Christie [23] examined the effectiveness of steroid injection and compared it with local anaesthetic injection for his patients. He observed 70 % cure rate in steroid injection group of 20 patients after a follow-up period of 3 months. Weiss et al. [4] compared steroid and local anaesthetic injection with splint treatment and found significant improvement with steroid injection. Lane et al. [24] conducted a retrospective study, comparing steroid and local anaesthetic injection with splint and oral NSAID treatment, and noticed 76 % of moderate to severe symptom patients were cured. Harvey et al. [25] compared steroid injection with surgery and found 80 % cure with one or two steroid injections. In all of these studies, there was no randomization performed between the two comparative groups which expose them to selection and treatment allocation bias.

Richie and Briner [26] carried out a pooled quantitative literature evaluation of conservative treatments of de Quervain's tenosynovitis, in which they included seven observational studies and found that 83 % of 226 wrists that received steroid injection alone were free of pain. They also found out that 61 % of 101 wrists that received a combined treatment of injection therapy and splinting, and 14 % of patients receiving splinting therapy alone, benefited with the respective treatments [26]. This systematic review, however, has a number of limitations. The selected studies were all non-randomised studies and the literature searches were only conducted using Medline and Ovid databases. They did not mention any additional searches performed on other databases, or how the studies were selected or how the data were extracted from the selected studies.

Peters-Veluthamaningal et al. [15] conducted a Cochrane Review on efficacy and safety of steroid injections for de Quervain's tenosynovitis in adults. They included one randomised trial and based their findings on 18 participants that were pregnant and lactating women. They reported that all patients in steroid injection group (9/9) were cured and none from the splint therapy group (0/9) had improvement in symptoms after a follow-up period of 1–6 days after the intervention. The number needed to treat (NNT) was 1, which means that each person having steroid injection for de Quervain's tenosynovitis achieves complete pain relief [15]. Although this systematic review had a robust search strategy, selection criteria and well-documented framework of data extraction, it included only one study containing 18 pregnant and lactating women, which are not representative of the whole population. The study itself had inadequate randomization and no allocation concealment and blinding of treatments.

The results generated from this review were, therefore, not reliable enough to be generalised to the whole population.

The above literature review suggests that there is limited evidence in the form of systematic reviews and meta-analysis with regards to steroid injection treatment for de Quervain's tenosynovitis. Therefore, the aim of this systematic review is to examine the effectiveness of steroid injections in comparison to splint therapy for patients with de Quervain's tenosynovitis.

## Methods of investigation

### Aims

The primary aim of this systematic review was to examine the effectiveness of steroid injection therapy as compared to splint therapy for treatment of de Quervain's tenosynovitis in adults. The secondary aim was to explore the safety of injecting steroids by recording adverse reactions reported by the authors.

### Inclusion criteria

Only randomised controlled trials were included for this systematic review if the authors included patients with a diagnosis of de Quervain's disease, symptoms were not caused by trauma, studies that compared injection therapy with splint or casting treatment and results of cure or resolution of pain were reported.

### Exclusion criteria

The studies were rejected if they were observational studies investigating injection therapy as a sole treatment choice, comparative studies that compared injection treatment with splint therapy but did not use any form of randomisation, randomised controlled trials that did not compare injection therapy with splint or casting treatment, studies comparing injection treatment with surgical treatment, studies on injection techniques and systematic review articles.

### Types of participants

The studies investigating adult patients (age 18 or above) who present with pain at radial aspect of the wrist on extension and abduction of the thumb against resistance, have tenderness at the first dorsal compartment over the radial styloid [14] and have positive Finkelstein test [1], were included in the systematic review. All studies

examining children and those adults who had more than one injection were excluded.

### Types of outcome measures

The primary outcome measure was mainly a resolution of tenderness over the first dorsal compartment of wrist and negative Finkelstein test [26]. As a secondary outcome, studies were assessed whether the authors have documented patient's level of comfort in using their hand after the intervention [27]. Any difficulties in carrying out activities of daily living were assessed [24]. Activities of daily living include personal hygiene, grooming, dressing, undressing, feeding oneself, transferring oneself from one place to another such as getting out of bed, being able to control urinary and bowel function and mobilisation for personal comfort and needs [28]. Adverse outcomes of interventions were also noted [15].

### Search strategy

We conducted a literature search of Medline (1950 to 1 December 2011), Embase (1980 to 1 December 2011), Cinahl (1981 to 1 December 2011), Amed (1985 to 1 December 2011) and PsycInfo (1806 to 1 December 2011) databases through NHS evidence. Cochrane Library (1993 to 1 December 2011) was also searched for relevant articles. Search terms included 'de Quervain tenosynovitis OR de Quervain's disease OR Repetitive strain injury OR Abductor pollicis longus OR Extensor pollicis brevis' AND 'Steroid injection OR Corticosteroid OR Glucocorticoid OR Kenalog OR Triamcinolone OR Betamethasone OR Methylprednisolone OR Hydrocortisone' AND 'Futura splint OR FRC splint OR plaster of Paris cast OR Thumb spica'.

There were no time limits applied to the search strategy on any of the databases. The search was not limited to English language as this disease was not specific to any region of the world. The search was carried out by one researcher (MOA) to avoid duplication of work. There were a total of 76 studies found by all the electronic searches.

The reference list of the found articles was scrutinised to find any other relevant articles [29]. Hand searching using electronic database of recent major orthopaedic journals was carried out to avoid missing any recent publications on the relevant topic. The journals included for hand searching were Journal of Bone and Joint Surgery, American Journal of Orthopaedics, Clinical Orthopaedics and Related Research, International Orthopaedics and Journal of Orthopaedic Research.

Relevant orthopaedic conference proceedings were searched for any related information on the topic [30].

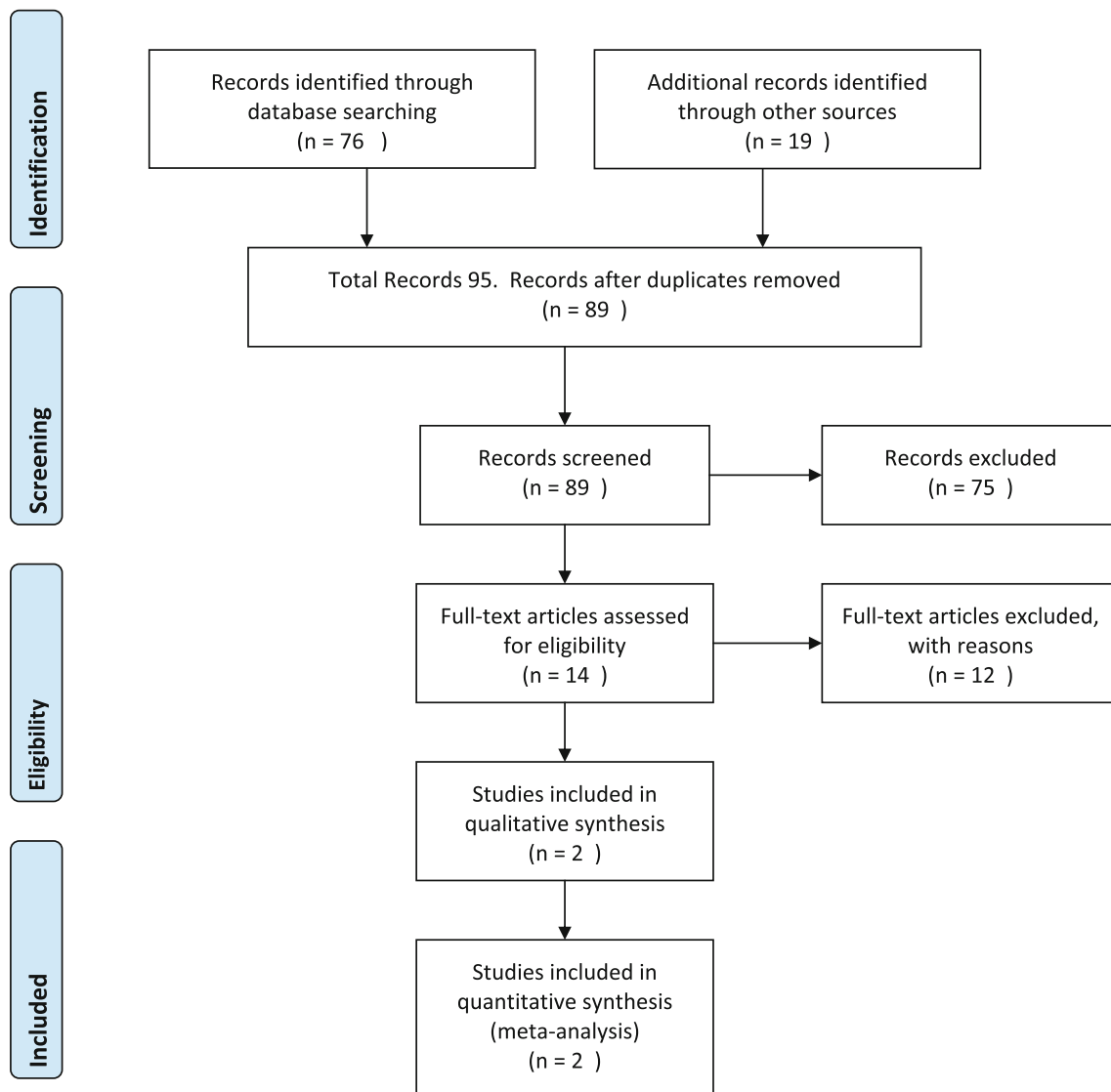
Grey literature was searched using OpenGrey website (System for Information on Grey Literature) [31]. Also an attempt was made to find any unpublished studies with an aim to reduce publication bias. This was done by going into meta-register of controlled trials available through Current Controlled Trials website and finding currently active related studies [32]. Local experts in the field were asked if they know of any other related trials on the subject [33]. All these additional searches revealed 19 related studies (Fig. 1).

#### Selection of studies

All the relevant references from all searches were transferred to reference management software such as RefWorks [35]. All the ninety-five references were examined

to remove any duplicate references, which resulted in a total of eighty-nine references waiting to be screened. Two reviewers (MOA and VGD) examined the titles and abstracts separately, looking for relevant articles [30]. There were fourteen studies out of eighty-nine which were selected for further evaluation and these articles were searched for full text either online or on paper through the medical library. The review authors were not blinded from the author list of the articles due to limitations of time required to perform blinding. The use of two review authors reduced the risk of selection bias. Berlin [36] showed that if blinding is carried out, the reduction in bias is small.

There were two studies selected directly by both authors for inclusion into the review, Avci et al. [12] and Mehdi-nasab and Alemohammad [14]. The other twelve were not



**Fig. 1** The flow chart [34] summarises the search results and selection of studies

found to be eligible according to the eligibility criteria. Disagreement between the two authors was solved by mutual discussion and an independent third colleague was consulted if there was a dispute [30]. The reasons for their rejection are summarised in Table 1, as this makes the selection process more transparent [37].

#### Data extraction

Data extraction was performed on the two selected studies by both authors separately. Information was collected on study participants, intervention performed, outcome assessment criteria, follow-up period, results of the study and complications of interventions. The information was stored on NHS computer with a logon password protection to prevent misuse of the data.

#### Methodological quality assessment

To identify potential sources of bias within the selected studies, methodological quality of the selected studies was assessed. For this purpose, the criteria given by Furlan et al. [42] were used. They gave a 12-point scoring system to assess risk of bias and deficiencies in the methodology of the trials [42]. The study was marked to be of high quality if it scored at least 50 % in the quality assessment criteria [43]. Any disagreement between the reviewers was solved with mutual discussion.

According to our set criteria of assessing quality of the included trials, both of the trials scored lower than 50 %. Avci et al. [12] scored 25 % and Mehdinasab and Alemohammad [14] scored 41 % only, as shown in Table 2. The main reasons for their low score were lack of proper randomisation, no concealment of treatment allocation and no systems in place for blinding patients, care providers or outcome assessors from treatment groups.

This showed that both of the studies had methodological flaws in their construction. To explore this further, sensitivity analysis was performed as suggested by Detsky et al. [44]. The study by Mehdinasab and Alemohammad [14] was the larger study of the two, which was given more weight of 96.3 % in the total estimate (Fig. 2). First, this study was selected alone for meta-analysis and showed a risk ratio of 2.4 with a narrow 95 % confidence interval, favouring steroid injection therapy. Then, both the studies were combined in the meta-analysis and showed a total effect estimate of 3 with a narrow 95 % confidence interval, which again favoured steroid injections (Fig. 2). It was noted that the summary effect did not change much, whether the large study was taken alone or both the studies were combined together. Therefore, it was concluded that although both studies were of poor methodological quality, they both suggest the same conclusion. Furthermore, both

**Table 1** Reasons for rejection of studies

Study	Reasons for rejection
1 Witt et al. [19]	Single group experimental study No control group
2 McKenzie [20]	Single group experimental study No control group
3 Anderson et al. [21]	Single group experimental study No control group
4 Zingas et al. [22]	Single group experimental study No control group
5 Christie [23]	Comparative non-randomised study
6 Weiss et al. [4]	Comparative non-randomised study
7 Lane et al. [24]	Comparative non-randomised study Retrospective study
8 Harvey et al. [25]	Comparative non-randomised study
9 Peters-Veluthamaningal et al. [38]	Non-relevant randomised study No comparison of interest
10 Kosuwon [39]	Non-relevant randomised study No comparison of interest
11 Jirattanaphochai et al. [40]	Non-relevant randomised study No comparison of interest
12 Goldfarb et al. [41]	Non-relevant randomised study No comparison of interest

the studies were included in the systematic review, as there were no other studies for consideration.

## Results

Meta-analysis was performed using RevMan 5.1 software [45]. The results are summarised in Fig. 2. Avci et al. [12] was the smaller study with a 3.7 % weight in the meta-analysis. There were 9 patients randomised to receive steroid injections and all were cured while 9 patients received splint therapy and none improved after the follow-up period. The second study Mehdinasab and Alemohammad [14] was the larger study having a 96.3 % weight in the summary effect. They randomised 37 patients to the steroid treatment and 32 of them were cured while 36 patients had splint therapy and only 13 benefited from it. Both the studies favour steroid injection therapy for de Quervain's tenosynovitis.

**Table 2** Quality assessment of selected RCT's

No.	Assessment of quality criteria of included studies	Avci et al. [12]	Mehdinasab and Alemohammad [14]
1	Adequate randomisation?	No	No
2	Allocation concealment?	?	?
3	Blinding patients?	No	No
4	Blinding caregiver?	No	No
5	Blinding outcome assessors?	No	No
6	Incomplete outcome data addressed? Dropouts?	Yes	Yes
7	Randomised participants analysed in the same group?	Yes	Yes
8	Free of suggestions of selective outcome reporting?	No	No
9	Similarity of baseline characters?	?	Yes
10	Co-interventions avoided or similar?	No	Yes
11	Compliance accepted in all groups?	?	?
12	Timing of outcome assessment similar?	Yes	Yes
	Maximum score possible	12	12
	Study score	3	5
	Percentage	25 %	41.6 %

Risk ratios for individual studies and total effect estimate was calculated by using fixed effect model with 95 % confidence intervals. Our calculations showed that the point estimate of total effect estimate was 3 with a narrow 95 % confidence interval (1.89, 4.77). This narrow 95 % confidence interval means that sample size was adequate to detect a significant result. Also the whole length of 95 % confidence interval lies on the same side of the chart and does not cross 1 which is the line of no effect. It was concluded that steroid injection treatment was significantly better than splint therapy for de Quervain's disease.

The test for overall effect in terms of z score showed a high value of 4.66 with a p value less than 0.00001, which

was highly significant. This means that the null hypothesis can be rejected with more than 99 % confidence ( $p < 0.01$ ), and concluded that there was significant improvement if steroid injections were given for de Quervain's tenosynovitis.

### Heterogeneity

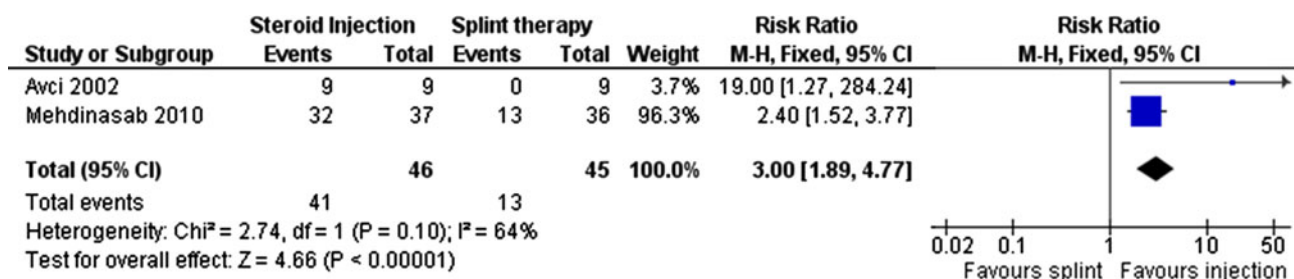
Heterogeneity was formally tested by I-square test [46]. In this meta-analysis, I-square was 64 %, which suggested moderate heterogeneity between the two studies. This heterogeneity was not significant as the p value was 0.1 ( $p > 0.05$ ), which showed that both the studies had the same effect size.

### Risk difference and number needed to treat

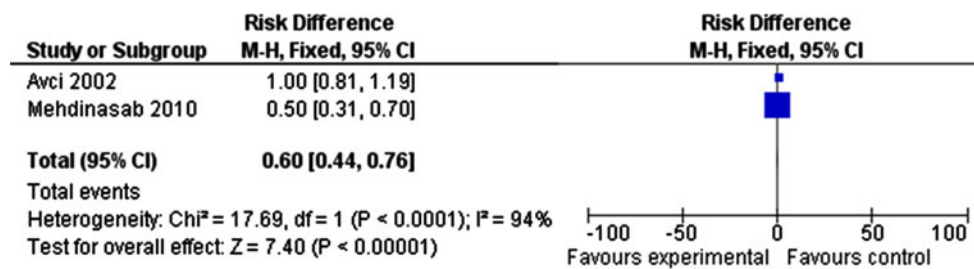
All the calculations so far were performed in relative terms such as risk ratios and z scores. The absolute effect can be expressed as a fraction of one, which is known as risk difference (RD). The risk difference was 0.6 with a narrow 95 % confidence interval (0.44, 0.76), as shown in Fig. 3. To convert this fraction to a whole number for better understanding, a reciprocal value of risk difference known as number needed to treat (NNT) was calculated which shows a value of 1.6. This is converted to the nearest whole number. So, in conclusion, two persons need to be treated with steroid injections to have a beneficial effect in one person.

### Discussion

de Quervain's disease is a stenosing tenosynovitis of the first dorsal compartment of the wrist. This occurs mostly due to repetitive strain injury, which causes thickening of the synovial membrane leading to pain on abduction and extension of the affected thumb. Several treatment modalities have been reported to be effective including both conservative and surgical treatments. From the conservative options, steroid injection therapy has been shown to be most effective in many of the studies.



**Fig. 2** Summary effect and forest plot of meta-analysis



**Fig. 3** Risk difference

In the current literature, various success rates have been reported ranging from 58 to 100 %. Christie [23] reported 70 % success rate for 20 patients after 3 months follow-up period while McKenzie [20] observed a 93 % cure rate for 30 patients at 18 months. Anderson et al. [21] reported 90 % success rate after one or two injections at 4 years follow-up period while Witt et al. [19] observed 62 % cure rate for 54 wrists at 18 months. Lane et al. [24] reported 76 % success rate at an average follow-up of 2.3 years while Harvey et al. [25] noticed an 80 % cure rate after one or two injections at a mean follow-up of two and half years. A pooled quantitative literature review by Richie and Briner [26] reported an 83 % cure rate in 226 wrists from seven experimental studies. Zingas et al. [22] reported the lowest cure rate of 58 % for 19 patients at 3 months follow-up. Only Avci et al. [12] reported a success rate of 100 % for 9 patients who were pregnant and lactating at the time of steroid injection therapy. Nobody has been able to match their results yet.

This systematic review with meta-analysis showed an overall effect, which favoured steroid injection in comparison to splint therapy. The point estimate of the overall effect was 3 with a narrow 95 % confidence interval (1.89, 4.77), denoting that the true value of definite effect lies between 1.89 and 4.77. Furthermore, the clinical correlation performed by calculating the number needed to treat (NNT) showed that for every two persons treated with steroid injections, beneficial effect was noticed in one person. This was similar to the general view from exploring the literature search that steroid injections had a beneficial effect in controlling symptoms of de Quervain's disease. No study, so far, demonstrated a negative or detrimental effect of using steroids for treating de Quervain's disease.

There are other aspects of the treatment still to be explored. Various authors have used different kinds of steroid injections for controlling symptoms of de Quervain's disease. It is still not clear which of the steroid preparation is most effective for treatment. In earlier studies by Christie [23] and McKenzie [20], hydrocortisone injection was used for de Quervain's disease. Methylprednisolone was the drug of choice for Harvey et al. [25], Anderson et al. [21], Witt et al. [19], Avci et al. [12],

Goldfarb et al. [41] and Mehdinasab and Alemohammad [14] while Weiss et al. [4] and Lane et al. [24] utilised betamethasone as the treating agent. More recent studies by Jirattanaphochai et al. [40] and Peters-Veluthamaningal et al. [15], however, explored the effects of triamcinolone as the injecting agent. These various drug choices could be explained by the local availability of a steroid agent and also by the experience of that particular researcher with that specific agent. Of note is that over time newer agents come into medical practice and take over the role of previous drugs but methylprednisolone was the most commonly used agent of choice for most of the researches.

Various authors used a variety of local anaesthetic agents in combination with the steroid injection. First published study by Christie [23] used procaine as the anaesthetic agent of choice that was mixed with steroid injection. Lidocaine (lignocaine, xylocaine) was the drug of choice as a local anaesthetic by most of the authors including McKenzie [20], Anderson et al. [21], Witt et al. [19], Weiss et al. [4] and Jirattanaphochai et al. [40]. Avci et al. [12] and Lane et al. [24] used bupivacaine in combination with steroid injection while Goldfarb et al. [41] used both lignocaine and bupivacaine along with steroid injection for their patients. It again depends on the experience of the treating physician and the availability of the drug, which dictates use of a particular agent.

Almost all of the studies documented resolution of symptoms and negative Finkelstein test as their primary outcome measure. There are, however, other assessments that can be considered as additional outcome measures. Activities of daily living (ADL) is one such objective assessment tool which could be used to gain more understanding of practical limitations which the patient experiences in performing day-to-day activities [27]. During our literature search, no study was found which considered this outcome measure as an additional objective assessment. Other outcome criterion such as visual analogue scale (VAS) was used by Mehdinasab and Alemohammad [14], but this could not be incorporated into the meta-analysis because Avci et al. [12] did not consider this outcome in their study. This is suggested to future researchers that they should consider all possible outcome assessments to have a

better understanding of the limitations caused by de Quervain's disease.

There were few reports of documented adverse reactions experienced after steroid injection. Mehdiinasab and Ale-mohammad [14] noticed a 40 % incidence of flare reaction in 32 patients who had steroid injection. They also noted one case of skin hypopigmentation and sensory radial nerve impairment. Goldfarb et al. [41] reported a flare reaction of about 33 % in their study. Peters-Veluthama-ningal et al. [38] reported 2 cases of hot flushes and 6 cases of post-injection flare reaction in 21 patients. Harvey et al. [25] reported 2 cases of persistent non-tender nodule over the affected tendons and 2 cases of skin discolouration. They noted that post-injection flare reaction was quite common but did not document the incidence. Jiratt-anaphochai et al. [40] also noted flare reaction to be the most common side effect but also documented subcutaneous nodule formation, ecchymosis and skin hypopigmentation in few patients. McKenzie [20] reported one case of weakness in grip strength in 30 cases while Christie [23] reported two cases of post-injection pain and one case of superficial thrombophlebitis in 20 patients who had steroid injection therapy.

The limitations of our systematic review was that it included only two randomised trials as there were lack of randomised studies, which compared steroid injection with splint therapy for de Quervain's tenosynovitis. Also one of the studies had a rather small sample. Furthermore, the quality assessment of the included studies was not up to the required criteria set for this systematic review, as both of the studies had inadequate randomisation and treatment allocation without blinding of the investigating treatments. This highlights the need for more proper randomised studies comparing the effects of steroid injection with splint therapy for de Quervain's tenosynovitis.

## Conclusion

This systematic review with meta-analysis was conducted to find out the effectiveness of steroid injection treatment in comparison to splint therapy in patients with de Quervain's disease. The meta-analysis concluded that steroid injection was an effective form of conservative management for de Quervain's disease and established that for every two persons treated with steroid injections, one person gets benefit of the treatment. These results were, however, based on two low-quality randomised studies, and therefore, more research in this field is warranted to establish the effectiveness of steroid injection as first line conservative treatment for patients with de Quervain's disease.

## Future directions

There are several aspects of de Quervain's disease, which need further research for diagnosis and management. During the literature review, it was evident that various authors used different diagnostic criteria for de Quervain's disease. Batteson et al. [3] proposed a 7-point diagnostic screening tool, known as de Quervain's screening tool (DQST), which incorporates various diagnostic criteria utilised by various studies on de Quervain's disease. It has an excellent inter-rater reliability and high test-retest reliability. This diagnostic tool could be utilised in future research to help in a homogenous recruitment of participants.

There is still need for validated outcome measures to be developed and tested. Further research is required with large sample sizes representing whole population, better randomisation, treatment concealment and blinding to achieve better level of evidence. Longer follow-up is required to establish the effectiveness of a particular treatment. Studies are required which explore results of various steroid preparations and to find a better dosage of those steroids. Randomised trials exploring steroid injection with surgical treatment are also needed.

**Conflict of interest** Each author certifies that he has no commercial associations (e.g. consultancies, stock ownership, equity interest, patent/licensing arrangements, etc) that might pose a conflict of interest in connection with the submitted article.

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