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## A prospective study on effectiveness of methylprednisolone acetate injection plus casting versus casting alone for the treatment of de quervain's tenosynovitis

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### Abstract

**Background:** De Quervains Stenosing Tenosynovitis is caused by thickening and accumulation of mucopolysaccharide in the sheath of the abductor pollicis longus and extensor pollicis brevis tendons. Prevalence is estimated at 0.5% among men and 1.3% among women Nonsurgical modalities include rest, ice, non-steroidal anti-inflammatory drugs and splinting. Corticosteroid injection is the mainstay of treatment for those patients who do not respond to the above.

**Aim:** This study was performed to match the result of methylprednisolone acetate injection plus thumb spica cast versus cast alone for the treatment of de Quervain's tenosynovitis.

**Materials and Methods:** All patients have explained the nature of the disease and plan of treatment. Patients were randomly grouped. Patients were divided into group A and group B. Among 40 patients =, 20 patients of group A treated with an injection of Methylprednisolone acetate in the first dorsal compartment of the wrist followed by a thumb spica cast and 20 patients of group B treated with a thumb spica cast alone. Wrist casting duration in both groups was 1 month and the patients were followed during 6 and 12 weeks.

**Study Type:** Randomized controlled Study. Diagnosis of disease was based on clinical findings. Patients with a previous history of acute trauma, wrist fracture, recent steroid injection and pregnancy were excluded from the study.

**Result:** 65% of study population were female and mean age group was 42.9 years. 35% of them were labourers. By the end of 12 weeks all patients in group A were asymptomatic.

**Conclusion:** Treatment of de Quervain's tenosynovitis with methylprednisolone acetate injection plus thumb spica cast is found to be more effective and statistically significant.

**Keywords:** de Quervain's tenosynovitis, methylprednisolone acetate, thumb spica cast

### Introduction

De Quervains Stenosing Tenosynovitis (DQST) is a condition characterized by thickening of and accumulation of mucopolysaccharide in the sheath of the abductor pollicis longus and extensor pollicis brevis tendons, which cross under the extensor retinaculum in the first dorsal compartment of the wrist [1]. The extensor retinaculum is a fibrous band attached to the underlying radius which prevents bowstringing of the extensor tendons off the dorsum of the wrist. The condition takes its name from the Swiss physician de Quervain who first described a case series of five patients in 1895. Prevalence is estimated at 0.5% among men and 1.3% among women. DQST is commonly considered as a work-related musculoskeletal disorder of the upper limb [2].

The differential diagnosis includes osteoarthritis of the first carpometacarpal joint, ganglia, infectious tenosynovitis, Wartenberg's syndrome and intersection syndrome. The patient typically complains of pain over the radial styloid process which is likely caused by mechanical friction as the tendon passes through its narrowed compartment [3]. On clinical examination, there is tenderness over the radial side of the wrist and symptoms can be elicited clinically by means of Finklestein's test.

Nonsurgical modalities are the primary line of treatment and include casting, ice, non-steroidal anti-inflammatory drugs, therapeutic exercise and splinting.

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Corticosteroid injection is then the mainstay of treatment for those patients who do not respond to the above [4]. Other described treatments include hyaluronic acid injection, ultrasound-guided percutaneous needle tenotomy and platelet-rich plasma (PRP) injection, and prolotherapy. Surgery is reserved for failure of conservative modalities and involves the release of the first dorsal compartment [5].

## Materials and Methods

### Source and type of study

This is a Randomized Controlled Study, done in RL Jalappa Hospital attached to Sri Devaraj Urs medical college from May 2019 to May 2020, for a period of 1 year. The study was conducted after getting the institutional ethical committee approval. Patients who were diagnosed with DQST were randomly divided into two groups by computer-generated random table.

Diagnosis of the disease was supported by three clinical findings, including:

1. Pain at the radial wrist with resisted extension or abduction of the thumb,
2. Tenderness at the first dorsal extensor compartment over the styloid process of the radius, and
3. A positive Finkelstein test.

Finkelstein's test was performed as it is the most pathognomic objective sign in diagnosis of this disease. It was considered positive when the passive ulnar deviation of the hand with thumb and fingers in palmar flexed position provoked pain over the styloid tip of the radius [6].

### Inclusion criteria

All patients admitted and diagnosed with de Quervain's tenosynovitis in the Dept. of Orthopaedics in RL Jalappa Hospital attached to Sri Devaraj Urs medical college, hospital and research centre during the study period who have given consent for inclusion in the study [7].

### Exclusion criteria

- Patients with a previous history of acute trauma
- Previous history of wrist fracture on same side
- Patient who are currently on any steroid injection for any other medical conditions
- Pregnancy [8].

As per the guidelines of our institution's statistician, a sample size of forty was given for the study. All patients were given explanations of the nature of the disease and the plan of treatment. Written informed consents were obtained from all the 40 patients. Patients were randomly assigned based upon their admission number using the computer generate the random table. Patients were consequently treated in two groups. A total of 40 patients with de Quervain's tenosynovitis were managed with either of these methods:

**Group A-**Injection of Methylprednisolone acetate in the first dorsal compartment of the wrist followed by thumb spica cast [9]. Injection of 1 ml (40 mg) methylprednisolone acetate with a 5 cc syringe at about 2 cm above the radial styloid process into the first dorsal compartment of the wrist. Followed by, A well-padded wrist thumb spica cast was applied. (Fig 1 and Fig 2).

### Group B: Thumb spica cast alone



**Fig 1:** Injection of methylprednisolone



**Fig 2:** Thumb Spica cast

Thumb spica casting duration in both groups was one month and the patients were followed during 6 weeks and 12 weeks. At the time of admission, the VAS score of the patient was assessed and noted, when the patient comes for review at the end of 6<sup>th</sup> week again the VAS score was reassessed and noted. This step was followed one more time, when the patient came for review at the end of the 12<sup>th</sup> week following the first visit. Now the VAS score of both the groups were compared at baseline, the 6<sup>th</sup> week and at the end of 12<sup>th</sup> week [10].

The data were entered into MS Excel, analysis was done using SPSS V.22. Quantitative variables were presented as frequency and percentage. The association between the study outcome and intervention was analyzed using Chi Square test to compare the effects of successful treatment between the two groups taking  $p \leq 0.05$  is considered as statistically significant.

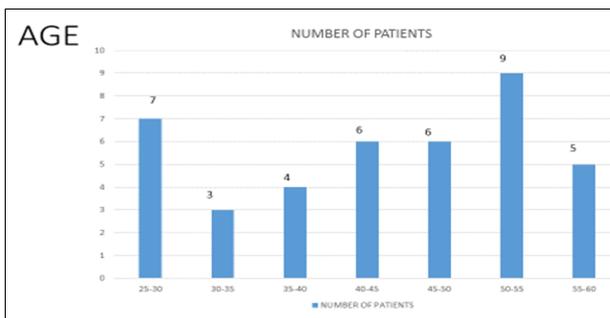
## Results

Demographic variables were compared between the two groups and it is found that no statistically significant changes are found. So the chance of selection is ruled out. A total of six males and 14 females were included in the group which received a steroid injection and cast. Whereas a total of 8 males and 12 females were included in the 20 patients group, which received cast as the only management [11].

The mean age in the steroid group was 41.6, with the youngest patient age is 26 and the oldest patient age is 62. In the cast only group the mean age was 47.8 with the youngest patient age is 32 and the oldest patient age is 64 (Table 1). There was a minimal difference in the mean age between the two groups [12]. Out of 40 patients 7 had comorbidities, 5 were diabetics and 2 were hypertensive.

**Table 1:** Group wise distribution of variables

Variable	Methylprednisolone acetate injection + thumb spica cast	Only Cast
Number	20	20
Male	6	8
Female	14	12
Age	41.6 YRS	47.8 YRS
Right	12	9
Left	8	11



**Fig 3:** Age wise distribution of patients

VAS score at the time of the first presentation was high in all patients. The persistent pain was present in all the patients in both the groups. The p-value was found to be 0.96, which was statistically insignificant. Later the patients were asked to review at the end of the 6<sup>th</sup> week [13]. Once again, the VAS score was assessed and this time, it was found that the persistent pain was significantly reduced in the group which received both steroid injections as well as casting when compared with the group of patients who received only casting. In the steroid group only 3 patients (15%) out of 20 patients receiving the steroid injection had persistent pain, whereas on the other hand almost all the 20 patients belonging to the cast-only group had some degree of persistent pain (100%) [14]. Even though the degree of the pain was reduced from the pain that was present at the time of the first presentation, all the patients still had some degree of pain. The p-value was evaluated between the two groups and was found to be <0.001 which is statistically very significant (Table 2).

VAS score was reassessed when the patients were reviewed at the end of 12<sup>th</sup>-week post-intervention. Now in the group who received steroid injection as well as a thumb spica cast, the pain reduction was seen in almost all the patients (100%). This proves that the inclusion of steroid injection is fruitful in the effective management. On the other hand, the VAS at the end of the 12<sup>th</sup> week in patients who received only a cast was found to be comparatively higher [15]. 13 patients out of 20 patients in the cast-only group was found to have persistent pain (65%) and only 7 patients hand reduction of pain (35%) in the group. Even though the intensity of the pain was reduced compared to the pain during the first presentation, 13 patients had some amount of persistent pain even after the 12<sup>th</sup> week of intervention. The p-value was calculated between the two groups and was found to be <0.001, which was statistically very significant. This result shows that treating the DQST patients with steroid injection and applying a thumb spica cast is a better mode of treatment than applying a thumb spica cast alone.

**Table 2:** VAS score at different intervals

Characteristics		Pain Persistent n (%)	Pain Reduction n (%)	p value
VAS score during presentation	Thumb spica & steroid	20 (100%)	0 (0%)	0.96
	Casting alone	20 (100%)	0 (0%)	
VAS score at 6 weeks	Thumb spica & steroid	3 (15%)	17 (85%)	0.001
	Casting alone	20 (100%)	0 (0%)	
VAS score at 12 weeks	Thumb spica & steroid	0(0%)	20(100%)	0.001
	Casting alone	13 (65%)	7 (35%)	



**Fig 4:** Before methylprednisolone injection +casting intervention



**Fig 5:** After Intervention with methyl prednisolone injection +casting

**Discussion**

De Quervains Stenosing Tenosynovitis (DQST) is a common condition which is manifested by thickening of the sheath of the abductor pollicis longus and extensor pollicis brevis tendons, which cross under the extensor retinaculum in the first dorsal compartment of the wrist. It is due to the accumulation of mucopolysaccharide. The extensor retinaculum is a fibrous band attached to the radius, the radius is under the extensor retinaculum, which prevents bowstringing of the extensor tendons off the dorsum of the wrist. The condition takes its name originating from the Swiss physician de Quervain, who first described a case series of five patients in 1895. Prevalence is estimated at 0.5% among men and 1.3% among women, the increased prevalence in women is not clearly understood, but it is believed to be due to hormonal factors which helps in the strengthening of ligaments in male [16]. Risk factors include repetitive or forceful manual work and pregnancy as well as old age. DQST is considered as a stress-related musculoskeletal disorder of the hand and forearm. The patient usually complains of pain in the styloid process of the radius, which is mostly due to the mechanical friction of the tendon. Once the diagnosis of DQST is established, nonsurgical managements are the preferred first line of management which include

complete rest, ice-pack, NSAIDs, therapeutic exercise and splinting. Corticosteroid injection is then the second line of management for those patients who do not improve to the first line of management. Surgery involves the release of the first dorsal compartment and is kept as the last option and is limited to those who do not show any signs of recovery with the medical management.

In our study, we included 40 patients who were diagnosed with DQST and randomly divided them into two groups each 20. One group received steroid injection along with casting, whereas the other group received only casting and the patients were reviewed after 6<sup>th</sup> week and 12<sup>th</sup> week after the intervention. Demographic variables were compared between the two groups and found that the female patients were higher significantly in both the groups, this corresponds with the increased incidence found in female population (1.3%) compared to the decreased incidence in the male population (0.6%). The mean age was also calculated and was found between 40 to 50 years in both the group. The mean age was 42.1 in steroid group and 47.6 in cast only group.

The VAS score was used to analyze the effectiveness of the treatment, it was noted at the time of the first presentation of the patient and also at the time of review at the end of 6<sup>th</sup> week and 12<sup>th</sup> week. It was found that all the patient had pain at the time of first presentation and the p-value obtained by comparing the VAS score at the time of first presentation was found to be 0.86 which was not statistically significant. But in the comparison of the VAS score during the 6<sup>th</sup> week and 12<sup>th</sup> week review, it was found that p value was very significant <0.001. at the end of 6<sup>th</sup> week 17 out of 20 patients in steroid group had no perception of pain whereas all the patient in the cast only group had pain at the end of 6<sup>th</sup> week. This proves that the addition of steroids to the management of DQST is useful in early pain relief. At the end of 12<sup>th</sup> week, only 7 out of 20 patients in cast only group had pain relief where as in the steroid group all the patients had pain relief. This shows that addition of steroids not only helps in early pain relief but also in sustained pain relief in patients suffering from DQST [17]. Currently the common treatment modalities for de Quervain's disease are non-operative and consist of modification of wrist activities, analgesic drugs, corticosteroid injection, bracing, casting, and physical therapy [18]. Surgery is reserved only for those with intense chronic pain unresponsive to conservative treatment. This study has revealed that more patients respond favorably to methylprednisolone acetate injection [19]. The effectiveness of corticosteroid therapy is attributed to the inflammatory effects of this drug, but the exact mechanism of action remains unclear.

In a systematic review of effectiveness of corticosteroid injection for de Quervain's tenosynovitis, performed by Richie and Eriner that included seven observational studies with 459 wrists, it was determined that 83% of the 226 wrists which received injection alone were cured, 61% of the 101 wrists that received injection and splint immobilization were cured, and 14% of patients who received splinting alone were cured. In a study by Kitti *et al.* the success rate with steroid injection was 67%.

#### Limitations of the study

- The limitations of our study may be the short-term follow-up time, therefore the recurrence rate was not possible to assess [19].
- Another limitation was the non-blinding method of the study.

#### Conclusion

We concluded that the injection of methylprednisolone acetate plus a thumb spica cast was more effective than

casting alone in the treatment of de Quervain's tenosynovitis. Application of prefabricate removable thumb holder and wrist splint for a short period of time may be preferred in patients who complains of pain after local steroid injection.

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