Original Article

Clinical Outcome of Nonoperative Treatment of de Quervain's Disease with Local Corticosteroid Injection in Nigerian Setting

Njoku Isaac Omoke[1], Ugochukwu Uzodimma Nnadozie[2]

[1]Department of Surgery, Federal Teaching Hospital, Ebonyi State University, Abakaliki, Ebonyi State, Nigeria, [2]Department of Surgery, Federal Teaching Hospital, Abakaliki, Ebonyi State, Nigeria

Abstract

Background: The goal of treatment of de Quervain's disease, pain relief and restoration of hand functions, is achievable with local corticosteroid injection. However, published reports indicate variations in its cure rate and efficacy from and within subregions. This study aimed to determine the outcome of this treatment modality in Nigerian setting. **Patients and Methods:** Fifty-one cases of de Quervain's disease in 41 consecutive eligible patients were enrolled between January 2011 and December 2016, treated with local methylprednisolone acetate injection and followed up prospectively in orthopedic clinics of Federal Teaching Hospital, Abakaliki, and Mater Miserere Cordiae Hospital, Afikpo, Nigeria. **Results:** Eight weeks post initial injection, 94% of the cases were signs and symptoms free. The recurrence rate post initial injection (19.6%) correlated directly with pain intensity ($P < 0.001$) and was significantly ($P = 0.018$) higher in subacute compared to acute and chronic presentations. At the end of a follow-up period that ranged from 24 to 84 months with a mean of 54 months, 47 (92.2%) cases were cured with either single injection (78.4%) or multiple injections (13.7%) of corticosteroid, 3 (5.9%) had incomplete resolution but were satisfied, and in 1 (2%) there was no beneficial response. There was no serious adverse reaction; 14 (27.5%) cases had localized skin depigmentation. **Conclusion:** In our setting, local corticosteroid injection as a treatment modality for de Quervain's tenosynovitis has short- and long-term success rates of over 90%, and is rarely associated with serious adverse reaction. It is recommended as the initial treatment of choice in de Quervain's disease.

Keywords: *De Quervain's disease, local corticosteroid injection, Nigeria, outcome, tenosynovitis*

Introduction

de Quervain's disease, also known as stenosing tenosynovitis, is a disorder characterized by pain of varying degrees of severity in the radial side of the wrist due to restricted gliding of the tendons of abductor pollicis longus and extensor pollicis brevis in the fibro-osseous canal of the first dorsal compartment of the wrist. A previously published report on the histopathology of de Quervain's disease indicates that the pathogenesis primarily involves degenerative changes that narrow the fibro-osseous canal and thicken the tendon sheet, rather than inflammation.[1] However, in a more recent report, Kuo *et al*. immunohistochemically demonstrated the presence of inflammatory cells and higher levels of infiltration factors in de Quervain's disease retinaculum, and that tissue inflammation and angiogenesis occurred and increased with progression of the disease.[2] Thus, the pain and disability from impaired hand functions associated with this disorder can be attributed to these degenerative changes with resultant impingement of tendons in fibro-osseous canal

Address for correspondence: Dr. Njoku Isaac Omoke, Department of Surgery, Federal Teaching Hospital, Ebonyi State University, PMB 102, Postcode 480001, Abakaliki, Ebonyi State, Nigeria.
E-mail: zicopino@yahoo.com

Access this article online

Quick Response Code:

Website: www.nigerianjsurg.com

DOI: 10.4103/njs.NJS_10_19

How to cite this article: Omoke NI, Nnadozie UU. Clinical outcome of nonoperative treatment of de Quervain's disease with local corticosteroid injection in Nigerian setting. Niger J Surg 2019;25:146-52.

and inflammation. The prevalence rate of de Quervain's disease in the general population is 0.5% for males and 1.3% for females.[3] In published reports, the risk of de Quervain's disease is relatively higher in the black race[4] and in occupation involving repetitive use of hand.[5]

The goal of treatment of de Quervain's disease is pain relief and restoration of fully functioning hand and wrist. This goal is achievable with either operative or nonoperative treatment modalities.[6] The cure rate of operative treatment modality ranges from 78.7% to 100%.[7-9] However, it is invasive and associated with higher cost and possibility of surgical complications. There are several nonoperative treatment modalities for de Quervain's disease.[6,10,11] Local long-acting corticosteroid injection alone is superior and the best treatment approach compared to other nonoperative treatment modalities.[10] It is also simple, cost-effective, and safe with a good short- and long-term efficacy in de Quervain's disease,[10,11] notwithstanding occasional minor and often self-limiting complications associated with it such as depigmentation of skin.[11] However, in published reports, the cure rate for local corticosteroid injection varies from 66% to 99%.[5,7,10-14] The cure rate of de Quervain's disease treated with local corticosteroid injection is mainly dependent on the accuracy of injection into the fibro-osseous canal.[13] Anatomical variation of the fibro-osseous canal that also varies in incidence (9.8%-61-8%)[15-17] is one of the most important factors in the accuracy of the injection;[14] it also accounted for over 90% of cases that failed to respond to local corticosteroid injection in the series reported by Harvey *et al*.[5]

Most of the published reports on the outcome of nonoperative treatment of de Quervain's disease with local corticosteroid injections were from studies in American, Asian, Australian, and European regions.[5,11,14,18] To the best of our knowledge, there is scanty or no published report on the outcome of treatment of de Quervain's disease with local corticosteroid injection in African subregions. The variations in the cure rates and efficacy of corticosteroid therapy in de Quervain's disease in these previous reports underscore the importance of data from our environment in West African subregion. Therefore, this study aimed to evaluate the outcome of nonoperative treatment of de Quervain's disease with local corticosteroid injection in Nigerian setting.

Patients and Methods

This study enrolled 41 consecutive eligible patients diagnosed with de Quervain's disease (ten of them had bilateral de Quervain's disease; hence, some of the data refer to 51 cases), between January 2011 and December 2016, and were treated with only local methylprednisolone acetate injection and followed up prospectively in the orthopedic clinics of Federal Teaching Hospital, Abakaliki, and Mater Miserere Cordiae Hospital, Afikpo, Ebonyi state, Nigeria.

The approval for this study was obtained from the Ethics and Research Committee of the hospitals. Prior to treatment, all the patients were counseled and informed consent was obtained from each of them.

Exclusion criteria were presence of systemic disorders such as diabetes mellitus or connective tissue diseases that cause tenosynovitis, presence of absolute contraindication to corticosteroid injection, prior treatment in the last 6 months with steroid injection and/or surgery at the same anatomical site, unwillingness to participate in the study, and those that objected to giving informed consent.

Patients were interviewed during initial clinical assessment and subsequent follow-up visits with a questionnaire designed to provide information about the patients' age, gender, occupation, symptoms, duration of complaints, the hand and wrist involved, hand dominance, treatment received prior to presentation to the orthopedic clinic, comorbidities, and associated history of recent obstetric confinement (postpartum/lactation state) for female patients. Other information collected in the pro forma included pain intensity rating on Visual Analog Scale (VAS) and physical signs at initial and subsequent follow-up visits, response to therapy and the number of local corticosteroid injections given, associated complications, and patients' contact telephone numbers.

In the pain intensity rating on VAS, 0 represented no pain, whereas 100 mm represented the severest type of pain. The patients were classified into three groups based on the pain intensity rating on VAS as mild (1–30 mm), moderate (40–69 mm), and severe (70–100 mm). de Quervain's disease was classified based on the duration at presentation into acute (<4 weeks), subacute (4 to ≤12 weeks), and chronic (>12 weeks).[6]

The diagnosis of this condition is clinical: history of pain along the radial side of the wrist aggravated by thumb motion and physical sign that consisted of tenderness at the tip of the radial styloid and pain reproduced by Finkelstein maneuver (positive Finkelstein test). Finkelstein maneuver consists of moving the patient's thumb into the palm of the hand, wrapping the finger around it, and gently forcing the wrist into the ulnar deviation. Although the diagnosis is clinical, X-ray of the involved wrist and hand was ordered to rule out

other differential diagnoses such as osteoarthritis and other disorders of the carpometacarpal joints.

After aseptic skin preparation of the injection site, with the patient's hand in ulnar deviation and thumb in slight flexion, a 25G needle was inserted (at an angle of about 45° to the longitudinal axis of the lateral aspect of the forearm) into the sheet on the dorsal side of the tendon at about 1 cm proximal to the tip of radial styloid process, and 1 ml of 40 mg methylprednisolone acetate and 1 ml of 2% xylocaine (without adrenaline) in a 2-ml syringe were injected alongside the tendons. Confirmation that the needle was in the proper space was accomplished by observation of the filling of the tendon sheet distal to the annular ligament of the first dorsal compartment. Then, a gentle massage was made with moderate pressure over the fibro-osseous canal for 3–5 min to distribute the medication within the tenosynovial sac and reduce subcutaneous leakage. Patients were instructed on activity modification (avoidance of activities that precipitate the symptoms) for 1 week. Patients were also informed that operative intervention is an option if the disease persists after a second or third injection. All the patients had injection performed by one of the authors to ensure uniformity in injection technique. A second local injection of corticosteroid was given to any patient whose symptom recurred in conjunction with positive Finkelstein maneuver and those that did not experience beneficial response from the initial injection after 4 weeks. The maximal session of the injection a patient could get was three. Surgery was offered to patients who did not experience beneficial response or persistent relief of symptom beyond 3 months after multiple sessions of the injection.

The patients were followed up in orthopedic clinic 1, 4, 8 weeks and then 6 and 12 months post injection. Thereafter, each patient was followed up 12 monthly. They were also advised to visit the clinic if symptoms persist or as soon as they experienced recurrence of symptoms. The ones with complete resolution that were unable to visit the clinic for a follow-up were contacted and interviewed through their mobile phone. The outcome measures were reduction in pain intensity on VAS and tenderness at the radial side of the wrist and negative Finkelstein test subsequent to injection. Complete resolution is when the pain intensity on VAS is 0 and Finkelstein test is negative, all symptoms resolve, and patient is satisfied with the treatment. Partial/incomplete resolution is when there is occasional tolerable symptom of mild pain (precipitated by strenuous activity) that does not warrant further treatment and patient is satisfied. Nonbeneficial response is when (after the multiple injections) there is either no response or partial response that warrants further treatment and patient is not satisfied. The cases were classified based on this clinical outcome for analysis.

Data were analyzed using Statistical Package for the Social Sciences (SPSS) version 20 (SPSS, Chicago, IL, USA) statistical software for graphs, frequency tables, and cross tabulation. Chi-squared test and Student's *t*-test (continuous variables) were used for statistical test of significance, and $P < 0.05$ was considered statistically significant.

Results

This study enrolled 41 consecutive patients with 51 wrists involved in de Quervain's disease. The male-to-female ratio was 1:12.7. The age of the patients ranged from 22 to 70 years, with a mean of 38.9 ± 11.27 years. The peak age group incidence was 31–40 years as shown in Figure 1. The three top occupations of the patients were nursing/nurse's aide, homemakers, and teaching as shown in Figure 2. Fourteen females in postpartum/lactation state (with involvement of 18 wrists) accounted for 35.9% of the females and 34.1% of the entire patients.

Eighteen patients (43.9%) had it only in the left wrist, 13 patients (31.7%) in the right wrist only, and 10 patients (24.4%) in both wrists. All the patients were right handed. The duration between the onset of symptoms and presentation to the clinic ranged from 2 to 208 weeks, with a mean of 28.5 ± 6.1 weeks. Of the 51 wrists involved, de Quervain's disease was acute in 5 (9.8%), subacute in 24 (47.1%), and chronic in 22 (43.1%) patients at presentation.

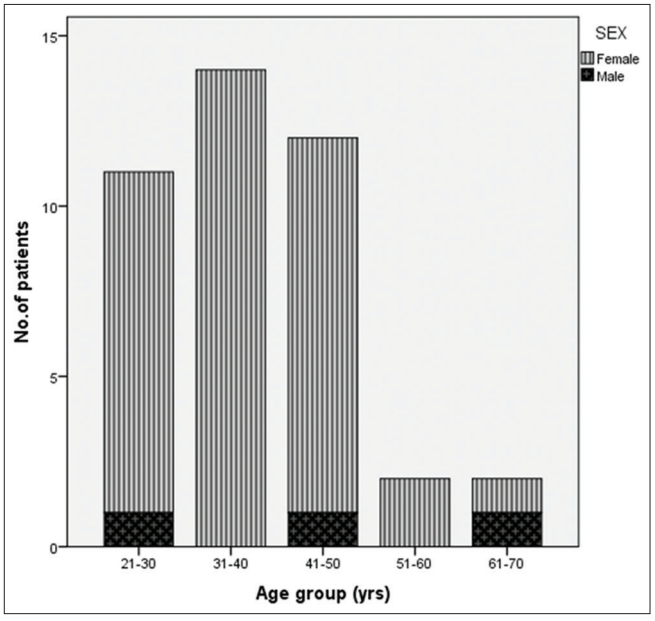

Figure 1: Distribution of the patients by age and gender

One week post injection with corticosteroid, Finkelstein test remained positive in all the wrists involved, and the pain intensity on the VAS ranged from 0 to 75 mm, with a mean of 29.2 mm that was different from the mean of pain intensity on the VAS prior to treatment ($P < 0.001$) as shown in Table 1. Four weeks post injection, Finkelstein test was negative in 49 (96%) wrists treated and 48 (94.1%) wrists were also sign and symptom free (pain intensity on the VAS was 0 mm). Of the three patients that were not completely symptom free (pain intensity on the VAS was 10, 20, and 30 mm, respectively) at 4 weeks post injection, Finkelstein test remained positive in two of them with pain intensity of 10 mm and 20 mm on the VAS, whereas negative Finkelstein test was observed in the patient with pain intensity of 30 mm on the VAS. After a further 2 weeks, two of these patients, the ones with VAS of 10 and 30 mm, respectively, had complete resolution of symptoms and signs.

At 8 weeks post injection, 48 (94.1%) wrists treated with one local injection of corticosteroid were signs and symptoms free, 1 (2%) wrist failed to respond to one injection, and the other 2 (4.2%) wrists had a recurrence of de Quervain's disease after symptom- and sign-free intervals. Afterward, eight more patients experienced recurrence of symptoms in the wrists after the initial injection. These recurrences were observed at 12, 20, 24, 32, and 40 weeks post injection in 2, 1, 3, 1, and 1 wrists, respectively. The mean of symptom- and sign-free interval between initial injection and recurrence was 18.4 weeks. The recurrence of de Quervain's disease after the initial injection correlated with pain intensity at presentation; the rate of the recurrence was higher in severe pain compared to mild and moderate pain intensity ($P < 0.001$) as shown in Table 2. This recurrence also correlated with the duration of the disease on presentation; the recurrence rate was higher ($P < 0.018$) in subacute compared to acute and chronic presentation as shown in Table 2. The recurrence rate was lower among the females in postpartum/lactation state compared to the other females (16.7% vs. 27.7%, $P = 0.550$).

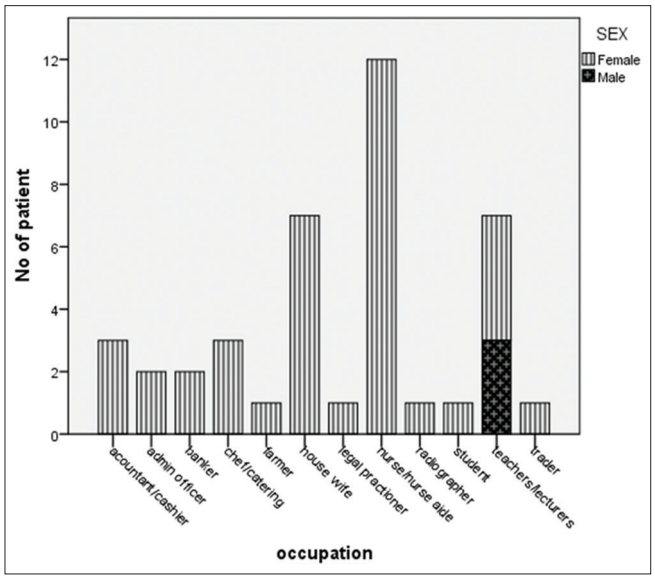

Figure 2: Distribution of the patients by occupation and gender

At the end of a follow-up period that ranged from 24 to 84 months with a mean and median of 54 and 48 months, respectively, there was complete resolution of symptoms and signs of the disease in 47 (92.2%) wrists, incomplete resolution of symptoms in 3 (5.9%) wrists, and no beneficial response in one (2%) wrist involved. The initial injection was enough for complete resolution in 40 (78.4%) wrists involved, whereas two and three sessions of the injection were needed for complete resolution of the disease in 6 (11.8%) and 1 (1.9%) wrists, respectively. One wrist of a patient that was not cured after multiple sessions of the injection was treated successfully by operative surgery. At surgery of this patient, the tendon of extensor pollicis longus was not in a separate compartment. Table 3 shows no significant difference in the long-term follow-up outcome among the age groups. The entire wrist involved in males had complete resolution of the symptoms and signs compared to 91.3% complete resolution in females, but this difference was not statistically significant ($P = 0.790$) as shown in Table 3. There was no correlation between the outcome and hand dominance as also shown in Table 3. There was no significant correlation between long-term clinical outcome and pain intensity at presentation as

Table 1: Pain intensity on VAS and Finkelstein test of the 51 cases of de Quervain's disease prior to and within 8 weeks post initial local corticosteroid injection

	Pain intensity on VAS				Finkelstein test	
	Range (mm)	Mean (mm)	Median (mm)	P^{α}	Positive (%)	Negative (%)
Prior to injection	30-100	69.98	70		51 (100)	0
Postinjection (weeks)						
1	0-75	29.2	30	0.001	51 (100)	0
4	0-30	1.2	0	0.001	2 (3.9)	49 (96.1)
8	0-20	1.17	0	0.001	3 (5.9)	48 (94.1)

[α]*t*-test, *P* value of the difference in the mean of pain intensity on VAS prior to injection and postinjection. VAS: Visual Analog Scale

Table 2: Clinical response to initial local corticosteroid injection by pain intensity, duration of de Quervain's disease, and hand dominance

	Clinical response			Total (%)	*P*
	Complete (%)*	Recurrence (%)**	None (%)***		
Pain intensity					
Mild	1 (50)	0	1 (50)	2 (3.9)	0.001
Moderate	14 (87.5)	2 (12.5)	0	16 (31.4)	
Severe	25 (75.8)	8 (24.2)	0	33 (64.7)	
Duration					
Acute	4 (80)	1 (20)	0	5 (9.8)	0.018
Subacute	14 (58.3)	9 (37.5)	1 (4.2)	24 (47.1)	
Chronic	22 (10.9)	0	0	22 (43.1)	
Hand dominance					
Yes	20 (87)	3 (13)	0	23 (54.9)	0.345
No	20 (71.4)	7 (25)	1 (3.6)	28 (45.1)	

*Complete resolution of signs and symptoms, ***No response, **Recurrence after symptom- and sign-free interval

Table 3: Long-term outcome of local corticosteroid injection by population characteristics

	Outcome			Total (%)	*P*
	Satisfactory		Not satisfactory		
	Complete (%)*	Incomplete (%)[α]	No beneficial response (%)[β]		
Age					
21-30	13 (100)	0	0	13 (25.5)	0.245
31-40	16 (94.1)	1 (5.9)	0	17 (33.3)	
41-50	14 (87.5)	1 (6.3)	1 (6.2)	16 (31.4)	
51-60	1 (50)	1 (50)	0	2 (3.9)	
61-70	3 (100)	0	0	3 (5.9)	
Sex					
Male	5 (100)	0	0	5 (9.8)	0.790
Female	42 (91.3)	3 (6.5)	1 (2.2)	46 (90.2)	
Hand dominance					
Yes	22 (95.7)	1 (4.3)	0	23 (45.1)	0.593
No	25 (89.3)	2 (7.1)	1 (3.6)	28 (54.9)	

[β]No beneficial response is either nonresponse or partial response that warrants further treatment, *Complete resolution of symptoms and signs, [α]Incomplete resolution (occasional tolerable and mild symptom) that does not warrant further treatment

Table 4: Long-term outcome of local corticosteroid injection by pain intensity and duration of de Quervain's disease

	Outcome			Total (%)	*P*
	Satisfactory		Not satisfactory		
	Complete (%)*	Incomplete (%)[α]	No beneficial response (%)[β]		
Pain intensity					
Mild	2 (100)	0	0	2 (3.9)	0.668
Moderate	14 (87.5)	1 (6.3)	1 (6.3)	16 (31.4)	
Severe	31 (93.9)	2 (6.1)	0	33 (64.7)	
Duration					
Acute	4 (80)	1 (20)	0	5 (9.8)	0.326
Subacute	21 (87.5)	2 (8.3)	1 (4.2)	24 (47.1)	
Chronic	22 (100)	0	0	22 (43.1)	

[β]No beneficial response includes no response and partial response that warrants further treatment, *Complete resolution of symptoms and signs, [α]Incomplete resolution (occasional tolerable mild symptom) that does not warrant further treatment

shown in Table 4. Complete resolution rate was 100% among those that presented in the chronic stage of the disease, but this rate was not significant compared to the rate of complete resolution in acute and subacute presentation as also shown in Table 4. All the females in postpartum/lactation state had complete resolution of signs and symptoms compared to the other females (100% vs. 85.7%, $P = 0.245$).

Fourteen (27.5%) wrists treated had localized skin depigmentation around the injection site. One (2%) wrist had minor post injection flare. There was no serious adverse reaction, and none of the patients had tendon rupture or injection-site infection.

Discussion

The demographic characteristics of patients with de Quervain's disease in this study are not quite different from the findings in previously published reports from other regions. The preponderance of females and the young and middle age groups observed is similar to the findings in most previous studies.[5,11]

Peters-Veluthamaningal *et al*. in a randomized study demonstrated that 1 week post injection results in significant improvement in the symptoms of de Quervain's disease treated with local corticosteroid injection compared to a placebo of normal saline injection.[18] Thus, in this study, the significant reduction in mean pain intensity on VAS post injection as shown in Table 1 is in keeping with this previous report,[18] and clinical response to methylprednisolone that starts working in about 3–5 days lasts for several days to a month.[19] In spite of this significant reduction in pain intensity, Finkelstein test remained positive in all the cases at 1 week post injection. However, the progressive improvement in symptoms and post injection Finkelstein test that was negative in over 90% of the cases at 4 to 8 weeks are all in keeping with methylprednisolone's slow onset but long duration of action. This also emphasizes the importance of waiting for a few weeks after initial injection before another treatment is considered for nonresponse to the former.

The rate of short-term complete response to injection in this study was within the range of 81%–95% in a previously published report.[13-15] However, the recurrence rate after the initial injection and the mean duration between initial injection and recurrences observed were different from 30.9% and 11 months, respectively, reported by Anderson *et al*.[11] The reasons for these differences are not also evident. The recurrence rate post initial injection that significantly correlated directly with increasing pain intensity on VAS as shown in Table 2 is an interesting finding. It suggests that, the higher the pain intensity or severity of the disease, the more likely the need for a repeated dose of injection to achieve complete resolution. The reason/s for the significantly high rate of complete response with the initial injection observed in acute and chronic compared to the subacute phases of the disease as shown in Table 2 is not evident. However, this correlation may be elucidated by determining the levels of tissue inflammation in these three phases, based on the report by Kuo *et al*., which indicate that tissue inflammation and angiogenesis in de Quervain's disease is directly related to the severity and progression of the disease.[2] In this study, the proportion of patients that were completely free of symptom and sign after the initial injection is comparable to 71% reported by Harvey *et al*.,[5] but very different from 58% and 51% by Anderson *et al*.[11] and Oh *et al*.,[12] respectively. The reasons for these variations in the rate of complete and successful response with one injection of corticosteroid are also not evident.

The proportion of patients in this study that had long-term complete resolution of symptoms and signs compares favorably to 90% reported by Anderson *et al*.[11] However, the percentage of the cases that had operative intervention because of nonbeneficial response to local corticosteriod injection was quite different from 6% and 17% reported by Anderson *et al*.[11] and Harvey *et al*.,[5] respectively. The high rate of failure of local corticosteriod injection as well as subsequent surgical intervention reported by Harvey *et al*. was attributed to the existence of separate compartment for the tendons, which was observed in over 90% of the cases that underwent surgical operation. Anatomical variation of the fibro-osseous canal that varies in incidence from and within subregions is one of the most important factors in the accuracy of the injection[15] and successful outcome. In the setting of this study, yet there is no data on the incidence of this anatomical variation. However, the proportion of the cases that had long-term complete response and the finding of no separate compartment for the involved tendons at operation of one case that had no beneficial response to the injection, all suggest that the incidence of anatomical variation may be relatively very low in our environment. Thus, short- and long-term complete resolution rather than failure is the expected result in overwhelming majority of cases of de Quervain's disease treated with local corticosteroid injection in our setting.

In this study, there was no serious adverse reaction observed, and the proportion of cases that had self-limiting local depigmentation of skin was similar to 29.1% as reported by Anderson *et al*. Thus, the rarity of serious adverse reaction makes local corticosteriod injection a relatively safe treatment modality for de Quervain's disease in our environment. The limitation of this study is in being a cross-sectional one; the data obtained may not be a representation of the entire population.

Conclusion

In our setting, local corticosteroid injection as a treatment modality for de Quervain's tenosynovitis

has short- and long-term success rates of over 90%, and is rarely associated with serious adverse reaction. It is recommended as the initial treatment of choice in de Quervain's disease. However, operative surgical intervention is indicated when there is no beneficial response after two or three sessions of the injections.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

References

1. Clarke MT, Lyall HA, Grant JW, Matthewson MH. The histopathology of De Quervain's disease. J Hand Surg Br 1998;23:732-4.
2. Kuo YL, Hsu CC, Kuo LC, Wu PT, Shao CJ, Wu KC, *et al.* Inflammation is present in De Quervain's disease – Correlation study between biochemical and histopathological evaluation. Ann Plast Surg 2015;74 Suppl 2:S146-51.
3. Walker-Bone K, Palmer KT, Reading I, Coggon D, Cooper C. Prevalence and impact of musculoskeletal disorders of the upper limb in the general population. Arthritis Rheum 2004;51:642-51.
4. Wolf JM, Sturdivant RX, Owens BD. Incidence of De Quervain's tenosynovitis in a young, active population. J Hand Surg Am 2009;34:112-5.
5. Harvey FJ, Harvey PM, Horsley MN. De Quervain's disease: Surgical and non -surgical. J Hand Surg 1990;15A: 83-7.
6. Huisstede BM, Coert JH, Fridén J, Hoogvliet P; European HANDGUIDE Group. Consensus on a multidisciplinary treatment guideline for de Quervain disease: Results from the European HANDGUIDE study. Phys Ther 2014;94:1095-110.
7. Muhammad RS, Amjad T, Zulfqar A, Ali N. Comparison of pain relief among patient of De Quervain disease with steroid injection versus surgical decompression J Sheikh Zayed Med Coll 2012;3:301-4.
8. Ta KT, Eidelman D, Thomson JG. Patient satisfaction and outcomes of surgery for De Quervain's tenosynovitis. J Hand Surg Am 1999;24:1071-7.
9. Scheller A, Schuh R, Hönle W, Schuh A. Long-term results of surgical release of De Quervain's stenosing tenosynovitis. Int Orthop 2009;33:1301-3.
10. Richie CA 3rd, Briner WW Jr. Corticosteroid injection for treatment of De Quervain's tenosynovitis: A pooled quantitative literature evaluation. J Am Board Fam Pract 2003;16:102-6.
11. Anderson BC, Manthey R, Brouns MC. Treatment of De Quervain's tenosynovitis with corticosteroids. A prospective study of the response to local injection. Arthritis Rheum 1991;34:793-8.
12. Oh JK, Messing S, Hyrien O, Hammert WC. Effectiveness of corticosteroid injections for treatment of De Quervain's tenosynovitis. Hand (N Y) 2017;12:357-61.
13. McKenzie JM. Conservative treatment of De Quervain's disease. Br Med J 1972;4:659-60.
14. Akram M, Shahzad ML, Farooqi FM, Irshad M, Kumar Sah R, Awais SM. Results of injection corticosteroids in treatment of De Quervain's tenosynovitis. J Pak Med Assoc 2014;64:S30-3.
15. Zingas C, Failla JM, Van Holsbeeck M. Injection accuracy and clinical relief of De Quervain's tendinitis. J Hand Surg Am 1998;23:89-96.
16. Minamikawa Y, Peimer CA, Cox WL, Sherwin FS. De Quervain's syndrome: Surgical and anatomical studies of the fibro-osseous canal. Orthopedics 1991;14:545-9.
17. Kulkarni MA, Ashok A. Are Indians more prone for De Quervain tendinitis? Indian J Basic Appl Med Res 2014;3:212-5.
18. Peters-Veluthamaningal C, Winters JC, Groenier KH, Meyboom-DeJong B. Randomised controlled trial of local corticosteroid injections for de Quervain's tenosynovitis in general practice. BMC Musculoskelet Disord 2009;10:131.
19. North Mississippi Medical Center: Pain Management FAQ. Available from: http://www.nmhs.netpain_manage_faqs.php. [Last accessed on 2019 Feb 08].