

Prophylactic corticosteroid injection in ulnar wrist pain in distal radius fracture

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ABSTRACT

Background: Ulnar sided wrist pain is one of the most common complications of distal radius fractures. The simplest method for decreasing pain for this affliction is corticosteroid injection. The present study was designed to assess the effect of corticosteroid injection in the prevention of ulnar sided wrist pain.

Materials and Methods: In this clinical trial patients with distal radius fractures scheduled for closed reduction and percutaneous pin fixation were divided into control and corticosteroid groups. In the corticosteroid group, the patient received a single betamethasone injection in the dorsoulnar side of the wrist before reduction, while the control group received placebo. The patients were to be followed for at least 6 months.

Results: 82 patients were followed for 6 months. At the end of the 3 months followup the difference between the two groups about the number of individuals without ulnar sided wrist pain was statistically significant ($P = 0.038$), so that less patients in the control group were painless, while this was not the case in the 6 months followup ($P = 0.507$), but in the both time frames the mean grip power, visual analog pain score and the disabilities of the arm, shoulder and hand (DASH) score showed statistically significant difference between the two groups, so that the corticosteroid groups demonstrated greater power grip and less scores in pain and DASH ($P < 0.05$).

Conclusion: Based on the findings of the present study it seems that prophylactic corticosteroid injection will be associated with a decrease in the severity of wrist pain in patients with acute distal radius fractures. With regard to the decrease in the number of painless individuals, it seems that the decrease is not persistent. Overall the need for a study with longer followup is obvious.

Key words: Pain, distal radius fracture, steroid, wrist

MeSH terms: Radius fractures, steroids, wrist injuries, pain management

INTRODUCTION

Distal radius fractures are one of the most common fractures that an orthopedic surgeon may encounter and just in 2001, 440,000 cases occurred in America.¹ The most common complaint of these patients is persistent ulnar sided wrist pain.^{2,3} and in one study 71% of patients complained of it.⁴ The etiology of ulnar sided

wrist pain in these patients may be instability of distal radioulnar joint, arthritis of the joint or damage to triangular fibrocartilage complex (TFCC).⁵ Fractures of distal radius are the most common cause of instability of the distal radioulnar joint and the most common cause of damage to TFCC, and injection of corticosteroid is a simple and usually the first step in decreasing the ulnar sided wrist pain in TFCC and ligaments injury and even joint instability.⁶

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We studied the effect of prophylactic injection of corticosteroids in the ulnar side of the wrist in patients with extraarticular distal radius fractures.

MATERIALS AND METHODS

The present study was a double blinded clinical trial, performed on the patients with extra articular distal radius fractures, from September 2011 to September 2012. The study was approved and financially supported by Kerman Neuroscience research center. The patients and the physician who was in charge of the study of followup were blinded about the group of treatment and did not know which patient belongs to which group. The study received the license of Ethics Committee of Kerman Medial

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Quick Response Code:	Website: www.ijoonline.com
	DOI: 10.4103/0019-5413.159595

University by code: EC/KNRC/89-93 and clinical trial studies system registration was also performed, number IRCT 201104062115N1.

The inclusion criteria were those who gave written and informed consent, age >18 years, extra articular fracture of distal 2.5 cm of radius without comminution (type A1) [Figure 1], presence of pain in the ulnar side of wrist, and no underlying disease that could affect the process of bone healing and no contraindication for use of corticosteroids.

The null hypothesis was that the injection of corticosteroid in the area of ulnar styloid has no effect on late pain in this area. For sample size calculation, we considered type one error and power at 0.05 and 0.80. Based on a pilot study and formula for sample size that compares means in two groups, estimated sample size at each group was 30. We included all subjects in 1-year. Our final comparisons confirmed that selected sample size was adequate to reveal differences between two groups. The patients entered the study after the necessary explanation about the goals, method of the study, method of blinding, possible side effects; followup by the researcher and filling the recent consent forms. The patients were randomized into corticosteroid and placebo groups by getting out one of the ten similar envelopes, five containing the word placebo and five with the word corticosteroids. All of the envelopes were to be changed after enrolling ten patients. Randomization was performed by a surgeon who performed the operations. The corticosteroid group had a single injection of corticosteroid (betamethasone LA, Daroupakhsh Company, 2 ampoules each one 1 cc) in the region of styloid process of ulna into TFCC, while the placebo group received injection of distilled water (2 cc), [Figure 2]. The distal radius fracture was managed by closed reduction and percutaneous pin fixation [Figure 3]. The patients were discharged after 24 h of intravenous antibiotics and control of swelling. The first postoperative visit was 2 weeks later and then on 1-month for pin and cast removal if everything was perfect. Then the patients were followed up for the 3 and 6 months postoperative visits. In the 3 and 6 months

followup, disabilities of the arm, shoulder and hand (DASH) score questionnaire and visual analogue scale (VAS) and grip strength test were done and recorded. DASH score questionnaire has 30 questions that measures the function of the upper limb. VAS contained a spectrum of the patient's ulnar sided pain, with two ends: No discomfort (0 points) and extremely severe pain (10 points) and the patient would score his pain verbally. Pain would mean ulnar sided pain in activity, rest or touch. Grip strength test was done by Jamar dynamometer device and pressing the handle would show the amount of grip pressing force. Finally, data entered computer and analyzed using central and distributive indexes of descriptive statistics, Chi-square test and independent *t*-test (Mann–Whitney U-test when appropriate), by SPSS (IBM) 19 software (SPSS 19 Inc., Chicago, IL, USA).

RESULTS

Ninety four patients were eligible to participate in this study, but 82 gave informed consent and finally completed the 6 months followup period, 39 of the patients were in control group (placebo) and 43 patients were in corticosteroid group



Figure 1: X-ray of right wrist joint anteroposterior and lateral views showing typical extraarticular distal radius fracture

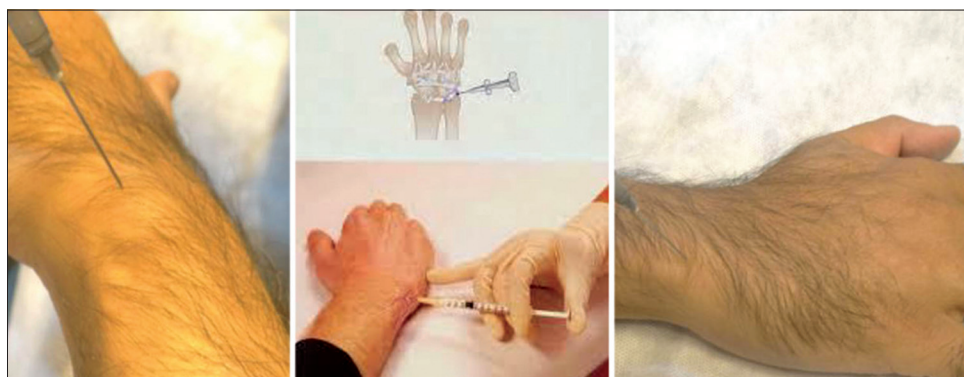


Figure 2: Clinical photograph and schematic presentation of injection site



Figure 3: Postoperative X-ray anteroposterior and lateral views of the same patient showing a distal radius fracture with pins *in situ*

[Flowchart 1]. No case of malunion (radial shortening, angulation) was observed. These two groups did not show statistically significant difference with regard to age and sex. Ulnar styloid was broken in 45 patients, 22 in the control group and 23 in the corticosteroid group (Chi-square test $P > 0.05$). In the 3 months followup, 35 patients reported no ulnar sided wrist pain, 12 in the control and 23 in the corticosteroid group (Chi-square $P = 0.038$). Rest of them had some degree of pain in the ulnar side of their wrist. In the 6 months followup 41 patients didn't report any ulnar sided wrist pain, 18 in the control group and 23 in the corticosteroid group (Chi-square test $P = 0.507$). In both of these followup periods, the difference of mean pain score was statistically significant between the two groups (pain score r effect size respectively was 0.430 and 0.324). Also, the difference of pain score between 3 and 6 months of followup was statistically significant in the control group. However, this was not the case with corticosteroid group [Table 1]. Grip strength was measured and compared in both of these groups and showed statistically significant difference in both. In the control group the mean grip strength at 3 months followup was 61.53 ± 8.63 and 97.09 ± 11.20 in the corticosteroid group ($r = 0.80$). In 6 months followup the mean grip strength was 70.38 ± 14.22 in control group and 97.09 ± 11.20 in corticosteroid group (t -test $P < 0.001$, $r = 0.730$). Comparison of DASH score of patients in three and 6 months of followup showed statistically significant difference between two groups: 33.56 ± 2.34 in control versus 16.90 ± 4.25 in corticosteroid group in 3 months ($r = 0.659$) and 15.80 ± 3.94 versus 8.77 ± 4.13 in 6 months followup ($r = 0.80$). By considering styloid fracture as a variable, there was no statistically significant difference regarding pain free patients, griping power and mean pain score [Table 2]. At the end of 6 months followup, all of the patients had complete range of motion of wrist and fingers [Figure 4 and Table 3].



Figure 4: Clinical photographs showing full range of wrist and finger motion 6 months after the initial fracture

Table 1: Comparison of pain scores

	3 months followup pain score	6 months followup pain score	Mann-Whitney U-test P
Control (n=39)	2.39±1.89	1.92±1.88	0.033
Steroid (n=43)	1.41±1.09	0.95±1.21	0.204
Mann-Whitney U-test P	0.002	0.029	

DISCUSSION

The most important finding of the present study was a persistent decrease in the severity of ulnar sided wrist pain in patients with distal of radius fractures that had received prophylactic injection of corticosteroid. In fact in 6 months of followup, percentage of patients experiencing some pain was similar in two groups but the patients who had injections felt less pain.

Significant decrease in grip power and DASH score increase in the control group is justifiable, because both power grip and doing usual works with the upper limb needs a pain-free hand. As it was observed, improvement was seen in both of these two variables by decrease in pain with time and in 6 months of followup.

In the present study, there was no association between fracture of styloid and ulnar sided wrist pain. Many studies have noticed the roll of ulnar styloid fracture in distal radius fractures. One study concluded that the fracture of styloid of ulna would indicate a poor prognosis for ulno-carpal complaints of patients.⁷ Another study found worse results in patients with ulnar styloid fracture.⁸ On the other hand, many studies didn't show this and they didn't find any relation between ulnar styloid status and the final result.⁹⁻¹² But it should be considered that there is no uniformity among these studies and some of them focused on displaced fractures fixed with plate and screws,^{9,10} another one were performed

Table 2: Variables of the study according to fracture of styloid process of ulna

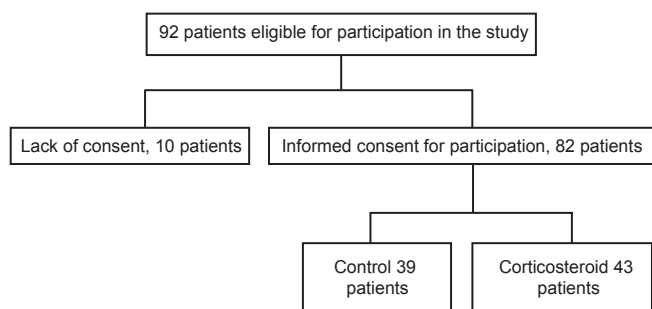
	3 months followup			6 months followup		
	Painless patients	Grip strength	Pain score	Painless patients	Grip strength	Pain score
Control						
Broken	7	62.90±9.78	2.22±1.87	11	70.90±15.71	1.90±1.99
Intact	5	59.76±6.75	2.52±1.97	7	69.70±12.47	1.94±1.78
Steroid						
Broken	14	87.21±10.85	0.78±1.16	14	96±11.32	0.82±1.40
Intact	9	87.55±10.64	1.15±1.26	9	98±11.29	1.41±0.31

P>0.05 in all cases

Table 3: Summary of the findings of the study

	3 months followup				6 months followup				
	No pain	VAS	Grip strength	DASH	No pain	VAS	Grip strength	DASH	DASH
Control	12	2.39±1.89	61.53±8.63	33.56±2.34	18	1.88±1.92	15.80±3.94	15.80±3.94	33.56±2.34
Steroid	23	1.41±1.09	97.09±11.20	16.90±4.25	23	1.21±0.95	8.77±4.13	8.77±4.13	16.90±4.25
P	0.038	0.002	<0.001	<0.001	0.507	0.029	<0.001	<0.001	<0.001

VAS=Visual analogue scale



Flowchart 1: Demonstrating the enrolment of patients into the study

on fractures treated by pinning⁸ and the other focused on the fractures, which were fixed with external fixation.¹² Again variables of the studies were different too, in a way that the reader should refer to the original articles. In fact, in the past surgery has been considered for nonunion of styloid.¹³ But recent studies have noticed that ulnar styloid nonunion is usually asymptomatic and cannot explain the ulnar sided wrist pain.¹⁴

An interesting finding of the present study was a decrease in severity pain in both groups with time, more obvious in the control group, so that some patients joined the pain-free group in followup. One may conclude that if the patients were followed for a longer time, even the difference of severity of pain would have minimized between the two groups. Although, decrease in the number of patients with ulnar sided pain after distal radius fractures with time is the finding of other authors too.⁴ It is interesting that these findings were more evident in the control group and in the 3-month period between the followups the pain score had a greater decrease in this group [Table 1].

Corticosteroid injection is used to treat injuries of TFCC, instability of distal radio-ulnar joint and even injuries of lunotriquetral ligament.¹⁵

Actually prophylactic injection of corticosteroid could decrease the prevalence and severity of pain at least for a short time. But it seems that this effect has been temporary, and the interesting point is the similar experience of other authors about the temporary effect of corticosteroid injection in ulnar sided wrist pain.¹⁶

In the present study, all of the patients were treated by percutaneous pinning and casting. It may be considered that with newer devices such as plate and screws, better results for treatment of such fractures have become possible and this may seem a pitfall of the study. But it should be considered that we compared the groups with similar treatment methods and on the other hand even the recent studies have not found any difference in the final function of the patients who were treated with pin or plate.¹⁷ Although, return to the normal function may be more rapid using the plate in a short term, in the long term it is not the case, and the function will be similar.^{18,19}

Is the use of plate and screws associated with a reduction in wrist pain after distal radius fractures? Up to the best of our knowledge, just one study has addressed this subject.²⁰ Although this study didn't have a control group, at the end of 18 months followup, a significant percentage of patients still had pain and the interesting point is that the radial side pain was more common than the ulnar sided. Again the reduction in the number of patients who had pain and decrease in severity of pain with time was another finding of this study.

The most important limitation of the present study is the short followup. Again the lack of arthroscopy made it impossible to have a definite diagnosis of injuries and the reason of the pain in the patients with ulnar sided wrist pain.

In conclusion, according to the results of the present study, it seems that injection of corticosteroid in region of styloid process of ulna in patients with distal radius fractures who are treated with percutaneous pinning and casting may reduce the incidence and severity of ulnar sided wrist pain in short term, though probably this would not be the case with time, at least with regard to the number of painless patients.

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How to cite this article: Saied A, Heshmati A, Sadeghifar A, Mousavi AA, Arabnejad F, Pooladsanj A. Prophylactic corticosteroid injection and ulnar wrist pain in distal radius fracture. *Indian J Orthop* 2015;49:393-7.

Source of Support: Nil, **Conflict of Interest:** None.