

Steroid injection in Orthopaedics: Does addition of lidocaine actually reduce pain?

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Abstract

Background: Local corticosteroid preparations are conventionally mixed with local anaesthetic agents to reduce pain during injection for various soft tissue affections in Orthopaedics. Although it can anaesthetise the area after injection, infiltration process itself can be more painful because of low pH of lidocaine.

Objectives: To assess whether addition of lidocaine actually reduces pain during local steroid injection.

Methods: This was a prospective comparative study conducted at Kathmandu Medical College over a period of nine months from June 2020 to February 2021 after obtaining ethical clearance. Patients requiring local corticosteroid injection for various indications in Orthopaedics were included by convenience sampling and divided into two groups. Out of 147 patients, 75 received steroid with lidocaine and 72 with normal saline. The Visual Analogue Score was recorded immediately along with injection in a scale of 0 to 10 where 0 meant no pain at all and 10 meant maximum pain imaginable. The difference in median Visual Analogue Score and the mean cost of injection between two groups was compared. Findings were analysed using SPSS v.20.

Results: Median Visual Analogue Score in lidocaine group was 5 whereas in normal saline group was 4 (p-value = 0.33, Mann-Whitney U test). The mean cost of injection in lidocaine and normal saline groups were Nepali Rupees 339.3 ± 37.7 and 282.3 ± 36.7 respectively (p < 0.001, Student's t-test).

Conclusion: Removal of lidocaine from steroid preparations in orthopaedics does not make it more painful if not less. It also reduces the cost of injection.

Key words: Corticosteroid; Intralesional injection; Lidocaine; Local anaesthetic; Visual analogue scale.

INTRODUCTION

Intralesional corticosteroid injection is a common practice in orthopaedic diagnoses like tennis elbow, de Quervain's tenosynovitis, trigger finger, plantar

fasciitis, and carpal tunnel syndrome.¹⁻⁵ It is a common practice to mix lidocaine with depot steroid preparation for injection.⁶ One of the possible rationales for this admixture is to reduce the injection pain.⁶ It also carries a diagnostic value. The relief of pain after injection confirms that the steroid has been injected at the actual source of pain. The local anaesthetic also increases the volume of the injectate to cover a larger surface.⁶ The increased volume can cause more stretching of the nociceptors and hence more pain. Lidocaine has been known to have serious side effects including anaphylaxis.^{7,8}

Local injection of lidocaine itself is very painful.^{9,10} Few studies suggest that the pain of injection actually increases when steroid is mixed with local anaesthetic agent.¹¹ Although it decreases the pain after sometime, the infiltration process itself is more painful.¹¹ So the theoretical advantage of mixing the steroid with lidocaine during intralesional steroid injection to reduce the injection pain has been a matter of debate. In this study, it was assessed whether mixing lidocaine actually reduces the pain during steroid infiltration.

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METHODOLOGY

This was a prospective comparative interventional study involving all the patients requiring steroid injection for various indications in orthopaedics conducted after taking ethical clearance (Ref. 2306202001) from institutional review committee of Kathmandu Medical College Teaching Hospital (KMCTH). The patients were divided into two groups on the basis of either they received steroid mixed with lidocaine - Group A or steroid with normal saline (NS) - Group B. With the confidence interval of 95% and power of 80% for detecting a minimum difference of 1.2 Visual Analogue Scale (VAS) between two groups, the sample size was calculated to be 69 in each group by using PS Power and Sample Size program. Significance was set at $p < 0.05$.

Patients between 15 years and 70 years of age presenting to the Orthopaedics outpatient department of KMCTH between June 2020 to February 2021 and requiring local corticosteroid injections were included in the study by convenience sampling. Patients having contraindication for steroid injection or lidocaine, uncontrolled diabetes or hypertension or who deferred written informed consent were excluded from the study.

The patients presenting on the odd day of Nepali calendar were included in group A and those on the even days were kept in group B. In group A, two millilitres mixture was prepared with one millilitre of 40 milligrams depot methylprednisolone and one millilitre of two percent plain lidocaine in commercially available five millilitre syringe and injected at the desired site. In group B, the same amount of mixture with one millilitre of 40 milligrams depot methylprednisolone and one

millilitre of normal saline was prepared in five millilitre syringe and injected at the desired site. All the patients were asked to rate the pain of injection immediately in the scale of zero to 10 where zero meant no pain at all and 10 meant worst pain imaginable.^{12,13} Analysis was done using IBM Statistical Package for the Social Sciences (SPSS) Statistics for Windows, version 20 (IBM Corp., Armonk, N.Y., USA). The difference in Median VAS score was compared using the Mann-Whitney U test. The categorical variables were analysed using Chi-square test and the continuous variables were compared by Student's t-test.

RESULTS

Total of 147 patients were included in the study. Out of them 75 (51.1%) were in lidocaine group (Group A) and in the normal saline group (Group B) there were 72 (48.9%) patients (Table 1).

The variety of conditions included in the study is shown in Table 2. The proportion of different diagnoses in two groups were similar ($p = 0.972$).

The median VAS Score in group A with lidocaine was five and in group B it was four. The difference in the VAS score was not significantly different in two groups (Mann-Whitney U test, $p = 0.33$). The cost of injection was significantly less in the normal saline group as compared to lidocaine group (Table 3).

The associated comorbidities in each group is shown in Table 4. One patient in group A with de Quervain's Tenosynovitis had temporary anaesthesia of radial nerve following injection which recovered after the effect of local anaesthetic was over whereas no immediate complications were noted in group B.

Table 1: Demographics of the study sample

Particulars	Steroid with lidocaine (A)	Steroid with normal saline (B)	p-value
N	75 (51.1)	72 (48.9)	
Age in years (Mean \pm SD)	51.7 \pm 14	53.4 \pm 12.1	0.432 (t-test)
Sex	Male	18 (24)	0.84 (Chi-square)
	Female	57 (76)	
Side	Right	44 (58.7)	0.41 (Chi-square)
	Left	31 (41.3)	
Dominant side involvement	44 (58.7)	33 (45.8)	0.13 (Chi-square)

Table 2: Variety of conditions included in the study, n (%)

Diagnosis	Steroid with lidocaine	Steroid with normal saline	Total	p-value
Tennis elbow	12 (54.5)	10 (45.5)	22	0.972 (Chi-square)
Golfers elbow	4 (66.7)	2 (33.3)	6	
Trigger finger	8 (53.3)	7 (46.7)	15	
Subacromial impingement	14 (43.8)	18 (56.2)	32	
de Quervain's tenosynovitis	10 (55.6)	8 (44.4)	18	
Carpal tunnel syndrome	3 (42.9)	4 (57.1)	7	
Osteoarthritis knee	16 (51.6)	15 (48.4)	31	
Plantar fasciitis	8 (50)	8 (50)	16	
Total	75 (51)	72 (49)	147 (100)	

Table 3: Comparison of VAS and cost of injection in two groups

	Steroid with lidocaine	Steroid with normal saline	p-value
Median VAS (interquartile range)	5.00 (3.00 - 6.00)	4.00 (3.00 - 5.00)	0.33 (Mann-Whitney U)
Mean cost of injection (NRs.)	339.3 ± 37.7	282.3 ± 36.7	<0.001 (Student's t-test)

Table 4: Comorbidities among patients in different groups

Comorbidities	Steroid with lidocaine	Steroid with normal saline
Diabetes	9 (12)	8 (11.1)
Hypertension	8 (10.7)	8 (11.1)
Hypothyroidism	2 (2.7)	-

DISCUSSION

Local injection of long acting corticosteroids is a common treatment modality for various conditions in orthopaedics. Corticosteroids inhibit inflammatory response and help reduce symptoms.^{14,15} Conventionally the addition of lidocaine is thought to decrease the pain associated with injection during local corticosteroid use. The injection of local anaesthetic itself is painful and whether the mixture of lidocaine makes injection less painful is not well known. Although the area will be anaesthetised after lidocaine action comes up, which will take some time, it will go away after few hours. So theoretically, the injection process will not be painless, patient will experience numbness for few hours and again pain comes up after the effect of local anaesthesia is over. It makes the area numb for some time after the procedure, but it adds up to the cost and volume of injection. With the injection of lidocaine, patient will also have risk though minimal of the severe side effects.^{7,8} We evaluated whether addition of lidocaine is actually beneficial to the patient in terms of pain reduction during local steroid injection in Orthopaedics.

In this study, lower pain scores were detected in patients receiving steroid injection with normal saline compared to lidocaine (median VAS 4 vs 5). However, the results

did not achieve the statistical significance. Patrinely showed that the local steroid injection with lidocaine was significantly more painful than steroid with placebo in patients with trigger finger (VAS 3.5 vs 2).¹¹ Similar results were shown by Zakria in injections for various dermatological conditions.¹⁶ To authors' knowledge, this is the first article mentioning the pain scores in patients getting steroid injection with local anaesthetic without adrenaline. VAS is a subjective score and the pain threshold is different for different people.^{17,18} Various factors like site of injection, amount of injectate, presence of neuropathy, psychological state, and past pain experiences also play an important role in the amount of pain perceived.^{9,17,19-21} These factors were not considered in current study, which might be the reason for not detecting the significant difference. The study involving more objective comparison of pain scores like in same individual with bilateral affections would help to confirm and further validate the results of this study.

There is no uniform guideline for the use of lidocaine with or without adrenaline while preparing the corticosteroid injections. In fingers and sites with end arteries, we follow the conventional practice of not injecting lidocaine with adrenaline in fear of causing necrosis²² and for uniformity in the study we used plain lidocaine in all cases. Lidocaine

with adrenaline is even more painful because of being more acidic.^{10,23}

The most painful part of the steroid injection is the pain associated with needle puncture, which activates the pacinian corpuscles, mechanoreceptors, and Ruffini endings whose impulses travels along the A-delta fibres to elicit sharp pricking pain.¹⁰ This is not affected by addition or removal of lidocaine in the steroid preparation.

The volume of injectate is also an important determinant of pain during injection. The infiltration of anaesthetic causes the activation of free nerve endings which creates an intense and prolonged pain.¹⁰ As the volume increases there will be more stretching of the nociceptors and the intensity of pain will increase.²⁴ Removal of lidocaine from the steroid preparation not only reduces the pain by reducing the volume of injectate, but also saves the patient from potential adverse effects of lidocaine.

Two groups in current study were identical in terms of demographics and the associated comorbidities.

The volume of injectate and the needle size were also uniform.

There were few limitations in this study. The surgeons were not blinded about the groups. Injections were not given by a single surgeon and injections for different diagnosis at different sites were included. The injection technique is known to influence the perception of pain and thus VAS score.^{10,24} Although the groups were similar in terms of diagnosis, the variation in the site of injection and technique could have led to some bias.

CONCLUSION

The findings of this study challenge the conventional thought of alleviating injection pain of steroid with addition of lidocaine. The removal of lidocaine does not make steroid injection more painful if not less, reduces the cost, and abolishes the possibility of adverse reactions of lidocaine. Further research with more objective measures of pain could add on to this study.

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