

Original Research Article

Effectiveness of transdermal NSAID administration in analgesia for rib fracture patients: a comparative study with intravenous NSAID administration

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ABSTRACT

Background: Simple rib fractures are the most common injuries sustained following blunt trauma chest, accounting for more than half of thoracic injuries from nonpenetrating trauma. Looking into new modalities of administration like transdermal patches helps reduce morbidity in such patients with minimal side effects. The objectives of this study were to assess the effectiveness of transdermal NSAID administration in analgesia for rib fracture patients and to compare the effectiveness with intravenous NSAID administration.

Methods: A prospective study comprising of 50 rib fracture patients who presented to the Emergency Medicine Department at RL Jalappa Hospital and Research Centre, Tamaka, Kolar. Study group were administered transdermal NSAID and the control group were administered intravenous NSAID.

Results: Of the 50 subjects studied, 9 were female and 41 were male. Group A in which transdermal NSAIDs were administered consisted of 2 females and 23 male subjects while Group B in which intravenous NSAIDs were administered consisted of 7 females and 18 male subjects. The comparison was made between the two groups. The study results showed that the analgesia effect with transdermal NSAID administration is slow in onset as evidenced by higher VAS readings on day 1 whereas it is comparable with analgesia effect of intravenous NSAID administration in the long run as evidenced by VAS readings on day 3.

Conclusions: Transdermal NSAID administration is effective in analgesia for rib fracture cases. The analgesia effect with transdermal NSAID administration is slow in onset as evidenced by high VAS readings on day 1 whereas it is comparable with analgesia effect of intravenous NSAID administration in the long run as evidenced by VAS readings on day 3.

Keywords: Analgesia, Intravenous NSAIDS, Newer modalities of drug administration, Rib Fractures, Transdermal NSAIDS

INTRODUCTION

Simple rib fractures are the most common injuries sustained following blunt trauma chest, accounting for more than half of thoracic injuries from non-penetrating trauma. Approximately 10% of all patients admitted after blunt trauma chest have one or more rib fractures. These

fractures are rarely life threatening but cause significant morbidity. Rib fractures are a significant cause of pain and disability in patients with isolated thoracic injury and in patients with associated extrathoracic injuries.¹

Pain is usually severe and is the main factor for predicting morbidity in these patients. Paracetamol,

NSAIDs, opioids or combination of these drugs are usually used for analgesia with NSAIDs being the most frequently being used. The benefits of NSAID therapy must be weighed against its potential for serious side effects. Systemic NSAIDs have many side effects. Use of oral NSAIDs has been associated with a significantly increased risk of GI complications; among patients in the primary care setting, the prevalence of NSAID-associated ulcers was found to be 16% in a study by Hollenz et al.²

Looking into new modalities of administration like transdermal patches helps reduce morbidity with minimal side effects.

The objectives of this study were to assess the effectiveness of transdermal NSAID administration in analgesia for rib fracture patients and to compare the effectiveness with intravenous NSAID administration.

METHODS

A prospective comparative study comprising of 50 rib fracture subjects who presented to the Emergency Medicine Department at our hospital between January 2016 and December 2016.

Inclusion criteria

All patients with rib fractures who presented to the emergency medicine department of our hospital.

Exclusion criteria

Patients below 18 years of age and those who are mentally challenged are excluded from the study.

Methodology

The subjects were divided into two groups with every second subject being in control group and the rest in study group. Study group were administered transdermal NSAID and the control group were administered intravenous NSAID.

Statistical analysis

Data was analysed using SPSS 22 version. Mean±Standard deviation, proportions were computed.

Mann whitney U test was the test of significance. p <0.5 was considered as statistically significant.

RESULTS

Of the 50 subjects studied, 9 were female and 41 were male. Group A in which transdermal NSAIDs were administered consisted of 2 females and 23 male subjects while Group B in which intravenous NSAIDs were administered consisted of 7 females and 18 male subjects. The comparison between the two groups is as follows. Mean age of subjects in Group A was 46.3±11.7 years and in Group B was 54.1±12.6 years. There was significant difference in age distribution between two groups.

Table 1: Age distribution of the study.

	Group				P value
	Transdermal		Intravenous		
	Mean	SD	Mean	SD	
Age	46.3	11.7	54.1	12.6	0.027*

Majority of subjects were males in both the groups. There was no significant difference between two groups.

Table 2: Gender distribution between two groups.

		Group				P value#
		Transdermal		Intravenous		
		Count	%	Count	%	
Sex	Female	2	8.0	7	28.0	0.066
	Male	23	92.0	18	72.0	

#Chi-square test

In Group A 56% had rib fracture on right side and in Group B 56% had rib fracture on left side. There was no significant difference in side of rib fracture between two groups.

Table 3: Side distribution between two groups.

		Group				P value#
		Transdermal		Intravenous		
		Count	%	Count	%	
Side	Bilater	0	0.0	1	4.0	0.363
	Left	11	44.0	14	56.0	
	Right	14	56.0	10	40.0	

Chi-square test

Table 4: Effectiveness on VAS score comparison between two groups at day 1.

GROUP		VAS – Day 1					P value#
		Mean	SD	Percentile 25	Median	Percentile 75	
	Transdermal	8	1	7	8	9	0.039*
	Intravenous	7	1	6	7	8	

#Mann Whitney U test

Mean VAS score on day 1 in Group A was 8 and in Group B was 7. This difference in mean VAS score on Day 1 between two groups was statistically significant. Mean VAS score on day 3 in Group B was 3 and in

Group B was 3. This difference in mean VAS score on Day 3 between two groups was not statistically significant.

Table 5: Effectiveness on VAS Score comparison between two groups at day 3.

		VAS-day 3					P value #
		Mean	SD	Percentile 25	Median	Percentile 75	
Group	Transdermal	3	1	2	3	4	0.075
	Intravenous	3	1	2	2	3	

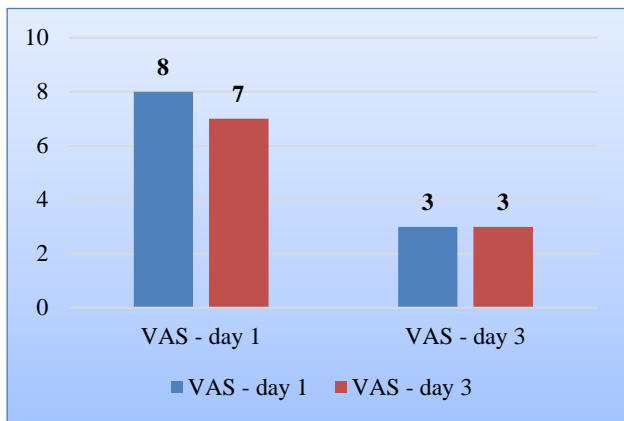


Figure 1: Effectiveness on VAS Score comparison between two groups at Day 1 and Day 3.

Data in Figure 1 shows that the analgesia effect with transdermal NSAID administration is slow in onset as evidenced by higher VAS readings on day 1 whereas it is comparable with analgesia effect of intravenous NSAID administration in the long run as evidenced by VAS readings on day 3.

DISCUSSION

Rib fractures are associated with significant pain and this is the main factor predicting morbidity. In a study by Kerr-Valentic et al on 40 subjects with rib fractures, mean rib fracture pain was 3.5±2.1 at 30 days and 1.0±1.4 at 120 days and the total mean days lost from work/usual activity was 70±41. Patients with isolated rib fractures went back to work/usual activity at a mean of 51±39 days compared with 91±33 days in patients with associated extrathoracic injuries (p <0.01).¹

Diclofenac the most commonly used NSAID is traditionally used in oral, intramuscular or intravenous forms but there are many gastrointestinal side effects documented. Newer modalities of administration like transdermal patches having minimal systemic side effects are being looked into but their efficacy is still a question.

A meta-analysis in 2004 by Mason et al showed topical NSAIDs to be effective and safe in treating acute painful

conditions for 1 week.³ This systemic review of 26 double-blind, placebo-controlled trials showed clinically significant efficacy in 19 of 26 trials, with a pooled relative benefit of 1.6 and number needed to treat of 3.8 vs. placebo to achieve an outcome of approximately 50% reduction in pain at 7 days. Several studies show that, perhaps because of low systemic concentrations, topical NSAIDs have a reduced risk of upper GI complications such as gastric and peptic ulcers, and GI nuisance symptoms such as dyspepsia as well as a lack of drug - drug interactions, which leads to minimal side effects in general.⁴⁻⁷

DETP treatment resulted in significant pain reduction within approximately 3 hours compared to placebo in a study by Yanchick et al and Gallacchi et al assessed blood and synovial levels of diclofenac after repeated application of DETP twice daily for four consecutive days in patients with joint effusion (N = 8).^{8,9} Synovial fluid concentrations of diclofenac were 36% of concentrations found in plasma. These concentrations indicate direct transport of diclofenac across the skin to reach the synovial fluid compartment. The mean plasma concentration was 3.62 ng/ml at 4 hours after the last application.⁹ Steady state plasma diclofenac concentrations evaluated in healthy subjects in 3 studies between 1998 and 2002 were achieved before day 3 and were approximately 3 ng/ml.¹⁰

In the study by Gulcin S et al where analgesic effectiveness of 3 different forms of diclofenac sodium were compared in early period pain management they determined that transdermal form provided as efficient analgesia as IM form and decreased opioid consumption.¹¹ Bhaskar et al compared analgesic effects of 100 mg oral diclofenac sodium with 100 mg transdermal diclofenac in 20 patients receiving orthodontic treatment and they found similar analgesic effects for both but advised transdermal application for its comfort and much less complications.¹²

In this study the comparison of groups showed significant difference in the VAS values on Day 1 whereas there was no significant difference in the VAS values on Day 3 which shows that the efficacy of transdermal administration is comparable to intravenous

administration but time to action is slightly delayed as compared to intravenous administration.

CONCLUSION

Transdermal NSAID administration is effective in analgesia for rib fracture cases. The analgesia effect with transdermal NSAID administration is slow in onset as evidenced by high VAS readings on day 1 whereas it is comparable with analgesia effect of intravenous NSAID administration in the long run as evidenced by VAS readings on day 3. Further studies need to be done to compare the side effects with both the modes of NSAID administration.

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Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Kerr-Valentic MA, Arthur M, Mullins RJ, Pearson TE, Mayberry JC. Rib fracture pain and disability: can we do better? J Trauma. 2003;54(6):1058-64.
2. Hollenz M, Stolte M, Leodolter A, Labenz J. NSAID-associated dyspepsia and ulcers: a prospective cohort study in primary care. Dig Dis. 2006;24:189-94.
3. Mason L, Moore RA, Edwards JE, Derry S, McQuay HJ. Topical NSAIDs for acute pain: a meta-analysis. BMC Fam Pract. 2004;5:10-9.
4. Baraf HS, Fuentealba C, Greenwald M. Gastrointestinal side effects of Etoricoxib in patients with osteoarthritis: results of the Etoricoxib versus Diclofenac Sodium Gastrointestinal Tolerability and Effectiveness (EDGE) trial. J Rheumatol. 2007;34:408-20.
5. Affaitati G, Vecchiet F, Lerza R. Effects of topical diclofenac (DHEP plaster) on skin, subcutis and muscle pain thresholds in subjects without spontaneous pain. Drugs Exp Clin Res. 2001;27:69-76.
6. Galer BS, Rowbotham M, Perander J, Devers A, Friedman E. Topical diclofenac patch relieves minor sports injury pain: results of a multicenter controlled clinical trial. J Pain Symptom Manage. 2000;19:287-94.
7. Galer BS. Topical medications. In: Loeser JD, editor. Bonica's Management of Pain. 3rd edn. Philadelphia, PA: Lippincott Williams & Wilkins; 2001:1736-42.
8. Yanchick J, Magelli M, Bodie J, Sjogren J, Rovati S. Time to significant pain reduction following DETP application vs. placebo for acute soft tissue injuries. Curr Med Res Opin. 2010;26(8):1993-2002.
9. Gallacchi G, Marcolongo R. Pharmacokinetics of diclofenac hydroxyethylpyrrolidone (DHEP) plasters in patients with monolateral knee joint effusion. Drugs Exp Clin Res. 1993;19:95-7.
10. Petersen B, Rovati S. Diclofenac epolamine (Flector) patch; evidence for topical activity. Clin Drug Invest. 2009;29:1-9.
11. Ural GS, Yener O, Sahin H, Simsek T, Aydinli B, Ozgok A. The comparison of analgesic effects of various administration methods of diclofenac sodium, transdermal, oral and intramuscular, in early postoperative period in laparoscopic cholecystectomy operations. Pak J Med Sci. 2014;30(1):96-100.
12. Bhaskar H, Kapoor P, Ragini. Comparison of transdermal diclofenac patch with oral diclofenac as an analgesic modality following multiple premolar extractions in orthodontic patients: a cross over efficacy trial. Contemp Clin Dent. 2010;1(3):158-63.

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