

## Evaluation of Efficacy of Pain Relief by Transdermal Diclofenac Versus Transdermal Ketoprofen in Patients Undergoing Hip Fracture Surgeries

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### Abstract

*Introduction:* Post-operative pain management after surgery can be challenging and detrimental. The commonly used drugs through this route can be diclofenac, ketorolac, ketoprofen, ibuprofen, mephenamic acid etc.

*Aim:* To evaluate the efficacy of pain relief by transdermal diclofenac and transdermal ketoprofen in patients undergoing hip fracture surgeries.

*Materials and method:* A total sample of 50 patients was selected divided into 2 groups namely group 1 (diclofenac group) and group 2 (ketoprofen group) with 25 patients each of comparable age and gender. Group 1 patients were given a single dose of a transdermal diclofenac patch of 100 mg, and for Group 2 we used a single dose of transdermal ketoprofen patch of 30 mg. Post operatively, we assessed pain immediately after surgery, then after 4 hrs, 8 hrs, 12 hrs and 24 hours using a VAS score. At any time during the study, if the VAS was more than, or equal to, four, then an injection of tramadol 100 mg was given intravenously as rescue analgesia.

*Results:* Postoperatively VAS score after 24 hrs in group 1 was  $3.1 \pm 0.24$  and group 2 had  $1.9 \pm 0.43$  which was statistically also significantly low when in comparison to group 2 ( $p < 0.05$ ). 9 out of 25 patients in group 1 required rescue analgesia i.e. injection of tramadol 100 mg, while only 3 out of 25 patients in group 2 required that in the first 24 hours and the difference of the values was also statistically significant ( $p < 0.05$ ). Mild nausea was seen in 6 cases of group 1 and 3 cases of group 2 patients.

*Conclusion:* We conclude from our observations that transdermal patches are efficient method with minimal complications. Also both ketoprofen and diclofenac drugs seem to be effective for postoperative analgesia in patients undergone hip fracture surgeries under spinal anaesthesia. On comparison ketoprofen group seems to render better results than diclofenac group and even rescue analgesic consumed by the patients was less in ketoprofen group.

**Keywords:** post operative Pain, hip fracture, Transdermal patch, Ketoprofen, Diclofenac

### Introduction:

Post-operative pain management after surgery can be challenging and detrimental and may affect various systems like respiratory, cardiovascular and gastrointestinal, and chronic effects like delayed recovery and chronic pain.

The drugs commonly used for reducing post operative pain belongs to different classes like NSAIDs,

opioids, glucocorticoids, local anesthetics,  $\alpha$ -2 agonists, ketamine and gabapentanoids. Non-steroidal anti-inflammatory drugs (NSAIDs) are the most popular drugs for pain management. They act by modulating the prostaglandin pathway by decreasing their production through cyclooxygenase pathway, thereby achieving analgesia. Their administration can be done various route which includes gel, ointment, cream, paste, oral, parenteral or transdermal route. Although, oral route being the most common one but has its own side effects like gastrointestinal bleeding, peptic ulcers and renal disease. An adhesive applied on skin to deliver a sustained release of the drug through the cutaneous route is referred to as transdermal delivery system (TDDS).<sup>2</sup>

Transdermal delivery drug system has its advantages like decreased pain associated with i.v. and i.m. routes and is definitely a preferable option for those in which oral drug delivery cannot be possible for certain reasons. Another advantage of this route is that it has decreased risk of upper gastrointestinal complications which are usually associated with the oral route.<sup>3</sup> The commonly used drugs through this route can be diclofenac, ketorolac, ketoprofen, ibuprofen, mephenamic acid etc.

Diclofenac is chemically aryl- acetic acid derivative while ketoprofen is propionic acid derivative. Both these drugs have been commonly used orally as well as through intra-venous and intra- muscular preparations in postoperative analgesia. Previous reports have shown that transdermal route of these drugs seems to be more effective with less side effects.<sup>4</sup>

Hence in the present study we evaluate the efficacy of pain relief by transdermal diclofenac and transdermal ketoprofen in patients undergoing hip fracture surgeries.

## Material and Methods

This present study was conducted in the department of Orthopaedics. An informed consent was obtained from the patients. We included all the patients who had presented to the department for hip fracture surgeries and were willing to be a part of the study. Patients included were in the age range of 20-70 years.

All those patients who had contraindications for spinal anaesthesia, any kind of drug allergy, cardiovascular disease, history of renal pathology, asthmatic, active peptic ulceration, or any other allergic reactions induced by aspirin or other NSAIDs, were excluded from our study.

A total sample of 50 patients was selected for our study. They were divided into 2 groups namely group 1 (diclofenac group) and group 2 (ketoprofen group) with 25 patients each of comparable age and gender. At the start of study, all patients underwent complete physical examination, and blood investigations (Hb, TLC/DLC, BT/CT).

Group 1 patients were given a single dose of a transdermal diclofenac patch of 100 mg, and for Group 2 we used a single dose of transdermal ketoprofen patch of 30 mg. The patch was applied on left shoulder in almost all patients and on back after cleaning the skin with spirit swab.

Post operatively, we assessed pain immediately after surgery, then after 4hrs, 8 hrs, 12 hrs and 24 hours using a VAS score. At any time during the study, if the VAS was more than, or equal to, four, then an injection of tramadol 100 mg was given intravenously as rescue analgesia.

## Statistical Analysis

Data thus obtained was expressed a mean and SD. Both the groups were compared Intragroup analysis was done using repeated measures ANOVA. Intergroup comparisons were done using unpaired 't' test. P value <0.05 were considered as significant.

## Results

The present study included 50 cases which were divided into 2 groups. The demographic characteristics of the patients were recorded for each group. The details for each group are tabulated in table 1

Table 1: Demographic characteristic of patients in both the groups

variable	Group 1 (Diclofenac group)	Group 2 (Ketoprofen group)	P value
Mean age (years)	46.43	43.54	p>0.05  (Not sig)
Mean weight (kg)	56.84	58.15	
Average duration of surgery (Min)	130±28.3	134±23.4	
Gender :			
Male	14	15	
Female	11	10	

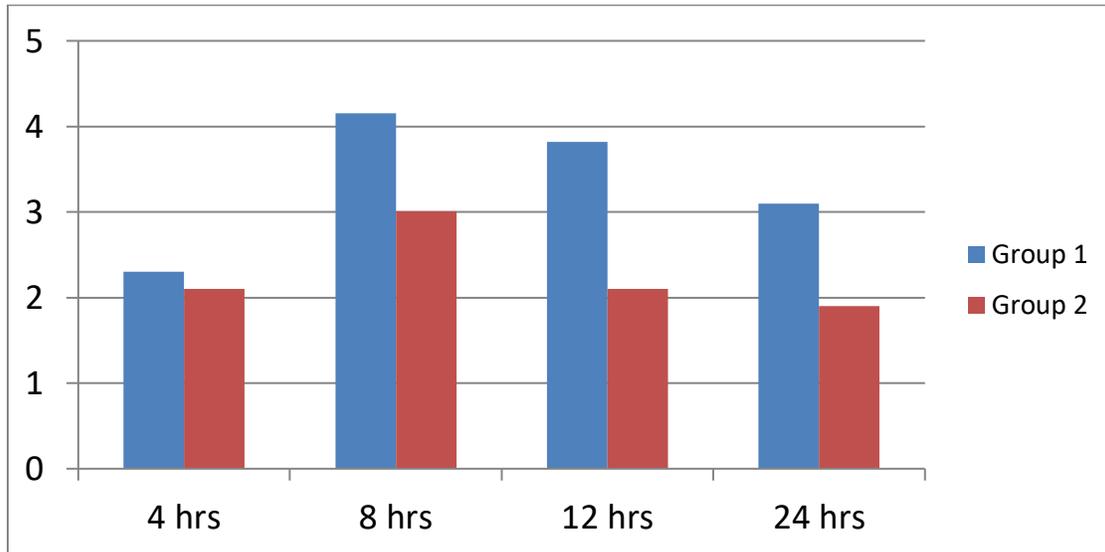
When postoperatively VAS score was compared after 24 hrs between both the groups. It was seen that group 1 had a VAS score of 3.1±0.24 and group 2 had a VAS was 1.9±0.43 which was statistically also significantly low when in comparison to group 2 (p<0.05). Further, it was observed that there was difference in mean VAS score at 4, 8, 12 and 24 hr time interval with group 2 having less mean score in comparison to group 1. Though the difference in scores was found to be statistically significant at 8 hr and 24 hr time interval only (p<0.05) (table 2).

Table 2: VAS score at different time interval

VAS score	Group 1 (Diclofenac group)	Group 2 (Ketoprofen group)	P value
Post operative VAS after 24 hrs	3.1±0.24	1.9±0.43	<0.05
Number of cases requiring Rescue analgesia	9	3	<0.05

P<0.05 statistically significant

Figure 1: Comparison of VAS score at different time intervals between both groups.



9 out of 25 patients in group 1 required rescue analgesia i.e injection of tramadol 100 mg, while only 3 out of 25 patients in group 2 required that in the first 24 hours and the difference of the values was also statistically significant ( $p < 0.05$ ). Also, We did not observe any severe allergic reaction to both the drugs and patches used patches. Only mild nausea was seen in 6 cases of group 1 and 3 cases of group 2 patients.

## Discussion

The results of the present study shows that transdermal patch of both ketoprofen and diclofenac seems to be effective for postoperative analgesia in patients undergone hip fracture surgeries under spinal anaesthesia though to ketoprofen group renders better results than diclofenac group and even rescue analgesic consumed is less in ketoprofen group in comparison to diclofenac group.

Both Diclofenac and Ketoprofen act by non-selective inhibition of cyclooxygenase pathway. Previous studies by various authors like Prabhakar H et al<sup>5</sup>, Hanna MH et al<sup>6</sup> and Atzeni F et al<sup>7</sup> have proven that Ketoprofen has better efficacy and even renders prolonged analgesia when compared with other pain killers like opioids, Diclofenac and ibuprofen in orthopaedic and rheumatic pain.

Pharmacodynamics of Transdermal drug delivery system (TDDS) shows that it bypasses first-pass metabolism (liver) and even overcomes complications associated with poor absorption of the drugs in the gastrointestinal tract. This acts as an advantage for large number of patients. Funk L et al concluded in their study that transdermal diclofenac patches offer significantly better postoperative pain control in comparison to diclofenac tablets after arthroscopic shoulder surgery.<sup>8</sup>

Similarly Esparza F et al<sup>9</sup> and Kawai S et al<sup>10</sup> also reported from their studies that Ketoprofen transdermal patches are more effective in both traumatic and non traumatic pain with no or minimal adverse effects.

In similarity to our study results Verma Ret al11 also concluded that transdermal patch of both ketoprofen and diclofenac are efficient enough in pain management after lower limb orthopaedic surgery under spinal anaesthesia. They also observed that more number of diclofenac group patients required rescue analgesia during first 24 hours in comparison to ketoprofen group patients.

## Conclusion

We conclude from our observations that transdermal patches are efficient method with minimal complications. Also both ketoprofen and diclofenac drugs seems to be effective for postoperative analgesia in patients undergone hip fracture surgeries under spinal anaesthesia. On comparison ketoprofen group seems to render better results than diclofenac group and even rescue analgesic consumed by the patients was less in ketoprofen group.

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