Section: Pharmacology

Original Research Article

COMPARISON OF EFFICACY AND SAFETY OF SINGLE DOSE TRANSDERMAL KETOPROFEN AND DICLOFENAC PATCHES IN POST- OPERATIVE PAIN MANAGEMENT IN PATIENTS UNDERGOING LOWER LIMB ORTHOPEDIC PROCEDURES

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Received : 07/08/2024
Received in revised form : 30/09/2024
Accepted : 14/10/2024

Keywords:
Transdermal patches, Ketoprofen, Post-operative, Pain management.

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DOI: 10.47009/jamp.2024.6.5.126

Source of Support: Nil,
Conflict of Interest: None declared

Int J Acad Med Pharm
2024; 6 (5); 670-673

Abstract

Background: Any orthopedic surgery requires post operative pain management, which is still an important component in post operative care. Nearly 20% of patients experience severe pain in the first 24 hrs. after surgery, a figure that has remained largely unchanged. This study aims at comparing the efficacy and safety of single dose transdermal ketoprofen and diclofenac patches in post operative pain management in patients undergoing lower limb orthopedic procedures. **Materials and Methods:** A total of seventy patients were allocated into two groups either ketoprofen or diclofenac using lottery method. Post operative pain was evaluated using visual analog scale. The statistical analysis was done using SPSS (statistical package for social sciences). **Result:** In group K the VAS score at 6 hours post operatively was 0.547_+0.92 and group D was 0.471_+0.80 which was statistically significant. Also, VAS score at 2 hour, 4 hour, 12 hour, 24 hour post operatively found to have p> 0.05. sleep interference score in group k was 2.26 compared to 2.77 in group D and the result is statistically significant. **Conclusion:** Transdermal patch of ketoprofen and diclofenac both are effective in post operative pain management. Rescue analgesia requirement in both groups were same but ketoprofen group showed less requirement.

INTRODUCTION

Orthopedic surgeries are forecasted to increase 4.9% per year. Total number of surgeries that had taken place in 2022 was around 28.3 million.[1] Postoperatively, over 50% of patients will experience at least one short-term complication, such as an infection, delirium, VTE, pressure sores, or cardiovascular problems. In the first 24 hours following surgery, over 20% of patients report significant pain, a percentage that has essentially not changed over the past 30 years. NSAIDs are the most widely used medications for postoperative analgesia worldwide. They can be administered orally, intravenously, intramuscularly, or transdermally. Any form of post-operative pain can have major consequences, and if the proper analgesia is not administered, it may adversely affect the respiratory, cardiovascular, gastrointestinal, urinary, and endocrinological systems as well as have long-term effects like delayed healing and persistent pain.

The Transdermal Delivery Systems (TDS) that has been used in clinical practice, overcome the pharmacokinetic problems of oral and parenteral routes. Transdermal delivery drug system avoids the pain associated with I.V. and I.M. routes and is an option for patients who don't tolerate the oral drug especially in postoperative period.[2] Bioavailability is improved by avoiding first-pass hepatic metabolism and enzymatic or pH-associated deactivation.

The advantage of transdermal patch is that it maintains a constant and prolonged drug level, reduces the frequency of dosing, can be self-administered and reduces the incidence of systemic adverse effects due to lower plasma concentrations.[3] Also, topical NSAIDs have a reduced risk of upper gastrointestinal complications such as gastric and peptic ulcers, and dyspepsia because of low systemic concentrations.[4-8]

The benefits of transdermal ketoprofen patch over oral diclofenac have been assessed in acute blunt injuries, sports injuries,[4] osteoarthritis,[5] etc., but

ISSN (O): 2687-5365; ISSN (P): 2753-6556

there hasn't been much research on its usage in lowering postoperative pain.

MATERIALS AND METHODS

After getting approval from the ethical committee of the institution, the study was conducted. Written informed consent was obtained from all patients. Patients included in the study were all ASA physical status I and II, age -18 to 60 years, BMI <30 KG/m2, who were all undergoing lower limb surgeries (ORIF). Patients who were all excluded in the study are pregnant or lactating mothers, patients on chronic pain treatment, patients with known allergy to the study drug, with any bleeding disorders, with history of impaired cognitive functions and history of alcohol and substance abuse.

The study was conducted for the period of six months. A total of 70 patients were included who were assigned into two groups using lottery method. Group k was assigned with 35 patients. Group D was assigned with 35 patients. Patients in Group K received transdermal ketoprofen 20 mg was given. Also, in Group D patients received transdermal diclofenac 100 mg.

Preoperatively demographic data like age, gender weight, BMI were noted. On the day of surgery patients were shifted to the operating room, standard monitors were applied, two wide bore intravenous cannula placed and spinal anesthesia were given. Two hours after administering the spinal anaesthesia, the corresponding transdermal patch was applied. The patch was applied to non- hairy areas of the body preferably in the upper chest or deltoid region. In the immediate postoperative period no other analgesics were given. To assess the postoperative pain visual analogue scale (VAS) were used. VAS score was recorded at 4,6,8,12, and 24 hours postoperatively. Sleep interference score was also recorded on a 10-point scale that described how the pain had interfered with patient's sleep during the first 24 hours.

Any allergic reactions to the study drug were recorded. If any patients required any rescue analgesia during the first 24 hours of postoperative period was also noted. The statistical analysis was conducted for the statistical package for social sciences (SPSS) software.

RESULTS

The study was conducted in 70 orthopedic patients. The study population was divided into two groups, GROUP D patients were managed by transdermal diclofenac and GROUP K patients were managed by transdermal ketoprofen patch.

The demographic parameters were analyzed. There is no significant difference between the two groups with respect to age, weight, and BMI. This signifies that both groups are comparable.

There is no significant difference between both groups with respect to age, weight, BMI. This signifies that both the groups are comparable. VAS score at all times except at sixth hour is statistically insignificant. Sleep interference score for group 1 was 2.26 compared to 2.77 in group 2. The result is statistically significant.

Table 1: Comparison of mean parameters within the two groups.

Parameters	Group 1		Group 2		MD	t Value	P Value
	M	SD	M	SD			
AGE	34.26	10.58	32.97	9.33	1.286	0.539	0.592
Weight	65.77	9.33	65.51	7.47	0.257	0.124	0.902
BMI	25.08	2.55	24.76	2.66	0.32	0.513	0.609
VAS4	2.4	0.49	2.54	0.51	0.143	-1.192	0.237
VAS6	2.77	0.55	3.31	0.47	0.543	-4.449	<0.001
VAS8	3.11	0.53	3.34	0.48	0.229	-1.889	0.063
VAS12	3.23	0.55	3.37	0.49	0.143	-1.151	0.254
VAS24	3.27	0.45	3.34	0.48	0.07	-0.618	0.539
Sleep interference score	2.26	0.611	2.77	0.73	0.514	-3.194	0.002

Table 2: Association between ASA, sleep interference score and need for rescue analgesia between groups.

Parameters	Sub parameter	Group 1		Group 2		t Value	P Value
		N	%	N	%		
ASA	I	23	65.7	21	60	0.245	0.805
	II	12	34.3	14	40		
Sleep Interference Score	1	2	5.7	0	0	9.261	0.026
	2	23	65.7	14	40		
	3	9	25.7	15	42.9		
	4	1	2.9	6	17.1		
Rescue analgesia	Not needed	31	88.6	26	74.3	2.362	0.218
	Needed	4	11.4	9	25.7		

There is no significant difference between any of these groups with respect to ASA and Need for rescue analgesia.

DISCUSSION

Post operative pain management using transdermal patches has become popular among surgeons. This study was conducted to compare the efficacy of transdermal ketoprofen and transdermal diclofenac in management of post operative pain in orthopedic

ISSN (O): 2687-5365; ISSN (P): 2753-6556

surgeries. The transdermal patch delivers the drug by penetrating the skin and into the capillaries.[6]

There are several layers in the transdermal patch which includes liner membrane, adhesive and backing. The liner should be removed before applying on the skin. There is a reservoir for drug storage. The release of the drug from the reservoir is controlled by the membrane.[7]

Post-operative pain after any type of surgery can have serious detrimental effects and if appropriate analgesia is not given, it can affect respiratory, cardiovascular, gastrointestinal, urinary, and endocrinological systems as well as have chronic effects like delayed recovery and chronic pain.[8] A German prospective cohort study,[9] of 50523 patients reported that up to 47·2 per cent of patients experienced severe pain (numerical rating scale score at least 8) in the first 24 h after surgery; however, this varied depending on the type of surgery performed. The intensity and duration of pain experienced increase the likelihood of patients developing chronic or persistent postsurgical pain (PPSP),[10] which results in longer-term psychological, social, and economic adversity.

In this study post operative pain was evaluated using visual analogue score. Visual analogue score (VAS) was recorded at regular intervals i.e 4 ,6,8,12, and 24 hours post operatively. Sleep interference score was rated on 10- point scale that described how pain had interfered with patient's sleep during the first 24 hours. Sleep interference score was observed to be statistically significant (p= 0.06). Rescue analgesia in Group k only 4 patients needed but in Group D 11 Patients needed. The VAS score analysis showed vas at 6 th hour post operatively statistically significant with($p<0.01$).

Both ketoprofen and diclofenac transdermal patch are effective for postoperative analgesia, but less patients in the ketoprofen group required rescue analgesia, according to Verma R et al,[7] comparison of the usefulness and safety of these two medications. In the immediate aftermath of arthroscopic shoulder surgery, Funk L et al,[11] found that diclofenac transdermal patches considerably reduced pain more effectively than oral diclofenac pills. According to Krishnan R et al,[12] intraoperative use of a single 100 mg transdermal diclofenac patch is just as efficacious as a single 75 mg intramuscular dosage of the medication.

Several authors have utilized ketoprofen for postoperative analgesia in oral, intravenous, and intramuscular preparations. They found that ketoprofen is an effective analgesic for moderate to severe acute postoperative pain.[13,14] According to a study by Sarzi Puttini P et al,[15] (2013), oral ketoprofen (50–200 mg/day) reduces moderate to severe pain and enhances functional status and overall condition more effectively than diclofenac (75–150 mg/day).

Furthermore, ketoprofen has one of the greatest levels of cutaneous permeability among NSAIDs. Consequently, compared to other NSAIDs like diclofenac or indomethacin, it penetrates the skin more quickly. Additionally, compared to diclofenac, flurbiprofen, and piroxicam in animal models, the ketoprofen patch formulation demonstrated greater skin permeability.[16]

CONCLUSION

To sum up, both ketoprofen and diclofenac transdermal patches are effective for postoperative analgesia in lower limb orthopaedic surgery under spinal anesthesia, but more patients in the diclofenac group needed rescue analgesics than in the ketoprofen group. Studies are also needed to demonstrate its effectiveness and safety in a variety of other surgical procedures.

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ISSN (O): 2687-5365; ISSN (P): 2753-6556

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ISSN (O): 2687-5365; ISSN (P): 2753-6556