

# Comparisons of Transdermal Buprenorphine Patch versus Transdermal Fentanyl patch for postoperative analgesia in lower limb orthopedic surgery

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## Abstract

**Background:** Postoperative pain are acute, moderate to severe type. Lower limb orthopedic surgeries are subset of surgery which requires multimodal analgesia postoperatively as it requires excellent postoperative analgesia for early orthopedic rehabilitation as well. Transdermal opioid patches is a part of this multimodal analgesia regimen for postoperative pain relief.

**Material and method:** The study was conducted after Institutional Ethical committee approval, and informed written consent taken from all participants. 60 patients enrolled for this study of ASA 1 and ASA 2 grade, either gender posted for lower limb orthopedic procedure. The patients were assessed preoperatively and patches applied 6hrs prior surgery. All patients received paracetamol 1gm as rescue analgesic. Total duration of analgesia, requirement additional analgesic noted, pain evaluated with VAS and any side effects also noted for 3 days .

**Results:** The visual analogue scale shows significant values in the fourth [Group B] and eight hours [Group F] hours of the post-operative period. 0.0005 is the p-value. Pruritus was more common in group F which was statistically significant as compared to the group a. Pruritus was seen in six patients in group F but only two patients in Group B. Group F showed more incidence of nausea/vomiting as well as more requirement of antiemetic as compared to other groups, but it was not statistically significant.

**Conclusion:** In lower limb arthroscopic procedures, buprenorphine patch was shown to be more effective than fentanyl patch for postoperative pain, with no increased hemodynamic instability or side effects.

**Keywords :** Transdermal patch, Buprenorphine, Fentanyl, Post-operative complications

## Introduction

Postoperative pain management is an ever-evolving topic that continues to be a challenge. According to studies, the majority of patients do not receive adequate pain control following surgery, which leads to delayed recovery, hemodynamic instability, insufficient respiratory effort, and other psychological

issues, all of which can lead to chronic postsurgical pain if not resolved promptly.<sup>1,2</sup>

Recent findings of the advantages of medications used to treat chronic pain, as well as the re-emergence of older analgesics in the treatment of acute pain, have improved postoperative recovery.<sup>3</sup> Transdermal drug delivery systems (TDS), which have been shown to

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be effective in the treatment of chronic pain, are now being utilized with success in the treatment of acute pain.<sup>4</sup>

TDS is a pain-relieving analgesic delivery system that is easy, dependable, and non-invasive. Transdermal administration of drugs such as fentanyl, buprenorphine, diclofenac, and others is possible.<sup>5</sup> Transdermal opioid patches are well-known for their use in chronic pain. TDS has the potential to remove the pharmacokinetic adverse effects of parenteral and oral medication administration for immediate postoperative pain.<sup>6</sup>

Although they are more expensive than parenteral and oral medications, they eliminate the need of additive opioid dosages in the postoperative phase. The medicine is delivered in tiny amounts, with a consistent and sustained blood level of the drug. A number of studies have shown that buprenorphine and fentanyl patches can be used safely and efficiently to treat acute pain.

## Materials and Methods

**Type of Study:** Random Cross-sectional study

**Sample size:** 60 patients with 30 patients each in Group B – Buprenorphine patch and Group F – Fentanyl patches

### Inclusion Criteria:

- Patients aged between 21 to 60 yrs were included
- ASA I and II

### Exclusion Criteria:

- Patients taking NSAID's, having allergies were excluded.
- Not willing to participate

The study was conducted after Institutional Ethical committee approval, and informed written consent taken from all participants. 60 patients enrolled for this study of ASA 1 and ASA 2 grade, either gender posted for lower limb orthopedic procedure. Patients were randomly divided into 2 groups. Group 1 received buprenorphine patch and Group 2 received fentanyl patch. The patients were assessed preoperatively and buprenorphine and fentanyl patches were applied. All patients received paracetamol 1gm as rescue

analgesic. Total duration of analgesia, requirement additional analgesic noted, panic evaluated with VAS and any side effects also noted for 3 days.

**Statistical analysis:** The SPSS 22 software was used to do the statistical analysis. The data was presented in the form of tables with means and percentages.

## Observation and Results

**Table 1: Distribution based on Gender and age group**

Gender	Group B	Group F	Total
Male	19(63.33%)	21(70%)	40(66.66%)
Female	11(36.66%)	9(30%)	20(23.33%)
Age Group			
21 - 30	5(16.66%)	5(16.66%)	10(16.66%)
31 - 40	7(23.33%)	6(20%)	13(21.66%)
41 - 50	8(26.66%)	9(30%)	17(28.33%)
51 - 60	10(33.33%)	10(33.33%)	20(33.33%)
<b>Total</b>	<b>43.12±9.21</b>	<b>46.18±8.57</b>	

Male predominance was observed in both the groups with total males accounting for 67% and females were 23%.

The majority of the patients belonged to the age group of 51 to 60 yrs accounting for 33% of the cases, followed by 41 to 50 yrs age group with 28%, 22% belonged to the age group of 31 to 40 yrs and the least belonged to the age group of 21 to 30 yrs with 17%.

The mean + S.D for age group for Group B and Group F was 43.12±9.21 yrs and 46.18±8.57 yrs respectively.

**Table 2: Distribution based on demographics and ASA**

ASA	Group B	Group F	Total
Weight	69.5 + 7.22	68.37 + 5.01	
Height	167.83 + 8.11	166.7 + 7.75	
ASA			
ASA I	10(33.33%)	16(53.33%)	26(43.33%)
ASA II	20(66.66%)	14(46.66%)	34(56.66%)

The weight and height were similar across both the group.

In Group B, ASA I were 33% and ASA II were 67%.

In Group F, ASA I were 53% and ASA II were 47%.

**Table 3: Distribution based on duration of surgery and analgesia**

Mean Duration	Group B	Group F
Mean Surgery Duration	112.8 + 17.5	114.5 + 18.1
Mean duration of analgesia	18.26 ± 1.69	12.88 ± 0.86

In Group B, the mean duration of surgery was 112.8 ± 17.5 minutes, the mean duration of analgesia was 18.26 ± 1.69 hrs.

In Group F, the mean duration of surgery was 114.5 ± 18.1 minutes, the mean duration of analgesia was 12.88 ± 0.86hrs.

**Table 4: Distribution based on VAS**

VAS	Group B	Group F
0 hrs	0.28 + 0.980	0.30 + 0.109
4 hrs	2.16 ± .841	2.96 ± .600
8 hrs	1.68 ± 0.690	1.76 ± 0.523

The visual analogue scale shows significant values in the fourth [Group B] and eight hours [Group F] hours of the post-operative period. 0.0005 is the p-value.

**Table 5: Distribution based on Post-op complications**

Post- Op complications	Group B	Group F
Nausea and vomiting	3	5
Pruritis	2	6

Pruritis was more common in group F which was statistically significant as compared to the group B. Pruritis was seen in six patients in group F but only two patients in Group B. Group F showed more incidence of nausea/vomiting as well as more requirement of antiemetic as compared to other groups, but it was not statistically significant.

## Discussion

Anesthesiologists employ a variety of strategies to provide analgesics in the treatment of postoperative pain. Each modality has its own set of advantages and disadvantages. The intravenous and oral methods, while successful in the immediate postoperative period, have drawbacks.<sup>7</sup> Because of specific benefits and great efficacy, transdermal patches are becoming more common in hip operations, knee arthroplasties,

and abdominal procedures for acute or postoperative pain. Strong opioids, such as buprenorphine and fentanyl, are available as transdermal patches with benefits such as simplicity of administration, safety profile, and a less intrusive manner of administration with a sustained level of medication in the blood.<sup>8</sup>

Fentanyl is a synthetic opioid with a low molecular weight and high lipid solubility, making it an excellent choice for transdermal application in the treatment of acute pain. Buprenorphine, a partial agonist at mu receptors with limited oral bioavailability, high lipid solubility, and low molecular weight, is similar.<sup>9</sup>

Both opioid patches have been examined and proven to be effective in the treatment of chronic and acute pain, but there have been few comparative studies. Furthermore, research comparing them in acute pain indicate that further prospective randomised studies are needed to determine the optimal dose and side effects decisively.<sup>10</sup>

Because opioid patches take 12–24 hours to take effect, all patients were administered a transdermal patch 12 hours before surgery. We employed non-opioid analgesics (diclofenac) as rescue analgesics in our trial since combining intravenous or oral opioids with transdermal fentanyl or buprenorphine can exacerbate the negative effects of opioids such as nausea, vomiting, and respiratory depression. The buprenorphine patch was shown to be more effective in alleviating acute pain after surgery in this study. With little side effects, the overall dose of rescue analgesics was reduced. The conclusions of this study are in line with Machado FC et al systematics review.<sup>11</sup>

Our study's limitations were that we only evaluated at the efficacy of transdermal patches in postoperative patients who had just lower limb arthroscopic procedures, so additional research is needed to understand how well they work in other major surgeries. Furthermore, no individual medication dosage response curve studies were conducted. The study's true power was not calculated using post hoc analysis.

## Conclusion

In lower limb arthroscopic procedures, buprenorphine patch was shown to be more effective than fentanyl patch for postoperative pain, with no increased hemodynamic instability or side effects.

**Ethical Clearance:** Ethical Clearance was obtained

from the institutional ethics committee of Bhaskar Medical College prior to the commencement of study.

**Source of funding:** Self

**Conflict of interest:** Nil

## References

- Holley FO, van Steennis C Postoperative analgesia with fentanyl: pharmacokinetics and pharmacodynamics of constant-rate i.v. and transdermal delivery. *Br J Anaesth.* 1988 May; 60(6):608-13.
- Nelson L, Schwaner R. Transdermal fentanyl: Pharmacology and toxicology. *Journal of Medical Toxicology* December 2009, 5:230.
- Duthied DJR, Rowbothamrwyldp J, Hendersonw D, Nimmo S. Plasma Fentanyl Concentrations During Transdermal Delivery Of Fentanyl To Surgical Patients. *British Journal Of Anaesthesia.* 1988; 60(6):614-618.
- David A Scott, David SN, Beilby, Calum McClymont, Postoperative Analgesia Using Epidural Infusions of Fentanyl with Bupivacaine: A Prospective Analysis of 1,014 Patients. *Clinical Science,* 1995.
- Scott LJ. Fentanyl Iontophoretic Transdermal System: A Review in Acute Postoperative Pain. *Clin Drug Investig.* 2016Apr; 36(4):321- 30.
- Peter JS, Koo, Pharm D. Postoperative pain management with a patient-controlled transdermal delivery system for fentanyl. *American Journal of Health-System Pharmacy,* 2005; 62(11):1171- 1176.
- Wendy Jeal, Paul Benfield. Transdermal Fentanyl A Review of its Pharmacological Properties and Therapeutic Efficacy in Pain Control. *Drugs* January 1997; 53(1): 109-138.
- Gourlay GK , Kowalski SR , Plummer JL , Cousins MJ , Armstrong PJ . Fentanyl blood concentration-analgesic response relationship in the treatment of postoperative pain. *Anesthesia and Analgesia* [01 Apr 1988; 67(4):329-337]
- Eugene R Viscusi, MD; Lowell Reynolds, MD; Frances Chung, MD et al Patient-Controlled Transdermal Fentanyl Hydrochloride vs Intravenous Morphine Pump for Postoperative Pain A Randomized Controlled Trial *AMA.* 2004; 291(11):1333-1341.
- Karas-Trzeciak M, Grabowski T, Woloszczuk-Gebicka B, Borucka B. Fentanyl with ropivacaine infusion for postoperative pain relief in infants and children. Kinetics of epidural fentanyl. *Paediatr Anaesth.* 2015; 25(8):818-823
- Nakamura RK, Machado FC, Novais LSR. Erector spinae plane block for perioperative analgesia in cardiac surgery. *Case Rep Br JP.* 2018;1(4):369-371.