



Anaesthesiology

A COMPARATIVE STUDY OF ANALGESIC EFFICACY BETWEEN TRANSDERMAL BUPRENORPHINE PATCH AND TRANSDERMAL DICLOFENAC PATCH FOR POSTOPERATIVE PAIN RELIEF IN MAJOR SURGERIES

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ABSTRACT

Background: Effective postoperative pain management remains a fundamental component of perioperative care. Inadequate pain control following major surgeries can delay recovery, prolong hospitalization, increase healthcare costs, and negatively affect patient satisfaction. Multimodal analgesia has emerged as the preferred strategy to optimize pain relief while minimizing opioid consumption and associated adverse effects. Among available options, transdermal drug delivery systems offer sustained analgesia, improved compliance, and avoidance of first-pass metabolism. **Aim:** To compare the analgesic efficacy and safety profile of transdermal buprenorphine patch and transdermal diclofenac patch in patients undergoing major surgeries. **Methods:** A prospective randomized comparative study was conducted among 100 adult patients undergoing major surgical procedures. Participants were randomly allocated into two equal groups. Group B received transdermal buprenorphine patch 10 µg/h approximately 12 hours before surgery, while Group D received transdermal diclofenac patch 100 mg approximately 2 hours before surgery. Pain intensity was assessed using the Visual Analog Scale (VAS) at predefined intervals up to 24 hours postoperatively. Primary outcome was Time-Weighted Average Pain (TWAP) over 24 hours. Secondary outcomes included rescue analgesic requirements, hemodynamic parameters, and adverse events. **Results:** Both groups demonstrated significant postoperative pain reduction over time. Mean TWAP values were comparable between the groups. Visual Analog Scale scores, responder rates, and rescue analgesic requirements showed no statistically significant differences. Hemodynamic variables remained stable in both groups. Adverse events were infrequent and comparable, indicating favourable tolerability of both interventions. **Conclusion:** Transdermal buprenorphine and transdermal diclofenac patches provide comparable postoperative analgesia and safety in major surgeries when administered appropriately before surgery. Both patches can be effectively incorporated into multimodal postoperative pain management protocols.

KEYWORDS : Postoperative Pain, Transdermal Buprenorphine, Transdermal Diclofenac, Analgesia, Major Surgery, Multimodal Analgesia

INTRODUCTION

Postoperative pain continues to be one of the most significant concerns in perioperative medicine despite advances in surgical techniques, anaesthetic management, and pain control strategies. Transdermal drug delivery systems have gained increasing attention in postoperative pain management due to several advantages. These systems provide continuous drug delivery, maintain stable plasma concentrations, bypass gastrointestinal absorption and hepatic first-pass metabolism, improve patient compliance, and reduce fluctuations associated with intermittent dosing.

Buprenorphine is a semisynthetic opioid derived from thebaine. It acts as a partial agonist at μ -opioid receptors and an antagonist at κ -opioid receptors. The transdermal buprenorphine patch provides sustained systemic drug delivery over several days, making it suitable for managing moderate-to-severe pain.

Diclofenac is a widely used non-steroidal anti-inflammatory drug (NSAID) that exerts its analgesic and anti-inflammatory effects through inhibition of cyclooxygenase enzymes and subsequent suppression of prostaglandin synthesis. Transdermal diclofenac patch formulation offers convenience and sustained pain relief without requiring repeated oral administration. The present study is designed to compare the analgesic efficacy, rescue analgesic requirements, patient outcomes, and safety profiles of transdermal buprenorphine and transdermal diclofenac patches in patients undergoing major surgeries.

Research Gap

Although substantial evidence supports the efficacy of transdermal buprenorphine and transdermal diclofenac individually, direct head-to-head comparisons in major surgical populations remain scarce. Many available studies involve small sample sizes, heterogeneous surgical procedures, and varying analgesic protocols. Furthermore, limited data exist regarding comparative outcomes such as time-weighted average pain scores, responder rates, rescue analgesic requirements, and adverse-event profiles.

The present study was therefore undertaken to address this gap by directly comparing transdermal buprenorphine and transdermal diclofenac patches in patients undergoing major surgeries under standardized clinical conditions. Such evidence is essential for guiding perioperative analgesic selection and optimizing multimodal pain management strategies.

MATERIALS AND METHODS

The present study was conducted as a prospective, randomized, comparative clinical study in the Department of Anaesthesiology at Bharat Ratna Late Shri Atal Bihari Vajpayee Memorial Medical College and associated hospital, Rajnandgaon, Chhattisgarh. The study was registered with Clinical Trial Registry- India (CTRI) and given registration number CTRI/2025/03/083412. Study was also undertaken after obtaining approval from the Institutional Ethics Committee and Institutional Scientific Committee. Written informed consent was obtained from all participants prior to enrollment.

A total of 100 ASA grade I-II patients aged 18–65 years, scheduled for major surgical procedure and willing to participate with written informed consent were randomly selected from a pool of patients and were subdivided into two equal groups. Exclusion Criteria were known hypersensitivity to Buprenorphine, diclofenac or paracetamol, skin lesions at patch site, history of opioids or substance abuse, significant cardiac, renal or respiratory disease, pregnancy or lactation and inability to understand VAS

All patients underwent standardized anaesthetic management according to institutional protocols. Patient in Group B (Buprenorphine) received a transdermal buprenorphine patch delivering 10 microgram/hour, applied 12 hours before surgery. Patient in group D (Diclofenac) received transdermal diclofenac patch containing 100mg, applied 2 hours before the surgery. Patches were applied on left arm after cleaning with alcohol swab and drying. Standard monitoring including electrocardiography, pulse oximetry, non-invasive blood pressure measurement, and respiratory monitoring was employed throughout the perioperative period. Intraoperative

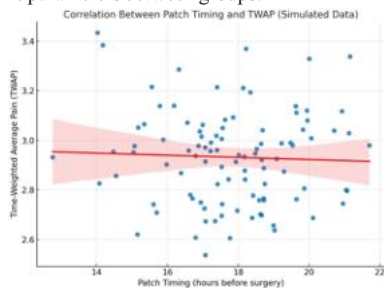
anaesthetic techniques were selected based on the nature of the surgical procedure and patient characteristics. Efforts were made to maintain uniformity in perioperative analgesic and anaesthetic practices to minimize confounding factors affecting postoperative pain outcomes.

Postoperative pain assessment was carried out using the Visual Analog Scale (VAS), a validated and widely accepted tool for quantifying pain intensity. Patients were educated regarding the use of the scale during the preoperative period. Pain scores were recorded at predetermined postoperative intervals of 0, 1, 2, 4, 8, 12, and 24 hours. The primary outcome measure was the Time-Weighted Average Pain (TWAP) score over the first twenty-four postoperative hours, providing an integrated measure of pain burden over time rather than relying on isolated pain assessments. In addition, the area under the pain curve (AUC) for VAS scores was calculated to evaluate cumulative pain exposure during the observation period.

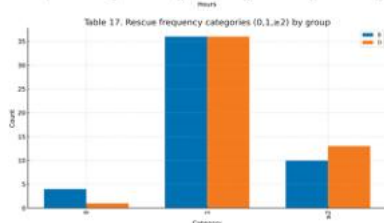
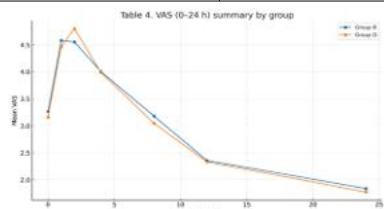
Secondary outcomes were rescue analgesic requirement, adverse events and hemodynamic stability. Rescue analgesia used was Inj. Paracetamol 1gm IV.

RESULTS

The study was done with 100 patients, with 50 patients in each group. The pre-operative and demographic data were similar. The baseline demographic characteristics were comparable between the two groups. There were no statistically significant differences in age distribution, gender composition, body weight, ASA physical status classification, or type of surgical procedure performed. The similarity of baseline characteristics indicated that both groups were adequately matched and that postoperative outcomes could be attributed primarily to the analgesic interventions rather than demographic or procedural differences. Pain intensity was assessed using the Visual Analog Scale (VAS) at multiple postoperative intervals extending from the immediate postoperative period to 24 hours after surgery. Both treatment groups demonstrated a progressive decline in pain scores over time, indicating effective postoperative analgesia. Immediately after surgery, pain scores were relatively higher in both groups, reflecting the expected postoperative pain response. However, subsequent assessments revealed steady improvement in pain control throughout the observation period. There was no difference in hemodynamic parameters between groups.



Group	Mean TWAP
Buprenorphine	2.82
Diclofenac	2.78



Outcome	Buprenorphine	Diclofenac	p-value
Mean TWAP	2.82	2.78	NS

Rescue analgesia	Comparable	Comparable	NS
Hemodynamic stability	Comparable	Comparable	NS
Adverse events	Comparable	Comparable	NS

Overall adverse-event analysis demonstrated that both transdermal buprenorphine and transdermal diclofenac possess favourable safety profiles. The low incidence of complications and absence of severe adverse reactions indicate that both interventions are well tolerated in the postoperative setting. These findings are particularly important given the growing emphasis on enhanced recovery protocols and patient-centred perioperative care.

DISCUSSION

The present study was undertaken to compare the analgesic efficacy and safety of transdermal buprenorphine patch and transdermal diclofenac patch in patients undergoing major surgical procedures. The growing emphasis on multimodal analgesia has encouraged the exploration of transdermal drug delivery systems as a means of providing sustained postoperative pain relief while minimizing the adverse effects associated with conventional opioid therapy. The findings of the present study demonstrated that both transdermal buprenorphine and transdermal diclofenac provided effective postoperative analgesia during the first twenty-four hours following surgery when applied well before time.

CONCLUSION

In patients undergoing major surgery, transdermal buprenorphine and transdermal diclofenac were similarly effective in providing postoperative analgesia for first 24 hours when applied well in advance with good safety. These both can be used in multimodal postoperative pain management. Larger multi-centre studies are warranted.

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