A PROSPECTIVE OBSERVATIONAL STUDY OF COMBINED SPINAL–EPIDURAL ANAESTHESIA FOR POSTOPERATIVE ANALGESIA IN ORTHOPAEDIC, LOWER ABDOMINAL AND OBSTETRIC & GYNAECOLOGICAL SURGERIES

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Abstract Background:
Effective postoperative pain management plays a crucial role in early mobilisation, enhanced recovery, and patient satisfaction. Combined spinal–epidural (CSE) anaesthesia offers the advantage of rapid onset of spinal blockade along with prolonged and controllable postoperative analgesia through the epidural route.
Objectives:
To evaluate the efficacy and safety of combined spinal–epidural anaesthesia for postoperative analgesia in orthopaedic, lower abdominal, and obstetric & gynaecological surgeries.
Methods:
This prospective observational study was conducted on 75 patients undergoing elective surgeries under CSE anaesthesia. Patients were equally divided into three groups: orthopaedic surgeries (n=25), lower abdominal surgeries (n=25), and obstetric & gynaecological surgeries (n=25).
Postoperative pain was assessed using the Visual Analogue Scale (VAS) at predetermined intervals. Secondary outcomes included time to first rescue analgesia, total postoperative analgesic requirement, and incidence of adverse effects.
Results:
Postoperative pain scores remained low across all groups. The time to first rescue analgesia was longest in the orthopaedic group, followed by obstetric & gynaecological surgeries, and least in lower abdominal surgeries. Overall analgesic consumption was minimal. Adverse effects were infrequent and mild, with nausea and vomiting observed in 2.6% and mild hypotension in 4% of patients. No serious complications were reported.
Conclusion:
Combined spinal–epidural anaesthesia provides effective and safe postoperative analgesia across orthopaedic, lower abdominal, and obstetric & gynaecological surgeries with minimal adverse effects and prolonged analgesic duration.

Keywords:*Combined spinal–epidural anaesthesia, postoperative analgesia, orthopaedic surgery, obstetric and gynaecological surgery, regional anaesthesia*

Introduction:

Postoperative pain, if inadequately controlled, can adversely affect recovery and increase perioperative morbidity. Regional anaesthesia techniques form the cornerstone of multimodal analgesia strategies. Spinal anaesthesia ensures rapid onset and dense sensory blockade, whereas epidural anaesthesia allows continuous and titratable postoperative pain control. The combined spinal–epidural (CSE) technique integrates these advantages and has been widely used in orthopaedic, abdominal, and obstetric & gynaecological surgeries [1,2].

Recent studies, including those published in the Journal of Pharmacy and Technology in Clinical Practice, have demonstrated the effectiveness of CSE in providing superior postoperative analgesia with reduced opioid consumption and a favourable safety profile [3].

Materials and Methods:

Study Design

This prospective observational study was conducted in the Department of Anaesthesiology of a tertiary care hospital.

Study Duration

One year (1st January 2025 - 31st December 2025)

Study Population

Seventy-five patients scheduled for elective surgeries under combined spinal–epidural anaesthesia were included. Patients were categorised into three groups based on the type of surgery, with twenty-five patients in each group: orthopaedic surgeries, lower abdominal surgeries, and obstetric & gynaecological surgeries.

Inclusion Criteria

1. Patients aged 18 to 70 years undergoing elective orthopaedic or lower abdominal surgeries.
2. Patients up to 40 years of age undergoing obstetric and gynaecological surgeries.
3. Patients belonging to American Society of Anaesthesiologists physical status I to III.
4. Patients planned for surgery under combined spinal–epidural anaesthesia.
5. Patients who provided written informed consent to participate in the study

Exclusion Criteria

1. Patient refusal or inability to provide informed consent.
2. Presence of coagulopathy or ongoing anticoagulant therapy.
3. Local infection at the site of neuraxial block.
4. Severe spinal deformity or previous spinal surgery.
5. Known allergy or hypersensitivity to local anaesthetic agents or opioids.

Preoperative Assessment

All patients underwent a detailed pre anaesthetic evaluation including medical history, physical examination, airway assessment, and routine laboratory investigations. Patients were familiarised with the Visual Analogue Scale for pain assessment during the preoperative visit.

Anaesthetic Technique

Standard monitoring including electrocardiography, non-invasive blood pressure, and pulse oximetry was established in the operating room. Combined spinal–epidural anaesthesia was performed under strict aseptic precautions. The epidural space was identified using the loss-of- resistance technique, and an epidural catheter was inserted and secured. Spinal anaesthesia was subsequently administered. Surgery was commenced after confirmation of adequate sensory blockade.

Postoperative Analgesia

Postoperative analgesia was maintained through the epidural catheter using a low-concentration local anaesthetic solution as per institutional protocol. Pain intensity was assessed using the Visual Analogue Scale at two, six, twelve, and twenty-four hours after surgery. Rescue analgesia was administered when the pain score exceeded four.

Outcome Measures

The primary outcome was postoperative pain intensity assessed using the Visual Analogue Scale. Secondary outcomes included time to first rescue analgesia, total analgesic requirement during the first twenty-four hours, and incidence of adverse effects.

Statistical Analysis

Data were analysed using appropriate statistical software. Continuous variables were expressed as mean with standard deviation, while categorical variables were expressed as frequencies and percentages. Comparison among the three groups was performed using analysis of variance. A p value less than zero point zero five was considered statistically significant.

Sample Size Calculation:

Sample size was calculated using the formula for comparison of means for continuous variables:

$$n = \frac{2 \times (Z_{\alpha/2} + Z_{\beta})^2 \times \sigma^2}{d^2}$$

Where:

- $Z_{\alpha/2} = 1.96$ (95% confidence interval)
- $Z_{\beta} = 0.84$ (80% power)
- $\sigma = 2.5$ (standard deviation of VAS from previous literature) [3]
- $d = 2$ (minimum clinically significant difference)

This yielded **25 patients per group**, giving a total sample size of **75 patients**.

Study Groups

- Group A: Orthopaedic surgeries (n = 25)
- Group B: Lower abdominal surgeries (n = 25)
- Group C: Obstetric & gynaecological surgeries (n = 25)

Outcome Measures:

Primary Outcome:

- Postoperative pain assessed using VAS at 2, 6, 12, and 24 hours.

Secondary Outcomes

- Time to first rescue analgesia
- Total analgesic consumption
- Adverse effects

Results:

Postoperative analgesia was satisfactory in all three groups, with mean VAS scores remaining below 3 during the first 24 hours.

Time to First Rescue Analgesia:

- Orthopaedic surgeries: 6.5 ± 1.4 hours
- Obstetric & gynaecological surgeries: 5.8 ± 1.3 hours
- Lower abdominal surgeries: 5.2 ± 1.2 hours

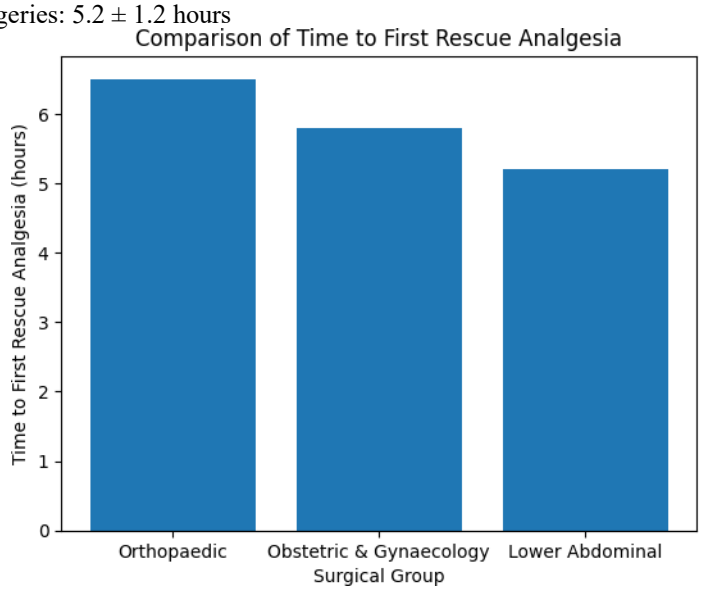
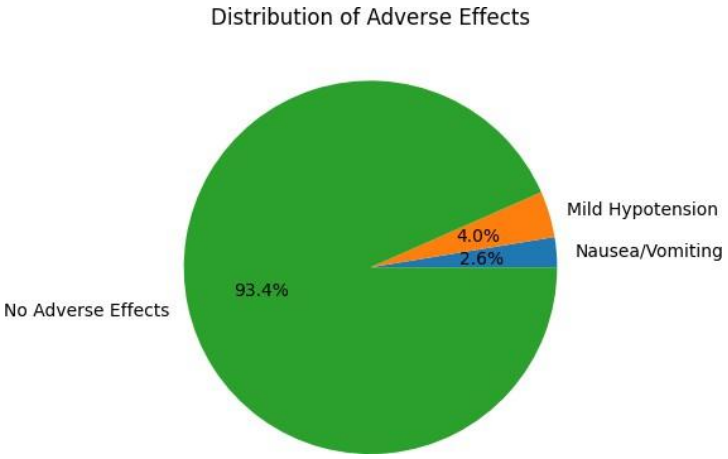


Figure:1 Comparison of time to first rescue analgesic vs different surgeries. Adverse Effects:

- Nausea and vomiting: 2.6%
- Mild hypotension: 4%

Figure 2: Distribution of adverse effects
No cases of respiratory depression, neurological deficits, epidural hematoma, or infection were observed.



Discussion:
Effective postoperative pain management is a crucial component of perioperative care, as inadequate analgesia can delay mobilisation, prolong hospital stay, and negatively affect patient satisfaction and recovery outcomes. Poor pain control is also associated with increased neuroendocrine stress responses and postoperative complications[1,2]. Consequently, regional anaesthesia techniques have become integral to multimodal analgesia strategies, particularly in major surgical procedures[3].
Combined spinal–epidural (CSE) anaesthesia combines the rapid onset and dense sensory blockade of spinal anaesthesia with the flexibility of prolonged and titratable analgesia offered by the
epidural component[4,5]. This dual advantage makes CSE a versatile technique suitable for a wide
range of surgical procedures, including orthopaedic, abdominal, and obstetric & gynaecological surgeries[6].
In the present study, postoperative pain scores assessed using the Visual Analogue Scale remained consistently low during the first 24 hours across all three surgical groups. This finding indicates that CSE anaesthesia provides effective and sustained postoperative analgesia. Similar observations
have been reported in earlier studies, which demonstrated superior pain control with CSE compared to spinal or epidural anaesthesia alone[7,8]. The effectiveness observed in this study can be attributed to the synergistic action of spinal anaesthesia, which ensures immediate pain relief, and epidural analgesia, which maintains analgesia as the spinal block regresses[9].
The time to first rescue analgesia was longest in patients undergoing orthopaedic surgeries, followed by obstetric & gynaecological and lower abdominal procedures. This variation may be explained by differences in surgical trauma, pain characteristics, and the relative contribution of
somatic versus visceral pain. Orthopaedic surgeries, particularly lower limb procedures, are well suited to neuraxial blockade and are associated with prolonged analgesic effects[10]. Mishra et al. similarly reported longer analgesic duration and reduced rescue analgesic requirements in
orthopaedic patients receiving CSE anaesthesia[11].
A noteworthy finding of the present study was the reduced postoperative analgesic requirement, highlighting the opioid-sparing benefit of CSE anaesthesia. Opioid minimisation is clinically
important, as opioid use is associated with adverse effects such as nausea, vomiting, sedation, respiratory depression, and postoperative ileus[12–14]. Several studies and meta-analyses have demonstrated that epidural-based analgesia significantly reduces systemic opioid consumption and improves postoperative outcomes[15,16].
With respect to safety, CSE anaesthesia was associated with a low incidence of adverse effects in the present study. The complications observed were mild and transient, including hypotension and postoperative nausea and vomiting. No serious complications such as neurological injury, epidural haematoma, infection, or respiratory depression were encountered. These findings are consistent with previous reports demonstrating the safety of CSE anaesthesia when performed using
meticulous technique and appropriate monitoring[17,18].
The findings of this study are in agreement with existing literature supporting the beneficial role of neuraxial anaesthesia in improving postoperative outcomes. Large systematic reviews and meta- analyses have shown that spinal and epidural anaesthesia are associated with reduced postoperative morbidity and mortality compared to general anaesthesia alone[16,19]. Furthermore, effective regional
analgesia has been identified as a key component of enhanced recovery after surgery (ERAS) protocols, contributing to early mobilisation and improved functional recovery[20,21].
Despite these positive findings, certain limitations of the present study should be acknowledged. The observational study design and absence of a control group limit direct comparison with other anaesthetic techniques. The relatively small sample size and single-centre setting may affect generalisability. Additionally, postoperative outcomes were assessed only during the first 24 hours, and long-term recovery parameters were not evaluated. Further randomised

controlled trials with larger sample sizes and longer follow-up periods are recommended to strengthen the evidence base[22].

In summary, the present study demonstrates that combined spinal–epidural anaesthesia provides effective, sustained, and safe postoperative analgesia across orthopaedic, lower abdominal, and obstetric & gynaecological surgeries. Its favourable analgesic profile, opioid-sparing effect, and low complication rate make it a valuable and reliable technique in contemporary anaesthetic practice.

Limitations:

This study was conducted at a single centre with a limited sample size, which may affect the generalisability of the findings. In addition, the observational study design and absence of a control group restrict direct comparison with other anaesthetic techniques. Long-term postoperative outcomes beyond the first twenty-four hours were not evaluated.

Conclusion:

Combined spinal–epidural anaesthesia is an effective and safe modality for postoperative analgesia in orthopaedic, lower abdominal, and obstetric & gynaecological surgeries. It ensures prolonged analgesia, minimal opioid requirement, and a low incidence of adverse effects.

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