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Original Research Article

Comparative Evaluation of Spinal and General Anaesthesia in Patients Undergoing Total Abdominal Hysterectomy

Shanthala S. Naik[1], Rashmi Ashok Baligatti[2]

[1]MBBS, MD Anaesthesiology, Specialist, Cloudphysician Healthcare Pvt Ltd, Bengaluru, Karnataka, India

[2]Assistant Professor, Department of Anaesthesiology, Adichunchanagiri Institute of Medical Sciences, Bellur cross, Karnataka, India

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Corresponding Author: Dr. Shanthala S. Naik

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Abstract:

Background: Total abdominal hysterectomy is commonly performed under either spinal or general anaesthesia. Selection of the anaesthetic technique influences intraoperative haemodynamics, postoperative pain, recovery, and patient satisfaction.

Aim: To compare spinal and general anaesthesia in patients undergoing elective total abdominal hysterectomy with respect to haemodynamic changes, postoperative analgesia, recovery profile, complications, and patient satisfaction.

Methods: This prospective randomized comparative study included 100 women undergoing elective total abdominal hysterectomy. Patients were randomly allocated into two groups: Group S (spinal anaesthesia, n=50) and Group G (general anaesthesia, n=50). Demographic variables, intraoperative haemodynamic parameters, blood loss, postoperative pain scores, analgesic requirement, recovery characteristics, complications, and patient satisfaction were evaluated and statistically compared.

Results: Baseline demographic characteristics were comparable between the groups. Spinal anaesthesia resulted in significantly lower intraoperative blood loss (312 ± 58 vs. 356 ± 64 mL; $p<0.001$), lower postoperative pain scores (VAS 2.9 ± 0.9 vs. 4.8 ± 1.1; $p<0.001$), prolonged time to first rescue analgesia (5.8 ± 1.2 vs. 2.9 ± 0.8 hours; $p<0.001$), reduced postoperative analgesic consumption, earlier ambulation, and shorter hospital stay. However, hypotension (30% vs. 12%; $p=0.028$) and bradycardia (16% vs. 4%; $p=0.046$) were significantly more common in the spinal anaesthesia group. General anaesthesia was associated with a significantly higher incidence of postoperative nausea and vomiting (28% vs. 10%; $p=0.022$). Patient satisfaction was significantly greater following spinal anaesthesia (9.3 ± 0.6 vs. 8.4 ± 0.8; $p<0.001$).

Conclusion: Spinal anaesthesia provides superior postoperative analgesia, improved recovery, reduced blood loss, and greater patient satisfaction compared with general anaesthesia for elective total abdominal hysterectomy. Although associated with transient haemodynamic changes, spinal anaesthesia remains a safe and effective technique when appropriate monitoring and perioperative management are employed.

Keywords: Total Abdominal Hysterectomy; Spinal Anaesthesia; General Anaesthesia; Postoperative Pain; Haemodynamic Changes; Patient Satisfaction; Recovery Profile.

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Introduction

Total abdominal hysterectomy (TAH) is one of the most frequently performed major gynecological procedures for the management of benign and malignant uterine disorders, including uterine fibroids, abnormal uterine bleeding, adenomyosis, endometriosis, and gynecological malignancies. The choice of anaesthetic technique plays a crucial role in determining intraoperative haemodynamic stability, postoperative pain control, recovery profile, and overall patient satisfaction. Both spinal anaesthesia and general anaesthesia are widely used for TAH, with each technique offering distinct advantages and limitations. [1-2] General anaesthesia provides complete unconsciousness, controlled ventilation, and optimal surgical conditions, making it suitable for prolonged or complicated abdominal procedures. However, it is associated with airway manipulation, postoperative nausea and vomiting, delayed recovery, increased opioid consumption, and potential respiratory complications. In contrast, spinal anaesthesia provides rapid onset of dense sensory and motor blockade, excellent muscle relaxation, reduced intraoperative blood loss, superior postoperative

analgesia, and avoidance of airway instrumentation. [2-4] Enhanced Recovery after Surgery (ERAS) protocols emphasize the importance of minimizing perioperative stress, reducing opioid use, facilitating early mobilization, and shortening hospital stay. Regional anaesthetic techniques, particularly spinal anaesthesia, have become an integral component of multimodal perioperative care because they attenuate the neuroendocrine stress response, improve postoperative pain control, and accelerate functional recovery following abdominal surgery. [5]

Several clinical studies have demonstrated that neuraxial anaesthesia is associated with reduced perioperative morbidity and mortality compared with general anaesthesia. Spinal anaesthesia improves tissue perfusion by producing sympathetic blockade, decreases the incidence of thromboembolic events, reduces pulmonary complications, and enhances postoperative recovery. Furthermore, effective postoperative analgesia achieved with spinal anaesthesia decreases opioid requirements and improves patient comfort during the early postoperative period. [6]

Outcome-based research has increasingly focused on comparing anaesthetic techniques not only with regard to intraoperative safety but also postoperative recovery, patient satisfaction, complication rates, and healthcare utilization. Previous investigations have suggested that regional anaesthesia may reduce postoperative pain scores, facilitate earlier ambulation, decrease hospital stay, and improve overall recovery compared with general anaesthesia, although results have varied depending on patient characteristics and surgical complexity. [7]

A recent systematic review evaluating neuraxial anaesthesia for major surgery reported that spinal anaesthesia may reduce postoperative complications, improve recovery profiles, and lower the incidence of respiratory and cardiovascular adverse events without compromising surgical outcomes. Nevertheless, both spinal and general anaesthesia continue to be routinely employed for total abdominal hysterectomy, and the optimal anaesthetic technique remains a subject of ongoing clinical research. [8]

Therefore, the present study was undertaken to compare spinal anaesthesia and general anaesthesia in patients undergoing total abdominal hysterectomy with respect to intraoperative haemodynamic changes, duration of surgery, postoperative pain, analgesic requirement, recovery characteristics, perioperative complications, and patient satisfaction.

Materials and Methodology

Study Design: This was a prospective, randomized, comparative clinical study.

Study Setting: The study was conducted in the Department of Anaesthesiology in collaboration with the Department of Obstetrics and Gynaecology at a tertiary care teaching hospital among women undergoing elective total abdominal hysterectomy.

Study Duration: The study was carried out over a period of 18 months after obtaining approval from the Institutional Ethics Committee.

Sample Size: A total of 100 patients were enrolled in the study and randomly allocated into two equal groups:

- **Group S (n = 50):** Spinal Anaesthesia
- **Group G (n = 50):** General Anaesthesia

The sample size was calculated using a 95% confidence level, 80% statistical power, and an anticipated difference in perioperative outcomes between the two anaesthetic techniques.

Study Population: Women scheduled for elective total abdominal hysterectomy under regional or general anaesthesia.

Inclusion Criteria

- Female patients aged 30–65 years.
- ASA physical status I or II.
- Scheduled for elective total abdominal hysterectomy for benign gynecological conditions.
- Ability to provide written informed consent.

Exclusion Criteria

- Patient refusal.
- Contraindications to spinal anaesthesia (coagulopathy, local infection, severe spinal deformity).
- Known allergy to study medications.
- ASA physical status III or IV.
- Significant cardiac, pulmonary, hepatic, renal, or neurological disorders.
- Morbid obesity (BMI >35 kg/m^2).
- Emergency hysterectomy.
- Previous major spinal surgery.

Randomization: Patients were randomized into either Group S or Group G using a computer-generated randomization sequence. Allocation concealment was achieved using sequentially numbered sealed opaque envelopes.

Anaesthetic Technique: All patients underwent routine pre-anaesthetic evaluation and overnight fasting. Upon arrival in the operating room, standard ASA monitors including electrocardiography (ECG), non-invasive blood pressure (NIBP), pulse oximetry (SpO_2), and heart

rate monitoring were applied. Baseline haemodynamic parameters were recorded. An 18G intravenous cannula was secured, and patients received 10–15 mL/kg of Ringer's lactate before induction.

Group S (Spinal Anaesthesia): Patients received spinal anaesthesia in the sitting position at the L3–L4 or L4–L5 intervertebral space using a 25G Quincke spinal needle. Following confirmation of free cerebrospinal fluid flow, 3 mL of 0.5% hyperbaric bupivacaine (15 mg) was injected intrathecally. Patients were then positioned supine, and surgery commenced after achieving a sensory block up to the T6 dermatome.

Group G (General Anaesthesia): General anaesthesia was induced with intravenous propofol (2 mg/kg) and fentanyl (2 µg/kg), followed by vecuronium (0.1 mg/kg) to facilitate endotracheal intubation.

Anaesthesia was maintained with oxygen, nitrous oxide, and sevoflurane, with intermittent doses of vecuronium administered as required. At the conclusion of surgery, neuromuscular blockade was reversed using neostigmine (0.05 mg/kg) and glycopyrrolate (0.01 mg/kg) before extubation.

Outcome Measures

Primary Outcomes

- Intraoperative heart rate.
- Systolic, diastolic, and mean arterial blood pressure.
- Intraoperative blood loss.
- Duration of surgery.
- Duration of anaesthesia.

Secondary Outcomes

- Postoperative pain assessed using the Visual Analogue Scale (VAS).
- Time to first rescue analgesic.
- Total postoperative analgesic requirement during the first 24 hours.
- Incidence of postoperative nausea and vomiting.
- Shivering.
- Urinary retention.
- Time to ambulation.
- Length of hospital stay.
- Patient satisfaction score.

Management of Complications: Hypotension (systolic blood pressure <90 mmHg or >20% reduction from baseline) was treated with intravenous crystalloids and incremental 6 mg mephentermine. Bradycardia (heart rate <50 beats/min) was managed with 0.6 mg intravenous atropine. Postoperative nausea and vomiting were treated with intravenous ondansetron 4 mg.

Statistical Analysis: Data were entered into Microsoft Excel and analyzed using SPSS version 25.0. Continuous variables were expressed as mean ± standard deviation (SD) and compared using the independent Student's t-test. Categorical variables were expressed as frequencies and percentages and analyzed using the Chi-square test or Fisher's exact test where appropriate. A p-value <0.05 was considered statistically significant.

Results

A total of 100 women undergoing elective total abdominal hysterectomy were enrolled in the study. Patients were randomly allocated into two equal groups:

- **Group S:** Spinal Anaesthesia (n = 50)
- **Group G:** General Anaesthesia (n = 50)

Both groups were comparable with respect to demographic and preoperative characteristics. The intraoperative haemodynamic parameters, postoperative pain, recovery profile, perioperative complications, and patient satisfaction were compared between the two groups.

Table 1: Baseline Demographic and Clinical Characteristics

Variable	Group S (n=50)	Group G (n=50)	p-value
Age (years)	47.8 ± 6.9	48.5 ± 7.2	0.621
Weight (kg)	63.6 ± 7.4	64.8 ± 8.1	0.438
Height (cm)	156.8 ± 5.9	157.4 ± 6.1	0.614
BMI (kg/m²)	25.8 ± 2.8	26.2 ± 2.9	0.482
ASA I, n (%)	32 (64.0)	30 (60.0)	0.680
ASA II, n (%)	18 (36.0)	20 (40.0)	
Duration of surgery (min)	91.6 ± 14.2	93.8 ± 15.1	0.452

The two groups were comparable regarding age, body weight, height, BMI, ASA physical status, and duration of surgery. No statistically significant differences were observed between the groups (p>0.05).

Table 2: Comparison of Intraoperative Haemodynamic Parameters

Parameter	Group S	Group G	p-value
Baseline Heart Rate (beats/min)	84.9 ± 8.4	85.6 ± 8.2	0.672
Lowest Heart Rate (beats/min)	68.8 ± 7.1	75.9 ± 6.9	<0.001
Baseline MAP (mmHg)	92.8 ± 6.9	93.2 ± 7.1	0.771
Lowest MAP (mmHg)	70.6 ± 6.2	79.4 ± 6.7	<0.001
Intraoperative Blood Loss (mL)	312 ± 58	356 ± 64	<0.001
Hypotension, n (%)	15 (30.0)	6 (12.0)	0.028
Bradycardia, n (%)	8 (16.0)	2 (4.0)	0.046

Patients receiving spinal anaesthesia experienced significantly greater reductions in heart rate and mean arterial pressure during surgery. However, intraoperative blood loss was significantly lower in the spinal anaesthesia group. The incidences of hypotension and bradycardia were significantly higher with spinal anaesthesia ($p<0.05$).

Table 3: Postoperative Recovery and Analgesic Profile

Variable	Group S	Group G	p-value
VAS pain score (6 hours)	2.9 ± 0.9	4.8 ± 1.1	<0.001
Time to first rescue analgesia (hours)	5.8 ± 1.2	2.9 ± 0.8	<0.001
Total analgesic doses (24 hours)	1.8 ± 0.7	3.1 ± 0.8	<0.001
Time to ambulation (hours)	11.6 ± 2.4	16.4 ± 3.2	<0.001
Length of hospital stay (days)	3.8 ± 0.7	4.6 ± 0.9	<0.001

Spinal anaesthesia provided significantly better postoperative analgesia, reflected by lower pain scores, delayed requirement for rescue analgesia, reduced analgesic consumption, earlier ambulation, and shorter hospital stay compared with general anaesthesia ($p<0.001$).

Table 4: Postoperative Complications and Patient Satisfaction

Variable	Group S (n=50)	Group G (n=50)	p-value
Nausea and vomiting	5 (10.0%)	14 (28.0%)	0.022
Shivering	6 (12.0%)	2 (4.0%)	0.140
Urinary retention	4 (8.0%)	1 (2.0%)	0.168
Respiratory complications	0	3 (6.0%)	0.079
Patient satisfaction score (0–10)	9.3 ± 0.6	8.4 ± 0.8	<0.001

Postoperative nausea and vomiting occurred significantly more frequently in patients receiving general anaesthesia. Although shivering and urinary retention were more common after spinal anaesthesia, these differences were not statistically significant. Patient satisfaction was significantly higher in the spinal anaesthesia group ($p<0.001$).

Discussion

The present prospective comparative study evaluated the efficacy and perioperative outcomes of spinal and general anaesthesia in patients undergoing elective total abdominal hysterectomy. The study demonstrated that spinal anaesthesia was associated with lower intraoperative blood loss, superior postoperative analgesia, earlier ambulation, shorter hospital stay, and higher patient satisfaction.

However, spinal anaesthesia resulted in a higher incidence of hypotension and bradycardia compared with general anaesthesia. Despite these haemodynamic changes, both anaesthetic techniques provided adequate surgical conditions and were safely administered. The findings of the present study are consistent with those reported by Memtsoudis et al. [9], who demonstrated that regional anaesthesia was associated with improved perioperative outcomes and reduced postoperative complications compared with general anaesthesia in patients undergoing major surgical procedures. Their large population-based analysis reported lower pulmonary complications, reduced opioid requirements, and enhanced postoperative recovery among patients receiving neuraxial anaesthesia, findings that are comparable with the improved recovery profile observed in the present study.

Although spinal anaesthesia produced greater intraoperative hypotension and bradycardia, these haemodynamic changes were transient and effectively managed with intravenous fluids and vasopressors. Similar observations have been reported by Uppal et al. [10], who emphasized that careful patient selection, vigilant intraoperative monitoring, and prompt management of haemodynamic alterations make neuraxial anaesthesia a safe technique for major abdominal surgery. The authors also highlighted that regional anaesthesia minimizes airway manipulation and decreases perioperative respiratory complications.

General anaesthesia in the present study was associated with higher postoperative analgesic requirements and a greater incidence of postoperative nausea and vomiting. Comparable

findings were reported by Afolabi and Lesi [11], who observed that patients receiving general anaesthesia experienced increased postoperative discomfort and opioid consumption compared with those managed with regional anaesthetic techniques. Effective postoperative analgesia achieved with spinal anaesthesia contributed to earlier mobilization and improved patient comfort in the present study.

Postoperative pain scores were significantly lower in the spinal anaesthesia group, with delayed requirement for rescue analgesics.

Similar findings were reported by Basaran et al. [12], who demonstrated that spinal anaesthesia provided superior postoperative pain control, reduced analgesic consumption, and facilitated faster recovery following abdominal hysterectomy. Their study also reported lower intraoperative blood loss and earlier ambulation among patients receiving spinal anaesthesia, findings that closely correspond with the present results.

Patient satisfaction was significantly higher in the spinal anaesthesia group. This observation agrees with the study conducted by Choi et al. [13], who found that improved postoperative analgesia, reduced nausea and vomiting, and earlier recovery contributed to higher patient satisfaction following spinal anaesthesia for abdominal hysterectomy.

Adequate pain relief and reduced opioid-related adverse effects remain important determinants of patient-reported outcomes after major gynecological surgery.

The present study also demonstrated shorter hospital stay and earlier ambulation in patients receiving spinal anaesthesia. These findings are comparable to those reported by Wodlin et al. [14], who observed that neuraxial anaesthesia significantly improved postoperative recovery and facilitated early discharge after abdominal hysterectomy.

Earlier mobilization is an important component of enhanced recovery protocols because it reduces the risk of thromboembolic complications and promotes faster functional recovery.

Overall, the present findings support the principles of multimodal perioperative care described by White and Kehlet [15], who emphasized that optimal postoperative recovery depends on effective pain management, minimization of opioid use, early mobilization, and reduction of perioperative complications. Spinal anaesthesia fulfills many of these objectives by providing excellent analgesia and promoting enhanced recovery while maintaining an acceptable safety profile with appropriate haemodynamic management.

Conclusion

Both spinal and general anaesthesia provided satisfactory operating conditions for elective total abdominal hysterectomy. Spinal anaesthesia offered superior postoperative analgesia, reduced intraoperative blood loss, earlier ambulation, shorter hospital stay, and greater patient satisfaction compared with general anaesthesia. Although spinal anaesthesia was associated with a higher incidence of hypotension and bradycardia, these complications were effectively managed with standard perioperative measures. General anaesthesia remained a safe alternative but was associated with increased postoperative pain, higher analgesic requirements, and a greater incidence of postoperative nausea and vomiting. Overall, spinal anaesthesia appears to be the preferred anaesthetic technique for elective total abdominal hysterectomy in appropriately selected patients.

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