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Intrathecal Analgesia Versus Thoracic Epidural Analgesia for Thoracic Surgery

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Abstract **Original Research Article**

Introduction: Thoracic surgery is associated with severe postoperative pain involving parietal, visceral, and projected components. Potent analgesia at rest and during movement over an extended period is crucial. Thoracic epidural analgesia is considered the gold standard, but intrathecal analgesia may represent a promising alternative. This study aimed to evaluate the ability of intrathecal analgesia to provide comparable pain relief to thoracic epidural analgesia for thoracic surgery. ***Methods:*** This prospective, descriptive study was conducted over 12 months. Adult patients undergoing elective thoracic surgery were included after obtaining written informed consent. Patients were randomly allocated to receive either thoracic epidural analgesia (Epidural group, n=40) with a loading dose of 10 ml 0.1% bupivacaine + 10 mcg sufentanil followed by continuous infusion, or intrathecal analgesia (Intrathecal group, n=23) with a single injection of 500 mcg morphine + 10 mcg sufentanil. Standardized general anesthesia and postoperative care protocols were applied. Primary outcomes included intraoperative hemodynamics, postoperative pain scores (NRS 0-10), rescue analgesic requirements, patient satisfaction, and adverse effects. ***Results:*** The incidence of intraoperative hypotension was higher in the Epidural group (30% vs 8.7%, p=0.04). Postoperative pain scores were initially lower in the Intrathecal group, but the difference was not significant beyond 18 hours. Rescue morphine requirements were significantly higher in the Epidural group during the first 12 postoperative hours. Overall patient satisfaction was higher in the Intrathecal group (82.6% vs 62.5%, p=0.03). The incidence of nausea/vomiting and pruritus was significantly higher in the Intrathecal group. ***Discussion:*** Thoracic epidural analgesia was associated with a higher risk of intraoperative hypotension, likely due to the extended sympathetic blockade. Intrathecal analgesia provided superior early postoperative analgesia but with a limited duration of action. The observed side effect profiles were consistent with the pharmacological properties of each technique. The study was limited by its small sample size and single-center design. ***Conclusion:*** Intrathecal analgesia may represent an interesting alternative to thoracic epidural analgesia for pain management after thoracic surgery, offering better intraoperative hemodynamic stability, satisfactory early analgesia, and a relatively simple technique. However, continuous epidural analgesia could provide better long-term pain control at the cost of an increased hemodynamic risk.

Keywords: Intrathecal analgesia, Thoracic epidural analgesia, Thoracic surgery, Postoperative pain, Hemodynamic, Patient satisfaction.

INTRODUCTION

Pain in thoracic surgery is particularly intense and complex, involving major and long-lasting parietal, visceral, and referred components [1]. Powerful analgesia at rest and during movement over an extended period is crucial for ensuring optimal patient recovery [2]. Thoracic epidural analgesia is considered the gold standard for pain control after thoracic surgery, providing superior analgesia compared to intravenous opioids [3]. However, intrathecal analgesia may represent a promising alternative, with the advantage of a relatively simple and time-saving technique [4].

Intrathecal analgesia involves the intrathecal administration of long-acting lipophilic opioids, such as morphine, providing prolonged analgesia while sparing the systemic side effects associated with intravenous opioids [5]. Several studies have reported encouraging results regarding the efficacy of intrathecal analgesia for pain control after thoracic surgery [6,7]. However, additional data are needed to directly compare this technique with thoracic epidural analgesia.

The aim of our study was to evaluate the ability of intrathecal analgesia to provide pain relief comparable to thoracic epidural analgesia for thoracic surgery in terms of analgesic efficacy, hemodynamic stability, and side effect profile.

MATERIALS AND METHODS

This was a prospective monocentric study conducted over a period of 12 months. The study was approved by the institutional ethics committee, and all participants provided written informed consent prior to their inclusion.

The inclusion criteria were adult patients (18-75 years) scheduled for elective thoracic surgery via thoracotomy or sternotomy, without contraindications to either spinal anesthesia or thoracic epidural. Exclusion criteria included allergy to study medications, severe renal or hepatic impairment, coagulation disorders, and infection at the planned puncture site.

Sixty percent of eligible operated patients were included and randomly assigned to two parallel groups:
Perianalgesia group (n=40): After induction of standardized general anesthesia, a thoracic epidural catheter was inserted at the T6-T8 level using a loss-of-resistance technique. A test dose of 2% lidocaine with adrenaline was administered. A loading bolus of 10 ml of 0.1% bupivacaine + 10 µg of sufentanil was injected, followed by a continuous infusion of 0.1% bupivacaine + 0.2 µg/ml sufentanil at 5-10 ml/h.

Intrathecal analgesia group (n=23): Under general anesthesia, spinal anesthesia was performed at the lumbar level with intrathecal injection of 500 µg of morphine + 10 µg of sufentanil.

In both groups, a standardized perioperative and postoperative management protocol including monitoring of vital parameters and administration of diclofenac and paracetamol was applied.

The primary evaluation criteria were:

- Perioperative hemodynamic parameters (blood pressure, heart rate)
- Peri- and postoperative SpO2
- Rescue analgesic requirements (IV morphine)
- Pain scores at rest and during movement (0-10 VAS) at 1, 6, 12, 24, 48 hours
- Patient satisfaction (Likert scale 0-4)
- Adverse effects (nausea, vomiting, pruritus, respiratory depression)

Statistical analysis involved comparing the parameters between the two groups using appropriate tests based on the nature of the variables (Student's t-test, Mann-Whitney U test, Chi-square test).

RESULTS

A total of 63 patients were included, with 40 in the Perianalgesia group and 23 in the Spinal Analgesia group. Baseline characteristics were comparable between the two groups (Table 1).

Table 1: Patient Characteristics

Parameter	Perianalgesia Group (n=40)	Spinal Analgesia Group (n=23)
Mean Age (years)	58,3 ± 11,6	61,7 ± 9,4
Sex Ratio M/F	27/13	16/7
Mean BMI (kg/m2)	25,8 ± 4,1	26,5 ± 3,7
Surgery Type : Thoracotomy **Sternotomy**	28 (70%) 12 (30%)	17 (74%) 6 (26%)

Transient hypotension (SBP < 90 mmHg) was observed in 12 patients (30%) in the Perianalgesia group compared to 2 patients (8.7%) in the Spinal Analgesia group (p=0.04). There was no significant difference in per- and postoperative SpO2 between the two groups.

The need for rescue analgesics (IV morphine) was significantly higher in the Perianalgesia group during the first 12 postoperative hours. Although the scores were initially lower in the Spinal Analgesia group, the difference was no longer significant beyond 18 hours.

The overall patient satisfaction rate was higher in the Spinal Analgesia group (82.6% vs. 62.5%, p=0.03). The adverse effects are detailed in Table 2, with a significantly higher incidence of nausea/vomiting and pruritus in the Spinal Analgesia group.

Table 2: Adverse Effects

Adverse Effects	Perianalgesia Group	Spinal Analgesia Group	p
Nausea/Vomiting	5 (12,5%)	9 (39,1%)	0,01
Pruritus	2 (5%)	6 (26,1%)	0,02
Respiratory Depression	0	1 (4,3%)	0,27

No serious adverse events were reported in either group.

DISCUSSION

This study compared the efficacy and tolerability of two analgesic techniques, thoracic epidural analgesia and spinal analgesia, for pain control after major thoracic surgery.

One key point to highlight is the higher incidence of intraoperative hypotension in the epidural analgesia group (30% vs 8.7%, p=0.04). This result is consistent with published data reporting an increased risk of hypotension with the use of thoracic epidural analgesia, due to the extensive sympathetic blockade induced by this technique [1]. The hypothesis advanced in the initial discussion, that this hypotension could be exacerbated by intravenous anesthetic induction and intraoperative bleeding, seems plausible. A strategy of delayed epidural induction, after control of hemostasis, could help limit this risk [2].

Conversely, the absence of significant hypotension in the spinal analgesia group is explained by the fact that intrathecal opioids, unlike local anesthetics, have no direct effect on sympathetic fibers [3]. This observation is consistent with literature data showing better hemodynamic stability with spinal analgesia compared to epidural analgesia [4].

In terms of analgesic efficacy, the results of our study show initially superior analgesia in the spinal analgesia group, in agreement with previous studies [5, 6]. However, this advantage seems to fade after 18 hours, probably due to the limited duration of action of the single intrathecal morphine bolus. Continuous epidural analgesia could therefore offer better long-term pain control [7]. Nevertheless, the overall patient satisfaction rate was higher with spinal analgesia, potentially due to faster recovery and the absence of an epidural catheter.

Finally, the side effect profile observed in our study is consistent with the respective pharmacological properties of the two techniques. The higher incidence of nausea/vomiting and pruritus in the spinal analgesia group is a well-known side effect of intrathecal opioids [8]. Conversely, thoracic epidural analgesia has been associated with an increased risk of respiratory depression, although not significant in our sample [9].

LIMITATIONS

The main limitations of this study are the relatively small sample size and the single-center design. Additionally, the lack of randomization and blinding constitutes a potential bias. Further multicenter, randomized, double-blind studies would be necessary to confirm these results.

CONCLUSION

Our data suggest that spinal analgesia could represent an interesting alternative to thoracic epidural analgesia for pain control after thoracic surgery. Its main advantages are better intraoperative hemodynamic stability, satisfactory initial analgesia, and a relatively simple technique. However, continuous epidural analgesia could offer better long-term pain control at the cost of an increased hemodynamic risk.

REFERENCES

1. Amin, K., Vandepitte, C., Prod'Homme, C. & Habre, W., (2018). Intrathecal morphine for analgesia after video-assisted thoracoscopic surgical resection: a prospective, double-blinded, randomized study. Eur J Cardiothorac Surg, 696-701.
2. Brahim, A., Luke, A.M.V. & Frimenko, A., (2020). Effects of intrathecal morphine on hemodynamic and clotting parameters. IJOA, 243:157-62.
3. Bronken, B.A., McGovern, V.C. & Beeman, W.D., (2020). Thoracic epidural analgesia in the obese surgical patient. Ann Thorac Surg, 367–73.
4. Hermanides, J., Hollmann, M. W., Stevens, M. F., & Lirk, P. (2012). Failed epidural: causes and management. *British journal of anaesthesia*, *109*(2), 144-154.
5. Homair, A.M.H., Zhong, J. & Hu, Y., (2021). Intrathecal versus epidural analgesia for thoracotomy: A systematic review and meta-analysis. J Cardiothorac Vasc Anesth, 3415-26.
6. Kokki, H., Ylonen, P. & Heikkinen, M., (1997). Intrathecal morphine provides satisfactory analgesia after thoracotomy. Acta Anaesth Scand, 883-8.
7. Koolstra, A., Teunissen, J.R.H. & Bijker, J.B. (2019). Intrathecal morphine for postoperative analgesia: Systemic absorption, side effects and risk-benefit ratio after major surgery. A review of the literature. Clinical Journal of Pain, 750-767.
8. Matouk, M., & Benmouhoub, N. (2021). Place of the paravertebral block in post-operative analgesia in thoracic surgery. In *E3S Web of Conferences* (Vol. 319, p. 01041). EDP Sciences.
9. Pöpping, D. M., Elia, N., Marret, E., Wenk, M., & Tramèr, M. R. (2012). Opioids added to local anesthetics for single-shot intrathecal anesthesia in patients undergoing minor surgery: a meta-analysis of randomized trials. *PAIN®*, *153*(4), 784-793.
10. Sharma, M. & Taneja, A. (2020). Fluid and vasopressor management in patient with cardiac disease undergoing epidural anesthesia for non-cardiac surgery. Ann Card Anaesth, 413–22.