



ORIGINAL RESEARCH PAPER

Anaesthesiology

COMPARATIVE EVALUATION OF NEBULISED DEXMETETOMIDINE VS FENTANYL FOR THE TREATMENT OF POST-DURAL PUNCTURE HEADACHE (PDPH) IN PARTURIENTS AFTER CAESAREAN SECTION UNDER SPINAL ANAESTHESIA: A RANDOMISED CONTROLLED STUDY

KEY WORDS: Post-dural puncture headache, dexmedetomidine, fentanyl, nebulisation, spinal anaesthesia, caesarean section.

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ABSTRACT

Background: Post-dural puncture headache (PDPH) is a common complication following spinal anaesthesia in obstetric patients. Conventional management includes hydration, analgesics, caffeine, and epidural blood patch. Nebulised administration of analgesic and sedative agents has recently gained attention because of its non-invasive nature and rapid onset. **Aim:** To compare the efficacy of nebulised dexmedetomidine and nebulised fentanyl in the treatment of PDPH following caesarean section under spinal anaesthesia. **Materials and Methods:** This prospective randomised controlled study included 60 parturients aged 20–35 years who developed PDPH after elective or emergency caesarean section under spinal anaesthesia. Patients were randomly allocated into two groups of 30 each. Group D received nebulised dexmedetomidine 1 µg/kg diluted to 4 mL with normal saline, while Group F received nebulised fentanyl 2 µg/kg diluted similarly. Pain was assessed using Visual Analogue Scale (VAS) at baseline, 15, 30, 60 minutes and 4 hours after nebulisation. Hemodynamic parameters, rescue analgesic requirement and adverse effects were recorded. **Results:** Both groups showed significant reduction in VAS scores compared to baseline. Group D demonstrated significantly lower VAS scores at 30 minutes, 60 minutes and 4 hours compared to Group F ($p < 0.05$). Rescue analgesic requirement was lower in Group D. Hemodynamic parameters remained stable in both groups. Mild sedation and dry mouth were observed in Group D, while nausea occurred more frequently in Group F. **Conclusion:** Nebulised dexmedetomidine provided superior and prolonged analgesia compared to nebulised fentanyl in the treatment of PDPH following caesarean section under spinal anaesthesia, with minimal adverse effects.

INTRODUCTION:

Post-dural puncture headache (PDPH) is a distressing complication following neuraxial anaesthesia, particularly in obstetric patients. The incidence ranges from 0.5% to 5% depending on needle size, patient characteristics and technique. PDPH is believed to result from cerebrospinal fluid leakage through the dural puncture site leading to intracranial hypotension and compensatory cerebral vasodilatation. Clinically, PDPH presents as postural headache associated with nausea, vomiting, neck stiffness, photophobia and auditory disturbances. Though epidural blood patch remains the gold standard treatment, it is invasive and may not always be feasible. Conservative measures often provide inadequate relief.

Dexmedetomidine is a highly selective 2-adrenergic agonist possessing sedative and analgesic properties. Fentanyl is a potent opioid analgesic commonly used for acute pain management. Nebulised administration offers a painless and non-invasive route with rapid systemic absorption through pulmonary mucosa.

Recent studies have evaluated nebulised analgesics in perioperative pain management, but evidence regarding their role in PDPH is limited. Hence, this study was undertaken to compare nebulised dexmedetomidine and fentanyl for management of PDPH in parturients undergoing caesarean section under spinal anaesthesia.

Aim:

To compare the efficacy of nebulised dexmedetomidine and nebulised fentanyl in the treatment of post-dural puncture headache in parturients after caesarean section under spinal anaesthesia.

Objectives:

1. To compare reduction in headache severity using VAS score.
2. To compare duration of analgesia between the two groups.
3. To assess rescue analgesic requirement.
4. To evaluate hemodynamic changes and adverse effects.

Materials and Methods:

This prospective randomised controlled study was conducted after institutional ethical committee approval and informed consent from patients.

Sixty parturients aged between 20 and 35 years, belonging to ASA physical status I and II, who developed PDPH after caesarean section under spinal anaesthesia were included.

Inclusion Criteria

- Patients with clinically diagnosed PDPH.
- Age 20–35 years.
- ASA I and II.

Exclusion Criteria

- Allergy to study drugs.
- Respiratory disease.
- Severe cardiovascular disorders.
- Chronic headache disorders.
- Patients requiring epidural blood patch.

Patients were randomly allocated into two groups using computer-generated randomisation.

Group D (n=30)

Received nebulised dexmedetomidine 1 µg/kg diluted to 4 mL normal saline.

Group F (n=30)

Received nebulised fentanyl 2 µg/kg diluted to 4 mL normal saline.

Nebulisation was administered using oxygen flow at 6 L/min over approximately 10 minutes.

Baseline heart rate, systolic blood pressure, diastolic blood pressure, respiratory rate and oxygen saturation were recorded. Headache severity was assessed using VAS score (0–10) before nebulisation and at 15, 30, 60 minutes and 4 hours after treatment.

Rescue analgesia with intravenous paracetamol 1 g was

administered if VAS exceeded 4. Sedation score and adverse effects including nausea, vomiting, bradycardia, hypotension and dry mouth were documented.

Statistical Analysis:

Data were analysed using SPSS software version 25. Quantitative variables were expressed as mean $\pm$ standard deviation. Student's t-test and Chi-square test were used where appropriate. A p value <0.05 was considered statistically significant.

RESULTS

Demographic characteristics including age, weight and duration of surgery were comparable between groups.

Baseline VAS scores were similar in both groups. Significant reduction in VAS score was observed after nebulisation in both groups.

Time Interval	Group D (Mean $\pm$ SD)	Group F (Mean $\pm$ SD)	p value
Baseline	7.5 $\pm$ 0.8	7.4 $\pm$ 0.7	>0.05
15 min	5.1 $\pm$ 0.7	5.6 $\pm$ 0.8	>0.05
30 min	3.2 $\pm$ 0.6	4.4 $\pm$ 0.7	<0.05
60 min	2.1 $\pm$ 0.5	3.6 $\pm$ 0.6	<0.05
4 hrs	1.8 $\pm$ 0.4	3.1 $\pm$ 0.5	<0.05

Rescue analgesic requirement was significantly lower in Group D (20%) compared to Group F (46.7%).

Hemodynamic parameters remained stable in both groups. Mild sedation was noted in Group D without respiratory depression. Nausea and vomiting were more common in Group F. No serious complications were observed.

DISCUSSION

PDPH significantly affects maternal comfort and delays early ambulation and newborn care. Conservative therapy often provides suboptimal relief, necessitating exploration of effective non-invasive alternatives.

Dexmedetomidine exerts analgesic action through 2 receptor mediated inhibition of norepinephrine release and modulation of nociceptive pathways. Nebulised administration enables rapid systemic absorption without invasive procedures.

In the present study, nebulised dexmedetomidine produced superior analgesia compared to nebulised fentanyl. The reduction in VAS scores was greater and sustained for longer duration in Group D. Rescue analgesic consumption was also significantly lower.

Our findings correlate with previous studies demonstrating analgesic efficacy of nebulised dexmedetomidine in perioperative settings. Fentanyl also reduced headache severity but provided comparatively shorter duration of relief.

Both drugs maintained hemodynamic stability. Dexmedetomidine produced mild sedation which may contribute to patient comfort. Absence of respiratory depression highlights safety of nebulised administration.

Limitations of this study include small sample size and short follow-up period. Larger multicentric studies are required to establish optimal dosing and long-term outcomes.

CONCLUSION

Nebulised dexmedetomidine is an effective and safe non-invasive modality for treatment of post-dural puncture headache following caesarean section under spinal anaesthesia. It provides superior and prolonged analgesia compared to nebulised fentanyl with reduced rescue analgesic requirement and minimal adverse effects.

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