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Effect of intrathecal fentanyl for prevention of PDPH in caesarean section: A randomized control study

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Abstract
Background and Aim: Subarachnoid block is the most commonly used technique for infraumbilical surgeries as it is safer, easier to perform and economical. The aim was to compare the incidence of post dural puncture headache (PDPH) with or without intrathecal fentanyl in parturients undergoing lower segment cesarean section (LSCS).
Methodology: The study was conducted in Pt. JNM Medical College Raipur. 250 patients undergoing caesarean section were included after approval from the Institutional Ethical Committee. The study CTRI number is: CTRI/2022/03/0410. A written informed consent was obtained from all the patients and incidence of PDPH following spinal anaesthesia with or without intrathecal fentanyl in parturients undergoing LSCS. The patients were divided equally into two groups (F and C) using random number table. We used VAS score to assess severity of PDPH and treatment was done with bed rest, adequate hydration, coffee and tab paracetamol 500 mg.
Result: The demographic profile was comparable in both the groups. The incidence of PDPH was 0.8% with fentanyl group and 4% with control group. The PDPH was mild in fentanyl group and moderate in control group. Backache, vertigo, nausea and vomiting each had an incidence of 0.8% in the fentanyl group as compared to 2.4% cases of backache, nausea and vomiting in control group. Pruritus was not reported in either of the groups.
Conclusion: We concluded that the incidence and severity of post dural puncture headache (PDPH) was decreased with intrathecal fentanyl (25 µg) in caesarean section in a non-significant manner. Though the severity increased in the control group, but it was also insignificant. Although an overall protective effect of neuraxial fentanyl was not observed in this study, its role as prevention for PDPH in caesarean section remains to be investigated.

Keywords: Postdural puncture headache, subarachnoid block, fentanyl, LSCS, intrathecal

Introduction
Subarachnoid block is the most widely used technique for LSCS. Although subarachnoid block (SAB) is safe and highly effective but it also has its associated complications like hypotension, unilateral block, transient neurological symptoms and post-dural puncture headache (PDPH) with other less common side effects being backache, nausea, vomiting, vertigo, tinnitus and blurring of vision. PDPH is the most distressing complication and clinically presents with frontal and occipital headache [1]. PDPH is most commonly seen in the obstetric population may be due to raised intraabdominal pressure during pregnancy which alters CSF pressure [2]. Unintetional dural puncture and CSF leak, dehydration during labour and rapid change in blood volume following delivery can also lead to PDPH, but the exact mechanism is still unknown [2]. In our study intrathecal fentanyl was used as an adjuvant to bupivacaine in SAB. Small doses of fentanyl are effective with faster onset and increased duration of action. Spinal opioids besides being advantageous in systemic pain management are found to reduce incidence of PDPH in SAB and epidural anaesthesia [3]. The aim of our study was to compare the effect of intrathecal fentanyl with control group for prevention of PDPH in LSCS.

Methodology
The present study was conducted in the Department of Anaesthesiology and Pain management Pt. J.N.M. Medical College Hospital Raipur (C.G.) after approval from the Institutional Scientific and Ethics Committee and study was enrolled with CTRI (CTRI number: CTRI/2022/03/0410). It was an interventional double blind randomized study.

A total of 250 patients aged between 18 to 45 years of ASA grade II who underwent elective or emergency caesarean section were selected for the study and randomly allocated into either group by using a random number table. (Table 3)

Group F: Received bupivacaine 2ml + fentanyl 0.5 ml (25 µg)

Group C: Received bupivacaine 2ml + normal saline 0.5 ml

Patients with any history of pregnancy induced hypertension, eclampsia, neurological deficit, migraine or any other headache, altered anatomy of spine (scoliosis, lordosis), on any analgesic medication, BMI>35 and in those where more than 1 attempt was required for SAB were excluded from the study.

After a thorough pre anaesthetic check-up and written informed consent, patients were shifted to operation theatre. ECG, non-invasive blood pressure, heart rate, and SpO_2 were monitored throughout the procedure (Mindray ipm10). An intravenous (IV) line was secured with 18G cannula and all the patients were hydrated with 10 ml/kg RL and premedicated with IV metoclopramide 10 mg. SAB was performed in sitting position through midline approach at L3-L4 interspace. A 25 guage Quincke spinal needle was used to perform SAB with bevel of the needle in lateral position after injecting the drug spinal needle was removed with stylet in situ [4].

Postoperatively all the parturients were monitored for next 3 days in ward and then telephonically after discharge till 14th day for headache and any other complications. If any patient complained headache, further its onset, characteristics, duration, severity, aggravating and relieving factors or any other associated symptoms like backache, vertigo, nausea, vomiting, pruritis were monitored. Severity of headache was evaluated by a visual analogue scale score (VAS). PDPH was treated with adequate hydration, coffee or 500 mg paracetamol.

Results

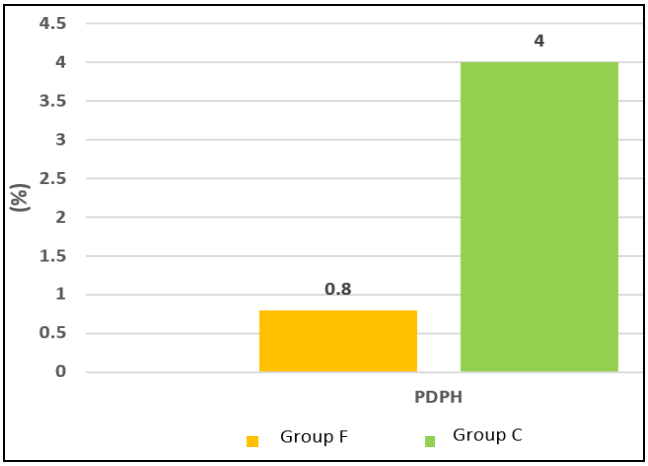
The demographic profile i.e. mean age, weight, height and BMI were comparable in both the groups. (Table 1)

Table 1: Demographic profile

	Group F (Mean ± SD)	Group C (Mean ± SD)
Age (yr)	25.16 ± 3.82	25.10±4.14
Weight (kg)	57.01 ± 6.45	57.91±6.04
Height (cm)	155.07 ± 20.91	155.79±5.60

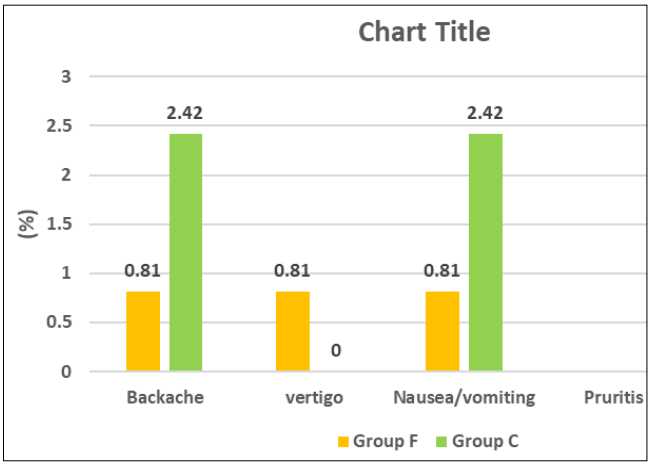
Table 2: Post dural puncture headache

Characteristics of PDPH	Group C No. of patients (%)	Group F No. of patients (%)	p value
Severity			
Mild (VAS≤3)	3 (2.4%)	1(0.8%)	0.31
Moderate (VAS 4-7)	2 (2.4%)	0	0.15
Severe (VAS>7)	0	0	0
Site			
Frontal	3 (2.4%)	1(0.8%)	0.31
Generalized	2 (1.6%)	0	0.15
Quality			
Dull aching	5 (4%)	1(0.8%)	0.098
Throbbing	0	0	0
Associated symptoms			
Backache	3 (2.40%)	1(0.80%)	0.31
Vertigo	0	1(0.80%)	0.30
Nausea /vomiting	3(2.4%)	1(0.80%)	0.31
Pruritus	0	0	0



Incidence od PDPH in fentanyl and saline group is 0.80% and 4%

Graph 1: Incidence of PDPH in both the groups



Graph 2: Complications

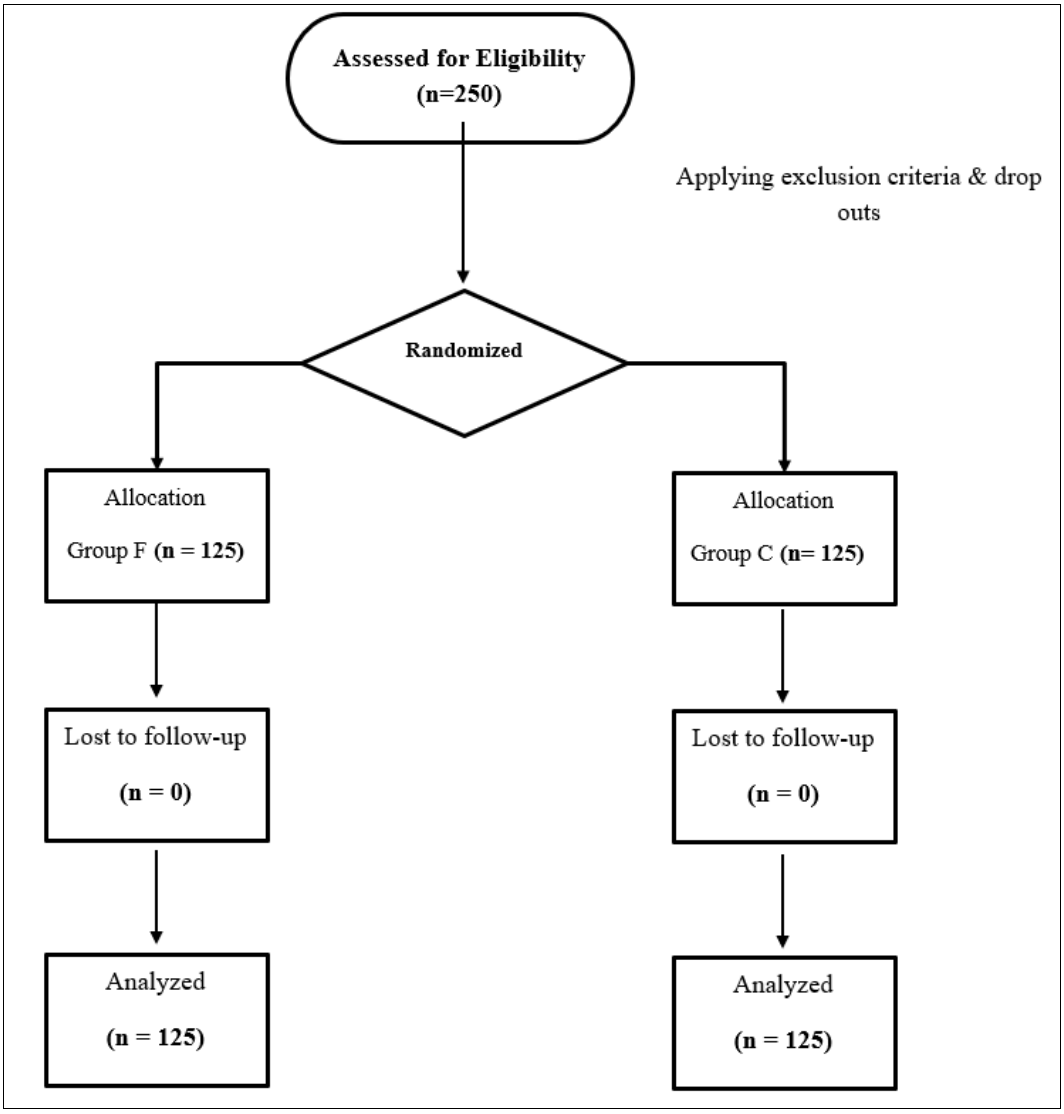


Diagram 3: Consort Diagram

The collected data was put in the master chart in excel sheet. The results were analysed by various statistical techniques like number, percentage, mean, standard deviation, Student's t-test, unpaired t-test & chi-square test.

Discussion

Central neuraxial anaesthesia is the gold standard technique for cesarean section. Post dural puncture headache (PDPH) is one of its very distressing side effect which presents with dull throbbing pain in the frontal and occipital distribution. The overall incidence varies between 0 to 37.2% [5]. The mechanism is believed to be a decrease in CSF pressure due to which there is sagging of the contents of the skull hence it is also called low pressure headache [6]. PDPH can be prevented by using finer spinal needle, alignment of needle parallel to dura fibers, maintaining adequate hydration, providing analgesics and caffeine [5].

Larger the gauge of needle more is the incidence of PDPH and finer gauge spinal needles have a low incidence [7]. The incidence of PDPH is reported to be almost twice in women then in men (12% vs 7% respectively) [8]. PDPH is more common in low BMI patients. Adequate hydration prevents the PDPH and most of the patients respond to simple analgesics like paracetamol. Pharmacological treatment for PDPH include caffeine, sumatriptan, gabapentin, epidural blood patch and acupuncture. The use of neuraxial opioids have been reported to reduce the incidence of PDPH after SAB. Most studies have used intrathecal morphine for prevention of PDPH in caesarean section [9]. At our institute we used intrathecal fentanyl due to unavailability of morphine. Although very few studies are available in literature demonstrating the effect of intrathecal fentanyl for prevention of PDPH in caesarean section. Opioids when combined with local anaesthetics improve the quality of block and reduce the need for systemic opioids postoperatively [10]. The other possible mechanism of action of opioids is an effect on pre and post synaptic neurons and activation of analgesia system of body. Activation of opioid receptor leads to closing of voltage sensitive calcium channels increasing the potassium efflux from cell leading to hyperpolarization and reduced cAMP production via inhibition of adenylyl cyclase [11]. Another possible explanation is rostral spread of epidural morphine to induce central analgesia from the neuraxial lumbar region [11].

The incidence of PDPH in our study was less in fentanyl group as compared to control group which was statistically insignificant (graph 1). Similar results has been reported previously where addition of opioids to local anesthetic have decreased the severity and duration of PDPH but has not reduced the incidence of PDPH [5, 6]. The mechanism is not known but it has been suggested that it could be due to systemic absorption of intrathecal morphine. However this

hypothesis is difficult to support as neither the small dose nor the systemic absorption of morphine would explain this. [11]. Lesser incidence of PDPH with higher dose of intrathecal opioids has been reported when using different doses of spinal opioids [12]. Reduced incidence of postoperative PDPH in case of accidental dural puncture following attempt of epidural anaesthesia has been reported [12].

Severity of headache and Visual Analogue Scale score for pain intensity of PDPH was mild in fentanyl group as compared to control group (Table 2). The severity of PDPH differs significantly in control group as compared to opioid group as indicated by higher VAS score [6, 8, 10, 12].

The difference in the incidence of backache, nausea, vomiting, vertigo, pruritis was not statistically significant between the groups and no other symptom was observed in either group (graph 2). The use of fentanyl with local anaesthetic abolishes the visceral pain and prevents nausea, vomiting [5]. The incidence of nausea and vomiting are less with use of fentanyl as compared to morphine [2, 7, 13].

Limitations

1. All the patients were discharged 3 days post caesarean section. After discharge follow up was done via telephonic conversation for 14 days. So there are high chances that we might have missed the late onset PDPH.
2. We enquired about the headache only once daily, during the evening so we could have missed the diurnal variation of PDPH.
3. The sample size of our study is very less. Larger sample size would have been more appropiate to draw a significant conclusion.

Conclusion

We concluded that the incidence and severity of post dural puncture headache (PDPH) was decreased with intrathecal fentanyl (25µg) in caesarean section in a non-significant manner. Though the severity increased in the control group but it was also insignificant. Although an overall protective effect of neuraxial fentanyl was not observed in this study, its role as prevention for PDPH in caesarean section remains to be investigated.

Conflict of Interest

Not available

Financial Support

Not available

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