



Assessment of Pain and Patient Satisfaction by Dural Puncture through Epidural Technique versus Conventional Epidural Technique: A Comparative Study

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Abstract:

Background: Neuraxial analgesia techniques are not limited to just standard epidural and Combined Spinal Epidural blocks. While the debate has been going on which neuraxial technique is superior to the other, a novel approach called dural puncture epidural (DPE) has recently gained popularity after the cornerstone study that compared standard epidural and CSE with DPE for labor analgesia. DPE as a technique has been used in labour analgesia but has not yet been evaluated in orthopaedic surgeries. Hence this comparative study was conducted with the objective to evaluate the effect of dural puncture epidural on pain and patient satisfaction when compared to conventional epidural technique.

Material & Methods: This study was carried out on 60 patients of both sexes in the age group of 20-60 years. Patients were ASA I-II scheduled for orthopaedic surgeries of lower limb. This clinical trial was designed as randomized, double blinded and randomization was done by using computer-generated random table. Sensory analgesia was assessed by VAS score to pin-prick at dermatome level T10 and duration was noted. VAS score noted on a scale of zero (no pain) to ten (the worst imaginable pain). Quality of anaesthesia and analgesia was assessed by asking the patient to grade from zero to three after the surgery.

Results: In this study, mean age of the patients in group DPE was comparable to group EPL (39.4±10.8 years vs. 44.9±10.5 years; P=0.053). Males predominated females in group DPE (60% vs. 40%) and group EPL (63% vs. 37%). There was no sex-based difference between both groups (P=0.791). Mean VAS score was lower in group DPE in comparison to group EPL at 5 min and 10 min and comparable at all other time points.

Keywords: Dural Puncture Epidural, Conventional Epidural Technique, Visual Analogue Scale

Introduction:

Advances in perioperative anaesthesia and analgesia have improved pain relief and satisfaction in surgical patients. Recent studies suggest that advances in anaesthesia and postoperative analgesia can affect postoperative outcome.¹ Epidural anaesthesia and analgesia have the potential to reduce or eliminate the perioperative physiologic stress responses to surgery and thereby decrease surgical complications and improve outcomes. Epidural anaesthesia and analgesia is one of the many advances that has gained rapid acceptance due to evidence based reduction in morbidity and overall patient satisfaction in anaesthesia practice. The use of epidural analgesia in the US has tripled between 1981 and 2001, with 60% of women using this technique in large hospitals.²

Combined Spinal and Epidural Anaesthesia (CSE) offers advantages over the epidural or single injection spinal anaesthesia alone. CSE combines the benefits of certainty with a definitive end point (the appearance of cerebrospinal fluid) that is characteristic of spinal anaesthesia with flexibility of continuous epidural anaesthesia. It involves the use of a minimal dose of spinal anaesthetic for a shorter duration but allows flexibility of epidural reinforcement if necessary. It has been advocated over the conventional epidural technique by several authors for the advantages of its rapid onset, profound analgesia, high patient satisfaction and verification of epidural space by definitive return of cerebrospinal fluid (CSF) via the spinal needle, causing reduction in epidural catheter failures.^{3,4}

However, the CSE technique has the potential of causing haemodynamic instability and other side effects of intrathecally given local anaesthetics and opioids.⁵ In order to minimize these side effects while retaining the advantages, a novel method of dural puncture epidural (DPE) is suggested by several authors in which a dural hole is created without intrathecal administration of drugs, prior to epidural injection of drugs.⁶

DPE as a technique has been used in labour analgesia but has not yet been evaluated in orthopaedic surgeries. With the aim of providing improved onset and duration of epidural anaesthesia and analgesia with fewer side effects and less epidural catheter failure, it was worthwhile to evaluate and compare the DPE technique with conventional epidural technique.

Material and Methods:

Study design: It was a double-blind randomized study. The study commenced after obtaining approval of institutional scientific review, and ethics committee.

Randomization: All patients were randomized by using computer-generated random table.

Study Area: Department of Anaesthesiology, Dr RPGMC Kangra at Tanda, Himachal Pradesh.

Study Population- After approval by Institutional Ethics Committee (IEC), this study was carried out on 60 patients of both sexes in the age group of 20-60 years. Patients were ASA I-II scheduled for orthopaedic surgeries of lower limb.

Study duration: Jan 2021- Dec 2021

Sample Size: All the patients within this duration and who fulfilled our inclusion and exclusion criteria were included in the study, a minimum of thirty patients in each group were taken.

Inclusion criteria –

1. Males and females between the age group 20-60 years.
2. ASA class I-II
3. Undergoing lower limb orthopaedic surgeries.

Exclusion criteria

1. Blood or CSF in the epidural catheter during procedure.
2. Patients having bleeding disorders.
3. Patients having decreased platelet counts.
4. Patients on anticoagulants.
5. Hypersensitivity to the study drugs.
6. Pregnant or lactating women.

Methodology

The patients fulfilling all the inclusion criteria presenting for orthopaedic surgery of lower limb were enrolled in the study, for the duration of one year. All patients were randomized into two groups of 30 each.

Group EPL- Patients who received conventional epidural analgesia.

Group DPE- Patients who received dural puncture epidural analgesia.

Patients were kept unaware of the epidural technique to be used for surgery. Post-procedural observations were made by an anesthesiologist who was unaware of the epidural technique. This was done to ensure a complete absence of observational bias by double-blinding. Study medication was prepared as- 10ml of injection 1.5% xylocaine with adrenaline in both the groups.

After written informed consent by the anesthetist performing the procedure, patients were subjected to a pre-anesthetic evaluation before taking to the operation theatre. All the standard monitors were attached (SPO₂, NIBP, ECG) and baseline vitals noted.

Sensory analgesia was assessed by VAS score to pin-prick at dermatome level T10 and duration was noted. VAS score noted on a scale of zero (no pain) to ten (the worst imaginable pain).

Quality of anaesthesia and analgesia was assessed by asking the patient to grade from zero to three after the surgery

Grade 0 Failure Grade 1 Incomplete

Grade 2 Good Grade 3 Excellent

Statistical Analysis

The data were entered into the Microsoft® Excel workbook 2019 and exported into Epi info v7 software. The quantitative variables were expressed as mean \pm SD, and compared using Student t-test. Categorical variables were expressed as frequency and percentage. The P-value (<0.05) was considered to be significant.

Results

The present study evaluated the effect of dural puncture on pain and patient satisfaction when compared to conventional epidural technique. A total of 60 patients were randomly divided to receive dural puncture epidural analgesia (group DPE) or conventional epidural analgesia (group EPL) at Department of Anaesthesia, Dr RPGMC Kangra at Tanda. Results of the study are presented below:

In this study, mean age of the patients in group DPE was comparable to group EPL (39.4 ± 10.8 years vs. 44.9 ± 10.5 years; $P=0.053$)

Males predominated females in group DPE (60% vs. 40%) and group EPL (63% vs. 37%). There was no sex-based difference between both groups ($P=0.791$).

Pain score

In this study, mean VAS score was lower in group DPE in comparison to group EPL at 5 min and 10 min and comparable at all other time points. Hence, mean VAS score was statistically lower in group DPE in comparison to group EPL at 5 min and 10 min and was significant ($P<0.0001$).

Table 1: Comparison of VAS score between both groups

VAS	DPE	EPL	P value
0 Min	10.0 \pm 0.0	10.0 \pm 0.0	-
5 Min	5.5 \pm 1.4	7.7 \pm 0.9	<0.0001
10 Min	0.8 \pm 1.0	5.1 \pm 0.9	<0.0001
15 Min	0.0 \pm 0.1	2.7 \pm 1.3	0.179
20 Min	0.0 \pm 0.0	0.1 \pm 0.4	-
25 Min	0.0 \pm 0.0	0.0 \pm 0.0	-
30 Min	0.0 \pm 0.0	0.0 \pm 0.0	-
45 Min	0.0 \pm 0.0	0.0 \pm 0.0	-
60 Min	1.1 \pm 1.0	0.8 \pm 0.8	0.071
90 Min	2.3 \pm 1.0	2.3 \pm 0.7	0.884
120 Min	0.0 \pm 0.0	0.0 \pm 0.0	-

Patient satisfaction score

In this study, mean patient satisfaction score (which assesses the quality of anaesthesia and analgesia) was higher in group DPE in comparison to group EPL (2.93 ± 0.25 vs. 2.73 ± 0.45) which was found to be statistically significant ($P=0.038$).

Discussion:

Neuraxial anesthesia techniques are not limited to just standard epidural and combined spinal epidural blocks, a novel approach dural puncture epidural which has gained popularity, is modification of CSE.³⁵ The DPE technique differs from the EPL technique by the presence of a dural puncture conduit, which causes translocation of epidural medication through the dural hole into the sub-arachnoid space which has been postulated as the possible mechanism by which DPE technique improves analgesia or anesthesia.

We observed that the mean VAS score of patients observed after 5 min and 10 min of injection was significantly lower in group DPE in comparison to group EPL ($P<0.0001$). Similar observations were made by Yadav et al⁷ in 2018 by comparing dural puncture epidural technique to conventional epidural technique for labor analgesia. This finding was also supported by Ashok Jadon et al⁸ in which they found that DPE provided faster relief of labor pain than the conventional labor epidural analgesia.

In our study, quality of anaesthesia and analgesia was better in group DPE. As 93% patients of group DPE accepted anaesthesia as excellent, while 7% labelled as good. While 73% patients in group EPL accepted anaesthesia as excellent and 27% labelled it as good. Overall, mean score for quality of anaesthesia and analgesia was significantly higher in group DPE in comparison to group EPL (2.93 ± 0.25 vs. 2.73 ± 0.45 ; $P=0.038$). Our findings were in concordance with the study done by Yadav et al in 2018 in which mean score for quality of analgesia was better in group DPE than group E ($P<0.05$).⁷

Conclusion:

Our study concludes that a 27-G Whitacre Dural puncture without intrathecal drug administration followed by the epidural administration of local anesthetic solution (DPE technique) improves the quality of block significantly in comparison to conventional epidural technique.

References:

1. Liu S, Carpenter RL, Neal JM. Epidural anesthesia and analgesia: their role in postoperative outcome. *The J Anaest Amer.* 1995 Jun 1;82(6):1474-506.
2. Bucklin BA, Hawkins JL, Anderson JR, Ullrich FA. Obstetric anesthesia workforce survey: twenty-year update. *The J Amer of Anest.* 2005 Sep 1;103(3):645-53.
3. Norris MC, Fogel ST, Conway-Long C. Combined spinal-epidural versus epidural labor analgesia. *The J Ame SocieAnesth.* 2001 Oct 1;95(4):913-20.
4. Cook TM. Combined spinal-epidural techniques. *Anesthesia2000*;55:42-64.
5. Van de Velde M, Teunkens A, Hanssens M, Vandermeersch E, Verhaeghe J. Intrathecal sufentanil and fetal heart rate abnormalities: A double-blind, double placebo-controlled trial comparing two forms of combined spinal epidural analgesia with epidural analgesia in labor. *AnesthAnalg2004*;98:1153-9.
6. Bernads CM, Kopaez DJ, Michel MZ. Effect of needle puncture on morphine and lidocaine flux through the spinal meninges. Implications for combined spinal-epidural anesthesia. *Anesthesiology1994*;80:853-8.
7. Yadav P, Kumari I, Narang A, Baser N, Bedi V, Dindor BK. Comparison of dural puncture epidural technique versus conventional epidural technique for labor analgesia in primigravida. *J ObstetAnaesth Crit Care* 2018;8:24-8.
8. Jadon A, Srivastawa S, Sinha N, Chakraborty S, Bakshi A, Singh B. A pilot study comparing dural puncture epidural with 27G Whitacre needle and conventional lumbar epidural labor analgesia. *Ain-Shams JAnesth+*. 2021 Dec;13(1):1-7.