

Original Article**An alternative management procedure after inadvertent dural puncture**

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Abstract

BACKGROUND: Accidental dural puncture during epidural blockade is a rare complication. Since postdural puncture headache (PDPH) is the most frequent complication, a wisely management method will also reduce the incidence of PDPH.

METHODS: Five patients who had inadvertent dural puncture during the epidural procedure before hip or knee arthroplasty were included in this study. After dural puncture we drew back the epidural needle and placed an epidural catheter into the epidural space.

RESULTS: Epidural anesthesia and postoperative epidural analgesia have been provided successfully in all cases. 20% showed PDPH.

CONCLUSIONS: These results demonstrate the effectiveness of management skills after inadvertent dural punctures.

KEYWORDS: Anesthesia, Epidural, Analgesia, Post-Dural Puncture Headache, Arthroplasty, Replacement, Hip, Knee.

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A number of complications can occur during epidural process. These include backache, transient neurological symptoms, hematoma, infectious complications, intravascular injection, nerve damage, hypotension, bradycardie or dural puncture.¹ Dural puncture during the application of epidural blockade is a rare complication. It varies from 0.4% to 6.0% as good technique and supervision are important factors.² There are several administration modalities that can be applied by the anesthesiologist when dural puncture occurs. Subarachnoid microcatheterisation or insertion of the epidural needle into another intervertebral disc space is one of the skills to manage this problem. These must be aimed at both constituting the anesthesia and reducing the PDPH. The patients undergoing primary total hip or knee arthroplasty frequently belong to geriatric population and have several health problems such as chronic obstructive

lung disease. Thus, lumber epidural block is frequently used for these orthopedic surgeries and also provides postoperative sufficient analgesia. In this case series, we report a method to accommodate a catheter into epidural space and its benefits in the postoperative period when accidental dural puncture occurs.

Methods

Following approval by our local research and the regional ethics committee and informed patient written consent, 5 patients who had accidental dural puncture during attempted epidural anesthesia for hip or knee replacement surgery were included to the study. Operations were elective primary total hip or knee arthroplasty for degeneration due to osteoporosis between September 2008 and August 2010 at Erzurum Central Education and Research Hospital. In total 182 patients from American Society of Anesthesiologists (ASA)

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with physical status of 1, 2 and 3, who aged from 45 to 75 were reviewed. The day before the surgery patients were informed about the epidural anesthesia technique. For premedication, Midazolam 0.07 mg/kg and Atropine 0.01 mg/kg were administered intramuscular (IM) 45 minutes before the surgical procedure. Extremely obese patients (body mass index > 40), those who refused to join the study, patients who had contraindications for neuraxial block or had complications during the operation such as respiratory depression or unsuccessful block were excluded from the study. Ramsey scale was used as a measure of sedation: 1 = anxious, agitated, restless; 2 = cooperative, oriented, tranquil; 3 = responds to comments only; 4 = brisk response to light glabellar tap or loud noise; 5 = sluggish response to light glabellar tap or loud noise; and 6 = no response.

A peripheral venous cannula was placed before the epidural procedure as a precaution. Intravenous (IV) vasopressors were not given before the procedure. The patients were given oxygen at the rate of 5 liters/minute through a face mask.

After setting up monitoring with non-invasive arterial pressure, ECG, and finger pulse oximetry and using an aseptic technique, with the patient in sitting position, 2 ml of 1% Lidocaine was infiltrated into the subcutaneous area. The epidural space was identified at the lumbar 3-4 or lumbar 4-5 interspace by the loss of resistance technique using midline approach and an 18-gauge Tuohy needle with cephalad orientation. 10 cc of 0.9% Saline solution was used for the loss of resistance technique. Perifix® soft tip 701 filter set (B Braun Melsungen AG) and 20 gauge epidural catheter with three lateral eyes were used. Inadvertent dural puncture was diagnosed by the free flow through the needle and checking the

warmness of cerebrospinal fluid (CSF). Following dural puncture, we drew back the epidural needle till no free CSF flowed. We verified this place as epidural place by 0.9% Saline injection and after negative aspiration for blood or CSF, an epidural catheter was inserted. After test dose of 0.1 ml/kg of 0.25% Bupivacaine with 1:200.000 Epinephrine, patients were observed for any increase in heart rate that would indicate intravascular injection of Epinephrine and were questioned about tinnitus, dizziness, metallic taste in mouth or sudden warmth or numbness in legs. If these responses were negative after 10 minutes we injected 16 cc of the solution of Bupivacaine 0.5% with 100 mcg Fentanyl. A cold sensitivity test was used to determine the extent of the block. The operation began 20 minutes after epidural solution injection. The patients were observed throughout 72 hours in the postoperative period and questioned about PDPH. A 100 point visual analog scale (VAS) was used to score the postoperative pain level. 0 would mean no pain and 100 would mean worst possible pain imaginable. Epidural catheter was kept for postoperative analgesia and removed after 72 hours. When the pain score was above 30 in VAS, a bolus dose of 3 mg Morphine with 15 mg of 0.5% Bupivacaine in 15 ml Saline via epidural catheter was administered. All patients received an additional 1 gr oral Paracetamol every six hour in order to obtain multimodal analgesia. By this method, we planned to reduce postoperative opioid consumption and related side effects. When PDPH was occurred, bed rest, hydration, analgesics and caffeine were recommended. Bed rest for one week, hydration as 3 liters per day orally, Paracetamol or non-steroidal anti-inflammatory drugs as analgesics and three cups of coffee per day were recommended. Additionally, findings of cranial

Table 1. Patients' characteristics

Male/Female	45%/55%
ASA physical status	21% ASA1, 43% ASA2, 36% ASA3
Age (years)	64 ± 4.8
Weight (kg)	76 ± 5.8
Height (cm)	164 ± 2.2

Data are presented as percent or mean ± SD.

Table 2. Types of surgical procedures, incidence of accidental dural puncture and PDPH

Type of surgery	Hip arthroplasty (58%), Knee arthroplasty (42%)
Total number of epidurals	182
Total number of accidental dural puncture	5
Total number of PDPH	1

magnetic resonance imaging were discussed with consultant neurosurgeon.

Results

106 patients underwent hip arthroplasty and 76 patients underwent knee arthroplasty surgery. 3 patients from hip arthroplasty group and 2 patients from knee arthroplasty group had accidental dural puncture. Mean age was 64 ± 4.8 ; 83 patients were male (45%) and 99 patients were female (55%). 21% of patients were included in ASA 1 group, 43% in ASA 2 group and finally 36% in ASA 3 group (Table 1). The incidence of dural puncture was 2.1%. 1 of the patients who had accidental dural puncture had PDPH (20%) (Table 2). Epidural blood patch was offered to the patient but she refused. So, this patient was managed with conservative treatment. The headache continued for 7 days. None of patients had any serious intraoperative or postoperative side effects. No respiratory depression and no sedation occurred. No complication of catheter infection at the entry site was seen. We searched the possibility of intracranial hemorrhage or any tumors but there was no abnormality in cranial magnetic resonance images.

Discussion

As epidural block decreases mortality, cardiovascular morbidity, incidence of deep vein thrombosis, pulmonary embolism and provides a short hospital stay; it is widely used for hip and knee replacement surgeries.³ When dural puncture occurs, several management methods are applied by physicians. The anesthesia can be converted to spinal anesthesia with subarachnoid injection via the epidural needle; general anesthesia can be applied or the epidural catheter can be inserted from a different intervertebral area. Nevertheless patients are exposed to be pierced second time and no precaution for PDPH is taken by this

method. Cesur et al lessened the incidence of PDPH by epidural catheter implantation but the disadvantage of this study was again the pain of patients exposed to repeated epidural needle insertion.⁴ Intrathecal catheterization by epidural catheter is another management skill.⁵ Subarachnoid microcatheterisation seems to be a rapid and effective method. In several retrospective studies it is proved that it reduces PDPH and epidural blood patch incidence.⁶ Inserting epidural catheter into subarachnoid space, giving back CSF through epidural needle and SF injection by intrathecal catheter were also attempted. However cauda equina syndrome and infective complications limit its practice. Ultrasonography-guided epidural anesthesia is nowadays applied. It is a useful method in preventing dural puncture when the distance between skin and ligamentum flavum is correctly measured.⁷ Fiberoptic-guided epidural anesthesia is another new technique and seems to be a safe method.⁸ On the other hand, one needs time to gain experience on its usage. PDPH is seen frequently in dural puncture patients. The incidence is nearly 70%.⁹ Being young, female, or pregnant, using thicker needle, and number of dural holes, increase this incidence.¹⁰ Therefore migraine, hypertension, pneumocephaly, sinusitis, meningitis, cortical venous thrombosis and intracerebral pathologies must be excluded when any kind of headache occurs. Neurosurgery consultation might be useful. Drawing back the needle after inadvertent dural puncture, provides us the facility to place an epidural catheter. When the patient's benefits are considered, as a rapid and safe method, we recommend this technique after accidental dural puncture. PDPH incidence will also be lower. Although the final epidural space can be checked by a test dose of Bupivacaine or Lidocaine, there is a potential risk for high sensorial level for the patients. This

disadvantage can be eliminated by anesthesiologists' experience. In our experience of 5 cases of inadvertent dural puncture, we found it is safe to practice. However, a large double-blind randomized trial is necessary to prove its ultimate safety.

Conclusions

In conclusion according to our experience for 5 cases of inadvertent dural puncture, we found it safe to practice. However, a large double blind randomized trial is necessary to prove its ultimate safety.

Conflict of Interests

Authors have no conflict of interests.

Authors' Contributions

KTS and AS carried out the design and coordinated the study and prepared the manuscript. FK and VF provided assistance in the design of the study and participated in manuscript preparation. All authors have read and approved the content of the manuscript.

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