

Epidural Blood Patch for the Management of Post-dural Puncture Headache

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✓ **Aim:** Post-dural puncture headache (PDPH) is characterized by its severity and nausea in some patients after spinal and epidural anesthesia. The aim of this study is to evaluate the effect of epidural blood patch (EBP) application and compare it to the conservative treatment procedure in patients suffering from PDPH.

Material and Methods: Between 2004 and 2007, The American Society of Anesthesiologists (ASA) physical status I patients comprising 1446 spinal (1272 males and 174 females), 45 epidural (all males) and 2 combined spinal epidural (2 females) anesthesia were performed patients, were investigated retrospectively.

Results: PDPH was observed in a total of 14 patients (0.93 %). EBP was performed on 9 patients while the remaining 5 patients received conservative treatment. For EBP, 15 ml of autologous blood was injected into the epidural space. EBP provided complete relief from headache within 15-30 minutes in 9 patients.

Conclusion: Epidural blood patch is an effective procedure in severe PDPH. Oral paracetamol and caffeine combinations and intravenous hydration are also effective in symptomatic treatment.

Key words: Postdural puncture headache, epidural blood patch

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Dural Ponksiyona Bağlı Baş ağrısının Tedavisinde Epidural Kan Yaması Uygulaması

✓ **Giriş:** Dural ponksiyona bağlı baş ağrısı (PDPH) spinal ve epidural anestezi sonrası bazı hastalarda şiddetli baş ağrısı ve mide bulantısı ile karakterizedir. Bu çalışmanın amacı PDPH nedeni ile yakınması olan hastalarda epidural kan yaması (EBP) uygulamasının etkisinin değerlendirilmesi ve konservatif tedavi prosedürüyle karşılaştırılmasıdır.

Materyal ve Metodlar: 2004-2007 yılları arasında, The American Society of Anesthesiologists (ASA) fiziksel durumu I olan 1446 spinal (1272 erkek ve 174 bayan), 45 epidural (tümü erkek) ve 2 kombine spinal epidural (tümü bayan) anestezi uygulanan hastası retrospektif olarak incelendi.

Sonuçlar: PDPH toplam 14 hastada (0.93 %) bulundu. 9 hastaya EBP, kalan 5 hastaya ise konservatif tedavi uygulandı. EBP için epidural bölgeye 15 ml otolog kan injeksiyonu yapıldı. Dokuz hastada da 15-30 dakika içerisinde baş ağrısı tam olarak geçti.

Yorum: Epidural kan yaması şiddetli PDPH tedavisinde etkili bir uygulamadır. Oral parasetamol ve kafein kombinasyonları ve intravenöz hidrasyon da ayrıca semptomatik tedavide etkilidir.

Anahtar kelimeler: Dural ponksiyon sonrası baş ağrısı, epidural kan yaması

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INTRODUCTION

Spinal and epidural anesthesia are often used in the lower extremities, lower abdominal and uro-

logical surgery. Perforation of the duramater is a complication of epidural anesthesia, whereas dural puncture is necessary in spinal anesthesia in order to inject local anesthetic into the intrate-

chal space. Dural puncture may cause severe headaches in some patients following spinal or epidural anesthesia due to the cerebrospinal fluid leakage resulting in decreased cerebrospinal fluid (CSF) volume and/or pressure ⁽¹⁾. Nausea, vomiting, visual disturbances, neck stiffness, and tinnitus may be present in addition to headache. These clinical signs are typically orthostatic, aggravated or provoked by a sitting or standing position, and can be relieved by lying flat ⁽²⁾.

Severe headache may increase the length of hospital stay, the number of emergency service visits of discharged patients, and may even result in fatal complications ⁽²⁾. Post-dural puncture headache (PDPH) usually spontaneously resolves within a few days, but in rare cases it may persist for several months ⁽³⁻⁵⁾. Volume injection into the epidural space has been reported to be beneficial for the management of PDPH in addition to pharmacotherapy ⁽²⁾. Epidural blood patch is performed with an injection of autologous blood into the epidural space. Epidural injection of autologous blood for treatment of PDPH was introduced by DiGiovanni and Dunbar in 1970, about 70 years after the first description of PDPH by Dr. August Bier ⁽⁶⁾. Recently EBP is used for spontaneous intracranial hypotension ⁽⁷⁾. The main factors affecting the occurrence of PDPH are age, gender, number of puncture attempts, the type and the size of the needle ^(8,9). In recent years, developments in design and size of the needles have led to a significant decrease in the occurrence of PDPH ^(2,10). Despite more than 100 years of research and clinical practice there is still considerable controversy about the pathogenesis, prophylaxis and treatment of PDPH. A recent Cochrane review of the use of prophylactic/therapeutic blood patching concluded that the need for further randomized trials before there is balance of risks and benefits of this application can be properly assessed ⁽¹¹⁾.

The aim of this study was to evaluate the effec-

tiveness of EBP compared to the conservative treatment procedure in the patients suffering from PDPH.

SUBJECTS AND METHODS

This retrospective study was approved by the local Ethics Committee of Gulhane Military Medical Faculty. Our hospital is a military hospital in which most of the patient population are male soldiers. Fourteen patients with PDPH (0.93 %) were identified retrospectively among 1446 spinal (1272 males and 174 females), 45 epidural (all male), and 2 combined spinal epidural (2 females) anesthesia were performed patients treated between 2004 and 2007.

Inguinal hernia, knee arthroscopy, cesarean-section, and hemorrhoid surgery were the main types of surgical procedures that required anesthesia. The patients' age was in the range of 21 to 65 years.

Technique of EBP: EBP was performed in the recovery room of the operating theater. The patients had an intravenous line installed and a basic monitoring (non-invasive blood pressure, ECG, pulse-oximetry) had been achieved.. Epidural technique was performed under sterile conditions, and the patient in the lateral decubitus position, using a toughy needle and the loss of resistance method to NaCl 0,9 %, at the interspace of the previous puncture which caused the PDPH. The autologous venous blood obtained by venous sampling, and withdrawn under sterile conditions, was slowly injected into the epidural space. The quantity injected was utmost 20 ml.

Patients (5 females and 9 males) with PDPH were between 21-33 years of age. The demographic characteristics of these patients are summarized in Table 1. The effect of EBP was classified as either providing complete relief (disappearance of all symptoms), incomplete relief (clinically improved patients who recovered suf-

Table 1. Demographic characteristics of patients with postdural puncture headache (PDPH).

Patient#	Age	Gender	Indication for Surgery	Type of anesthesia	Needle size (G) Used in spinal anesthesia	Post. op. start of headache
1	27	M	Knee arthroscopy	Spinal	22	2 nd day
2	22	M	Inguinal hernia	Spinal	22	2 nd day
3	21	M	Knee arthroscopy	Spinal	22	2 nd day
4	23	M	Knee arthroscopy	Spinal	22	2 nd day
5	23	M	Knee arthroscopy	Spinal	22	3 rd day
6	28	F	Cesarean section	Spinal	22	2 nd day
7	21	M	Knee arthroscopy	Spinal	22	3 rd day
8	21	M	Inguinal hernia	Spinal	22	3 rd day
9	22	M	Knee arthroscopy	Spinal	22	3 rd day
10	30	F	Cesarean section	Spinal	22	1 st day
11	21	M	Knee arthroscopy	Spinal	22	3 rd day
12	28	F	Cesarean section	Spinal	22	2 nd day
13	31	F	Cesarean section	Spinal	22	1 st day
14	33	F	Cesarean section	Spinal	22	2 nd day

M, male; F, female

ficiently to perform normal daily activities), or failure (persistence of severe symptoms). Nausea, neck and back pain were other symptoms identified besides headache in patients suffering from PDPH. These symptoms were especially reported to be more severe when in a standing position.

RESULTS

PDPH developed in the first post-operative day in 2, the second day in 7 and the third day in 5 patients. The needle used in all patients was 22G cutting spinal needle. Knee arthroscopy was performed in 7 cases, cesarean section in 5 and inguinal hernia repairment in 2 patients. The patients were encouraged to walk about 24 hours after the operation.

According to the patients' records, it was noted that EBP was performed in 9 patients whose visual analog scale (VAS) scores were between 7 and 9. The other 5 patients whose VAS scores were 4 or 5 were followed conservatively (intravenous fluid replacement 3000 mL IV and analgesic treatment with paracetamol and caffeine combination or non-steroidal anti-inflammatory drugs). In patients treated with EBP, about 15 mL of autologous blood was injected into the epidural space in the recovery room. The EBP application time was about 2 days after the dural

puncture. EBP provided complete relief of symptoms in all patients within 15-30 minutes. All patients were satisfied after the first application of EBP treatment and a second injection was not required in any of the patients. No complication of EBP was reported in the patients' files.

The headaches of 5 patients who did not receive EBP persisted for an additional 3-4 days. These patients were followed with analgesics and i.v. fluid replacement.

The patients who had received EBP were discharged 2-3 hours later. On the other hand, those who received conservative treatment had to stay 3-4 more days in the hospital.

DISCUSSION

In the present study we described 14 postdural puncture headache cases among 1446 surgical patients with spinal anesthesia. EBP provided immediate and successful relief from headaches in all of the patients. The reported success rate of EBP varies largely in different studies ⁽²⁾. Considering the full recovery or incomplete recovery as a success parameter and variations in patient characteristics, differences in the procedure have been assumed to account for the high variability in the treatment success ⁽²⁾. According to our patients' records, application

of the first EBP resulted in complete relief of headache in all patients. Timing of EBP is an important factor for the success of the procedure. Literature data suggests that the optimal application time for EBP is about 24 hours after the postdural puncture. Application of EBP within the first 24 hours of the dural puncture has been reported to have higher incidence of failure. Early application of EBP has also been reported to be a risk factor for the treatment failure in the largest reported series of patients receiving EBP that involved 504 patients⁽²⁾. Safa-Tisseront et al⁽²⁾ also reported that the percentage EBP failure was significantly increased if EBP was performed within three days following dural puncture. In that study, decreased effectiveness of early EBP was more related to the size of the epidural puncture rather than the application time of the patch because patients with more pain received EBP earlier. On the other hand, some other studies show the benefit of early EBP^(12,13). In this retrospective investigation of patients' records, EBP was applied to all of the patients about 2 days after the dural puncture and complete pain relief in all cases was achieved.

The size of the needle used for dural puncture has also been reported to be a predictive factor for the failure of EBP in treating PDPH^(2,14). Larger needle size is associated with greater risk of headache. The incidence of PDPH decreases with a smaller needle size, which supports the cerebrospinal fluid leakage theory. A thinner needle diameter produces a smaller tear in dura and therefore there is less potential for leakage of cerebrospinal fluid.

In a recent metaanalysis performed in parturients, PDPH has been suggested as a frequent complication⁽¹⁵⁾. The risk of accidental dural puncture during epidural insertion has been reported to be 1 in 67 and approximately half of all dural punctures result in PDPH⁽¹⁵⁾. PDPH was not observed among 45 epidural anesthesia

patients in the present report.

Many observational studies reported success rates of the EBP for PDPH to be 70-96 percent⁽¹⁶⁻¹⁸⁾. Van Kooten F et al reported that EBP was by far superior to conservative treatment in reducing the number of patients with headache, duration of headache, and the severity of residual headache as well after the start of the treatment⁽¹⁹⁾. A 15 mL volume of autologous blood was injected into the lumbar epidural space in all of the cases included in the present retrospective report. There is no consensus about the optimal recommended blood volume for the injection. In the literature there is a large range of proposed blood volumes from 2 to 20 ml^(20,21). Some researchers report a reduced success rate if the volume of the injected blood is less than 10 ml, whereas others could not detect any advantage of using higher volumes⁽²²⁾. On the other hand, researchers tend to use larger volumes up to 20 ml⁽²²⁾. Crawford reported a 96 % success rate with 20 ml blood injection and none of these patients suffered from pain in the back, buttocks or legs during or after injection of the blood^(22,23). These symptoms suggestive of neural or medullar compression have been reported to be a limitation for the injection of larger volumes. However, in the present study patients were reported to tolerate a 15 injection of blood without any complaint. Female gender has been reported to be a risk factor for the development of PDPH⁽¹⁵⁾. We reported a 5/9 female/male ratio and this finding does not seem to be contradictory to the literature because the female/male ratio in the whole study population was 174/1272. This female/male ratio is representative of our hospital, a typical military hospital in Turkey with a large male patient population.

In the present study, nausea, vomiting and neck pain were the other reported symptoms beside headache. These symptoms are common complaints of PDPH which have been previously reported in the literature⁽²⁴⁻²⁶⁾.

In conclusion, epidural blood patch seems to be an effective procedure for alleviating the symptoms in patients with severe PDPH. Oral paracetamol-caffeine combinations, nonsteroidal anti-inflammatory drugs and intravenous fluid replacement are also effective in relieving symptoms but the length of hospital stay is longer and patient satisfaction is lower compared to the EBP treatment group. Further evaluation of EBP methodology is needed in larger studies for a definitive conclusion to be drawn.

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