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CLINICAL REPORT

Fluoroscopically guided epidural blood patch in patients with postdural puncture headache after spinal and epidural anesthesia

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Abstract Postdural puncture headache (PDPH) is one of the major complications after spinal and epidural anesthesia. An epidural blood patch (EBP) may be applied when PDPH persists regardless of conservative treatment. We describe the results of management including fluoroscopically guided EBP in a series of patients with moderate to severe PDPH. From January 2007 to December 2009, PDPH developed in 15 of 3,381 patients (0.44%) who received epidural or spinal anesthesia: 5 (0.21%) after general anesthesia combined with epidural anesthesia, 8 (0.81%) after spinal anesthesia, and 2 (3.14%) after combined spinal and epidural anesthesia. Of 15 patients, PDPH was relieved without the EBP in 9 patients and 6 patients required the EBP. EBP was performed under fluoroscopy in a prone position; a 4:1 mixture of autologous blood and contrast medium was injected to cover the site of dural puncture. The success rate of fluoroscopically guided EBP was 100% with a mean blood volume of 7.2 ml. No complications were associated with EBP except for a mild backache. Fluoroscopically guided EBP may be successfully and safely performed to treat persistent PDPH with a relatively small volume of blood for epidural injection.

Keywords Postdural puncture headache · Epidural blood patch · Fluoroscopy

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Introduction

Postdural puncture headache (PDPH) is one of the major complications after spinal and epidural anesthesia. The reported incidence of PDPH varies from <1% to >80%, depending on type of patient, needles used for anesthesia, definition of headache, and methods for follow-up [1, 2]. Initial treatment of PDPH may include bed rest, hydration, and medication [2, 3]. When PDPH persists regardless of such conservative treatments, an epidural blood patch (EBP) is applied as an invasive technique [4, 5]. In this article, we describe the results of management including fluoroscopically guided EBP in our series of patients with moderate to severe PDPH after spinal or epidural anesthesia.

Case presentation

From January 2007 to December 2009, epidural anesthesia (EA) with general anesthesia (GA), spinal anesthesia (SA), or combined spinal and epidural anesthesia (CSEA) was performed in 2,329, 989, and 63 patients, respectively, at Nara Medical University, Nara, Japan. SA was performed using a 25 G Quincke needle in the majority of cases. In a few cases, a pencil point needle was selected at the discretion of the attending anesthesiologist. EA was performed using a 19 G Tuohy needle. Occurrence of accidental dural puncture (ADP) during EA was based on the description in the anesthesia records. PDPH was defined as moderate to severe postural headache, which developed within 15 min after positioning to sitting or standing, and required bed rest. Patients with mild postural headache, in whom bed rest was not required to relieve the headache, were not included in the analysis. PDPH developed in 15 of 3,381 patients

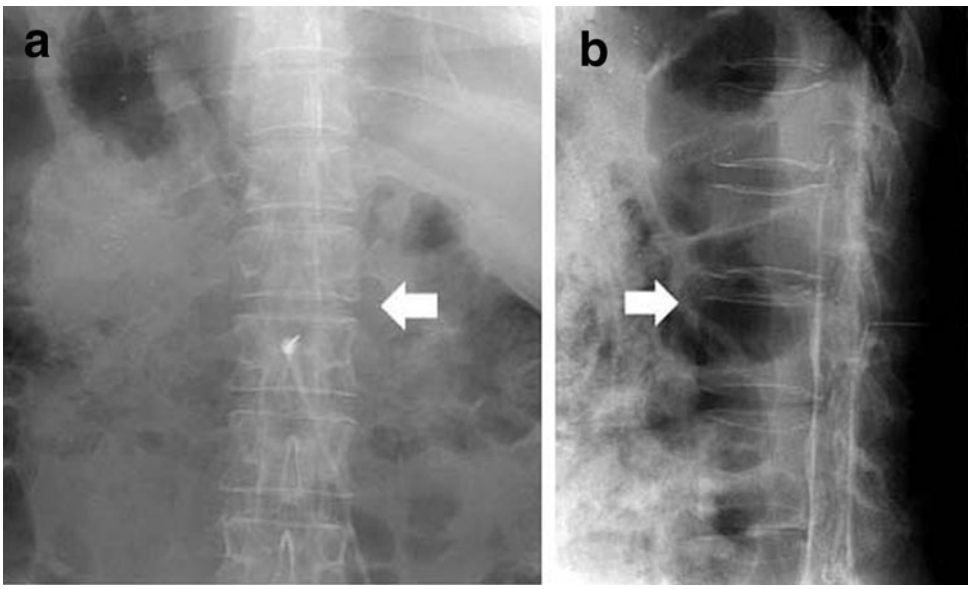

Fig. 1 Fluoroscopic image during epidural blood patch (EBP) at anterior–posterior view (**a**) and at lateral view (**b**). A 4:1 mixture of autologous blood and contrast medium was injected to cover the site of dural puncture. *Arrows* indicate the dural puncture site

(0.44%): 5 of 2,329 patients (0.21%) after GA combined with EA, 8 of 989 patients (0.81%) after SA, and 2 of 63 patients (3.14%) after CSEA. All 15 patients were female, with a mean age of 39 years (range 25–63 years). Of these 15 patients, 10 underwent cesarean section, 4 underwent a gynecological operation, and 1 patient underwent nephrectomy.

Initial conservative treatments of PDPH were performed at the discretion of the physicians (surgeons). Generally, if PDPH was diagnosed, conservative treatment with bed rest and hydration with or without drug administration was performed for at least 72 h. PDPH resolved without EBP in 9 of 15 patients. Mean duration until a relief of PDPH was 4.4 days with a range of 3–7 days. Of 9 patients, 8 patients underwent SA and 1 had CSEA. Based on the severity of postural headache and careful discussion concerning the advantage and disadvantage of EBP between patient and anesthesiologists, EBP was performed if necessary.

Of 15 patients, 6 patients required EBP. Mean duration until the time of EBP procedure was 6.5 days. Of these 6 patients, 5 underwent GA combined with EA and 1 had CSEA. All 5 patients who underwent GA combined with EA had an episode of ADP during the epidural catheter insertion. EBP was conducted on a patient in the prone position. Epidural puncture was performed under fluoroscopy at the intervertebral level, which is at the same level or one level below the dural puncture site. The direction and tip of the needle was fluoroscopically adjusted to reach the epidural space with the aid of loss of resistance technique; 1 ml contrast medium (iohexol; Daiichi Sankyo, Tokyo, Japan) was injected to confirm epidural spread fluoroscopically by visualizing both at anteroposterior (AP) view and at lateral view. When the epidural space was identified fluoroscopically, an autologous venous blood sample (8–12 ml) was drawn from an antecubital vein or other vein of the upper limb. Under fluoroscopy, a 4:1 mixture of autologous blood and contrast medium was injected to cover the dural puncture site (Fig. 1). When the patient complained of a feeling of pressure in the back, the injection was discontinued. Table 1 shows the data of EBP in 6 patients who required EBP. Mean total amount of contrast medium and autologous blood was 7.2 ml. In 3 patients, 10 min after the EBP procedure, spinal computed tomography (CT) (EBP-CT) was performed to evaluate the spread of the contrast medium and autologous blood (Fig. 2). EBP-CT revealed that the dural puncture site was covered with the blood in these cases.

After EBP, the patient underwent bed rest in the supine position for 2 h, and was allowed to adopt a sitting position until the following day and then walk on the second day. There were no complications associated with EBP, except for a mild backache that persisted for a few days after EBP in three patients. In six patients, complete recovery of PDPH was obtained within 3 days after EBP.

Discussion

The incidence of PDPH after SA, when a 25 G needle was used, has been reported to be from 0 to 20% depending on subjects studied, type of needle, and definition of PDPH [2]. In our series of patients, moderate to severe PDPH developed after SA in 8 of 989 patients (0.81%), in whom PDPH resolved within 7 days and EBP was not required. The duration of PDPH obtained in this study is compatible with that in previous studies, which indicate that median duration of PDPH was 5 days or less [6, 7]. Considering

Table 1 Summary of patients who underwent epidural blood patch (EBP) for persistent postdural puncture headache

Case	1	2	3	4	5	6
Age (years)	37	53	46	49	37	63
Anesthesia	EG	EG	EG	EG	CSE	EG
ADP	+	+	+	+	−	+
DP site	T10/T11	T12/L1	T12/L1	T11/T12	L4/L5	T11/12
Operation	GS	GS	GS	GS	CS	NE
Date of EBP (days after DP)	6	6	3	9	6	9
EBP site	T10/11	T12/L1	L1/L2	T12/L1	L4/L5	L1/L2
Amount of blood for EBP (ml)	7	6	8	8	5	9
Extent of blood on EBP-CT	NA	NA	T4–L5	T7–L3	T8–L5	NA
Outcome	CR	CR	CR	CR	CR	CR
Adverse effects	None	mBA	None	mBA	None	mBA

All patients were female

EG epidural anesthesia combined with general anesthesia, *CSE* combined spinal and epidural anesthesia, *ADP* accidental dural puncture during the insertion of epidural catheter, *DP* dural puncture, *GS* gynecological surgery, *CS* cesarean section, *NE* nephrectomy, *EBP-CT* spinal computed tomography after EBP, *NA* not applied, *CR* complete recovery, *mBA* mild backache

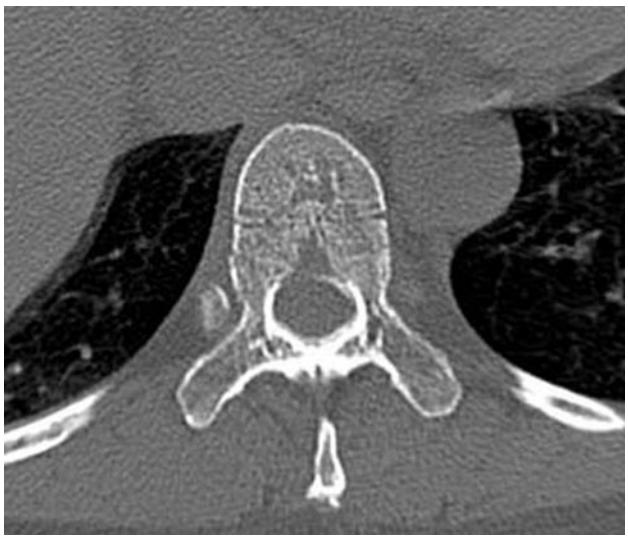

Fig. 2 Representative cross-sectional image of spinal computed tomography 10 min after EBP procedure (EBP-CT) shows the dural puncture site is covered with contrast medium and autologous blood

that PDPH after SA can resolve spontaneously within 5–7 days in most cases, the decision to perform EBP may be preferably made 5–7 days after SA.

Recently, van Kooten et al. [4] compared the effects of EBP and conservative treatments for PDPH; they demonstrated that at 7 days after treatment, headache was present in 16% after EBP and 86% after conservative treatments, indicating the usefulness of EBP for the treatment of PDPH. Success rates of EBP for PDPH have been shown to range from 70% to 90% [4]. Although it is controversial, several investigators assumed that a larger volume of blood was associated with a lesser failure rate of EBP [8–10]. Thus, the tendency is to use a larger volume of blood, approximately 20 ml, for EBP. However, EBP, especially with a large volume of blood, may be associated with adverse effects.

We used fluoroscopically guided EBP for the following reasons. First, under fluoroscopy the direction of the needle to the epidural space can be adjusted while avoiding the needle hitting the bone. Second, when the tip of needle reached the epidural space with the aid of the loss of resistance technique, spread of contrast medium in the epidural space can be confirmed by injecting a small amount of contrast medium. Third, the spread of autologous blood and contrast medium is confirmed by fluoroscopy, and the volume of autologous blood can be determined by the image showing that injected blood covers the site of dural puncture. In this study, even a small volume of blood, 5–9 ml, was enough to cover the area of the dural puncture site. Results in this study indicated that the success rate of fluoroscopically guided EBP was 100% with a mean blood volume of 7.2 ml; there were no obvious complications except for a mild backache.

Because fluoroscopic information during EBP is limited to that in a long-axis direction, EBP-CT was performed after EBP in three cases. EBP-CT can provide the information in cross-sectional view, which allows us to evaluate whether injected blood covers the dural puncture site. If failure of EBP were observed on EBP-CT findings, the necessity of the next EBP can be promptly decided. In this study, EBP-CT findings revealed that the dural puncture site was covered with epidurally injected blood in these three cases. These results indicate that fluoroscopic findings during EBP may be reliable. However, as the number of patients is small in this study, further evaluation is required.

There are several limitations in this report. First, moderate to severe PDPH was included in this study. If mild PDPH were included, the incidence of PDPH might be higher. Second, in this study, EBP was performed 3–7 days after dural puncture. If EBP were performed earlier or later, the success rate might be different. Third, we used a 4:1 mixture of autologous blood and contrast medium. However, it is unknown whether this is the best ratio. Finally, because the number of patients is small, further prospective study with more patients is required to confirm the clinical utility of a fluoroscopy-guided blood patch.

In summary, we showed the results of our management of moderate to severe PDPH after spinal or epidural anesthesia. In our series of patients, 40% of patients with PDPH required EBP. Although the number of patients was small in this study, the success rate of fluoroscopically guided EBP was high and there were no moderate to severe adverse effects. These results indicated that fluoroscopically guided EBP may be effectively and safely performed with a relatively small volume of blood for epidural injection and can be one of the alternative techniques to treat persistent PDPH.

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