

Conventional treatment or Epidural Blood Patch for the treatment of different etiologies of Post Dural Puncture Headache

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Abstract : Post dural puncture headache (PDPH) represents a complication of anesthesia (with an increased incidence in obstetric patients) or as the consequence of a diagnostic lumbar puncture. The aim of the present study was to evaluate the efficacy of the epidural blood-patch (EBP) versus the conventional medical treatment of post-anesthetic headaches also including the PDPH following a diagnostic puncture, a category of patients rarely referred to the anesthesia consultation in our hospital because it was believed that they might have equal benefit from conventional measures due to the smaller size of needles used.

We studied in a prospective, randomized, double-blinded manner 32 obstetric and non-obstetric patients with PDPH having the onset of the symptoms 24 hours before the inclusion in the study. The patients were randomly divided in two groups : group A (16 patients) receiving conventional treatment (oral and intravenous fluid replacement, non-steroidal anti-inflammatory drugs – NSAIDs –, caffeine) and group B (16 patients) in whom an epidural blood-patch was performed. The intensity of the headache was evaluated using a visual analogue scale (VAS) from 0-10, before, 2 hours and 24 hours after the EBP. There were no statistical differences concerning the demographic data and the cause of PDPH between the groups ($p > 0.05$). The intensity of PDPH was similar before performing the EBP ($p > 0.05$), with a value on VAS of 8.2 ± 1.4 in group A and 8.0 ± 1.6 in group B. Two hours after the treatment, the intensity of headache on VAS diminished extremely significant ($p < 0.0001$) : in group B the value was 1.0 ± 0.18 versus 8.2 ± 1.4 in group A. The difference recorded after 24 hours remained statistically significant ($p < 0.0001$) : the VAS scores were 0.7 ± 0.16 and 7.8 ± 1.2 respectively.

The epidural blood patch represents the first choice treatment of PDPH no matter the etiology, being significantly superior to the conventional treatment which did not affect pain scores. In severe PDPH there is no reason to delay the EBP more than 24 hours after the diagnosis as all except two patients of the conventional treatment group required blood patching following the study period.

Keywords : Anaesthesia ; complications, post dural puncture headache ; Treatment, epidural blood patch.

Severe post dural puncture headache (PDPH) appears after spinal anesthesia (1%), an accidental dural puncture with a Tuohy needle when performing an epidural anesthesia (70%) or a diagnostic lumbar puncture (1). The accidental dural puncture has a variable incidence among studies. It is considered to appear with an incidence of 0,5 – 5% and to be an index of the anesthesia department quality (2, 3). Its frequency tends to be higher if the number of neuraxial anesthetic techniques performed by an anesthetist is low (4).

Obstetric patients are predisposed to PDPH because of the physiological and circumstantial reasons i.e. decreased epidural space, performance of epidural anesthesia when the patients have already uterine contractions predisposing to unpredictable movements and finally leakage of the cerebrospinal fluid at the puncture orifice caused by the delivery efforts. The epidural blood-patch (EBP) with autologous blood is widely considered as one of the most efficient methods in treating PDPH (5-7).

In our hospital the EBP is the treatment of choice for the PDPH following anesthetic techniques as the headache is mostly caused by large bore needles. However, other hospitals, mainly dealing with headaches secondary diagnostic punctures will claim acceptable success with conventional measures thus avoiding to repeat part of the invasive procedure responsible for this disabling side-effect.

The aim of the present study was to evaluate the efficacy of the epidural blood-patch (EBP) versus conventional medical treatment in different

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etiologies of PDPH including obstetric patients but also diagnostic punctures, performed with smaller needle sizes by radiologists and neurologists, At the present time the latter category of patients is rarely referred to anesthesia consultation in our hospital as they were mostly treated previously with conventional measures. Combination of post-anesthetic and post-diagnostic puncturing was necessary to obtain a sufficiently large sample size for statistical evaluation. Finally the study was also intended to evaluate whether it is reasonable to delay the EBP more than 24 hours.

METHODS

After the approval by the Ethic Committee of the Hospital we invited the different departments to address to the study team the patients with PDPH of any origin, having the onset of symptoms no longer than 24 hours.

After written consent we included in a prospective, randomized, double-blinded study 32 obstetric and non-obstetric patients with PDPH. The patients were randomly divided in two groups. Group A (n = 16) received conventional treatment (fluid replacement intravenously and orally up to 3000 ml daily, non-steroidal anti-inflammatory drugs, caffeine 500 mg intravenously every 6 hours) and in group B (n = 16) an EBP with 15-20 ml autologous blood was performed.

The EBP was accomplished in the morning in the recovery room of the operating theatre. The patients had an intravenous line installed and a basic monitoring (non-invasive blood pressure, ECG, pulse-oximetry). The epidural technique was performed in sterile conditions, in lateral position, using a Tuohy needle and the loss of resistance method to NaCl 0,9%, at the inter-space of the previous puncture which caused the PDPH. If there was no possibility to establish the level of the causative dural puncture, the technique was performed at the level of the L4-L5 inter-vertebral space. The autologous venous blood obtained by venous sampling, withdrawn in sterile conditions, was slowly injected in the epidural space. The quantity injected was 20 ml unless the administration was stopped earlier because of the sensation of pain or important lumbar pressure and/or paresthesia in the legs. The supine position was maintained for at least 30 minutes after the EBP. The intensity of the headache was evaluated on a Visual Analogue Scale (VAS 0-10, before, 2 and 24 hours after the EBP. We considered the PDPH to be

Table 1
Patients' characteristic at entry to the study

Demographic data	Group A	Group B	Statistical significance
Number	16	16	ns.
Gender (females/males)	11/5	12/4	ns.
Age (years)	34,5 ± 14	35,1 ± 10	ns.
Weight (kg)	65,2 ± 8	63,7 ± 10	ns.
Height (cm)	164,5 ± 1,3	166,3 ± 1,2	ns.

Data are mean ± SD ; ns : not significant (p > 0,05).

Table 2
Etiologies of PDPH

Cause of PDPH	Group A (n = 16)	Group B (n = 16)	Statistical significance
Accidental puncture (Tuohy)	4	5	ns.
Diagnostic puncture	10	9	ns.
Spinal anesthesia	2	2	ns.

Data are mean ± SD ; ns : not significant (p > 0,05).

severe if the intensity of the pain on VAS was ≥ 7 . All assessments after the start of treatment were performed by colleagues unaware of the allocation group.

Sample size estimation and statistical analysis were performed using EPPINFO 2002 software package. Results are mean and standard deviations (SD). Data were statistically analyzed using unpaired Student's t-test. A P < 0.05 value was considered to be statistically significant.

RESULTS

All patients tolerated the study treatments well. There were no statistical differences concerning the demographic data (Table 1). The majority of patients were females in both groups of whom 5 were parturients in group A and 6 in group B.

Also the cause of PDPH was not different between the two treatment groups (Table 2). The diagnostic lumbar puncture represents the cause of PDPH in the majority of the cases in both groups (10 in group A and 9 in group B).

However in the obstetric population more patients suffered headache due to an accidental dural tap (4 out of 5 patients in group A and 5 out of 6 patients in group B).

Based upon the VAS scores the intensity of the headache before performing the EBP was similar in both groups : i.e. 8.2 ± 1.4 in group A and $8,0 \pm 1.6$ in group B (Table 3).

Table 3
Intensity of PDPH measured by VAS-scoring (0-10)

The moment of evaluation	Group A	Group B	Statistical significance
Before EBP	8,2 ± 1,4	8,0 ± 1,6	ns
2 hours after EBP	8,2 ± 1,4	1,0 ± 0,18	p < 0,0001
24 hours after EBP	7,8 ± 1,2	0,7 ± 0,16	p < 0,0001

Data are mean ± SD ; p < 0,0001 : extremely significant.

The intensity of PDPH in obstetric patients was significantly higher in obstetric patients comparing with the mean : VAS was $9,7 \pm 0,3$ in the obstetric patients versus $8,2 \pm 1,4$ in group A ($p < 0,05$) and VAS was $9,8 \pm 0,2$ in obstetric patients versus $8,0 \pm 1,6$ in group B ($p < 0,05$). The intensity of PDPH were similar in the obstetric and the non-obstetric patients in group B after performing the EBP.

Two hours after the EBP the VAS scores of PDPH decreased significantly in group B ($1,0 \pm 0,18$, $p < 0,0001$) as compared to group A in which VAS scores did not change i.e. $8,2 \pm 1,4$.

After 24 hours the difference between groups remained statistically significant. The mean VAS value in group B was $0,7 \pm 0,16$ versus $7,8 \pm 1,2$ in group A ($p < 0,0001$).

There were no complications following the performance of the EBP. In one case the symptoms reappeared after 24 hours imposing an additional EBP which was curative.

After termination of the study an EBP was performed in 14 patients of group A resulting in significant relief of the symptoms. In only 2 patients symptoms had decreased sufficiently not necessitating EBP treatment.

Even if the therapeutic solution of an EBP was similar to the technique that caused the PDPH, thus worrying most of the patients, there were no refusals, probably because of the intensity of the symptoms.

DISCUSSION

The differential diagnosis of PDPH is mandatory before performing the EBP. A headache related to a conduction anesthesia technique is easy to be diagnosed as PDPH. A lumbar diagnostic puncture (for myelography or cerebrospinal fluid analysis) could cause a similar symptom that is more difficult to be diagnosed as PDPH. In our study 7 out of 19 patients having a diagnostic lumbar puncture as a medical antecedent were examined interdisci-

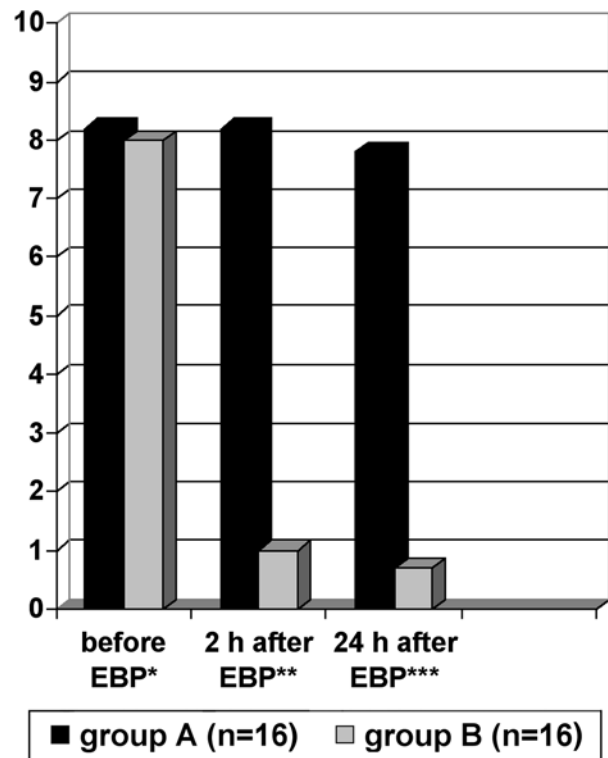


Fig. 1. — The graphic representation of the intensity of PDPH on VAS (1-10) before, 2 hours and 24 hours after EBP : *($p > 0,05$) ; **($p < 0,0001$) ; ***($p < 0,0001$).

plinary by an anesthetist and another specialist (neurologist, neurosurgeon or radiologist).

The PDPH intensity is influenced by the patient's position : the headache increases in vertical and diminishes in supine position. The headache is located in the occipital region in the majority of cases, but could be frontal or unilateral as well. One patient in our study experienced interscapular and cervical pain. This kind of symptom is cited in the medical literature as a rare manifestation of this pathology (8). In the situation where the diagnosis was difficult we used the clinical test recommended by Gutsche (9) : by pushing with a firmly pressure the abdomen with one hand and the lumbar region with the other hand the symptoms should ameliorate with reappearance of pain immediately after stopping the maneuver.

There are a few theories that try to establish the mechanism that makes the EBP being so effective in treating the PDPH. One of these suggest that the autologous blood injection in the lumbar epidural space increases the subdural pressure and then causes the migration of cerebrospinal fluid in a cephalad direction, finally increasing the intracranial pressure (10). Other authors consider that the rapid coagulation of the blood injected constitutes

a clot stopping the leakage of cerebrospinal fluid (1, 10). The relief of a headache caused by cervical puncture with a lumbar EBP excludes this theory (11). On the other hand, the “epidural clot theory” is sustained by MRI and “in vitro” experiments; the clot is formed more rapidly in the presence of cerebrospinal fluid (12).

In our opinion both these theories have to be considered in order to explain the spectacular efficiency of EBP: not only the cephalad migration of cerebrospinal fluid, but also the clot formation with obstruction of the dural orifice may lead to an increase of intracranial pressure. Both of them contribute to a vascular response, with a secondary vasoconstriction and then the pathogenic mechanisms (the decrease of cranial pressure, the intracranial vasodilatation) are interrupted.

Our study confirms the expected efficacy of EBP with a rapid and persistent ceasing of PDPH. In one case (6%) the symptoms reappeared after 24 hours imposing an additional EBP which was curative.

About the technical details, we have to mention that in 7 cases there were no tegument marks and we performed the EBP at the level of L4-L5 lumbar space. The reason of this choosing was the cephalad migration of the injected blood and its spreading between 4-5 vertebrae (13). There are also different opinions in the medical literature about administration of a test dose of local anesthetic (Lidocaine). We didn't administer it because it is beyond any doubt that lidocaine, even in small quantities, inhibits the clot formation (14). The local anesthetic leads to a platelet membrane's stabilization that inhibits the release of granules and their aggregation (15). If there are doubts about positioning the needle in the epidural space the administration of a test dose of local anesthetic is mandatory (16).

The diagnostic lumbar puncture represents the pathogenic cause of PDPH in the majority of the cases in our study. One explanation could be that the diagnostic lumbar puncture imposes the use of spinal needles of a large size and design (Quincke) and/or the performance of this technique by specialists (radiologists, neurologists, neurosurgeons) who are not aware with all the details about the pathogenic causes of PDPH. That point out the importance of interdisciplinary communication. The discussions of the results of the study with our non-anesthetic specialists influenced their attitude as they send patients with PDPH more commonly to our anesthesia consultation and this within the first 24 hours after the diagnosis.

The poor results of conventional treatment despite the combination of medication and the high incidence of EBP requested after termination of the study period calls into question whether it is still justified to consider the former treatment especially in obstetric patients (higher pain scores) or patients at risk for the development of thromboembolism. The results of the present study did not evidence any reduction of pain during the 24 hours of follow up in the conventional medical treatment group. This may underline that there is no reason to delay the EBP and as a consequence, we perform the EBP more rapidly than before i.e. within the first 24 hours after the diagnosis. Therefore, the reduction of the duration of suffering has a particular importance in obstetric patients, because the highest pain scores are very invalidating for the new mother.

In conclusion, the EBP is a gold standard therapy of PDPH, significantly superior to conventional medical treatment no matter the etiology. There is no reason to delay the EBP for more than 24 hours. In our opinion the technique has to be performed at the level of the causative dural puncture or with one space lower. A test dose of local anesthetic administration is reserved to the cases with uncertain position of the Tuohy needle.

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