

A.R.A.

Anestesia Obstétrica (Actualización)

Banks, S; Paech, M; Gurrin, L.

An Audit of Epidural Blood Patch after Accidental Dural Puncture with a Tuohy needle in obstetric patients. (Original Article)

Abstract: We report the results of a prospective audit of accidental dural puncture in 100 obstetric patients in a single tertiary referral institution during the period 1993 to 1999. The post dural puncture headache rate was 81%. Of the 81 parturients with post dural puncture headache, 58 (72%) received a therapeutic epidural blood patch, using 7 to 25mL of autologous blood. After the initial blood patch, complete relief of headache was obtained in 67% and complete or partial relief in 95%. However, severe headache returned in 31% and 28% obtained in 67% and complete or partial relief in 95%. However, severe headache returned in 31% and 28% received more than one blood patch. The incidence of complete relief of headache with one blood patch or more was 50%, with 38% achieving partial relief and 12% having unrelieved headache. There was no significant association between volume of blood used for blood patch and success rate. The initial rate of resolution of headache did not differ significantly between parturients receiving a blood patch within 48 h of dural puncture and after 48 h ($P = 0.70$). However, in the former group, the incidence of recurrent headache was significantly higher (59% versus 11%, $P < 0.001$).

Introduction

Accidental dural puncture is an unfortunate complication of Tuohy needle insertion in obstetrics. It occurs with an incidence of 0.18% to 3.6% in the UK and breach of the dura with a Tuohy needle leads to post dural puncture headache (PDPH) in about 80% of parturients. (2-5). PDPH has implications for the mental and physical health of the mother and has a significant impact on the cost of health care. It often lasts several days, prolongs hospitalization and may be associated with auditory and visual disturbances, nausea and vomiting, and cranial nerve palsy.

Many methods of treatment for PDPH have been suggested but all have proved of variable and limited success. The most effective treatment of PDPH is the injection of autologous blood into the epidural space. (6) Epidural blood patch was first described in 1960 by Gormley, (7) was popularized by Crawford in the 1970's (8) and is now widely accepted for the treatment of PDPH. (6)

We report the results related to blood patch from the first 100 cases in a continuing prospective audit that details the management of dural puncture complicating Tuohy needle

or epidural catheter insertion in obstetric patients. Factors related to dural puncture, PDPH and its symptomatic management are described in a separate paper. (9)

Methods

In 1993 a prospective audit was instigated to document demographic and treatment data for all obstetric patients in whom a dural puncture or PDPH occurred, with completion of data collection usually at the time of in-patient discharge. Details of the common clinical practices during the period of audit and methods of data collection are described elsewhere. (9) Whenever dural puncture was recognized, an explanation was provided and the possibility of PDPH raised. After diagnosis of PDPH, its prognosis and treatment modalities were discussed, with blood patch an option either immediately, at any time after daily review, or on request. Contraindications to blood patch were fever and risk of bleeding. In those patients electing to undergo therapeutic blood patching, informed verbal and, more recently, written consent were obtained.

All blood patches were performed in the operating unit anaesthetic room, usually by a consultant anaesthetist but sometime with an anaesthetic registrar under consultant supervision, assisted by a second anaesthetist and an anaesthetic nurse. The parturient was usually placed in the left lateral position and the procedure carried out under strict aseptic conditions including skin preparation and the wearing of mask, gloves and gown when identifying the epidural space and mask and gloves when performing venepuncture. Autologous blood was collected by the second anaesthetist and handed to the first, who injected slowly into the epidural space until a specific volume determined by the attending anaesthetist was delivered (policy suggested 15-20 mL) or a feeling of intense pressure or pain was reported by the patient. From 1993 to 1995 parturients were encouraged to remain recumbent for a period of 30 min, but this was increased to 2h in 1995. All patients were reviewed after the blood patch and discharge within a few hours was permitted. Patients were routinely informed that they should report back to the hospital if they had any concerns following discharge.

Data are presented using descriptive statistics and frequency data analysed in the form of contingency tables using the χ^2 or Fisher's exact test. A P value of <0.05 was considered statistically significant.

Results

One hundred cases of accidental dural puncture were analysed. Eighty-one parturients (81%) developed PDPH. Fifty-eight (72%) of these received a blood patch (Table 1): The remaining 23 with PDPH were treated symptomatically with analgesia, bed rest and cerebral vasoconstrictors, awaiting resolution of PDPH. The outcome of accidental dural punctures is shown in Figure 1.

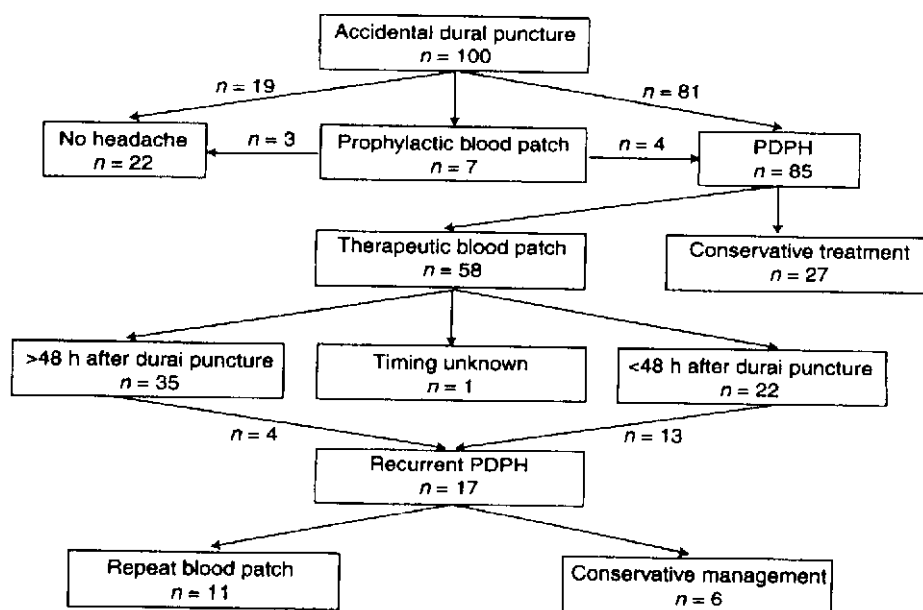
A prophylactic blood patch was performed in seven parturients. Of these, three developed no headache, one developed a mild headache that was treated conservatively and three required at least one subsequent therapeutic blood patch. The incidence of PDPH after

prophylactic blood patch was not significantly reduced compared with that of parturients who did not have a prophylactic blood patch (57% vs 77%, $P = 0.12$)

Table 1. Number of blood patches received by 100 parturients with accidental dural puncture

Blood patch (n)	Percentage of cases
0	42
1	43
2	11
3	4

Fig. 1. Relationship between accidental dural and epidural blood patch. Expectant, symptomatic management was used where no blood patch was performed. Data on timing of blood patch was unavailable in 1 case. PDPH = postdural puncture headache



Therapeutic blood patching was performed within 24 h of dural puncture in only seven cases (12%), with 15 (26%) between 24 to 48 h and the majority ($n = 35$, 61%) after 48 h or more. The longest duration from dural puncture to initial blood patch was 14 days. When performing a blood patch, epidural insertion was below the initial site of epidural needle insertion in 29 cases (50%); at the same level in 27 (46.6%) and above in two (3.4%). The level at which the blood patch was performed had no influence on its efficacy. The mean (SD) volume of blood used was 17.4 (3.5) mL and the distribution of volumes is shown in

Table 2. There was no association between the volume of blood injected and efficacy. Thirteen parturients 22% developed transient backache after patching, but no other side effects were recorded.

Table 2. Volume of autologous blood used for therapeutic epidural blood patch (n = 58)

Volume (mL)	Number (%) of Parturients
7	1 (1.7)
10	3 (5.2)
12	2 (3.4)
13	1 (1.7)
15	15 (25.9)
17	2 (3.4)
18	4 (6.9)
19	3 (5.2)
20	24 (41.4)
21	1 (1.7)
22	1 (1.7)
25	1 (1.7)

The first blood patch was completely successful in relieving headache in 39 parturients (67%), partially successful in 16 (28%) and unsuccessful in three (5%). For those who obtained relief, the blood patch was effective within 1 h in 22 parturients (40%), within 1 to 4 h in 27 (49%) and in greater than 4 h in 6 (11%). Thus, 49 parturients (88%) experienced either complete or partial relief from their headache within 4 h.

Despite complete or partial relief from the initial blood patch in 55 cases (95%), 17 (31%) of these parturients experienced a recurrence of moderate or severe PDPH. The mean (SD) time to development of recurrent headache was 31.8 (19.3) h (range 12-96 h), with 64% presenting 20 to 36 h later. Of the 17 parturients with recurrent headache, 11 (65%) were treated with a repeat blood patch and the remaining six (35%) treated expectantly. Repeat blood patch provided complete relief in seven parturients (64%) and partial relief in the remaining four (36%). Four parturients received a total of three blood patches (Table 1). Two had received a prophylactic blood patch after a recognised dural puncture, but nevertheless developed severe PDPH and received a therapeutic blood patch. After complete symptomatic relief initially, both subsequently developed recurrent severe headache that was successfully treated with a further blood patch. The third of these parturients had two blood patches, both of which brought full relief at first, but she then

requested a third blood patch on the fifth day after dural puncture following another recurrence of headache. This provided partial relief. The fourth parturient had a subarachnoid catheter removed after delivery and then required a blood patch on days two, three and five after dural puncture, eventually obtaining complete and permanent relief.

The relationship between the timing of blood patch and risk of recurrent headache is shown in Table 3. Although 48 parturients (61%) developed PDPH within 24 h of dural puncture (and 24% within 1 h), only seven therapeutic blood patches (81.2%) were performed within four complete relief and two partial relief from headache. However, five of the six with relief (83%) developed a recurrent PDPH requiring a repeat blood patch. The incidence of recurrent headache if blood patch was performed within 48 h was significantly greater than that when the initial blood patch was performed more than 48 h after dural puncture (Table 3)

Table 3. Incidence of recurrent headache in relation to timing of epidural blood patch (n = 57)

Timing of blood Patch	No. (%) with recurrent PDPH	No. (%) without recurrent PDPH
< 48 h	13 (59)	9 (41)
> 48 h	4 (11)	31 (89)

P <0.001, Fisher's exact test. Data unavailable in one case.

Discussion

Epidural blood patch is a common intervention in our unit for the management of PDPH after accidental dural puncture with a Tuohy needle. Prophylactic epidural blood patch did not significantly reduce the risk of PDPH, but this may reflect inadequate power because of our small sample size. Despite evidence from randomized and non-randomised observational studies that prophylactic blood patching with at least 15 mL of blood significantly reduces PDPH, (6) this approach has not gained widespread acceptance (10-12). Our experience with prophylactic epidural blood patching prior to this audit had also been disappointing, as others have reported. (4, 13) A recent prospective series, similar to this one, also found that three of seven parturients required a subsequent therapeutic blood patch despite a prophylactic patch. (13) We found a high initial success rate following therapeutic blood patch for established PDPH. Nevertheless, as in other series, (3, 13-15) in about a third of such cases PDPH recurred, the risk being related to the timing of blood patch after dural puncture. The efficacy and recurrent headache rate after a repeat blood patch appeared similar to that after the initial patch.

Success rates for relief of PDPH by blood patch in previous studies range from 56% to 98% (2-5, 8, 13-18) Many older series may not have recorded the long-term success of a blood patch accurately, because both the regularity and duration of follow-up were often inadequate. The variation in reported efficacy of epidural blood patch may be accounted

for by factors such as the definition of successful outcome, the timing of administration of the blood patch, the volume of autologous blood administered, the subsequent clinical management and the duration of patient review. Williams et al recently reported an initial success rate (defined as complete and permanent relief from PDPH) following one therapeutic blood patch of 34% and a failure rate of 7% (13). A second blood patch was performed on 27% of their patients, of whom 55% obtained complete relief. We found an overall success rate of 43% (based on a similar definition) after the first blood patch and 52% after repeat blood patch. This may be an overestimate of efficacy, because it is possible that some parturients who were discharged after a successful blood patch suffered a recurrent PDPH without our knowledge. Differences in clinical management between our unit and that of Williams et al included their injection of 10 mL of autologous blood, a post-blood patch recumbency period of 4-6 h, and a follow up duration of 10 days.

Some investigators found high success rates and recommended early therapeutic blood patch, (18) so an important finding of this audit was the significant blood patch was delayed in relation to the time of dural puncture. William et al (13) performed just over half of their blood patches at or within 24 h of the presentation of the PDPH, which may partly account for their low initial success rates. Our findings are consistent with those of Loeser et al (19) who reported a failure rate of 71% when the blood patch was done less than 24 h after dural puncture and 4% if performed thereafter. Recent preliminary reports (14-15) also indicate that early therapeutic blood patch is not ideal. Ascanio et al found that a median time interval from dural puncture to blood patch was 52.5 h in those for whom it was successful, compared with 20 h in those for whom it was unsuccessful (14). Our results were also similar to those of Rutter et al who found a 50% repeat blood patch rate if the initial patch was performed within 48 h and a 9% rate when it was delayed until after 48 h. (20) The self-limiting nature of PDPH and its propensity to resolve with time may bias outcome with delayed blood patch. Lower efficacy of early blood patch may also be explained by the presence of local anaesthetic, which interferes with normal blood coagulation in the epidural space. (21) Lidocaine and bupivacaine inhibit blood coagulation more than ropivacaine, and in addition lidocaine enhances fibrinolysis. (22)

The volume of blood injected during blood patch is thought to influence outcome, but has not been systematically evaluated. Gormley used only 2-3 mL and reported a 100% success rate. (7) Larger volumes subsequently became popular, especially when Crawford reported a 30% failure rate with 6-15 mL compared with a 96% success rate after 20 mL. (8) Szeinfeld et al reported that an average volume of 14.8 mL had 100% success rate and covered 8-10 spinal segments, (23) yet Taivainen et al concluded that there was no advantage in using more than 10 mL. (16) Others have suggested volumes greater than 20 mL, or continued injection until limited by patient discomfort. (15, 20) During this audit it was usual practice to inject blood until either patient discomfort in the lumbar region mandated cessation or until about 20 mL had been administered (Table 3). Despite subgroup analyses, including of those receiving less than 20 mL compared with 20 mL or more, we were unable to demonstrate a relationship between the volume of blood administered and efficacy of blood patch. Pratt et al reported the preliminary results of injecting 10-40 mL, using the development of mild discomfort in the back as an end point. (15) Their overall success rate (56%) was similar to this series and they noted a trend toward greater efficacy with volumes greater than 20 mL. Ascanio et al however, found no

significant difference in volumes used for successful and failed blood patch. (14) Further controlled investigation is required to determine if more than 15-20 mL of blood should be administered.

In a randomized trial, Martin et al advocated 2 h of recumbency after a blood patch, based on a better rate of headache resolution compared with periods of 30 min or 1 h. (24) They speculated that a longer period of recumbency allows more time for the cerebrospinal fluid (CSF) to regenerate and for CSF pressure to normalize once the dural hole has sealed. As our practice changed gradually over the audit period in this respect, we are unable to comment on this issue.

Backache, possibly due to extensive subcutaneous spread of blood, (25) is the most commonly encountered side effect of epidural blood patch. Although some series report very low rates, the incidence probably varies according to the method of assessment and duration of review; our rate of almost a quarter is consistent with other series. (15-17) Serous complications associated with epidural blood patch include lumbovertebral syndrome, arachnoiditis (thought to be due to injection of blood into the subarachnoid space via an intrathecally placed catheter), acute meningeal irritation, deterioration of mental status and seizures, subdural haematoma, acute exacerbation of PDPH and transient bradycardia. (6, 13) The incidence of such events is unknown, but case reports are sporadic and infrequent. Nevertheless, because they may have serious consequences for the patient, such complications should be discussed when obtaining informed consent for blood patch. (12). Some anaesthetists perform sepsis screening and coagulation studies before the blood patch. (10) We did not perform either, but did exclude those who were febrile until fever had settled on antibiotic therapy.

In conclusion, current evidence in the literature supports the use of prophylactic blood patch if an epidural catheter has been reinserted after a dural puncture. (6) Nevertheless, results in this audit were unimpressive and the merit of routinely using prophylactic blood patch is unresolved. Many older articles appear to have overestimated the efficacy of a therapeutic blood patch after dural puncture with a Tuohy needle in the obstetric population. A policy of providing the first blood patch on demand is likely to result in permanent relief of PDPH in less than 50% of cases. The influence of the volume of blood injected requires further controlled investigation, but appears weak. Success rates with a single blood patch after accidental dural puncture with 16- or 18- gauge Tuohy needles in the obstetric population appear most closely related to timing after breach of the dura. Recurrent headache is a common event unless blood patch is delayed by at least 48 h, but a randomized trial would be required to determine if delayed blood patch. Repeat blood patch results in similar outcomes to that of the first blood patch. After failed blood patch, alternative diagnoses for postpartum headache should always be reconsidered. (26)

Acknowledgements

The authors wish to thank our nursing and medical colleagues for their assistance in the identification and management of these cases.

References

- 1.- Gleeson, C; Reynolds, F. Accidental dural puncture rates in UK obstetric practice. **Int J Obstet Anesth** 1998; 7: 242-246.
- 2.- Brownridge, P. The management of headache following accidental dural puncture in obstetric patients. **Anaesth Intensive Care** 1983; 11: 4-15.
- 3.- Hunter, GJ; Fogel, ST; Holtmann, B. The recognition and management of accidental dural puncture in obstetrical patients (abstract) **Anesth Analg** 1997; 84: S390.
- 4.- Stride PC; Cooper, GM. Dural taps revisited. A 20-year survey from the Birmingham Maternity Hospital. **Anaesthesia** 1993, 48: 247-255.
- 5.- Costigan, SN; Springs, JS. Dural puncture. The Patient's Perspective. A patient survey of cases at a DGH maternity unit 1983-1993. **Acta Anaesthesiol Scand** 1996; 40: 710-714.
- 6.- Duffy, PJ; Crosby, ET. The epidural blood patch. Resolving the controversies. **Can J Anesth** 1999; 46: 878-886.
- 7.- Gormley, JB. Treatment of postspinal headache. **Anesthesiology** 1960; 21: 565-566.
- 8.- Crawford, JS. Experiences with epidural blood patch. **Anaesthesia** 1980; 35: 513-515.
- 9.- Paech, MJ; Banks, S; Gurrin, L. Accidental dural puncture during epidural insertion of a Tuohy needle in obstetric patients. **Int J Obstet Anesth** 2001; 10: 172-176.
- 10.- Sajjad, T; Ryan, TDR. Current management of inadvertent dural taps occurring during the siting of epidurals for pain relief in labour. A survey of maternity units in the UK. **Anaesthesia** 1995; 50: 156-159.
- 11.- Souron, V; Simon, L; Sacquin, P; Hamza, J. Current management of inadvertent dural taps occurring during epidural analgesia for pain relief in labour: a French postal survey (Abstract). **Brit J Anaesth** 1998; 80: A253.
- 12.- Berger, CW; Crosby, ET; Grodecki, W. North American survey of the management of dural puncture occurring during labour epidural analgesia. **Can J Anaesth** 1998; 45: 110-114.
- 13.- Williams, EJ; Beaulieu, P; Fawcett, WJ; Jenkins, JG. Efficacy of epidural blood patch in the obstetric population. **Int J Obstet Anesth** 1999; 8: 105-109.
- 14.- Ascanio, RS; Evans, RE; Siegle, J; Curry CS. Successful therapeutic epidural blood patch in obstetrics. Later rather than sooner. (Abstract). **SOAP Abstracts, Anesthesiology Suppl** 1999; A96.
- 15.- Pratt, SD; Sarna, MC; Soni, AK; Oriol, NE. Efficacy of greater than 20 cc volumes for epidural blood patch. (Abstract) **Anesthesiology** 1996; 85: A875.
- 16.- Taivainen, T; Pitkanen, M; Tuominen, M; Rosenberg, PH. Efficacy of epidural blood patch for post-dural puncture headache. **Acta Anaesthesiol Scand** 1993; 37: 702-705.
- 17.- Abouleish, E; de la Vega, S; Blendinger, I, Tio, T. Long term follow-up of epidural blood patch. **Anesth Analg** 1975; 54: 459-463.
- 18.- Kwan, WF; Chen, BJ, Liao, KT; Lee, MDC. Epidural blood patch after inadvertent dural puncture in parturients: time vs. success rate and hemodynamic changes. (Abstract). **Anesthesiology** 1995; 83: A986.
- 19.- Loeser, EA; Hill, GE; Bennet, GM; Sederberg, JH. Time vs. success rate for epidural

- blood patch. Anesthesiology 1978; 49: 147-148.
- 20.- Rutter, S; Russell, R; Popat, M. Efficacy of epidural blood patch in obstetric population (Letter). Int J Obstet Anesth 2000; 9: 69-71.
- 21.- Tobias, MD; Pilla, MA; Rogers, C; Jobes, DR. Lidocaine inhibits blood coagulation: implications for epidural blood patch. Anesth Analg 1996; 2: 766-769.
- 22.- Ti, KL; Lee, TL. Inhibition of coagulation by local anesthetics. A comparison of lidocaine, bupivacaine, and ropivacaine. (Abstract) Anesth Analg 1999; 88: S282.
- 23.- Szeinfel, M; Ihmeidan, IH; Moser, MM.; Machado, R; Klose, KJ; Serafini, AN. Epidural blood patch. Evaluation of the volume and spread of blood injected into the epidural space. Anesthesiology 1986; 64: 820-822.
- 24.- Martin, R; Jourdain, S; Clairoux, M; Tetrault, JP. Duration of decubitus position after epidural blood patch. Can J Anesth 1994; 41: 23-25.
- 25.- Beards, SC; Jackson, A; Griffith, AG; Horsman, EL. Magnetic resonance imaging of extradural blood patches. Appearances from 30 min to 18 h. Brit J Anaesth 1993; 71: 182-188.
- 26.- Stocks, GM; Woodler, DJA; Young, JM; Fernando, R. Postpartum headache after epidural blood patch. investigation and diagnosis. Brit J Anaesth 2000; 84: 407-410.