

Obstetrical and Pediatric Anesthesia

Expectant management of postdural puncture headache increases hospital length of stay and emergency room visits

[Le traitement symptomatique de la céphalée post-ponction durale augmente la durée du séjour hospitalier et les visites à la salle d'urgence]

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Purpose: This retrospective cohort study examined hospital length of stay (LOS) and emergency room (ER) visits in parturients diagnosed with postdural puncture headache (PDPH) following recognized dural puncture (DP). All cases were managed expectantly. Outcomes were compared with matched controls with uneventful labour epidurals.

Methods: After Ethics Committee approval, the hospital perinatal database was used to identify healthy parturients with recognized DP during labour epidural placement from 1996–2001. Women developing PDPH after expectant management were matched with women with uneventful epidurals and no evidence of PDPH, as well as by parity, delivery mode and admission date. All women delivered term singletons. The primary outcome was LOS (hours) from delivery to discharge. Secondary outcomes included: number (#) nights in hospital, #ER visits for PDPH, epidural blood patch (EBP) timing (pre vs post discharge), EBP location (ward vs ER) and blood volumes used.

Results: 26 cases and 26 controls were identified. Precise discharge times were found for 23 cases and 23 controls. In cases, the LOS was increased by a mean of 17 ± 23.8 (SD) hours; [95% confidence interval (CI) = 8, 26; $P = 0.0012$] and # nights in hospital was increased by a mean of 0.62 ± 0.94 nights (95% CI, 0.26, 0.98, $P = 0.0027$). Nineteen cases (73% 19/26) received at least one EBP. Sixteen cases received at least one EBP prior to discharge with 38% (6/16) returning to ER for re-assessment/repeat EBP. Forty-four percent (4/9) of cases without an EBP prior to discharge returned to ER for further assessment/EBP.

Conclusion: PDPH leads to a significant increase in hospital LOS and ER visits. Studies of preventive therapy are warranted.

Objectif: Notre étude rétrospective de cohorte a vérifié la durée de séjour (DDS) hospitalier et le nombre de visites à la salle d'urgence (SU) de parturientes souffrant de céphalée post-ponction durale (CPPD) comparées à des témoins qui ont eu une analgésie péridurale sans conséquence.

Méthode: La consultation de la base de données de l'hôpital nous a permis de trouver des parturientes en santé qui avaient subi une PD reconnue pendant la mise en place de l'analgésie péridurale entre 1996 et 2001. Les victimes de CPPD après un traitement symptomatique ont été comparées aux femmes sous péridurale sans incident et sans CPPD, comparées aussi par parité, selon le mode d'accouchement et la date de l'admission. Toutes les femmes n'avaient eu qu'un seul enfant à terme. Le principal paramètre était la DDS (heures) entre l'accouchement et le départ. Les autres paramètres étant : le nombre (#) de nuits à l'hôpital, le # de visites à la SU pour CPPD, le moment du colmatage sanguin péridural (CSP) (avant vs après le congé), l'endroit où il a été fait (la chambre vs la SU) et les volumes de sang utilisés.

Résultats: Nous avons trouvé 26 cas et 26 témoins. Les heures précises de départ étaient notées pour 23 cas et 23 témoins. Chez les cas, la DDS était plus longue de $17 \pm 23,8$ (écart type) heures en

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moyenne ; [intervalle de confiance (IC) de 95 % = 8, 26 ; $P = 0,0012$] et le # nuits à l'hôpital a augmenté en moyenne de $0,62 \pm 0,94$ nuits (IC de 95 %, 0,26, 0,98, $P = 0,0027$). Dix-neuf cas (73 % 19/26) ont reçu au moins un CSP. Seize cas ont reçu au moins un CSP avant de quitter l'hôpital et 38 % (6/16) sont revenues à la SU pour la réévaluation/la répétition du CSP. Quarante-quatre pour cent (4/9) des cas sans CSP avant le congé sont revenus à la SU pour une évaluation plus poussée/ un CSP.

Conclusion : Les CPPD augmentent significativement la DDS hospitalier et le nombre de visites à la SU. Cette situation justifie d'autres études de traitement préventif.

POSTDURAL puncture headache (PDPH) is the most common significant morbidity of dural puncture (DP) and an important source of litigation against anesthesiologists.^{1,2} The reported incidence of unintentional DP during epidural placement varies widely (0.04–6%) in North America.³ Though prophylactic epidural blood patching (EBP) has been advocated by some when a large gauge DP is recognized,^{4–9} in many institutions, management of such punctures is expectant and associated with a high rate (75–86%) of PDPH.^{10,11}

While concerns related to the risks and effectiveness of prophylactic EBP limit its widespread use,¹² expectant management is also likely to be associated with "costs." This matched retrospective cohort study examined hospital length of stay (LOS) and emergency room (ER) visits in healthy parturients developing PDPH after expectant management of recognized DP during labour epidural placement. Outcomes were compared with women receiving uneventful labour epidurals with no evidence of PDPH in the medical record. All women had uneventful vaginal deliveries (spontaneous or instrumental) and had healthy full-term singletons.

Methods

After Research Ethics Board approval, the institutional perinatal database was used to identify ASA I–II parturients with recognized DP during epidural placement at the Women's College Campus from 1996–2001 and to provide an initial screening tool for study eligibility. Independent review of the medical charts was done to confirm eligibility and to permit verification of cases and controls. Outcomes were compared between healthy women with uneventful deliveries developing PDPH (cases) after expectant management of recognized DP and matched controls with uncomplicated labour epidurals.

Inclusion criteria were: absence of significant maternal medical illness, delivery of a healthy full-term (> 37 weeks) singleton, and an uncomplicated vaginal (spontaneous or instrumental) delivery. Women with the following characteristics on the database that could increase LOS were excluded *a priori*: premature delivery, multiple gestation, neonatal intensive care admission, or antibiotic use in the postpartum period. Women with evidence of third or fourth degree perineal tears, urinary retention, noted difficulties with breastfeeding and excessive neonatal weight loss (> 10% birth weight) according to our lactation consultants on chart review were also excluded.

Selection of PDPH cases

The charts of women with recognized DP meeting study inclusion criteria were reviewed by two independent reviewers (P.A., S.T.) to ensure that DP had occurred, to determine whether PDPH had developed, and to confirm patient eligibility. Only patients receiving expectant management of recognized DP (usual hospital practice) were included. Prophylactic therapy involving use of the epidural space (normal saline, EBP) or intrathecal catheter placement were considered reasons for exclusion. PDPH was defined as the presence of a postural headache or neckache (with or without cranial nerve symptoms) present at > 24 hr after epidural placement and lasting at least an additional 24 hr, occurring within the first ten days of epidural placement.

Selection of matched controls

By using the perinatal database, controls were matched with cases by parity (multiparous *vs* primiparous), mode of vaginal delivery (spontaneous *vs* instrumental) and date of admission within one year. Women with instrumental deliveries were matched for forceps *vs* vacuum extractions. A perinatal database programmer (not associated with the study) matched women with the closest possible admission dates using patient characteristics and eligibility criteria present in the database. Once matched, the charts of controls were reviewed by two independent reviewers to confirm study eligibility, the accuracy of matching and to exclude evidence of DP or PDPH. In the instance where controls were found to be ineligible, the data programmer then chose the next closest match by the next closest date of admission.

Outcomes were assessed only after patients were entered into the study and assigned to groups. The primary outcome was LOS (hours) from birth to patient discharge or last recorded time in the chart. Secondary outcomes included: 1) number of nights

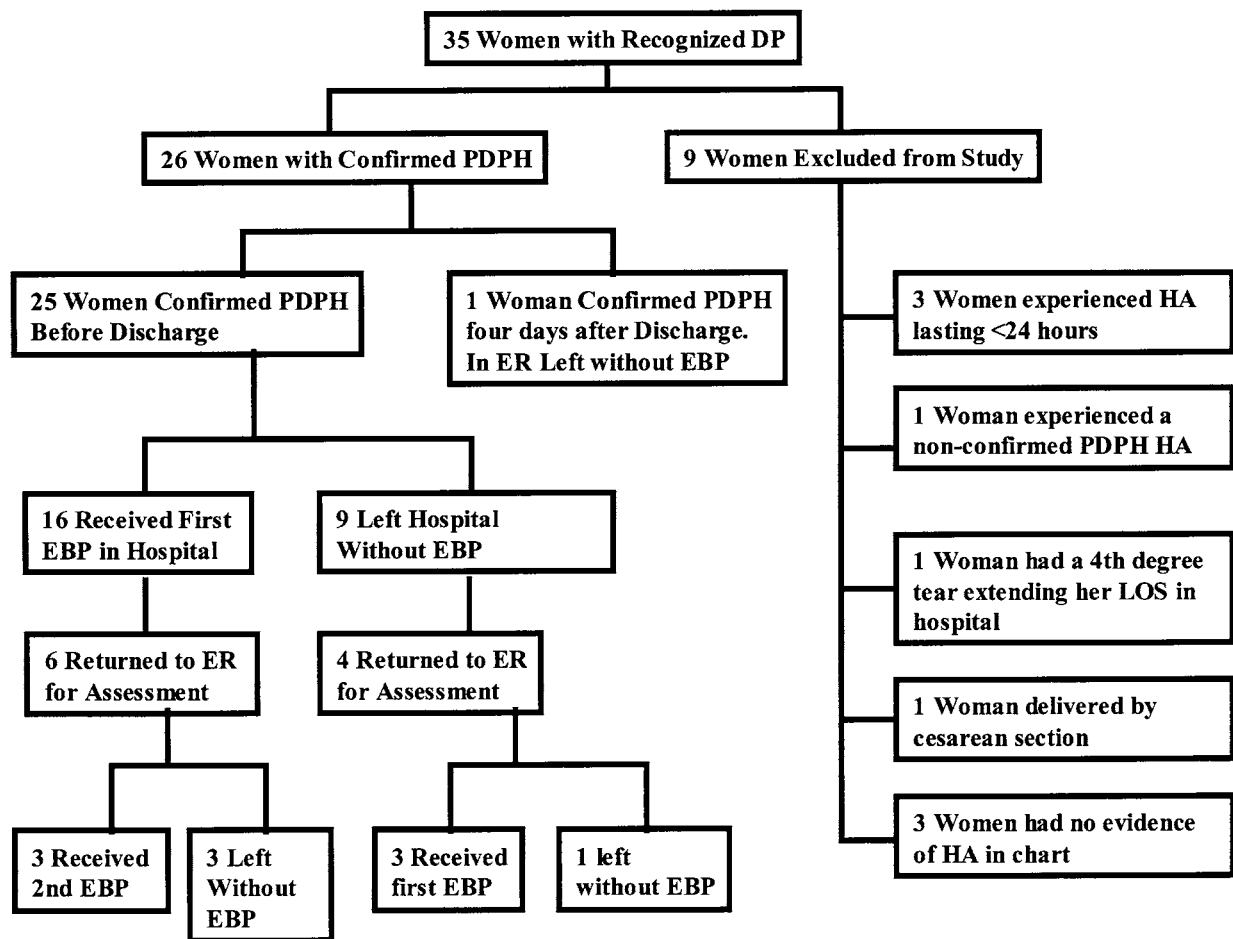


FIGURE 1 Flow chart describing all women with dural punctures. PDPH = postdural puncture headache; ER = emergency ward; EBP = epidural blood patch; HA = headache.

spent in the hospital; 2) number of ER visits after delivery; 3) EBP timing (pre *vs* post-discharge); 4) EBP effectiveness; and 5) EBP blood volume used. Length of hospital stay for women with recognized DP and PDPH was compared with matched controls without recognized DP or evidence of PDPH in the chart. LOS for women with recognized DP and no evidence of development of PDPH while in hospital is also reported.

Usual hospital practice

In our hospital, management of a recognized large gauge DP is usually expectant. Patients and staff are informed of the DP, the symptoms of PDPH are described as well as the spectrum of available therapies, and arrangements are made to follow the patient. Management includes opioid and non-opioid anal-

gesics, non-steroidal anti-inflammatory drugs, caffeinated beverages, maintenance of normovolemia, stool softeners and instructions to avoid straining, and early ambulation to permit early detection. Therapeutic blood patches are usually performed for moderate to severe persistent PDPH and are given after discussion with the patient. Hospital discharge is based upon achievement of discharge-based criteria (rather than a set time). These include: stable vital signs, normal bladder function, the ability to manage the activities of daily living including breastfeeding and a neonatal weight loss within the accepted norm (< 10% birth weight). These criteria did not change over the study period.

Statistical analysis

The primary outcome, mean difference in length of hospital stay between matched pairs, was analyzed

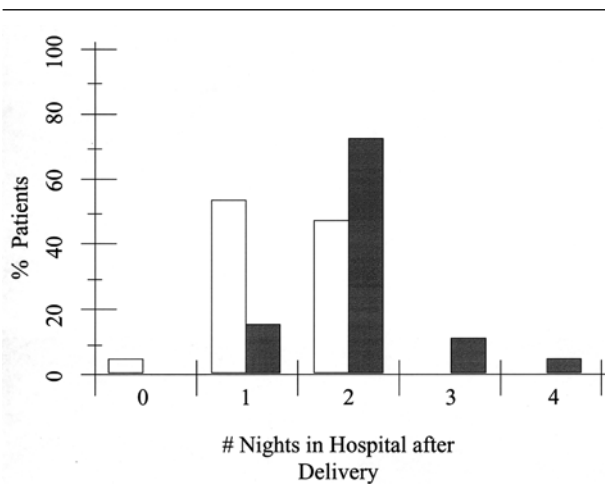


FIGURE 2 Number of nights spent in hospital after delivery in the controls (clear bars) and in the cases (shaded bars).

using paired t test with alpha, two-tailed, set at 0.05. Sample size calculation done *a priori* suggested that 23 matched pairs were required to achieve a power of 80% to detect a minimally clinically important difference of 12 hr between groups at a conventional significance level of less than 0.05. The secondary outcome, number of nights spent in hospital post-delivery, was analyzed using a paired t test with a two-tailed alpha set at 0.025 to correct for multiple testing.

Results

The charts of 35 women identified with recognized DP during labour epidural placement in the database were examined. Twenty-six women developed PDPH according to our definition to give an overall study incidence of 74% (26/35); (Figure 1). These 26 women met all of the study eligibility criteria and were included as cases. The remaining nine women with DP were excluded for the following reasons: three women experienced headaches lasting < 24 hr; one experienced a non-evolving non-postural headache; one had a fourth degree vaginal tear extending her stay; one delivered by Cesarean section; and three women had no evidence of PDPH in the chart. LOS was 52 ± 16 (SD) hours in women who developed PDPH as compared with 35 ± 13 (SD) hours in those with uncomplicated epidurals. In three women with recognized DP but no evidence of PDPH (who otherwise met study entry criteria), LOS was 33 ± 16 (SD) hours.

The 26 women with PDPH meeting study entry criteria were matched with 26 controls. Precise discharge times were found for 23 cases and 23 controls.

TABLE I Patient demographics

	Cases (n = 26)	Control (n = 26)
Age (yr)	31 ± 1	31 ± 1
Weight (kg)	67 ± 2	62 ± 3
Height (cm)	166 ± 2	165 ± 2
Gestational age (weeks)	39 ± 1	40 ± 1

Data are means \pm SEM. Weights were recorded for $n = 19$ in both groups. Heights were recorded for $n = 19$ in the case group and $n = 17$ in the control group.

TABLE II LOS and number of nights in hospital

	Increase in cases vs controls	Actual range:
LOS in Hospital	17 ± 23.8 (SD) hours (95% CI, 8, 26; $P = 0.0012$)	Cases: 27–84 hr Controls: 2–61 hr
# Nights in hospital	0.62 nights ± 0.94 (95% CI, 0.26, 0.98; $P = 0.0027$)	Cases: 1–4 nights Controls: 0–2 nights

LOS = Length of stay; CI = confidence interval.

Demographics did not differ significantly between groups (Table I). Hospital stay in PDPH cases was increased by a mean of 17 ± 23.8 (SD) hours [95% confidence interval (CI), 8, 26; $P = 0.0012$]. The number of nights spent in hospital post-delivery was increased by a mean of 0.62 ± 0.94 (SD) in women with PDPH (95% CI, 0.26, 0.98; $P = 0.0027$); (Table II). Figure 2 demonstrates the range of nights spent in hospital for both cases and controls. None of the controls visited the ER whereas 10 cases made a total of 14 visits to the ER, all of which were related to PDPH.

Overall, 73% (19/26) of women with PDPH received at least one EBP (blood volume $18.7 \text{ mL} \pm 2.5 \text{ mL}$). Sixteen women received their first EBP while in hospital. Six of these women returned to the ER (within three days of discharge) for additional assessment of PDPH and 3/6 received at least one repeat blood patch.

Nine women with suspected PDPH symptoms while in hospital did not receive an EBP prior to discharge. Four of these women returned to the ER within six days of discharge for PDPH reassessment with 3/4 receiving their first EBP.

Discussion

In many institutions, management of recognized dural puncture is expectant, aimed more at early detection and early symptom management than at efforts to fur-

ther prevent PDPH. The current lack of an objective diagnostic tool makes it difficult to diagnose PDPH in the presence of only mild non-postural symptoms and impossible to predict which patients will ultimately develop PDPH and require an EBP. Thus expectant management usually means that patients must develop moderate to severe postural symptoms before the diagnosis of PDPH is made and effective treatment (EBP) instituted. While prophylactic EBP is likely to be associated with risks, expectant management is also likely to be associated with "costs" of its own including additional use of health resources and importantly, human costs related to maternal quality of life and effects on maternal-infant bonding. Unfortunately, the overall quality of the literature related to PDPH is poor¹³ and the relative risks and benefits of prophylactic *vs* therapeutic EBP remain unclear.¹⁴

Our study examined length of hospital stay and ER visits attributable to expectant management of PDPH in women with recognized DP during epidural placement. The overall incidence of PDPH was 75% (19/26) in women with DP and is consistent with the incidence found in the greater literature.^{11,15} The small number of cases identified over the study period reflect the low institutional DP rate (0.5%; epidural analgesia is provided only by staff anesthesiologists and senior anesthesia residents and fellows) and the stringent criteria necessary for study entry. The stringent eligibility criteria used were constructed to avoid confounding of the primary outcome of interest, hospital LOS, by other factors such as air headache, maternal co-morbidities, neonatal prematurity, or complications of delivery in each group. We chose to measure LOS only in women with both recognized DP and PDPH (rather than all parturients with recognized DP) since this approach allowed a more precise estimation of the "true costs" of expectant management related to LOS and ER visits. We excluded women with PDPH symptoms lasting less than the first 24 hr after DP since these self-limiting headaches were likely to represent headache related to air used as part of loss of resistance technique rather than cerebral spinal fluid leak.¹⁶

Women with recognized DP (meeting study entry criteria) but no evidence of PDPH stayed in hospital around the same amount of time as women with uncomplicated epidurals [33 ± 16 (SD) *vs* 35 ± 13 (SD) hours respectively]. We found that patients who developed PDPH stayed in hospital longer (17 hr on average), that the added time usually involved an extra overnight stay, and that both women with treated and untreated headache prior to discharge had a high rate of return to the ER for assessment and treatment.

Information related to the added LOS in those with recognized DP and PDPH also provides an estimate of the maximal potential benefit (reduction in hospital stay, ER visits) possible by using prophylactic EBP. Ultimately these "costs", among others associated with expectant management, must be weighed against the potential benefits and risks of prophylactic EBP. No attempt was made to place a monetary value on the use of these resources. Since prophylactic EBP is not commonly used in our institution (only one patient was identified as having received a prophylactic EBP in our review), no attempt was made to assess the value of this modality.

Overall, our results suggest that parturients developing PDPH following expectant management of recognized DP with a large gauge epidural needle have a high rate of EBP utilization (73%, 19/26) and is consistent with the literature. We found that approximately 40% of parturients receiving an EBP for moderate to severe PDPH prior to discharge returned to the ER for reassessment/treatment. Similarly, around 40% of patients discharged with milder PDPH symptoms (and no EBP) were also found to have returned to the ER for further assessment/treatment.

Recent work suggests that delayed EBP, given more than four days after DP, may be associated with a lower failure rate than EBP given within the first four days of DP.¹⁷ It should be noted that the authors of this study took great care in the interpretation of their results, noting that their findings may simply reflect the more refractory nature of more severe headaches, which are more likely to be associated with larger gauge needles, more likely to be treated earlier and probably more likely to fail therapy, rather than evidence to suggest that one should delay EBP to improve the odds of success following large gauge punctures. We believe that this carefully noted observation applies to the results found in our study and would not recommend delaying EBP in symptomatic patients following DP except in the cases where air headache is possible or alternative causes of PDPH-like symptoms are being entertained (for example, sagittal sinus thrombosis in pre-eclampsia). Since most of the women in our study receiving an EBP prior to discharge did so within the first four days of DP and information on the success rates of EBP administered in the ER is not available, we cannot comment on the role of timing of EBP on success rate in our study.

While acknowledging the limitations inherent in retrospective research, we believe that our results provide a reasonable estimate of the added length of hospital stay attributable to PDPH in women managed expectantly. Further, the results presented must be

viewed as a conservative estimate of resource utilization since any additional visits to other health care providers for interim assessment of headache (e.g., family practitioners) would not have been captured.

In summary, our results suggest that PDPH, managed expectantly, extends hospital LOS compared with women without PDPH and increases the number of ER visits in the immediate postpartum period compared with women without PDPH. We would suggest that, in the absence of contraindications, clinicians treat moderate to severe PDPH symptoms with EBP prior to discharge and provide parturients with information necessary for further follow-up/reassessment should this become necessary. We also believe that additional studies related to prophylactic therapy are warranted.

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