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Unintentional Dural Puncture with a Tuohy Needle Increases Risk of Chronic Headache

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BACKGROUND: Neuraxial analgesia is chosen by almost half of women who give birth in the United States. Unintentional dural puncture is the most common complication of this pain management technique, occurring in 0.4% to 6% of parturients. Severe positional headaches develop acutely in 70% to 80% of these parturients. Acute postdural puncture headaches are well known, but few studies have investigated long-term sequelae. We investigated the incidence of and risk factors for chronic headache and chronic back pain in parturients who experienced unintentional dural puncture with a 17-gauge Tuohy needle compared with matched controls.
METHODS: In a case control design, 40 parturients who sustained unintentional dural puncture with a 17-gauge Tuohy needle over an 18-month period and 40 controls matched for age, weight, and time of delivery were recruited by telephone and 2 validated questionnaires were administered assessing headache and back pain symptoms 12 to 24 months after delivery.
RESULTS: The incidence of chronic headaches in the study group (28%) was significantly higher than in the matched controls (5%) (OR = 7, $P = 0.0129$). Subjects who experienced dural punctures were more likely than controls to report chronic back pain (OR = 4, $P = 0.0250$), but treatment with an epidural blood patch was not a risk factor for chronic back pain.
CONCLUSIONS: Patients who incur unintentional dural punctures with large-gauge needles are surprisingly likely to continue to suffer chronic headaches. Treatment with an epidural blood patch does not enhance the risk of chronic back pain. The pathophysiology underlying these symptoms and the best treatment for this syndrome are not known. (Anesth Analg 2012;115:124–32)

Neuraxial anesthesia was first introduced into obstetrics by the Swiss obstetrician Dr. Oscar Kreis.[1] Neuraxial anesthesia has become one of the most frequently used analgesic modalities for the treatment of labor pain. Although neuraxial anesthesia is considered safe, unintentional dural puncture is the most common complication.[2–4] Occurring in 0.4% to 6% of parturients, unintentional dural punctures are associated with acute severe positional headache in approximately 70% to 80% of these parturients.[5,6] It has been assumed that these headaches are self-limited, and they are normally successfully treated with either an epidural blood patch (EBP) or conservative therapy. It is concerning, however, that case reports have described long-term headache symptoms in patients with known dural punctures but previously undiagnosed postdural puncture headaches (PDPHs). These cases were successfully managed with EBPs up to 24 months after the initial dural puncture.[7–9] MacArthur et al.[10] reported a 23% incidence of headache lasting longer than 6 weeks in parturients who had sustained a dural puncture with a large-gauge needle. When compared with matched controls, this difference was found to be significantly greater. The long-term outcome in these patients was not reported.

The optimal prophylactic measures and treatment modalities for acute PDPH are controversial. In the setting of an unintentional dural puncture, possible courses of action are to place a catheter into the intrathecal space to use for analgesia or to replace a catheter correctly in the epidural space. If an epidural catheter is successfully replaced, one has the option to perform a prophylactic blood patch after resolution of anesthesia.[1,11,12] There is good agreement that placing autologous blood into the epidural space through a de novo epidural puncture (blood patch) 24 to 48 hours after the dural puncture is an effective treatment for acute headache symptoms although the headache may recur.[2,3,5,12–14]

To address the question of whether unintentional dural puncture with a large-gauge needle is a risk factor for chronic headache, we administered a validated pain questionnaire[14,15] to a cohort of patients who had incurred this complication and to matched controls 12 to 24

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months after delivery. We hypothesized that unintentional dural puncture with a large-gauge Tuohy needle is a risk factor for the development of chronic headache and that the EBP would mitigate this risk. We also administered a validated questionnaire for chronic back pain[16] to determine whether treatment with an EBP is a risk factor for chronic back pain.

METHODS

With approval from the IRB at Columbia University Medical Center (CUMC), we identified parturients treated at CUMC between January 2009 and June 2010. Parturients who delivered during this time period and had a known dural puncture with a 17-gauge Tuohy needle were identified from divisional Quality Assurance records. Parturients with preexisting headache or backache disorders, those who refused to participate, and those who could not be reached for follow-up were excluded from the study. Sixty-five index cases were identified during this time period and were followed by the obstetric anesthesiology team during their hospitalization. Forty patients met inclusion criteria and agreed to participate by answering our questionnaires. Those patients were matched to a control patient who had the same type of neuraxial anesthesia and delivery but did not have an unintentional dural puncture, delivered within 1 week of the index patient, and were found to be the closest in height, age, and weight.

Management of acute dural puncture was at the discretion of the attending anesthesiologist who treated the patient. Modalities used for acute management included placement of an intrathecal catheter, prophylactic or therapeutic EBP, and/or conservative therapy. Symptomatic patients were all offered conservative treatment with acetaminophen, oxycodone/acetaminophen, and/or butalbital/acetaminophen/caffeine and/or an EBP. All patients were followed by the clinical anesthesia team acutely in the hospital or by telephone until improvement of symptoms. Patients were advised to contact the anesthesiology department if headache symptoms persisted.

Blood patches were performed with aseptic technique by either an attending anesthesiologist or a resident anesthesiologist under the direct supervision of the attending. Autologous blood was collected using a sterile technique and 15 to 20 mL of blood was slowly injected into the epidural space until the full volume was delivered or the patient complained of pressure or pain.

Twelve to 24 months after the dural puncture, the index patients and their matched controls were recruited by telephone. Upon obtaining verbal informed consent, the investigator administered questionnaires according to an IRB-approved telephone script (Appendix). The questionnaire used to evaluate headache was derived from the Chronic Pain Grade Questionnaire created and validated by Von Korff et al.[15,16] This instrument was created to measure chronic pain for severity, persistence, and disability. It has been validated in patients who suffer from back pain, headache, and temporomandibular joint pain.[15,17,18] The chronic back pain questionnaire was derived from the Low Back Pain Rating Scale as developed by Manniche et al.[19] This scale separately rates pain, disability, and physical impairment with pain scales. It was originally validated in patients who had undergone lumbar spine surgery but has been used in clinical trials of primary care patients with back pain, disk herniation, and to assess various treatment paradigms.[20–22] Patients were also asked to rate their satisfaction with the obstetric anesthesiology team on a scale of 0 to 10 with 0 being the worst and 10 the best. Patients who acknowledged chronic headache and back pain were advised to contact their primary care physicians for referral to the chronic outpatient pain clinic at CUMC.

The association between the incidence of acute headache and previously associated risk factors (maternal height, weight, and age) was evaluated in study patients. Demographic characteristics were compared between subjects who had a dural puncture and control patients including maternal age, height, weight, body mass index (BMI), interval since delivery, and parity to evaluate the quality of matching to control subjects. The mean values for continuous variables were compared with a Mann-Whitney *U* test. The statistical relationships were evaluated with InStat3 (GraphPad Software, La Jolla, CA) and R (www.r-project.org). The incidence of chronic headache and back pain, as well as the degree of pain-related disability were compared between study subjects and controls using Fisher exact test. $P < 0.05$ (2-tailed) was used to reject the null hypothesis. We used the Holm-Bonferroni correction to adjust for multiple comparisons.[23] Because the *P* values for the association between dural puncture and headaches, back pain and headache, and back pain disability are nearly identical, both corrected and uncorrected values are given.

Because we did not have a good idea of effect size (incidence of chronic headaches), we studied all available index cases that occurred since detailed quality assurance data began being collected in January 2009. However, we used simulation with the existing data to derive a post hoc sample size calculation that can be used to plan future studies.

RESULTS

Sixty-five parturients who sustained an unintentional dural puncture were identified by our Quality Assurance team. From this group, 40 met inclusion criteria and agreed to participate. Each index patient was matched with a control patient for age, height, and weight (Fig. 1). There was no significant difference in age, height, or weight between study subjects and control patients. Subjects who had an unintentional dural puncture were more likely to be parous than their matched controls ($P = 0.0280$). The average interval between time of delivery and administration of the questionnaires was 18 months with a standard deviation of 5.6 months and was not different between index cases and controls (Table 1).

Thirty-three parturients who had sustained an unintentional dural puncture with a 17-gauge Tuohy needle reported an acute PDPH during their hospitalization (83%). Among the index cases, parturients with a higher BMI and body weight were more likely to develop acute PDPH compared with parturients with a lower weight ($P = 0.0230$) and BMI ($P = 0.0215$). There were no other significant associations between demographic variables and acute headache incidence (Table 2). Twenty-four of the 33 parturients with an acute PDPH were treated with an EBP. Six

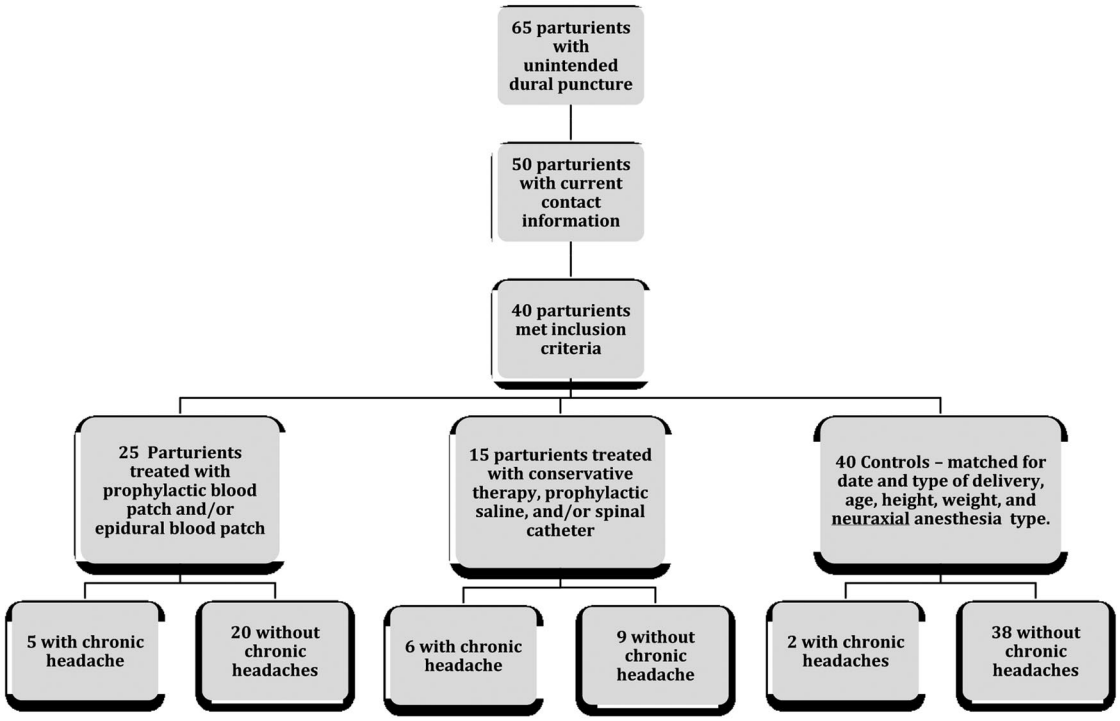

Figure 1. Distribution of controls and index cases. Sixty-five parturients who had unintentional dural puncture with a 17-gauge Tuohy needle were identified by the obstetric anesthesiology team during their hospitalization. Of these patients, 50 had current contact information and 40 met the inclusion criteria and agreed to participate. Forty control parturients who delivered within 1 week of the index cases were matched for delivery date, delivery type, neuraxial anesthesia type, and maternal age, height, and weight.

Table 1. Demographic Characteristics of Subjects and Matched Controls

	Dural puncture (n = 40)	IQR	Control (n = 40)	IQR	P value
Age (y)	32	27–34	32	28–34	NS
Height (cm)	165	160–168	164	161–168	NS
Weight (kg)	79	69–85	75	69–83	NS
BMI (kg/m^2)	29	25–33	29	26–32	NS
Interval (mo)	18	12–21	20	12–24	NS
Parity	1.0	0.8–1.0	0	0–1	0.0280
Scoliosis (n)	0		0		NS
Preeclampsia (n)	1		0		NS
Migraine history (n)	0		0		NS

Subjects and controls were matched for neuraxial anesthesia type, delivery date and type, and maternal age, height, weight. Subjects who had an unintentional dural puncture were more likely to be parous than their matched controls. There were no other significant differences. Interval (months) between time of delivery and administration of questionnaire between index cases and controls was not significantly different. The incidence of scoliosis is unknown in the control population. Continuous variables are expressed as median (interquartile range [IQR]) and compared with the Mann-Whitney U test.

NS = not significant; BMI = body mass index.

Table 2. Characteristics of Index Patients Who Developed Acute Postdural Puncture Headaches

	No headaches (n = 7)	IQR	Headaches (n = 33)	IQR	P value
Age (y)	33	22–39	32	27–34	NS
Height (cm)	164	157–173	165	160–168	NS
Weight (kg)	65	59–76	80	73–86	0.0230
BMI (kg/m^2)	24	21–27	29	25–33	0.0215
Parity	1	0.3–1	1	1	NS
Scoliosis (n)	0		0		NS
Preeclampsia (n)	0		1		N/A
Migraine history (n)	0		0		N/A
Blood patch (n)	1		24		N/A

Parturients with a higher body mass index (BMI) and body weight were more likely to develop acute postdural puncture headaches compared with parturients with a lower weight and BMI. Blood patches include both prophylactic and therapeutic blood patches. Continuous variables are expressed as median and interquartile range (IQR) and compared using the Mann-Whitney U test.

NS = not significant.

blood patches were administered prophylactically before the onset of headache. Twenty-three of 24 patients with acute headache (96%) reported resolution of acute symptoms, whereas 1 patient was initially lost to follow-up and did not return phone calls from the obstetric anesthesia team. The average time to resolution of the acute headache was 2.8 ± 2.8 days.

When queried, approximately 18 months after the childbirth, 11 of 40 parturients (28%) who sustained an unintentional dural puncture reported chronic headaches whereas only 2 of the 40 well-matched controls (5%) reported chronic headaches (Fig. 2A). This difference between parturients who sustained an unintentional dural puncture and controls was statistically significant (odds ratio = 7, P = 0.0129, 0.0387 corrected). There were no demographic differences between those who developed chronic headaches compared with those without chronic headaches (Table 3). Within the dural puncture group, only 5 of the 25 parturients treated with an EBP (20%) developed chronic headaches whereas 6 of the 15 parturients who were not treated with a blood patch (40%) developed chronic headaches (Fig. 2B). However, this trend did not reach statistical significance (P = 0.153).

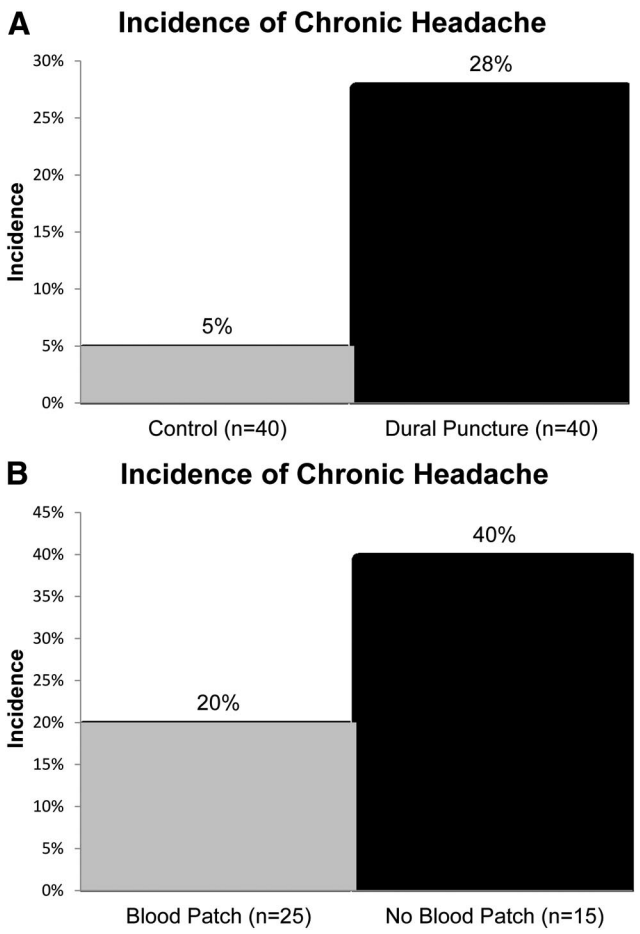

Figure 2. Incidence of chronic headache. A, Parturients with known dural punctures compared with matched controls. In the dural puncture group, 11 of 40 (28%) had chronic headaches compared with 2 of 40 (5%) of the controls (odds ratio = 7, **P* = 0.0129, 0.0387 corrected). B, Incidence of chronic headache in parturients with known dural punctures who were treated with an epidural blood patch (EBP) versus those not treated with an EBP. Five of 25 parturients treated with an EBP (20%) developed chronic headaches compared with 6 of 15 parturients who were not treated with an EPB (40%). The difference was not statistically significant (*P* = 0.153).

Patients who had a dural puncture were also more likely to have chronic back pain. In the dural puncture group, 17 of the 40 parturients (43%) reported chronic back pain as compared with 6 of the 40 matched controls (15%). This difference was significant (odds ratio = 4, *P* = 0.0125, 0.0250 corrected; Fig. 3A). Treatment with an EBP did not increase the likelihood of chronic back pain. Eight of the 25 parturients treated with an EBP (32%) reported chronic back pain whereas 9 of the 15 parturients who were not treated with a blood patch (60%) reported chronic back pain. This difference was not statistically significant (Fig. 3B). Chronic headache and chronic backache traveled together as 7 of the 11 parturients (64%) who had chronic headache also endorsed chronic back pain. Similarly, 7 of the 17 parturients (41%) who had chronic back pain also had chronic headaches.

Disability related to chronic headaches and chronic back pain was evaluated using the Chronic Pain Grade Questionnaire and the Low Back Pain Rating Scale, respectively.

Table 3. Characteristics of Index Patients and Chronic Headache

	No chronic headache, *n* = 29/40 (72%)	IQR	Chronic headache, *n* = 11/40 (28%)	IQR	*P* value
Age (y)	33	28–35	30	25–33	NS
Height (cm)	165	160–171	162	157–167	NS
Weight (kg)	77	69–83	81	70–86	NS
BMI (kg/m^2)	28	26–32	29	27–33	NS
Parity	1	0–1	1	0–1	NS
Scoliosis (*n*)	0		0		NS
Preeclampsia (*n*)	1		0		NS
Migraine history (*n*)	0		0		NS
Blood patch (*n*)	20		5		NS

There were no significant demographic differences between parturients who developed a chronic headache and those who did not. Continuous variables are expressed as median and interquartile range (IQR) and compared using the Mann-Whitney *U* test. Treatment with an epidural blood patch did not significantly reduce the incidence of chronic headache.

NS = not significant; BMI = body mass index.

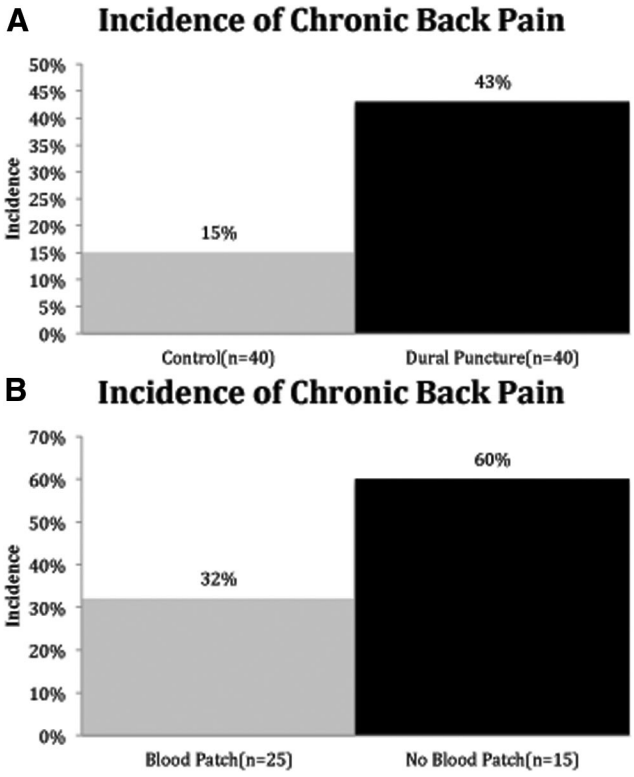

Figure 3. Incidence of chronic back pain. A, Parturients with known dural punctures compared with match controls. In the dural puncture group, 17 of 40 (43%) reported chronic back pain compared with 6 of 40 (15%) of matched controls (odds ratio = 4, **P* = 0.0125, 0.0250 corrected). B, Incidence of chronic back pain in parturients with known dural punctures who were treated with an epidural blood patch (EBP) versus those not treated with an EBP. Eight of 25 parturients treated with an EBP (32%) reported chronic back pain compared with 9 of 15 parturients not treated with an EBP (60%). The difference was not statistically significant.

Parturients with known dural punctures were more likely to experience disability from chronic headaches as compared with well-matched controls because 7 of the 40 parturients with dural punctures (18%) had headache

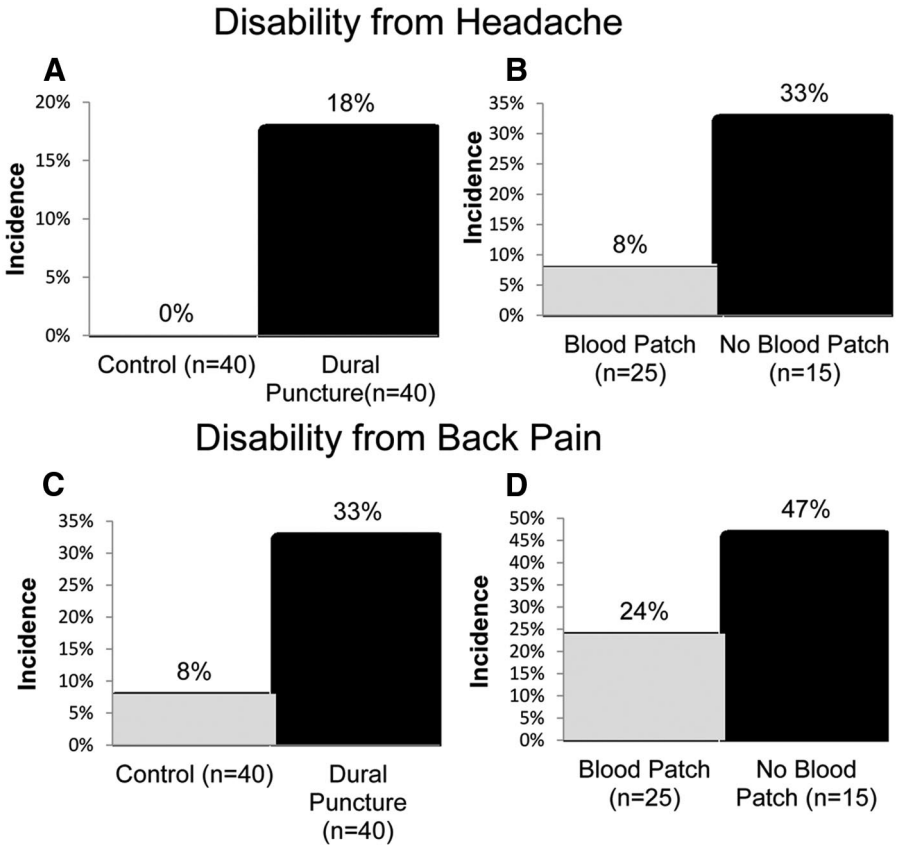

Figure 4. Pain-related disability. A, Headache disability in patients who had dural puncture versus no dural puncture. Seven of 40 parturients with known dural puncture (18%) experienced disability from chronic headache pain whereas none of the control parturients experienced disability (odds ratio = 18, $*P = 0.0117$). B, Headache disability after dural puncture, blood patch versus no blood patch. In patients who had dural puncture, 2 of 25 parturients treated with an epidural blood patch (EBP) (8%) complained of disability from headache pain whereas 5 of 15 patients not treated with an EBP (33%) experienced disability from headache pain. Using Fisher exact test, this difference was not statistically significant. C, Back pain disability, dural puncture versus no dural puncture. Three of 40 parturients in the control group (8%) experienced disability from back pain. Thirteen of 40 parturients with known dural punctures (33%) experienced disability from back pain (odds ratio = 6, $*P = 0.0129, 0.0516$). D, Back pain disability, blood patch versus no blood patch. Six of 25 parturients treated with an EBP (24%) experienced disability from back pain. Seven of 15 parturients not treated with an EBP (47%) experienced disability from back pain. Using Fisher exact test, this difference was not statistically significant.

symptoms that limited function whereas none in the control group reported disability (odds ratio = 18, $P = 0.0117$; Fig. 4A). Treatment with an EBP did not significantly attenuate the risk of disability in this sample. Of patients who had dural punctures, 2 of 25 parturients treated with an EBP (8%) complained of disability from headache pain and 5 of 15 patients not treated with an EBP (33%) experienced disability from headache pain. This difference also did not reach statistical significance (Fig. 4B).

Parturients with known dural punctures were also more likely to experience disability from back pain as compared with matched controls, although the value is slightly higher than 0.05 when corrected for multiple comparisons according to the Holm-Bonferroni method. Thirteen of 40 parturients with a known dural puncture (33%) experienced back pain–related disability as compared with 3 of 40 well-matched controls (8%) (odds ratio = 6, $P = 0.0129$, 0.0516; Fig. 4C). Treatment with an EBP did not increase the risk of disability from back pain; in fact, there was a trend suggesting potential mitigation. Seven of the 15 patients who did not receive EBPs (47%) experienced some level of disability whereas only 6 of 25 of those who received EBPs (24%) experienced disability from back pain (Fig. 4D).

DISCUSSION

Unintentional dural puncture continues to be the most common complication associated with neuraxial anesthesia,[2,4] resulting in acute PDPH in 70% to 80% of parturients who experience this complication.[5,6] We have identified a surprisingly high incidence of chronic head and back pain in these patients using validated pain scales in an investigation remote from the inciting event. The principal finding of our case control study is that chronic headaches are more likely after an unintentional dural puncture, occurring in 28% of patients who had dural puncture with a 17-gauge Tuohy needle. Nearly 20% of these women experienced significant disability from the reported headaches. The incidence of chronic back pain was also found to be higher in patients who had dural punctures and may be part of a chronic postdural puncture syndrome. There was overlap between chronic headache and backache; 7 of the 11 parturients (64%) who reported chronic headaches also had chronic back pain. The physiological mechanism that underlies the back pain may in fact be related to that mediating the chronic headaches.

The incidence of chronic headache that we have identified is high but is supported by previous studies. MacArthur et al.[10] reported a 23% incidence of headache and/or neck pain persisting at 6 weeks whereas control patients had a low (7.1%) incidence of these symptoms. These rates are similar to those in our more remote cohort. If the parturients studied are comparable, it might imply that patients who have headaches at 6 weeks after dural puncture are unlikely to recover without treatment. Prospective longitudinal studies will be required to answer this question. MacArthur's group did not evaluate the effect of EBP or the incidence of back pain.

Eighty-three percent of our index patients experienced acute postdural puncture syndromes giving an incidence of acute symptoms similar to that found in other studies.[5,6]

All but one was reported to have resolved acutely and that patient was initially lost to follow-up. Seven members of our study group did not develop any headache symptoms during their hospitalization. From this group, 6 were managed with conservative therapy and 1 with a prophylactic EBP immediately after resolution of the anesthesia. From this group, 3 (50%) reported chronic headaches. As such, acute headache syndrome may not be required for the development of chronic headache.

EBP is regarded as the gold standard treatment for acute PDPH and has been found to be 50% to 70% effective in treating the acute headache symptoms related to a large-gauge needle.[6,24] However, little is known about what, if any, long-term complications might be caused by epidural placement of autologous blood. We were concerned that treatment with an EBP might result in trading a headache for long-term back pain. Although our sample size was relatively small (40) and only 25 patients were treated with EBPs, there was no suggestion that treatment with an EBP was a risk factor for remote back pain. In fact, parturients who received EBPs were less likely to report chronic back pain. The difference did not reach statistical significance for a protective effect, but it is possible that not only are EBPs not a risk factor for long-term chronic back pain, they may actually be beneficial for its prevention. These findings will have to be pursued in larger, likely multicenter trials because even large centers that have high epidural rates should have relatively low rates of unintentional dural puncture.

The pathophysiology associated with conversion from acute to remote dural puncture headaches is not known. Dural perforation, regardless of the needle type, results in leakage of cerebral spinal fluid (CSF) at a rate that is greater than its production.[25] Although the exact mechanism for the acute headache is not well understood, many believe that the resulting intracranial hypotension causes traction of intracranial structures and induces a compensatory adenosine-mediated dilation of the meningeal vasculature.[1,25,26] Initially, the injection of blood (or any fluid) leads to an increase of the epidural pressure that reverses the cerebral vasodilation while subsequent fibroblastic reactions lead to closure of the perforated dura.[3,27–29] The recurrence of headaches in patients treated with EBPs might be explained by inadequate sealing of the initial areas of dural perforation or might be due to recurrence of this migraine-like physiology.[30] It is possible that in our patients, chronic CSF leakage has resulted in enhanced blood flow in the meninges that cover both the head and spinal cord. This explanation is supported by the finding that patients who had headache years after a dural puncture have been successfully treated with an EBP.[8,9] Alternatively or in addition, the pain syndromes reported may be a manifestation of central sensitization.

The International Headache Society defines persistent PDPHs that do not spontaneously resolve after 7 days as CSF fistula headaches.[3,31] Although it is true that some of these chronic headaches may result from dural fistulas that allow chronic leak of CSF, it is also very likely that, similar to other chronic headache syndromes, central sensitization predisposes to recurring headache symptoms.[32] In patients who have a predisposition for developing a chronic pain syndrome, the severe headache associated with a PDPH may be the inciting factor leading to central sensitization. Moreover, several studies have found pain memory to have an important role in developing chronic pain syndromes. Patients who have experienced a traumatic painful event are more likely to consider pain symptoms important.[33–35] It is important to note that this investigation only included patients who did not have headache or back pain before delivery. The impact of dural puncture on patients with continuing head and back pain syndromes is unknown.

Our study has several limitations, some of which are inherent to case control studies. The retrospective nature of case control design lends itself to recall bias, such that patients with unintentional dural punctures may attribute pain to the event and over-report symptoms. Additionally, given our relatively low rate of dural punctures at our institution (<1%, from Quality Assurance data), our sample size was small even over a relatively long period. Because the incidence of chronic headaches after a dural puncture was unknown, we were not able to estimate a sample size based on a known occurrence rate. With our sample size of 40 index patients and 40 controls, we were able to answer our primary question of whether dural puncture is associated with remote headache. However, our post hoc power analysis suggests that our sample size was not adequate for the subgroup comparisons required to assess whether EBP is protective against developing chronic headache and/or back pain. Using various sample sizes randomly selected from our data, bootstrap analysis suggests that approximately 180 index cases would be required to have 80% power to detect the impact of EBP on chronic headache at the 0.05 level. Finally, although our study used validated pain questionnaires, we did not elucidate specific headache symptoms to determine the type and nature of the chronic headaches that would ultimately aid in determining best treatment modalities.

These limitations can be addressed by continuing this investigation in a prospective multicenter trial. Currently, we are developing a prospective cohort study using validated pain questionnaires and diagnostic headache tools to corroborate our findings and elucidate mechanisms and best treatment modalities for patients who develop chronic headaches after dural puncture. Patients will be offered follow-up in our pain treatment centers so that the likely etiology of these headaches and backaches can be investigated by physical examination by pain physicians and the best treatment modality can be ascertained.

APPENDIX

Chronic Headache After Dural Puncture Questionnaire (IRB AAAF3467)

Hello, my name is Dr._____, I am part of the Anesthesiology care team at NY Presbyterian Hospital where you delivered your baby. Do you have a few minutes to talk about your anesthesia care?

Informed Consent

We are conducting a research survey to better understand possible outcomes that women have after anesthesia for childbirth. We will be asking you a few questions about

headache and backache based on your experience. With your permission, we will also look at your medical records for things that might make it more or less likely that you would suffer from a headache or backache. We hope that your answers will help us to better treat other women with similar experiences. Your responses and identity will be kept confidential, your name and medical record number will be eliminated and only a number assigned to you. There are no risks to you, you may choose not to participate, your participation is voluntary, and refusal to participate will not affect your future care in any way. This will take approximately 5 to 10 minutes of your time. If you have any questions about the research, you may contact Dr. Flood's office at 212-305-2008.

Yes: continue

No: Thank you very much for your time, have a great day!

1. Did you have headaches or back pain before your delivery?

Yes: headache

On average how often did you have a headache?
Average how severe (0–10)?
On average how long did they last?
How long have you had this problem?
Yes: backache
On average how often did you have back pain?
Average how severe (0–10)?
On average how long did it last?
How long did you have this problem?

2. Have you had headaches since your delivery?

If Yes: headache questionnaire

3. Have you had back pain since your delivery?

If Yes: backache questionnaire

Last question

4. Can you give us a rating of your overall satisfaction with your anesthesia care at CUMC? (0–10)

Thank you for helping us with this important research.

Low Back Pain Rating Scale (Manniche et al.[19])

1. Pain at this time (0–10)
2. Worst back pain in 2 weeks (0–10)
3. Average level of back pain (0–10)

Disability Index

1. Can you sleep at night without low back pain interfering?
2. Can you do your daily work without low back pain reducing your activities?
3. Can you do easy chores at home such as watering flowers or cleaning the table?
4. Can you put on shoes and stockings by yourself?
5. Can you carry 2 full shopping bags (10 kg in total)?
6. Can you get up from a low armchair without difficulty?
7. Can you bend over the wash basin to brush your teeth?
8. Can you climb stairs from one floor to another without resting because of low back pain?
9. Can you walk 400 meters without resting because of low back pain?
10. Can you run 100 meters without resting because of low back pain?
11. Can you ride a bike or drive a car without feeling any low back pain?
12. Does low back pain influence your emotional relationship to your nearest family?
13. Did you have to give up contact with other people within the last 2 weeks because of low back pain?
14. If it was of present interest, do you think that there are certain jobs which you would not be able to manage because of your back trouble?
15. Do you think that the low back pain will influence your future?

The Chronic Pain Grade Questionnaire (Smith et al.[16])

For the following questions with a scale of 1-10 please circle one number only

1. How would you rate your pain on a 1-10 scale at the present time, that is right now, where 0 is "no pain" and 10 is "pain as bad as could be"?

No pain										Pain as bad as could be
0	1	2	3	4	5	6	7	8	9	10

2. In the past six months, how intense was your worst pain rated on a 0-10 scale where 0 is "no pain" and 10 is "pain as bad as could be"?

No pain										Pain as bad as could be
0	1	2	3	4	5	6	7	8	9	10

3. In the past six months, on average, how intense was your pain rated on a 1-10 scale, where 0 is "no pain" and 10 is "pain as bad as could be"? (That is, your usual pain at times you were experiencing pain.)

No pain										Pain as bad as could be
0	1	2	3	4	5	6	7	8	9	10

4. About how many days in the last six months have you been kept from your usual activities (work, school or housework) because of this pain?

0-6 days	
7-14 days	
15-30 days	
31 or more days	

5. In the past six months, how much has this pain interfered with your daily activities rated on a 1-10 scale where 0 is "no interference" and 10 is "unable to carry on activities"?

No interference										Unable to carry on activities
0	1	2	3	4	5	6	7	8	9	10

6. In the past six months, how much has this pain changed your ability to take part in recreational, social and family activities where 0 is "no change" and 10 is "extreme change"?

No change										Extreme change
0	1	2	3	4	5	6	7	8	9	10

7. In the past six months, how much has this pain changed your ability to work (including housework) where 0 is "no change" and 10 is "extreme change"?

No change										Extreme change
0	1	2	3	4	5	6	7	8	9	10

RECUSE NOTE

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Attestation: Christopher Allen-John Webb has seen the original study data, reviewed the analysis of the data, approved the final manuscript, and is the author responsible for archiving the study files.
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