OBSTETRICS

Postpartum headache: is your work-up complete?

Caroline L. Stella, MD; Cristiano D. Jodicke, MD; Helen Y. How, MD; Ursula F. Harkness, MD; Baha M. Sibai, MD

OBJECTIVE: Headache is a common finding in the postpartum period, and there are limited data describing the cause and treatment of women with postpartum headache. Our objective was to describe our experience with women who were hospitalized for postpartum headache and to develop a management algorithm for these women.

STUDY DESIGN: Data for 95 women with headache >24 hours after delivery from 2000-2005 were reviewed retrospectively. Maternal assessment included an evaluation for benign and serious causes of headache that included preeclampsia, dural puncture, and neurologic lesions. Neurologic imaging were performed on the basis of initial neurologic findings and clinical course. Outcomes that were studied included cause, a need for cerebral imaging, neurologic findings, maternal complications, and long-term follow-up evaluations.

RESULTS: The mean onset of headache was 3.4 days (range, 2-32 days) after delivery. Tension-type/migraine headache was the most common cause (47%). Preeclampsia/eclampsia and spinal headache comprised 24% and 16% of cases, respectively. Anesthesia evaluation was required in 15 patients because of suspected spinal headache; blood patch was required in 12 of these patients. Cerebral imaging was performed in 22 patients because of focal neurologic deficits and/or failure to respond to initial therapy; 15 of these women (68%) had abnormal findings. Ten patients had serious cerebral pathologic findings, such as hemorrhage, thrombosis, or vasculopathy. There were no deaths; 2 women had minor residual neurologic damage on follow-up evaluation.

CONCLUSION: The evaluation of persistent headaches that develop >24 hours after delivery must be performed in a stepwise fashion and requires a multidisciplinary approach. Preeclampsia should be considered initially in women with hypertension and proteinuria. Normotensive women should be evaluated initially for tension-type/migraine headache or spinal headache. Patients with headache that is refractory to usual therapy and patients with neurologic deficit require cerebral imaging to detect the presence of life-threatening causes.

Key words: postpartum headache, migraine headache, tension headache, spinal headache, preeclampsia

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Headache is 1 of the most common symptoms that are encountered in the postpartum period.[1] The postpartum period is characterized usually by various life changes such as sleep deprivation, irregular food intake, and dehydration. All of these factors can be associated potentially with a headache. Hormonal fluctuations in estrogen levels and headaches (particularly migraine headache) tend to recur in the postpartum period.[1-3] The reported incidence of postpartum headache ranges from 11% to 80%.[4] Goldszmidt et al[3] reported a 39% incidence of headache in the first 7 days after delivery. Despite its frequency, investigations that relate to postpartum headache are limited.[3] Evidence-based literature exists mainly in anesthesia and neurology journals,[4-7] whereas obstetric literature on postpartum headache is confined to case reports.[8-12]

Previous investigations are far encompassing in scope and focus on primary headaches, such as migraine headaches. The medical literature is scarce on the postpartum course of migraine headaches. In a retrospective review, Stein[1] reported that 61% of patients with a family history of migraine headaches and 64% of patients with a history of migraine headaches have a recurrence in the postpartum period. Sances et al[6] followed 96 patients with migraine headaches during pregnancy until the postpartum period and found a 34% recurrence within the first week after delivery and a 55.3% recurrence within the first month after delivery.

Headache can be classified as primary or secondary. Migraine headaches, tension-type headaches, and cluster headaches are considered to be primary headache.[3] A common, but underreported, cause of a primary headache in the puerperium includes orgasmic headache.[13] The proposed triggers of puerperal orgasmic headache are hormonal (elevated estrogen, prolactin, and oxytocin levels) and neurologic (autonomic nervous system regulation of orgasm) in origin.[14] Secondary headaches include headaches that are the result of regional anesthesia complications, obstetric complications, or neurologic lesions.[3] In 1 of the earlier works on postpartum headache, Stein et al[2] proposed the following definition for *postpartum headache*: usually bifrontal, prolonged (may last for 12 hours), with

From the Division of Maternal-Fetal Medicine, Department of Obstetrics and Gynecology, University of Cincinnati College of Medicine, Cincinnati, OH.

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Reprints: Baha Sibai, MD, Division of Maternal-Fetal Medicine, University of Cincinnati, 231 Albert Sabin Way, Room 5052, Medical Sciences Building, PO Box 670526, Cincinnati, OH 45267-0526; baha.sibai@uc.edu

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mild photophobia and/or mild nausea; anorexia; and a history of migraine headache that respond to minor analgesia and not as severe as classic migraine headache. There are minimal data that describe the cause and treatment of women with postpartum headache that begins >24 hours after delivery. Previous studies include the onset of headache that included the first 24 hours from delivery. Our study describes women with severe headaches that developed during hospitalization and/or after discharge because of new onset of severe headaches. Our objective was to describe our 5-year experience with a large number of women who were hospitalized because of postpartum headache >24 hours after delivery. We also aimed to develop a management algorithm to guide clinicians in diagnosing life-threatening causes of postpartum headache.

Material and Methods

This was a retrospective analysis of data for patients who were hospitalized because of postpartum headache at The University Hospital, Inc, between the years 2000 and 2005. *Postpartum headache* was defined as the onset of severe unrelenting headache >24 hours from the time of delivery and within 42 days after delivery. Based on this definition, the inclusion criteria were patients who had a headache >24 hours who were either in the hospital or who were readmitted because of a headache and patients who had a severe unrelenting headache that was unresponsive to the usual doses of analgesics. The exclusion criteria included patients who had a headache for the first time during the first 24 hours after delivery and patients with known neurologic disease such as epilepsy, a history of previous stroke, and known central nervous system malformation.

The cause of the headache was assigned on the basis of the diagnosis that was given by the staff physician who was on-call and was based on patient symptoms that are listed in the criteria that was established by the International Headache Society.[13] Severity of headache was graded by the staff at the obstetric special care unit. Whenever possible, the level of functionality was assessed. Patients were identified through discharge diagnosis International Classification of Diseases, 9th Revision, codes and from a perinatal database. This study was approved by the institutional review board at our institution. Records were reviewed for patient demographic information, the timing of postpartum headache, associated medical or obstetric complications, labor and delivery demographics, pertinent laboratory findings, the anesthesia that was used during labor and delivery, radiologic imaging studies, the use of any medications (primarily magnesium sulfate, antihypertensive agents, anticoagulants, and anticonvulsants), postpartum information (eg, breastfeeding), and follow-up anesthetic or neurologic care and associated morbidities.

Patients with hypertension and proteinuria were diagnosed initially as having severe preeclampsia.[15] Patients with hypertension and seizures were diagnosed initially as having eclampsia.[16]

Proteinuria was defined as dipstick proteinuria of 2+ on at least 2 occasions or the presence of 24- hour urine protein of ≥300 mg.[17] Magnesium sulfate and/or antihypertensive agents were started in these patients. In these women, further work-up such as neurologic consultation and imaging studies was performed as needed for patients whose condition was unresponsive to magnesium sulfate and antihypertensive therapy and for patients who had a neurologic deficit. Eclampsia was considered atypical if seizures developed at >48 hours from the time of delivery or refractory to 24 hours of magnesium sulfate therapy (recurrent seizures, despite magnesium sulfate therapy).

For patients with a history of regional anesthesia placement, a record of the number of attempts, type and gauge of needle used, and modes of anesthesia placement (spinal, epidural, general or combination) were obtained. Anesthesia consult was obtained when a patient had history of regional anesthesia placement and a severe headache that was unresponsive to maximal doses of analgesics. Radiologic imaging studies were performed in patients with evidence of neurologic deficits and/or in patients refractory to therapy for dural puncture (at least 2 attempts of blood patch)[18] to rule out central nervous system pathologic conditions (tumors, hemorrhage, thrombosis, and infection).

Neurologic consult was obtained when the patients had neurologic deficits and/or abnormal imaging studies other than posterior reversible encephalopathy syndrome (PRES), which is a common finding in women with eclampsia.

In our institution, postpartum patients with complications usually are referred to a home health agency for follow-up evaluation. In addition, patients with medical complications received their postpartum follow-up visit in our special clinic for medical complications of pregnancy. Hence, all patients had follow-up visits for at least 6 weeks from delivery. Maternal outcome and follow-up data included subsequent death and any residual neurologic deficits.

Results

During the study period, 95 patients with severe headache >24 hours after delivery were identified. Seventy-eight of these women (82%) were already in the hospital at the onset of their headache, and 17 of the women (18%) were reevaluated for headache after discharge. Fourteen of the latter 17 patients required readmission because of their symptoms; 3 women were discharged home from the triage area after evaluation and treatment.

Table 1 describes the demographic characteristics of the study patients. The mean maternal age was 25.2 years (range, 14-39 years), and 44% of the women had a history of depression. A total of 83 women (87%) received some type of regional anesthesia, and 29% of the women had cesarean section.

Table 2 describes the presumed cause of postpartum headache in the study patients. Tension-type headache and/or migraine headache was considered the cause in 47% of these women. Fifteen women (16%) were diagnosed with spinal headache. All 15 of these women received anesthesia consult. The condition of 3 of the 15 women responded to analgesics and/or caffeine and fluid adminis-

TABLE 1
Patient demographic information

Demographic	N	%
Age (y)		
<30	76	80
>30	19	20
Nulliparous	22	23
Race		
White	51	54
African American	39	41
Hispanic	3	3
Other	2	2
Smoker	27	28
History of headache		
Migraine with or without aura	10	10
Tension headache	37	39
Combined diagnosis	8	8
Depression		
Antepartum	21	22
Postpartum	2	2
Breastfeeding	60	63
Obstetric complication		
Chronic hypertension	10	11
Diabetes mellitus	8	8
Asthma	5	5
Thrombophilia	1	1
Anesthesia use		
Epidural	54	57
Spinal	19	20
Combined epidural/spinal	10	11
General	8	8
None	4	4
Cesarean section	28	29

tration; 12 women required a blood patch (1 of the 12 women required 2 blood patches).

Twenty-three women had a diagnosis of preeclampsia/eclampsia (5 women had eclampsia). Maternal blood pressure on admission ranged from 145 to 188 mm Hg systolic and from 92 to 130 mm Hg diastolic. Proteinuria was diagnosed by dipstick in 20 women and by 24-hour sample in 3 women. Nineteen women received intravenous magnesium sulfate for preeclampsia/eclampsia for seizure prophylaxis or treatment. The duration of magnesium sulfate therapy ranged from 24 to 48 hours. Eight women also required antihypertensive medications for control of severe hypertension. One of the 23 women in this group was later diagnosed with cerebral venous thrombosis.

Five women received anticonvulsants for the treatment of seizures that were unrelated to eclampsia, and 3 women received anticoagulants for thrombophilia and/or cerebral venous thrombosis.

Twenty-two patients required radiologic imaging. Indications for cerebral imaging were focal neurologic deficits (n = 8 women), new onset seizures (n = 3 women), recurrent seizures while receiving magnesium sulfate (n = 2 women), persistent visual changes (photophobia, blurred vision, and blindness; n = 14 women), and persistent refractory headache (n = 8 women). Some of these women had >1 indication for cerebral imaging. Table 3 describes the cerebral imaging findings in these women. Only 7 of these women (32%) had normal findings. The remaining 15 women had various neurologic lesions such as PRES (Figure 1), sagittal sinus thrombosis (Figure 2), parietal hemorrhage (Figure 3, **A**), and vasculitis (Figure 3, **B**).

There were no maternal deaths. Neurologic consult was obtained in 22 cases. On follow-up evaluation, only 2 patients had sustained residual neurologic symptoms. One patient was diagnosed initially with status migrainosus as the result of multiple visits and a lack of response to maximal doses of analgesics. She underwent 4 imaging studies: The first 2 studies were normal, and the third imaging study revealed a vasculitis for which she received corticosteroids. She later sustained a facial droop from a left hemispheric stroke (the finding of her fourth imaging study). Another patient had the same sequela after a diagnosis of a left transverse sinus thrombosis. She had photophobia, severe headache, and neck pain. She consequentially sustained a facial droop. Hemiparesis, paraparesis, and other focal neurologic deficits may occur in this case when the thrombosis propagate to the surface veins.[19] Her brain magnetic resonance imaging showed marked hypointensity within cortical veins of the frontal lobe that extended to the superior sagittal sinus.

COMMENT

The findings of our study provide important information regarding the initial evaluation and subsequent treatment of women who experience persistent headaches > 24 hours after delivery, particularly those with headaches after discharge from the hospital. Many of these patients are seen initially by either an obstetrician or an emergency room physician. In addition, anesthesiologists and/or neurologists may also be called to provide help in the treatment of these cases.

Our findings show that the most common reason for persistent headache >24 hours after delivery is tension-type headache and/or migraine headache. These findings are contrary to the common dictum that postpartum headache usually is caused by a spinal headache.[18] This might be due to the fact that we excluded patients who had headaches during the first 24 hours delivery. Our findings, however, are similar to those that were reported by Goldszmidt et al,[3] who reported that primary headaches (tension or migraine) are nearly 20 times more frequent that a secondary headache (postdural puncture).

TABLE 2
Cause of postpartum headache (n = 95)

	Number	%
Tension-type headache	37	39
Preeclampsia/eclampsia	23	24
Spinal headache	15	16
Migraine headache	10	11
Pituitary hemorrhage/ mass	3	3
Cerebral venous thrombosis	3	3
Cerebral vasculopathy	2	2
Thalamic lesion	1	1
Subarachnoid hemorrhage	1	1

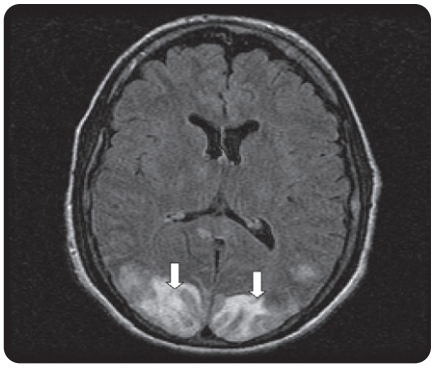
TABLE 3
Neurodiagnostic evaluation (n = 22 patients)

Variable	N	Onset of headache (postpartum day)
Normal imaging	7	2-11
Abnormal imaging	15	2-32
Pituitary hemorrhage/mass	4	2-32
PRES*	4	2-16
Cerebral venous thrombosis†	3	2-10
Inflammatory changes	2	6-14
Thalamic lesion	1	2
Subarachnoid hemorrhage	1	6

* PRES-posterior reversible encephalopathy syndrome.
† One of the patients had vasculitis and left parietal hematoma.

Hormonal changes in the postpartum period usually are characterized by estrogen withdrawal.[6] This pivotal event is associated with an increase in serotonergic tone.[20] It is reported that ovarian steroids play a critical role in serotonin synthesis, reuptake, and degradation, which may explain the theoretic relief of migraine headaches in pregnancy and its recurrence postpartum within the first week of delivery.[20,21] This trend does not seem to apply to tension headache, which is not associated with estrogen levels and, hence, remains unchanged in pregnancy.[4]

FIGURE 1
T2-weighted brain MRI shows abnormal hyperintense cortical and subcortical signal in the occipital lobes consistent with PRES



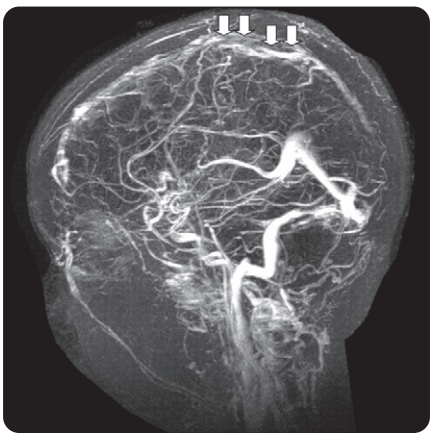
The *arrows* point to cerebral edema in the occipital lobes.

Refractory headaches can be due to either migraine headache with or without aura or tension-type headache. Migraine headaches normally improve during pregnancy but promptly recur after delivery. This phenomenon is due to the sustained estrogen levels in pregnancy and estrogen fluctuations after delivery.[6]

There are conflicting data regarding whether breastfeeding reduces or increases the likelihood and severity of headaches in the postpartum period.[22-24] It is interesting to note that most of the patients in our study were breastfeeding; however, our study design does not allow us to address the impact of breastfeeding on the course of headache in the postpartum period because we do not know what percent of women breastfeed in our general patient population.

The evaluation of postpartum headache should be performed in a stepwise fashion and requires a multidisciplinary approach (Figure 4). The typical parturient who complains of a postpartum headache usually is instructed to take analgesics. Those who continue to have persistent headache, despite the use of analgesics, require evaluation and treatment. Subsequent treatment will depend on their history, clinical findings, and presence or absence of associated neurologic symptoms or deficits. Patients without focal neurologic deficit and without findings that are consistent with preeclampsia should be considered initially to have tension-type or migraine

FIGURE 2
Three-dimensional reconstructed image from an magnetic resonance venogram with gadolinium shows the absence of normal enhancement of the superior sagittal sinus, which indicates thrombosis (*arrows*)

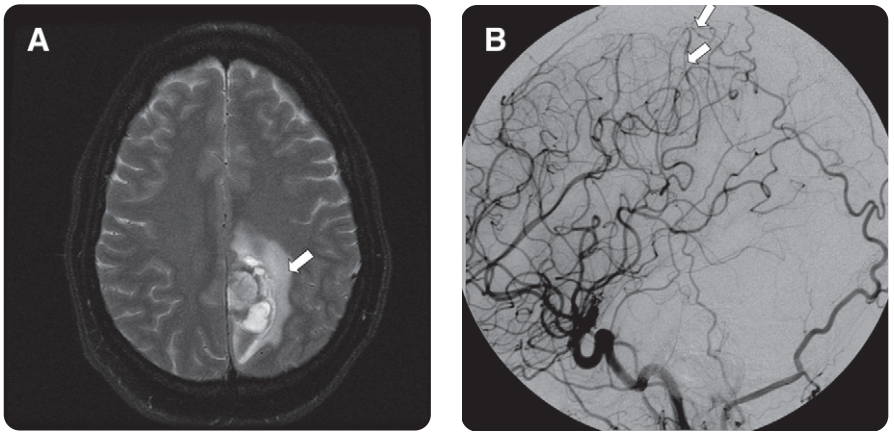


headache. If there is a history of regional anesthesia use and no associated neurologic deficits, the anesthesiologist is called for further evaluation and treatment. Severe unrelenting headaches with focal neurologic signs usually require neurologic imaging and then referral to neurologists. Obstetricians, family practitioners, and emergency room physicians who practice in centers without access to such referral system therefore must be able to recognize and triage the "ordinary" benign postpartum headache and the "not-so-ordinary" life-threatening headache that warrant evaluation and treatment in a timely fashion.

Preeclampsia should be considered particularly in women with hypertension and/or proteinuria. In patients with suspected preeclampsia, magnesium sulfate therapy must be initiated promptly for seizure prophylaxis, while considering an alternative pathologic finding for a headache.[15] Headache may herald an impending eclamptic seizure, especially late postpartum eclampsia (>48 hours after delivery).[25] Chames et al[25] emphasized that 79% of postpartum cases of eclampsia develop at >48 hours after delivery. Thus, we must be vigilant in the recognition of the atypical presentations

FIGURE 3

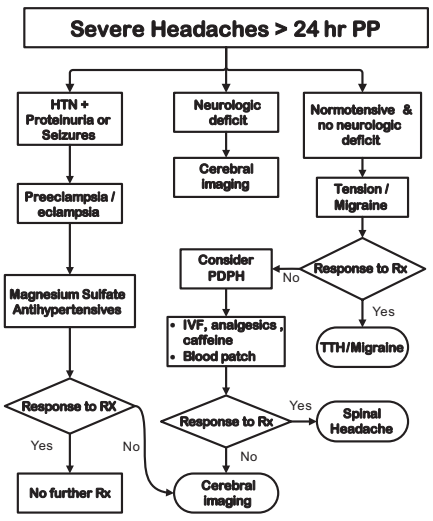
A, Axial T2-weighted magnetic resonance image shows a heterogenous signal in the left parietal parasagittal region with surrounding edema, which is compatible with a parenchymal hematoma. B, Right common carotid artery injection from a cerebral angiogram shows multiple areas of segmental narrowing in the distal anterior cerebral artery branch vessels, which is compatible with vasculitis (*arrows*)



of eclampsia (signs and symptoms that develop for the first time at >48 hours after delivery) and in those who continue to have seizures, despite adequate magnesium sulfate therapy.[26,27]

FIGURE 4

Proposed algorithm for the management of severe headache that lasts >24 hours after delivery



It is important to emphasize that some patients may have overlapping symptoms, diagnostic tests, and treatment. Therefore, the final diagnosis will depend on the clinical course, the response to treatment, and the result of the imaging study.

Parturients have a 1 in 67 risk of accidental dural puncture during epidural insertion, with approximately one-half of the puncture resulting in postdural puncture headache.[18] Most of these headaches occur in the first week after dural puncture, particularly in the first 24 hours after dural puncture.[18] The incidence of postdural puncture is increased in those women in whom ≥2 attempts made at the epidural site with the use of cutting and wider gauge needles.[18]

Women who are normotensive should be evaluated for spinal headache. Spinal headache is usually described as a severe headache, "searing and spreading over like hot metal."[18] Classic spinal headache is also characterized as postural that markedly improves by assuming the supine position and worsens by assuming an upright position.[8,28] In general, most postdural puncture headaches are self-limited and benign and will respond to analgesia and fluid hydration. However, blood patch should be administered to those women whose headache is unresponsive to maximum doses of analgesics, narcotics, caffeine, and adequate hydration. It is important to limit the number of blood patch placements to 2 and to proceed to neurologic imaging if there is no improvement in symptoms.

TABLE 4

Differential diagnosis of postpartum headache

Primary headache
Migraine headache
Tension-type headache (includes benign ordinary headache)
Orgasmic headache
Secondary headache
Postdural puncture headache
Preeclampsia/eclampsia
Cerebral venous sinus thrombosis*
Stroke (ischemic or hemorrhagic)*
Ruptured aneurysm or malformation
Hypertensive encephalopathy or bleeding
Cerebral arterial thrombosis or embolism
PRES
Postpartum cerebral angiopathy*/Call-Fleming syndrome
Pituitary apoplexy
Pseudotumor cerebri
Subarachnoid hemorrhage*
Meningitis*

* Life-threatening.

Continuous refractory headache with focal neurologic signs, without a history of migraine or tension headache, that are unrelieved by analgesics or change in position should have neurodiagnostic imaging to detect the presence of other possible causes.[29] Table 4 provides a list of all the possible differential diagnoses for this category.[30-38] One must realize that the differential diagnoses is far-encompassing, some even life-threatening.

In the puerperal period, several types of stroke can occur, including cerebral venous thrombosis (Figure 2).[39] In the largest cohort of 353 peripartum and postpartum stroke patients, Lanska and Kryscio[39] found a very strong association with pregnancy-related hypertension. Albeit rare, another major condition that deserves mention in the differential diagnosis of a puerperal headache is Call-Fleming syndrome, which is hallmarked by abrupt onset-headache, seizures, focal neurologic deficits, and segmental narrowing of cerebral arteries in a nonpreeclamptic woman.[12] Call et al[40] empha-

sized that a salient and constant feature of this syndrome is sudden, high-intensity headache with accompanying nausea, vomiting, and sometimes photophobia. When cortical blindness, aphasia, hemiparesis, and ataxia occur, they are attributable to the involvement of the occipital lobes and the "border zone" arterial territories.[14]

Cerebral angiopathy is another rare but important cause of both headache and stroke in the postpartum period.[37] Singhal et al[36] described cerebral angiopathy and Call-Fleming syndrome in the same category as a "spontaneous reversible vasoconstriction syndrome." This condition is usually benign but can manifest as seizures with accompanying focal neurologic signs.[41] On cerebral angiography, areas of focal narrowing and ectasia at the intracranial vessels (diffuse vasospastic process) are seen (Figure 3B).[42] Our patient with an initial diagnosis of a vasculitis eventually sustained a left parietal hemorrhage that was consistent with the literature on postpartum cerebral angiopathy (Figure 3A).[37,41-44]

PRES is clinically characterized by acute-onset headache, altered mental status, cortical blindness, and seizures with parietooccipital involvement.[30] Radiographically, it is characterized as edema in the white matter in the parietooccipital areas of the cerebral hemisphere (Figure 1).[44] This magnetic resonance image finding may be related to a variety of conditions. In our series, however, this finding was correlated with preeclampsia/eclampsia.

The strengths of our study are that (1) this is the only investigation in a select group of women with persistent headache beginning >24 hours after delivery and (2) this is a single-center study in which practices in obstetric and anesthesia management are standardized.

The study also has limitations that include its retrospective nature and inclusion of patients on the basis of discharge diagnosis. In the event that the condition was not coded correctly, the patient may have been excluded unintentionally. In addition, we may have also excluded most of the dural puncture headaches that occurred in the first 24 hours after delivery. Thus, our reported incidence of dural puncture headache is indeed an underestimation because of this selection bias. Another important consideration is the distinction between migraine and tension-type headache. Although there are strict criteria that are available from the International Headache Society, we have relied on the chart diagnosis that was established by the staff physician on-call. Finally, our study applies only to women who had persistent headache during hospitalization and/or women who returned for evaluation after hospital discharge because of persistent headaches. This selection bias might help explain the high rate of abnormal cerebral imaging finding in this study population.

In summary, postpartum headache is a very common complaint. The cause could be benign or life-threatening; therefore, the practicing physician should be aware of the various diagnostic and management modalities of this complaint. We recommend an algorithm that includes a rational stepwise approach towards its diagnosis and timely treatment for the evaluation of women who experience persistent headaches >24 hours after delivery. ■

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