A hospital based study of acute postpartum headache
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Background
Postpartum headache, including both primary and secondary headache disorders, affects between 12 and 39% of women after pregnancy.\textsuperscript{1-4} The prevalence of postpartum migraine in patients with a prior migraine history is quite high, with 24% of patients reporting migraine in the first postpartum week and 50-55% by the fourth post-partum week.\textsuperscript{5,6} Furthermore, 5% of women with migraine experience their first ever attack in the postpartum period.\textsuperscript{7} The unique physiology of the postpartum period including hypercoagulability and hormonal changes also increases the risk for secondary headache disorders—including headache attributed to cerebrovascular disease, preeclampsia (PEC) and related disorders. Lastly, the widespread use of epidural anesthesia results in increased rates of postdural puncture headache (PDPH) in this vulnerable population.

Differentiating between primary and secondary headache disorders in the acute postpartum period (up to six weeks after delivery) is a diagnostic challenge, particularly amongst the most severe patients referred for urgent neurological consultation. To our knowledge, there has been one prior retrospective study of acute headache diagnosis in the post-partum period.\textsuperscript{8} This study reported that over half (53%) of headaches in postpartum women were secondary in etiology including potentially life-threatening causes. However, it did not include patients who presented with headache within 24 hours of delivery. Our primary objective was to describe diagnoses in women presenting emergently in the postpartum period with acute headache across a broad timespan, and to determine which factors may predict secondary versus primary headache.

Methods
We conducted a single-center retrospective study of consecutive postpartum women age ≥18 years presenting with acute headache to a large urban tertiary-care hospital between July 1, 2009 and December 31, 2016. Consultations were requested by the obstetrical service or emergency department and performed by the neurology teaching service. Measures ascertained from chart review included demographics, attack features, timing with respect to delivery (<24 hrs, 24-72 hrs, >72 hrs), information regarding labor/delivery (including type of delivery, method of anesthesia, complications), prior histories (headache, neurological, psychiatric and medical), physical examination data, laboratory and imaging results.

Headache diagnoses were confirmed by applying chart review data to ICHD-3 beta criteria.\textsuperscript{9} Patients were initially grouped as having a primary vs secondary headache disorder. We then made comparisons between migraine and the most common categories of secondary headache disorders encountered (post-dural puncture headache and vascular headaches—which included preeclampsia/eclampsia). Statistical analyses were performed using student’s T-test, chi-square and Fisher’s exact test. Institutional review board approval was obtained prior to study initiation.

Results
Of 63 women who presented with acute postpartum headache, 17 (27.0%) were diagnosed with a primary headache disorder and 46 (73.0%) were diagnosed with a secondary headache disorder (see Table 1). The average age was 29.5 ± 6.6 years, parity was 1.7 ± 1.4 births, and headache onset was postpartum 4.7 ± 7.3 days; most (79.4%) received epidural anesthesia. There were no significant differences between primary and secondary groups for these demographic factors and headache onset time.

Migraine comprised the overwhelming majority of primary headache diagnoses (76.5%). Secondary headache most commonly featured post-dural puncture headache (45.7%), post-partum pre-
eclampsia (26.1%) and a diverse group of cerebrovascular headache disorders (21.7%) including pituitary apoplexy, cerebral venous thrombosis, Moyamoya, RCVS, PRES and vertebral artery dissection. Factors associated with having a secondary headache included a lack of any headache history (54.3% versus 23.6%, p=0.045). Proportions of individual headache features, delivery by Cesarean section, receipt of epidural anesthesia, and abnormal examination were not significantly different between primary and secondary headache groups.

In the secondary analysis (migraine vs PDPH and migraine vs cerebrovascular headache disorders), patients with migraine were much more likely to feature headache onset later than patients with PDPH (7.7 ±12.4 days after delivery versus 0.80 ± 0.88 days (p=0.014), but not compared to patients with cerebrovascular headaches (6.59 ± 5.8 days, p = 0.716). Furthermore, patients with migraine were more likely to have side predominance compared with patients with post-dural puncture headache (46.1% vs 4.8%, p=0.003), but not cerebrovascular headaches (22.7%, p = 0.1492). Compared to patients with migraine, patients with headaches secondary to cerebrovascular disorders were more likely to have acute hypertension (72.7% vs 38.5%, p = 0.046), abnormal laboratory values (60.0% vs 25.0%, p = 0.055) and abnormal imaging (55.0% vs. 0.0%, p = 0.002). The remainder of this analysis is currently in process.

Conclusions:
Secondary headache comprised nearly 3/4 of acute headache diagnoses during the post-partum period among patients referred for urgent neurological consultation in our sample. This rate is in contrast to acute headache consultations during pregnancy in which secondary headache comprised only 35% of diagnoses, in the same institution. Post-dural puncture headache (PDPH) was the most common secondary headache disorder diagnosed; however, almost half of secondary headaches were attributed to post-partum PEC or vascular disorders. The absence of a headache history and a clear PDPH description should prompt strong consideration for neuroimaging to rule out vascular etiologies of headache as well as close monitoring for signs/symptoms of PEC in women presenting with acute severe post-partum headache.

Presentation within 24 hours and lack of side predominance helped to differentiate PDPH from migraine. This observation results in two clinical implications. First, headache presentation within 24 hours post-delivery and without side predominance can reinforce clinical suspicion of PDPH – and thus lead to faster treatment and avoidance of unnecessary imaging. Conversely, it suggests patients who present after 24 hours post-partum with headache are much more likely to have an alternative secondary headache or migraine. As noted in a review by Klein et al, the literature contains a large number of case reports which report mistaken PDPH diagnoses in women who have eventually been diagnosed with a plethora of more vascular-type headaches and stroke. Perhaps use of a pre- and post- 24 hour cutoff in predicting other secondary headaches would be helpful not only to neurologists, but also to obstetricians as they triage consults for the many post-partum women who present with headache.

There was no significant difference between headache onset or side predominance between migraine and PEC/Vascular type headaches. However, hypertension, any abnormal lab value and abnormal imaging was more prevalent in the PEC/vascular type group. Given the difficulty in differentiating between migraine and PEC/vascular type headaches, objective measures (including vitals and laboratory data) should trigger neurological consultation and imaging recommendations. Our results suggest that the diagnosis of migraine or other primary headache in a post-partum woman should be made with caution – and with monitoring of blood pressure and liberal use of imaging to particularly rule out vascular etiologies of headache including postpartum PEC.