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CASE REPORTS / CASE SERIES

Interscapular pain associated with neuraxial labour analgesia: a case series

Douleur interscapulaire associée à une analgésie neuraxiale pour le travail obstétrical: une série de cas

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Abstract

Purpose *Some labouring women with neuraxial labour analgesia experience severe upper back pain, typically between the scapulae. This pain may complicate management of neuraxial analgesia/anesthesia, and it may also have important implications for the mode of delivery. This case series describes the clinical course and management of three patients who developed interscapular pain associated with neuraxial labour analgesia.*

Principal findings *Neuraxial labour analgesia was initiated in all patients with a combined spinal-epidural technique and maintained via patient-controlled epidural analgesia. Two patients were nulliparous. One patient experienced interscapular pain during initiation of epidural anesthesia for Cesarean delivery after 19 hr of maintenance of labour analgesia with local anesthetic/opioid solution. The other two patients experienced interscapular pain during routine maintenance of epidural labour analgesia. In two patients, the epidural space was identified using loss of resistance to air. Another patient recalled experiencing interscapular pain with her prior labour epidural. Management of these patients included decreasing the epidural infusion rate, increasing the concentration of local anesthetic in the epidural infusion solution, administration of epidural opioids, and replacement of the epidural catheter. All patients eventually experienced relief of their interscapular pain.*

Conclusions *While little is understood about the etiology of this unique anesthetic complication, it may have important clinical consequences, including inadequate analgesia, inability to provide timely epidural anesthesia, and an increased risk of Cesarean delivery. Future work should characterize at-risk patients, delineate effective treatment strategies, and identify any associated long-term consequences.*

Résumé

Objectif *Pendant le travail obstétrical, certaines femmes recevant une analgésie neuraxiale ressentent une douleur forte dans le haut du dos, typiquement entre les omoplates. Cette douleur pourrait compliquer la prise en charge de l'analgésie / anesthésie neuraxiale, tout en ayant d'importantes conséquences sur la voie d'accouchement. Cette série de cas décrit le parcours clinique et la prise en charge de trois patientes ayant manifesté une douleur interscapulaire associée à l'analgésie neuraxiale pour le travail obstétrical.*

Constatations principales *L'analgésie neuraxiale pour le travail obstétrical a été amorcée chez toutes les patientes à l'aide d'une technique rachidienne et péridurale*

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combinée et maintenue par une analgésie péridurale contrôlée par la patiente. Deux patientes étaient nullipares. Une patiente a souffert de douleur interscapulaire pendant l'amorce de l'anesthésie péridurale pour un accouchement par césarienne, après 19 h de maintien de l'analgésie pour le travail à l'aide d'une solution d'anesthésique local et d'opioïdes. Les deux autres patientes ont manifesté une douleur interscapulaire pendant le maintien de routine de l'analgésie péridurale pour le travail obstétrical. Chez deux patientes, l'espace péridural a été identifié grâce à la perte de résistance à l'air. Une autre patiente s'est souvenue d'avoir ressenti une douleur interscapulaire lors d'une anesthésie péridurale précédente pour le travail obstétrical. La prise en charge de ces patientes a comporté une réduction du taux de perfusion de la péridurale, une augmentation de la concentration d'anesthésique local dans la solution de perfusion péridurale, l'administration d'opioïdes pérididuraux et le remplacement du cathéter péridural. Toutes les patientes ont finalement été soulagées de leur douleur interscapulaire.

Conclusion *Bien qu'on ne sache que peu de choses de l'étiologie de cette complication unique de l'anesthésie, elle pourrait avoir des conséquences cliniques importantes, notamment une analgésie inadaptée, l'incapacité d'offrir une anesthésie péridurale au moment opportun, et un risque accru d'accouchement par césarienne. Les travaux futurs devraient tenter de caractériser les patientes à risque, décrire des stratégies de traitement efficaces, et identifier toute conséquence associée à long terme.*

Anecdotal experience suggests that a small subset of women experience upper back pain during neuraxial labour analgesia, typically between the scapulae. The etiology of this pain is not completely understood, and it is not well described in the literature. One study, published as an abstract, prospectively evaluated 9,056 labouring women and identified 44 cases of back pain (i.e., in the upper or lower back, scapula, neck, and shoulder) with epidural injection/infusion.[A] The pain typically worsened with a bolus injection of anesthetic solution into the epidural space and was relieved by slowing or stopping the infusion rate, administration of epidural fentanyl, administration of intravenous opioids, withdrawing the epidural catheter 1-2 cm, or removing the epidural catheter altogether. Although all patients eventually experienced relief, no single modality guaranteed improvement in pain in all patients. Alarmingly, in that study, patients with this pain had an overall rate of Cesarean delivery that was much higher than the institutional rate (66% *vs* 26%, respectively). Little is understood about the mechanism of this pain and its optimal treatment.

In this case series, we describe three parturients who experienced interscapular pain associated with neuraxial labour analgesia and speculate on its possible mechanisms. All three patients gave written consent for publication and had an opportunity to review this manuscript.

Case descriptions

Case 1

The first patient was an 18-yr-old gravida (G) 1 para (P) 0 African-American parturient who presented in spontaneous labour at 37.1 weeks estimated gestational age (EGA). She was 163 cm tall and weighed 84 kg, with a body mass index (BMI) of 32 $kg \cdot m^{-2}$. Her medical history was remarkable for gestational hypertension. Labour analgesia was initiated at 2.5 cm cervical dilation using a combined spinal-epidural (CSE) technique with loss of resistance to air with a 17G Tuohy needle and 27G pencil-point spinal needle using a needle-through-needle technique at the L4-5 interspace. Analgesia was initiated with intrathecal fentanyl 25 μg and maintained using an infusion of 0.0625% bupivacaine and fentanyl 2 $\mu g \cdot mL^{-1}$ via patient-controlled epidural analgesia (PCEA). The PCEA settings were as follows: infusion rate, 8 $mL \cdot hr^{-1}$; PCEA demand dose, 8 mL; lockout interval, ten minutes; and maximum epidural infusion volume, 32 $mL \cdot hr^{-1}$. The patient developed breakthrough pain three times during the course of her labour, requiring three physician-delivered manual re-doses that provided some but not complete relief. The first re-dose occurred 8.5 hr after the initiation of CSE analgesia, and 0.125% bupivacaine 15 mL was administered incrementally through the epidural catheter. The second re-dose occurred approximately 12 hr after initiation of analgesia, and another dose of 0.125% bupivacaine 15 mL was administered epidurally. Her final re-dose consisted of 1% lidocaine 5 mL and 0.25% bupivacaine 5 mL administered epidurally 18 hr after initiation of analgesia. Approximately 19 hours after initiation of analgesia (and a cumulative volume of 312 mL of epidural local anesthetic solution), the patient was taken to the operating room for a Cesarean delivery for arrest of dilation (4 cm). To initiate surgical anesthesia, 2% lidocaine with epinephrine 1:200,000, 20 mL was administered through the epidural catheter; however, the sensory level did not increase higher than the T7 dermatome. Immediately after lidocaine administration, the patient complained of intense pain between her scapulae that worsened when sitting. Epidural fentanyl

[A] *Lee S, Doty W, Ross V, Pan PH*. What is pain with epidural injection/infusion (PWEI)? Anesthesiology 2007; 106: B83.

100 μg provided some relief from her interscapular pain within minutes of its administration (although the large-volume epidural infusion was also stopped at that point). The epidural catheter was replaced in the operating room at the L3-L4 interspace, and 3% 2-chloroprocaine 10 mL was injected through the new catheter without return of her interscapular pain. Within 12 min, a T4 dermatomal sensory level was established, and the patient experienced complete pain relief. Her Cesarean delivery proceeded uneventfully.

Case 2

The patient was a 33-yr-old G2P1, BMI 30.7 $kg \cdot m^{-2}$ (height: 160 cm, weight: 78 kg), Caucasian parturient who presented for induction of labour at 37.0 weeks EGA for trisomy 18 and anticipated palliative care of her infant. The patient's medical history was unremarkable. When cervical dilation was 1 cm, CSE labour analgesia was initiated using a loss of resistance to saline technique. Intrathecal analgesia was initiated with bupivacaine 2.5 mg and fentanyl 15 μg, and PCEA was maintained in a manner similar to Case 1. The patient developed moderate interscapular pain and lower neck pain six hours later. At the time of her complaint of interscapular pain, she had received a 120-mL epidural infusion solution. No physician-delivered re-doses were administered prior to the patient's complaint of interscapular pain. She described the pain as a constant dull non-radiating "crick in the neck" between her shoulder blades and extending into her lower neck. The patient did not recognize any aggravating or alleviating factors. She mentioned that she had developed the same pain during epidural analgesia during her previous delivery; however, specific details of this pain were not documented in her prior anesthetic record.

After her interscapular pain developed, the basal infusion rate was decreased to 6 $mL \bullet hr^{-1}$, and the concentration of bupivacaine in her local anesthetic/opioid infusion was increased from 0.0625% to 0.11%. Her pain completely resolved one hour after this intervention. Approximately 15 hr after the initiation of CSE analgesia, the patient developed breakthrough labour pain, which was relieved with 0.125% epidural bupivacaine 10 mL. Her interscapular pain returned while this epidural bolus was being delivered but resolved spontaneously moments after it was completed. Her PCEA basal infusion rate was then increased from 6 to 8 $mL \cdot hr^{-1}$. She delivered uneventfully 16 hr after initiation of analgesia with no recurrence of her symptoms.

Case 3

The patient was a 27-yr-old G3P0, BMI 28.6 $kg \cdot m^{-2}$ (height: 157 cm, weight: 71 kg), African-American parturient who presented in spontaneous labour at 40.1 weeks EGA. Her medical history was unremarkable. Combined spinal-epidural analgesia was initiated when the cervix was closed using a loss of resistance to air technique. The patient received intrathecal fentanyl 25 μg, and PCEA was initiated as previously described. Approximately 9.5 hr later, the patient developed severe constant throbbing interscapular pain with some radiation to her anterior chest that worsened with use of the PCEA demand button. She had received 116 mL of epidural solution without any physician-delivered re-doses. The concentration of bupivacaine in her local anesthetic/opioid infusion was increased from 0.0625% to 0.11%. The PCEA infusion rate remained unchanged. Epidural fentanyl 100 μg was administered, and the patient experienced complete relief of her interscapular pain 1.5 hr later. She delivered uneventfully 12 hr after analgesia initiation.

Details of the three cases are summarized in the Table.

Discussion

This case series describes three parturients who developed interscapular pain associated with neuraxial labour analgesia. All three cases occurred at our institution over a one-month period. During this time period, approximately 700 neuraxial procedures were performed. The true incidence of this complication, however, remains unknown.

The mechanism of this pain remains elusive. Some authors have postulated that high pressure in the epidural space might contribute to the development of interscapular pain.[1] One small study may support this theory. In 1993, Shah *et al.* measured epidural space pressures in 17 parturients undergoing epidural saline infusion for prophylactic treatment of post-dural puncture headache after unintentional dural puncture.[2] In that study, four of the 17 patients developed interscapular pain that was associated with a higher epidural pressure than those who did not develop interscapular pain during the epidural saline infusion. In two of these four patients, an improvement in their symptoms occurred when the epidural saline infusion was slowed and a lower epidural space pressure was measured. It was presumed that the pain was radicular pain resulting from compression of the thoracic spinal cord. The large number of physician-delivered re-doses and the comparatively large volume of epidurally administered medications in our first patient may support the theory that elevated epidural pressure contributes to this pain. Even so, the volume of epidural solution did not seem excessive in Cases 2 and 3. Nevertheless, pressure is related to epidural space compliance, and it is possible that lower total volumes of

Table Characteristics of patients with interscapular pain associated with neuraxial labour analgesia

	Case 1	Case 2	Case 3
Age (yr)	18	33	27
Nulliparous	Yes	No	Yes
BMI ($kg \bullet m^{-2}$)	32	31	29
Cervical dilation at CSE* (cm)	2.5	1	0
Loss of resistance technique	Air	Saline	Air
Physician-delivered manual re-doses	3	1	0
Total volume of epidural infusate prior to complaint of interscapular pain (mL)	312	120	116
Time to first complaint of interscapular pain following initiation of analgesia (hr)	19	6	9.5
Interventions that provided relief of interscapular pain	Epidural fentanyl, epidural catheter replacement	Decrease epidural infusion rate, increase epidural local anesthetic concentration	Increase epidural local anesthetic concentration, epidural fentanyl
History of interscapular pain with neuraxial labour analgesia	Not ascertained	Yes	Not ascertained
Mode of delivery	Cesarean	NSVD	NSVD

BMI = body mass index; CSE = combined spinal-epidural; NSVD = normal spontaneous vaginal delivery

* In all patients, labour analgesia was initiated using a combined spinal-epidural technique with a 17G Tuohy needle and 27G spinal needle using a needle-through-needle technique. A 19G single-orifice wire-reinforced epidural catheter was used for maintenance of neuraxial labour analgesia in all cases

epidural solution might be associated with pain if there is low compliance in the epidural space. This mechanism, however, is speculative.

Our institution uses a dilute solution of local anesthetic/opioid for maintenance of neuraxial labour analgesia, and patients may receive a large volume of maintenance solution, especially if patients request neuraxial analgesia prior to 4-cm cervical dilation. All patients have access to supplemental boluses via PCEA, and some patients may receive physician-delivered re-doses. If indeed there is an association between total volume and development of interscapular pain, these may be contributing factors. It is unknown if the adoption of analgesic maintenance techniques that reduce the volume of epidurally administered solution, such as programmed intermittent boluses combined with PCEA,[3] will reduce the incidence of this complication. It is further unknown whether the volume of solution administered via infusion, or the volume delivered by PCEA administration, or the type or total amount of local anesthetic contributes to the development of interscapular pain. The patient in our first case had received epidural bupivacaine, lidocaine, and 2-chloroprocaine.

Several other proposed mechanisms of interscapular pain exist. In one report, the authors describe a case of a parturient developing interscapular pain associated with neuraxial labour analgesia. The pain persisted after the initiation of neuraxial anesthesia for Cesarean delivery, which suggested that this pain could be referred pain from abdominal viscera.[4] These authors speculate that the position of the fetus *in utero* and referred pain from the stomach transmitted by the nerves of the anterior vagal trunk at the T6-9 spinal cord level are causative. Another case report proposes that this interscapular pain may be associated with subdural catheter placement.[5] We found no evidence of subdural catheter placement in any of our cases. A third proposed mechanism, suggested over two decades ago, is that air entry into the epidural space is causative.[6] Two of three cases in this series used loss-of-resistance to air to identify the epidural space. Interestingly, delivery of the fetus has also been described as one ameliorating factor[1] that may be related to cessation of neuraxial analgesia or other obstetric factors, such as a reduction in epidural pressure due to relief of engorgement of the epidural venous plexus. Finally, one patient in this case series experienced interscapular pain with her prior labour epidural. It is possible that as yet undetermined patient-specific risk factors contribute to the development of this complication.

Interestingly, interscapular pain has also been associated with other medical conditions, including acute myocardial infarction, aortic dissection, pulmonary embolism, and even post-dural puncture headache.[7,8] It has been theorized

that convergent nociceptive inputs at the level of the dorsal horn and brain stem can result in inaccurate localization of pain signals.[9] It is possible that the visceral innervation of the heart, aorta, and pulmonary arteries share convergent signalling pathways with nociceptive pathways from the upper back. Interscapular pain associated with post-dural puncture headache may be due to mechanical traction of the upper thoracic or cervical nerve roots.[10]

Some women who experience this pain state that it is severe as or worse than their labour pain. In two of our patients, the intensity of their interscapular pain was given a verbal numeric score that was at least as high as the numeric score assigned to their labour pain at the initiation of neuraxial labour analgesia. Additionally, in our anecdotal experience, the pain encountered during initiation of epidural anesthesia for Cesarean delivery may be so severe that induction of general anesthesia is required. Fortunately, there is a lack of studies reporting any long-term complications of interscapular pain. Nevertheless, the acute clinical consequences of inadequate analgesia, the inability to provide timely epidural anesthesia for emergency Cesarean delivery, and the possible association with an increase in the risk of Cesarean delivery are worrisome. Several questions remain to be answered, including the pathogenesis of interscapular pain associated with neuraxial labour analgesia as well as the identification of risk factors for the development of this unique complication. Future work should characterize at-risk patients, delineate effective treatment strategies, and identify any associated long-term consequences or morbidity.

Conflicts of interest None declared.

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References

1. *Nelson KE*, *Tonidandel A*. Interscapular pain during cesarean delivery under epidural anesthesia. Int J Obstet Anesth 2011; 20: 196.
2. *Shah JL*. Epidural pressure during infusion of saline in the parturient. Int J Obstet Anesth 1993; 2: 190-2.
3. *Leo S*, *Ocampo CE*, *Lim Y*, *Sia AT*. A randomized comparison of automated intermittent mandatory boluses with a basal infusion in combination with patient-controlled epidural analgesia for labor and delivery. Int J Obstet Anesth 2010; 19: 357-64.
4. *McKeown KJ*, *Watson JT*. Interscapular pain during cesarean delivery under epidural anesthesia. Int J Obstet Anesth 2010; 19: 463-4.
5. *Moore AR*, *Siddiqui N*, *Kassel EE*, *Carvalho JC*. Unintentional subdural catheter placement during labor analgesia shows typical radiological pattern but atypical response to the Tsui test. Int J Obstet Anesth 2010; 19: 111-4.
6. *Rajanna P*. Interscapular pain during epidural anaesthesia. Anaesthesia 1989; 44: 1014.
7. *Haydar AA*, *Morgan-Hughes G*, *Roobottom C*. Investigating severe interscapular pain. BMJ 2008; 337: a688.
8. *Mokri B*. Spontaneous low pressure, low CSF volume headaches: spontaneous CSF leaks. Headache 2013; 53: 1034-53.
9. *Arendt-Nielsen L*, *Svensson P*. Referred muscle pain: basic and clinical findings. Clin J Pain 2001; 17: 11-9.
10. *Dunbar SA*, *Katz NP*. Post-dural puncture thoracic pain without headache: relief with epidural blood patch. Can J Anaesth 1995; 42: 221-3.