postoperative infection occurs in patients who have received allogeneic blood products. In the patient who has undergone cesarean section, who already experiences a high rate of infection of 5–25%,[8] an increase such as this significantly increases peripartum morbidity.[9]

Although this case report does not, by any means, prove the safety of cell salvage in obstetrics, it supports its consideration in the face of life-threatening obstetric hemorrhage. Currently, the paucity of data regarding this technique in the obstetric setting makes meaningful risk–benefit analysis impossible. Extensive prospective studies of its safety still need to be performed.

References

1. Jackson SH, Lonser RE: Safety and effectiveness of intracesarean blood salvage. Transfusion 1993; 33:181

2. Bernstein HH, Rosenblatt MA, Gettes M, Lockwood C: The ability of the Haemonetics 4 cell saver system to remove tissue factor from blood contaminated with amniotic fluid. Anesth Analg 1997; 85:831–3

3. Morgan M: Amniotic fluid embolism. Anaesthesia 1979; 34: 20–32

4. Kling D, Börner U, Bormann v. B, Hempelmann G: Heparin-elimination und freies Hämoglobin nach Zellseparation und waschen autologen blutes mit dem Cell Saver® 4. Anaesth Intensivther Notfallmed 1988; 23:88–90

5. Umlas J, O'Neill TP: Heparin removal in an autotransfusor device. Transfusion 1981; 21:70–3

6. Lostumbo MM, Holland PV, Schmidt PJ: Isoimmunization after multiple transfusions. N Engl J Med 1966; 275:141–4

7. Klein HG: Allogeneic transfusion risks in the surgical patient. Am J Surg 1995; 170:21S–6

8. Mathelier AC: A comparison of postoperative morbidity following prophylactic antibiotic administration by combined irrigation and intravenous route or by intravenous route alone during cesarean section. J Perinat Med 1992; 20:177–82

9. Di Lieto A, Albano G, Cimmino E, Pontillo M, Gallo F, Micalef R, Paladini A: Retrospective study of postoperative infectious morbidity following cesarean section. Minerva Ginecol 1996; 48:85–92

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Epidural Anesthesia in a Parturient with a Lumboperitoneal Shunt

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LUMBOPERITONEAL shunts are used to treat pseudotumor cerebri in patients with intractable headaches or progressive visual dysfunction unresponsive to conservative management (diuretics, steroids, serial lumbar punctures).[1,2] Thirteen parturient patients with lumboperitoneal shunts for pseudotumor cerebri have been described.[1–6] Most had normal pregnancy outcome, but labor pain management was not addressed. We report a case of epidural anesthesia in a parturient patient with preeclampsia and a lumboperitoneal shunt for pseudotumor cerebri.

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Key words: Cerebrospinal fluid shunt; labor; pregnancy; pseudotumor cerebri.

Case Report

A 26-yr-old women, gravida 7, paragravida 1, was admitted at 32 weeks' gestation with severe preeclampsia. Her history included pseudotumor cerebri successfully treated 5 yr before with placement of a lumboperitoneal shunt at the L3–4 interspace. The preanesthetic evaluation revealed that she was obese (120 kg; body mass index, 41.5 kg/m^2) and had an adequate airway anatomy and a normal platelet count ($201 \times 10^9/l$).

Five days later, because of worsening clinical status, labor was induced with oxytocin. Repeated examination by the same anesthesiologist revealed significant changes in her airway since the initial evaluation. Her tongue obstructed the view of the soft palate and

uvula, which had been easily visualized at the first examination. She also had marked facial edema. Her platelet count remained normal (290×10^9/l). The neurosurgeon who had placed the lumboperitoneal shunt had been consulted and believed that neuraxial anesthesia, including epidural catheter placement, was not contraindicated.

An open-ended, single-orifice epidural catheter was easily situated below the scar with a midline approach at the L4–5 interspace. Results of a test dose of 3 ml lidocaine, 1.5%, with 5 μg/ml epinephrine was negative. An additional 10-ml dose of bupivacaine, 0.125%, did not produce a detectable block. To determine the proper functioning of the catheter, 10 ml lidocaine, 1.5%, with 5 μg/ml epinephrine was administered. This resulted in a dense T8–S1 sensory block on the left, T10–S1 on the right, and significant bilateral lower extremity weakness. Because she was not yet experiencing labor pain, the block was allowed to dissipate. She requested labor analgesia 3 h later. Injection of 8 ml bupivacaine, 0.25%, resulted in complete analgesia and a sensory block of T8–S1 on the left and T10–S1 on the right. A continuous infusion of 10 ml/h bupivacaine, 0.125%, with 2 μg/ml fentanyl was initiated. She remained comfortable for 7 h of adequate contractions, after which the obstetrician elected to perform cesarean delivery because of a nonreassuring fetal heart rate tracing and unchanged cervical dilation of 1 cm.

Epidural administration of 20 ml lidocaine, 2%, with 5 μg/ml epinephrine, in divided doses, produced an inadequate right-sided block. The catheter was easily removed and replaced with a midline approach, this time above the scar at approximately T12–L1. The catheter was injected with 3 ml lidocaine, 1.5%, with 5 μg/ml epinephrine, and then 15 ml lidocaine, 2%, with 5 μg/ml epinephrine, in divided doses, and 100 μg fentanyl. This produced a dense bilateral sensory block to T8 before surgical drapes were placed. Although sacral nerve distribution was not tested, the patient was comfortable throughout surgery (90 min) and required no supplemental analgesia. A 1,535-g infant was delivered at 32 and 5/7 weeks. Apgar scores were 6, 8, and 9 at 1, 5, and 10 min, respectively. The epidural catheter was removed easily, and postoperative analgesia was provided *via* intravenous patient-controlled analgesia using morphine.

The mother's clinical status improved rapidly after delivery of the infant. But on the second postoperative day a fever of 40.8°C developed. The obstetrician added clindamycin to a continuing regimen of ampicillin and gentamicin, both of which were initiated for a low-grade fever of unknown origin when labor was induced. The patient's antibiotics were changed to piperacillin–tazobactam when blood cultures grew *Proteus mirabilis*. Results of all other cultures and evaluations were negative. Abdominal and pelvic computed tomography ruled out abscess and revealed a normal lumboperitoneal shunt. The source of infection was believed to be genitourinary or gastrointestinal. The patient was discharged on postoperative day 8, was afebrile during oral antibiotic treatment, and had no further complications.

Discussion

This case illustrates successful epidural anesthesia for labor pain management and subsequent cesarean delivery in a parturient patient with lumboperitoneal shunt for pseudotumor cerebri. Parturient patients with medically treated pseudotumor cerebri (*i.e.*, those without a lumboperitoneal shunt) have successfully received various anesthetics, including epidural and spinal anesthesia for vaginal and operative delivery.[3,7] Some authors have described contraindications to neuraxial blockade in patients with lumboperitoneal shunts,[3] based largely on theoretical considerations. Concerns include trauma to the shunt and potential loss of local anesthetic into the peritoneal cavity (spinal anesthesia). They conclude that general anesthesia is preferable for cesarean section delivery of infants in patients with lumboperitoneal shunts.

No cases of trauma or disruption of the spinal portion of a lumboperitoneal shunt have been reported. Abouleish *et al.*[3] suggest that radiologic studies should be performed in the event of neuraxial anesthesia in patients with lumboperitoneal shunts. We thought this was unnecessary. Lumboperitoneal shunts are inserted into the dural sac at a low vertebral interspace. The tubing runs laterally, tunneled underneath the skin until it reaches the peritoneal cavity.[2] By approaching the epidural space from the midline, below or above the scar, we minimized the risk for contact of the Tuohy needle with the lumboperitoneal shunt. Tarshis *et al.*[8] also considered this risk minimal when, without previous imaging, they inserted an epidural needle below the scar in a parturient patient with an implanted intrathecal pump. Although knot formation at the tip of epidural catheters has been reported in the absence of other foreign bodies, it is a rare complication that occurs in approximately 1 in 30,000 cases.[9] Knotting of the epidural catheter with the lumboperitoneal shunt is a theoretical concern. Obviously, the epidural catheter should be removed cautiously. Abnormal resistance during removal should raise the possibility of lumboperitoneal shunt entanglement and dictate appropriate imaging studies.

Ineffective epidural anesthesia has been described in patients who underwent previous back surgery and instrumentation, presumably because of scarring of the epidural space.[10] Lumboperitoneal shunt insertion is a simple surgical procedure that requires minimal instrumentation compared with these more extensive surgical procedures (Harrington rod, spinal fusion). The first catheter provided excellent labor analgesia for 7 h. After transfer of this morbidly obese parturient patient to the delivery room, the same catheter failed to produce surgical anesthesia. Most likely this was a result of catheter dislodgment. Postoperative scarring of the epidural space from previous shunt placement would have been expected to impair labor analgesia. The catheter was replaced and the new one provided excellent surgical anesthesia for cesarean section. Epidural catheter replacement led to administration of a higher than usual total dose of lidocaine. Epinephrine minimized systemic absorption, but this patient's morbid obe-

sity permitted a higher total dose. Nevertheless, divided administration and close monitoring for early signs of local anesthetic neurotoxicity were the keys to safe management of this patient.

With the potential for cesarean delivery, the risk for airway catastrophe was a major factor in electing early neuraxial anesthetic intervention in this morbidly obese parturient patient with preeclampsia. The benefits of epidural anesthesia were judged to outweigh the theoretical risks to the lumboperitoneal shunt. Despite the need for catheter replacement, epidural anesthesia was safely and successfully administered in this patient with a lumboperitoneal shunt.

References

1. Shapiro S, Yee R, Brown H: Surgical management of pseudotumor cerebri in pregnancy: Case report. Neurosurgery 1995; 37:829–31

2. Kassam SH, Hadi HA, Fadel HE, Sims W, Jay WM: Benign intracranial hypertension in pregnancy: Current diagnostic and therapeutic approach. Obstet Gynecol Surv 1983; 38:314–21

3. Abouleish E, Ali V, Tang RA: Benign intracranial hypertension and anesthesia for cesarean section. ANESTHESIOLOGY 1985; 63:705–7

4. Digre KB, Varner MW, Corbett JJ: Pseudotumor cerebri and pregnancy. Neurology 1984; 34:721–9

5. Keltner JL, Miller NR, Gittinger JW, Burde RM: Pseudotumor cerebri. Surv Ophthalmol 1979; 23:315–22

6. Landwehr JB Jr, Isada NB, Pryde PG, Johnson MP, Evans MI, Canady AI: Maternal neurosurgical shunts and pregnancy outcome. Obstet Gynecol 1994; 83:134–7

7. Palop R, Choed-Amphai E, Miller R: Epidural anesthesia for delivery complicated by benign intracranial hypertension. ANESTHESIOLOGY 1979; 50:159–60

8. Tarshis J, Zuckerman JE, Katz NP, Segal S, Mushlin PS: Labour pain management in a parturient with an implanted intrathecal pump. Can J Anaesth 1997; 44:1278–81

9. Bromage PR: Epidural Analgesia. Philadelphia, WB Saunders, 1978, pp 230–1

10. Pascoe HF, Jennings GS, Marx GF: Successful spinal anesthesia after inadequate epidural block in a parturient with prior surgical correction of scoliosis. Reg Anesth 1993; 18:191–2

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Complete Atrioventricular Block and Cardiac Arrest following Intravenous Famotidine Administration

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CARDIAC rate and rhythm abnormalities may result from the administration of the H_2-receptor antagonists cimetidine and ranitidine.[1] Famotidine, however, is an H_2-receptor antagonist that has not been associated thus far with disturbances of cardiac rhythm. However, because cimetidine and ranitidine have the potential to induce atrioventricular block, the package labeling for famotidine includes the same adverse effect warning. We report a case of famotidine-induced cardiac arrest from third-degree atrioventricular heart block that occurred soon after famotidine administration.

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Key words: Epidural anesthesia; H_2-receptor blockers; prostatectomy.

Case Report

A 59-yr-old man with a history of hypertension, non–insulin-dependent diabetes mellitus, diabetic retinal disease, and a surgically treated peptic ulcer disease was admitted to the hospital for radical prostatectomy. His cardiac history was unremarkable. Results of a dobutamine echo stress test performed 6 weeks before surgery were negative, and his left ventricular function was within normal limits (his ejection fraction was 55%). He had no known drug allergies. His medications