A surgically placed epidural catheter in a patient with spinal trauma

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Purpose: To report the successful perioperative anaesthetic and analgesic management of a spinal trauma patient with a surgically placed epidural catheter.

Clinical features: A 15-yr-old adolescent woman sustained an unstable spinal column injury with an incomplete neurological deficit following a high speed motor vehicle accident. She was scheduled for spinal decompression and stabilisation through a left thoracoabdominal approach. Balanced general anaesthesia was undertaken. Prior to closure, a multi-orifice epidural catheter was surgically placed under direct vision 5 cm into the anterior epidural space. The catheter was then tunneled out through the psoas muscle and secured in place. Combined epidural-general anaesthesia was then initiated for the duration of the case using 5 ml bupivacaine 0.25% after an initial test dose of 3 ml lidocaine 1.5% with epinephrine. An infusion of bupivacaine 0.10% and fentanyl $5 \mu\text{g}\cdot\text{ml}^{-1}$ at $8 \text{ ml}\cdot\text{hr}^{-1}$ using patient controlled epidural analgesia (PCEA) provided excellent postoperative pain control for four days. She had an uncomplicated postoperative course.

Conclusion: A surgically placed epidural catheter provided excellent, safe, perioperative anaesthesia and analgesia in this patient with unstable spinal trauma.

Objectif : Rapporter le traitement périopératoire anesthésique et analgésique d'un trauma du rachis au moyen d'un cathéter péridural placé au moment de la chirurgie.

Aspects cliniques : Une adolescente de 15 ans, impliquée dans un accident de la route subi à haute vitesse, a présenté une fracture instable du rachis avec déficit neurologique incomplet. Elle a été opérée sous anesthésie générale pour décompression de la moëlle et stabilisation du rachis par approche thoracoabdominale gauche. Avant la fermeture, un cathéter épidural multiorifices a été placé sous vision directe par le chirurgien, 5 cm étant introduit dans l'espace épidural antérieur. Le cathéter a ensuite été tunellisé à travers le muscle psoas et fixé solidement en place. À partir de ce moment, une anesthésie épidurale a complété l'anesthésie générale pour le reste du cas, utilisant 5 ml de bupivacaine 0,25% après une dose test initiale de lidocaïne 1,5% avec adrénaline. Une infusion de bupivacaine 0,1% avec fentanyl $5 \mu\text{g}\cdot\text{ml}^{-1}$ à raison de $8 \text{ ml}\cdot\text{hr}^{-1}$ selon le mode analgésie péridurale a permis un contrôle de la douleur postopératoire pour 4 jours. Le postopératoire a été sans complication.

Conclusion : Un cathéter péridural placé par le chirurgien a fourni une anesthésie et une analgésie périopératoire sécuritaire et d'excellente qualité chez cette patiente présentant un trauma instable du rachis.

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POLYTRAUMA patients with unstable spinal column injuries present many challenges for anaesthetic and perioperative care. These patients are at high risk for multisystem perioperative complications due to their injuries and immobility imposed by an unstable spine.^{1,2} They often require major surgical procedures for decompression and stabilisation. Ideally, such patients would benefit from intraoperative and postoperative epidural anaesthesia and analgesia.³ Historically, however, this group of patients has not received these benefits because of the risks inherent in positioning for percutaneous placement of an epidural catheter. We report a case of a surgically placed epidural catheter for perioperative pain management in a patient with severe spinal trauma.

Case report

A 15-yr-old, 68-kg adolescent woman was admitted to hospital following a single motor vehicle rollover at highway speed. It took one hour to extricate her from the vehicle at which time she was found severely flexed at the waist. There was no loss of consciousness at the scene. She was haemodynamically stable throughout transfer and emergency evaluation. Past medical history consisted of hypothyroidism which was treated with 100 µg synthroid *po* daily. Physical examination revealed paraplegia consisting of a complete motor deficit with incomplete sensory sparing below T₁₂. Computerised tomographic images showed a burst fracture of L₁ with retropulsion of bone fragments and 70% compromise of the central canal.

Surgery was scheduled to decompress the spinal canal and to help correct her kyphotic deformity. Before surgery, her pain had been managed with morphine patient-controlled analgesia (PCA) with moderate success. Initial PCA settings were: dose 1.3 mg, six minute lockout, four hour limit 25 mg, and no basal infusion. This resulted in a visual analogue scale (VAS) pain score (0–10) of 2 to 7 (at rest) with an average score of 6. The average VAS pain score (at rest) was decreased to 4 by increasing the morphine dose to 1.5 mg (Figure 2).

On the day of operation, the patient was log-rolled onto the operating table. The unstable thoracolumbar spinal trauma prohibited positioning for preoperative epidural catheter placement. General anaesthesia was induced with 2.5 µg·kg⁻¹ fentanyl and 4.0 mg·kg⁻¹ thiopentone followed by 0.7 mg·kg⁻¹ rocuronium. A #37 left double lumen tube was placed and its position was confirmed by auscultation and fiberoptic bronchoscope. Arterial and central venous access were obtained. Anaesthesia was maintained with air, oxygen, isoflurane (ET₁₈₀ 0.8–1.3), 200 µg fentanyl, and

150 mg rocuronium. A cell saver was used for the seven hour operation.

A left thoracoabdominal approach for resection of the compressed L₁ vertebra was undertaken. Spinal decompression was effected and vertebral reconstruction was performed using iliac crest bone graft and a titanium Z-plate. Prior to closure, a multi-orifice epidural catheter (Smiths Industries Medical Systems, Keene, NH, USA) was placed by the surgeon under direct vision along the anterior epidural space above the vertebral defect (Figure 1). It was inserted to a distance of 5 cm. The catheter was then tunnelled out through the psoas muscle exiting through a separate stab incision using a 17-gauge Tuohy needle. The catheter was secured with a suture, sterile OpSite™ (Smith & Nephew Inc, Lachine, Quebec), and adhesive dressing. The catheter was tested with 3 ml lidocaine 1.5% with epinephrine. This was followed with 5 ml bupivacaine 0.25%. Subsequently, an infusion of 5 µg·ml⁻¹ fentanyl and bupivacaine 0.10% was started at 8 ml·hr⁻¹ using patient controlled epidural analgesia (PCEA). Initial PCEA settings were: bolus 5 ml, lockout 10 min, four

FIGURE 1 Course of surgically placed epidural catheter
A - exit point through skin, B - entry point into chest wall, and
C - insertion point into epidural space.

The use of regional anaesthesia in the presence of a fresh spinal cord injury and neurological deficit is controversial. We recognise that the use of regional anaesthesia and analgesia may potentially mask a new postoperative neurological deficit. However, we believe that the probability of missing a new postoperative deficit is very small with this technique. First, the incidence of a new deficit postoperatively is unknown, but rare. Second, we use low concentrations of local anaesthetic (bupivacaine 0.05–0.10%) combined with 5 µg·ml⁻¹ fentanyl which allows for assessment of gross motor and sensory function. This is analogous to the use of low dose “walking epidurals” for labour analgesia. The neurosurgeons in our institution do not believe that this low dose technique impairs their clinical management of these patients. Lastly, if there is any evidence of a new neurological deficit, the patient would go directly to Magnetic Resonance Imaging to delineate any pathology present.

Surgical positioning of epidural catheters into an open epidural space raises new considerations. The action and spread of local anaesthetic in the epidural space may be altered. A damaged, oedematous spinal cord is unlikely to respond normally to local anaesthetics and may be resistant to their effect. Drug may egress from the inferior border of the epidural space toward the surgical site. This might create a potentially larger volume of distribution for the drugs and may result in a less dense block requiring higher concentrations or larger volumes of drug to effect the same degree of blockade. Systemic toxicity might arise as a result of increased vascular uptake in a fresh postoperative surgical field. However, the epidural space is already a highly vascular area and, with adequate surgical haemostasis, this is unlikely. Although epidural abscesses are very rare, they can have devastating sequelae.^{22,23} The risk of infection should not be substantially increased with this technique.²⁴ This is a clean, uncontaminated surgical field through which the catheter passes only transiently. Most epidural abscesses occur as a result of haematogenous spread and are not related to catheter placement.²³ Catheter removal is unlikely to be more difficult or to disrupt the surgical wound when the catheter is tunnelled through its own site some distance from the surgical incision. In the absence of surgically induced dural trauma, catheter migration into the subarachnoid space should not be of concern. However, in the presence of post-traumatic dural tears, this technique may be contra-indicated. Intravascular catheter migration is still a potential complication, but is not expected to occur with greater frequency than with percutaneous epidural placement. Catheter dislodgment is also a potential

concern. The catheter maybe more prone to migrate away from midline in postoperative tissues compared to a catheter placed into normal tissue planes. To our knowledge, there is no evidence to support or negate such speculation.

In summary, we report the successful perioperative anaesthetic and analgesic management of a surgically placed epidural catheter in a patient with an unstable thoracolumbar spine. We believe that the many potential benefits of such a technique outweigh the exceedingly rare potential complications or costs. Further prospective research into the effectiveness of this means of perioperative anaesthesia and analgesia is warranted.

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