Use of Bilateral Paravertebral Catheters for Pain Control in Pediatric Liver Resection

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### Introduction
- Post-operative pain control in children continues to be an evolving field.
- We encountered a 2.5 year old child in need of liver resection for hepatoblastoma. Given the patient’s potential for coagulopathy after resection an epidural was felt to be contraindicated.
- Bilateral paravertebral catheters were instead placed providing excellent pain control in the post-operative period.
- We discovered only a few examples of the use of paravertebral catheters in children and none for liver resection.
- We believe paravertebral catheters may present a safe approach to pain management in children who may develop coagulopathies.

### Case Description
- A 2.5 year old 10.3 kg child was scheduled to undergo resection of a liver hepatoblastoma for which chemotherapy had previously been administered. Patient was not a candidate for liver transplantation due to portal vein occlusion.
- PMH included birth at 27 weeks gestation with IUGR and a 4 month NICU stay. Abdominal US while in the NICU showed no hepatic masses.
- Before surgery, the decision was made to place bilateral paravertebral catheters for post-operative pain relief in lieu of an epidural to decrease the risk of hematoma.
- Following an uneventful anesthetic induction the acute pain service successfully placed the bilateral catheters.
- Liver resection proceeded with a blood loss of approximately 150 ml. 180 ml of PRBCs was transfused during the procedure.

### Catheter Placement
- The patient was first placed in lateral decubitus position. Ultrasound was then utilized to mark and measure the depth to the transverse processes and lungs between T5 and T6.
- A 17/18 gauge 2 inch Tuohy needle was inserted with LOR at 2.5 cm. Correct needle tip placement was confirmed by ultrasound and abdominal wall twitch at < 2.5 mA.
- A 19/20 gauge 60 Stimuplex catheter was passed and secured 5cm at the skin.
- Test dose of 1 ml of 1.5% lignocaine with 5 mcg/ml of epinephrine was injected with no change in vital signs.
- The procedure was then repeated on the contralateral side.
- Both catheters were bolused with 2 ml of 0.5% ropivacaine and an infusion of 0.2% ropivacaine was initiated at 2 ml/hr.

### Paravertebral Catheters
- Paravertebral blocks place local anesthetic at the root level as nerves exit the spinal canal.
- Should be considered “paraneural” or “paraspinal” blocks.
- Care should be taken to avoid placing anesthetic through the dura surrounding the nerve roots.
- These blocks can be placed through a posterior approach by advancing the needle forward until a bony landmark is encountered. The needle is then walked off the bone through the surrounding tissue to enter the paravertebral space.
- At the thoracic level the needle is advanced off the transverse process in a caudal and lateral direction through the costotransverse ligament until a distinct loss of resistance is felt indicating entrance into the paravertebral space.
- Ultrasound is now commonly used to define the position and depth of the paravertebral space as well as provide visual guidance for the needle and confirmation of correct local anesthetic placement.

### Outcome
- Our patient reported excellent pain control in the immediate post-operative period with minimal narcotic requirements.
- A total of 3 mg of intravenous morphine was given over the next 24 hours.
- Patient pain complaints were mostly related to an indwelling Foley catheter.

### References

### Discussion
- In comparison to epidurals, paravertebral blocks are associated with less nausea, vomiting, pruritis, urinary retention, and risk of spinal cord injury.
- Paravertebral blocks may be placed in patients receiving enoxaparin where epidurals are contraindicated. A study by Chelby, et al showed 3,588 patients on a variety of anticoagulants including warfarin in which paravertebral catheters were successfully removed without incident.
- Although the risk of hematoma appears less with the use of paravertebral catheters, it is nonetheless important to be mindful of correct placement and watchful of signs of neuroaxial hematoma.
- Epidural and intrathecal spread of paravertebrally injected local anesthetic can occur if the dural sleeve is entered by a medially projected needle.
- We could not find any reports of the use of paravertebral catheters in the postoperative pain management of hepatectomy in children. Berta, et al, did describe their use to excellent effect in children undergoing renal surgery.

### Conclusion
- Paravertebral catheters were placed in a child after liver resection in lieu of an epidural to decrease the chance of epidural hematoma.
- Patient experienced excellent postoperative pain control.
- Paravertebral catheter placement may be efficacious in the treatment of pediatric postoperative pain in patients where an epidural in contraindicated.

### Instructional Video
- An instructional video produced by the University of Florida Department of Anesthesiology can be found at the following URL: http://simulation.health.ufl.edu/research/ra_sim.wmv