Incorporating an ultrasound-guided regional anesthesia program into a busy private pediatric practice—Is it feasible. And you think that we can send these children home with peripheral nerve local anesthetic infusion catheters—myth or reality?

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Objectives:
- Discuss the techniques available for postoperative pain control in children
- Recognize barriers to performing regional anesthesia in a busy OR and how to overcome them
- Describe the implementation of a regional anesthesia program

Case history:
A 13 year old female presents for surgical repair of the anterior cruciate ligament as an outpatient at your ambulatory surgery center. She is otherwise healthy. She and her family are very concerned about post-operative pain control, especially since she has a history of severe nausea and vomiting from narcotic pain medications following a tonsillectomy.

Questions:
What options can you present the family for post-operative pain control?

Case history and physical examination (continued):
She is anxious about needles, but cooperates easily with IV placement. The surgeon is pacing impatiently waiting for you to induce general anesthesia.

Questions:
What is the typical regional block technique for ACL repair and post-operative analgesia? Does a single shot versus catheter matter? She tolerated an awake IV; does she need a general anesthetic for the block placement? Should we involve the surgeon in the decision for anesthetic choice?

Case progression:
You have a new ultrasound machine and have been waiting for such a case to try it having attended a workshop at last year’s SPA meeting. Your department recently completed an 8 hour in-service with a representative from the ultrasound company.
Questions:
Is this a good idea? So what is your anesthetic plan? Do we have alternative ways of taking care of this patient? What would you use for analgesia?

Informed consent:
You describe the sedated ultrasound-guided femoral nerve block with a catheter for postoperative analgesia to the patient and her family. Dad was wondering if anesthesia is safe for his daughter and if you can give him a percentage of complications from regional anesthesia in children.

Questions:
What risks and possible complication should be disclosed to the patient (and his parents)? Would you mention nerve damage? How do you present these complications? Would you give specific number? Do we have alternatives to regional anesthesia?

Postoperative care:
You have never used the ultrasound for a catheter placement; however you have read that the best pain control would be to send her home with an infusion. Your department has never sent a child home with a peripheral nerve block catheter infusion.

Questions:
What do you need before attempting a new procedure? What do you need from your institution before starting outpatient peripheral nerve block infusions? Where do you start?

Discussion:
The use of ultrasound for regional anesthesia has experienced immense growth in recent years. The premise of image guidance for nerve localization could not have a better suitor than a developing pediatric anatomy that defies predictable landmarks and has a narrow margin of safety. Despite the demonstrated reduction in required volume of local anesthetic (1,2), faster onset/longer duration of sensory and motor blocks, and improved quality of sensory block (1,3-5), real world offers many obstacles to incorporation of ultrasound guided regional anesthesia (UGRA) into the everyday practice. Start-up pediatric regional programs face a multitude of challenges and require tools and education for success.

Implementation of the Program
1. Evaluate existing potential
2. Evaluate existing resources
3. Develop a training plan
4. Educate everyone around you and encourage communication/feedback
5. Determine which patients/procedures are to receive regional blocks first
6. Streamline the process
7. Continue to expand, educate and improve the process

Training and safety
Inexperience is highly correlated to increased complication rate and in the current age of heightened patient safety awareness may preclude talented physicians from realizing the benefits of ultrasound guided regional anesthesia. Recent publications have increasingly focused on
optimizing learning environment and designing learner-centered curriculum(8,9). It is worth highlighting the most common novice behavior patterns that were associated with poor block outcomes:

1. Advancement of the needle when the tip was not well visualized,
2. Unintentional probe movements,
3. Failure to recognize an intramuscular location of the needle tip before injection,
4. Poor ergonomics,
5. Failure to identify maldistribution of local anesthesia,
6. Operator fatigue,
7. Failure to correctly correlate ultrasound sidedness to patient’s anatomy,
8. Inappropriate choice of needle insertion site and angle...

In summary, a pediatric center wishing to establish a regional program and to adopt the ultrasound technology must individually rediscover the best methodology to train the faculty, create an efficient/safe performance infrastructure and rapidly generate acceptance from the surgical colleagues.

Take home points
1. Continuous peripheral nerve block analgesia, regardless of catheter location, provides superior postoperative analgesia and fewer opioid-related side effects when compared with opioid analgesia.
2. There is strong evidence suggesting that continuous peripheral nerve blocks provided at home improve postoperative analgesia, sleep quality, and patient satisfaction while decreasing supplemental opioid requirements and opioid-related side effects.
3. Ultrasound guided nerve blocks increase success, decrease time to perform, have faster onset, and longer duration than those with peripheral nerve stimulator. Ultrasound guidance for sciatic and femoral nerve blocks in children increases the duration of sensory blockade in comparison with nerve stimulator guidance. Prolonged sensory blockade is achieved with smaller volumes of local anesthetic when using ultrasound guidance.
4. Overall, the randomized controlled trials and case series report that use of ultrasound significantly reduces time or number of attempts to perform blocks and in some cases significantly improves the quality of sensory block.
5. Patient education is important for the safe and effective use of peripheral nerve catheters for outpatients. There must be written instructions how to recognize and manage breakthrough pain, signs and symptoms of toxicity, contact pain service, protect the blocked extremity, safe ambulation, care of insertion site, dressing change if saturated, and catheter removal.

References: