PUDENDAL NERVE BLOCK

Surgical Specialty:	Urology
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Background:

- The pudendal nerve block is a regional anesthesia procedure that involves applying local anesthetic to the area surrounding the pudendal nerve. This nerve provides sensory input to the perineum, external genitalia, and surrounding structures. There is a wide variety of uses for this block, but this case guide will focus on the intraoperative application of this technique in the pediatric population.[1]
- In pediatric surgery, pudendal nerve blocks are most commonly used to help with intra- and post-operative pain control for certain urologic procedures.[2-5]
- In the various other settings, pudendal blocks were performed via transvaginal or transperineal approaches, but this is done superficially at the gluteus muscles intraoperatively.
- Previously, pudendal nerve blocks were performed with nerve stimulation, but recent advances in ultrasound techniques have allowed for this method to be used more frequently.[2]
- Many consider the pudendal nerve block as the preferred analgesic technique in lieu of caudal analgesia for certain urologic procedures.[2,4,5]
    - The pudendal nerve block provides more selective analgesia than neuraxial techniques and avoids the lower extremity motor blockade that can be distressing for young children.
    - The pudendal nerve block also has the advantage of being possible in children with spinal dysraphism, which can be more prevalent in the population requiring some of these urologic procedures.
- Anatomy
    - The pudendal nerve carries both sensory and motor signals.
    - From the sacral plexus, the S2-S4 roots become the pudendal nerve (A), which passes through the sciatic foramen and by the sacrospinous and sacrotuberous ligaments before it joins the internal pudendal artery and vein and passes through the lesser sciatic foramen. The nerve then continues through the ischiorectal fossa and the pudendal (Alcock) canal (E), where it first branches off into the inferior rectal nerve before further branching off into the posterior scrotal (B) and later the perineal nerve (B), and the primary branch becomes the dorsal nerve (C) (See figure 1).[1,3]
    - A landmark relevant to the ultrasound-guided technique is the ischial tuberosity at the point where the pudendal nerve enters the pudendal (Alcock) canal.

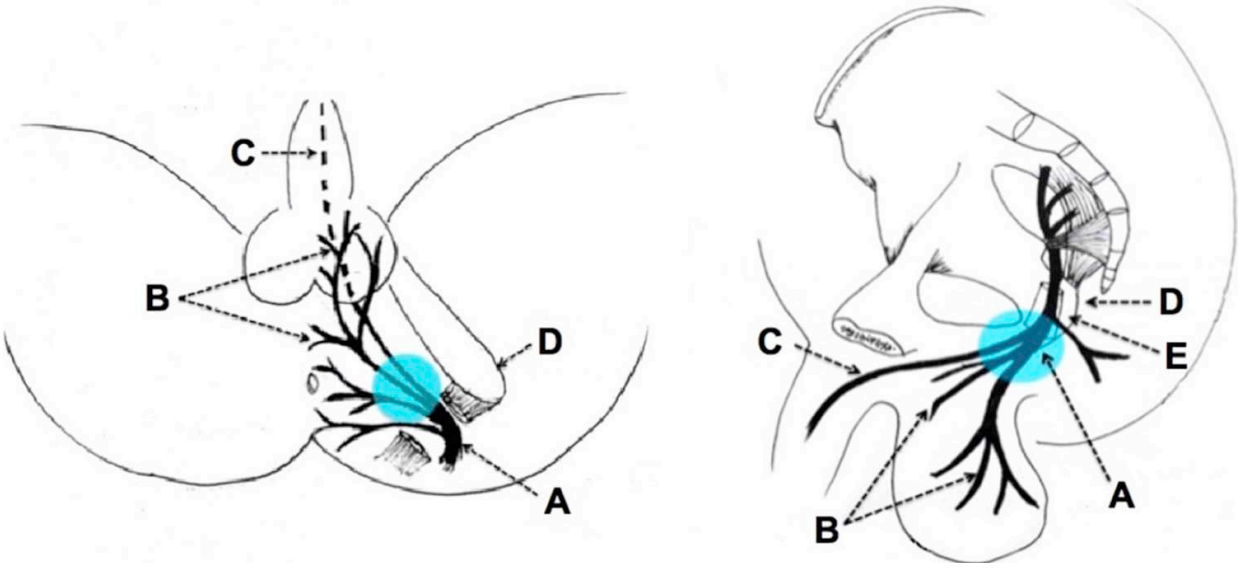


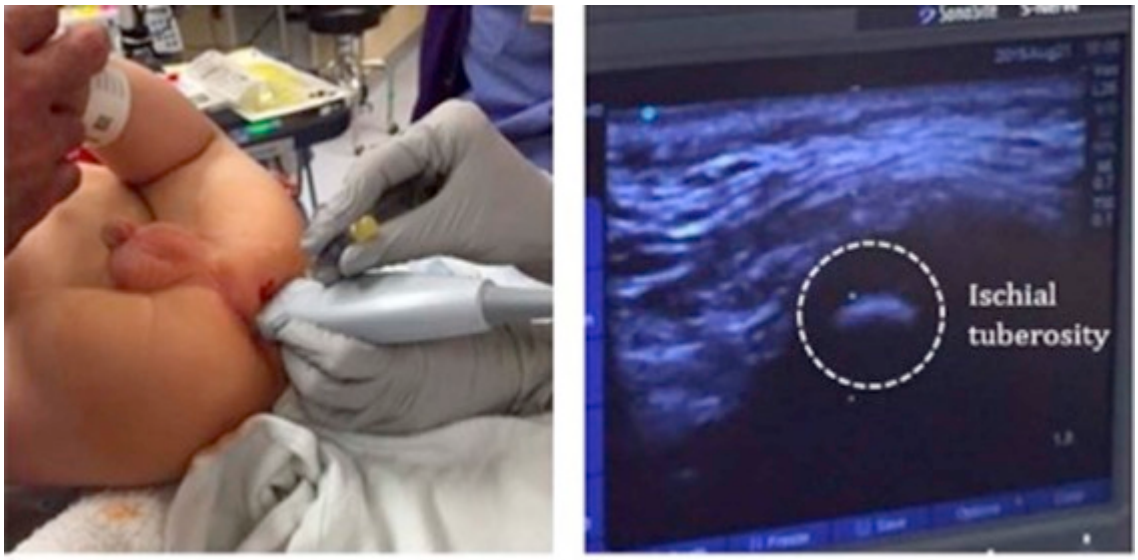
Figure 1. Pudendal nerve path from the nerve roots in two views. Left: Axial view schematic of the pudendal nerve from the pudendal canal to its termini. Right: Sagittal view of the pudendal nerve from the roots. A. Pudendal nerve, B. perineal and posterior scrotal nerve, C. dorsal nerve, D. Ischial tuberosity, E. Pudendal (Alcock) canal.

- Innervation:
  - Dorsal nerve: penis and clitoris
  - Inferior rectal nerve (often branches proximal to E.- Pudendal canal): external anal sphincter and perineal skin
  - Perineal nerve:
    - Motor: bulbospongiosus, ischiocavernosus, levator ani
    - Sensory: labia majora and scrotum

Anesthetic Planning:

- Indications
  - Urologic procedures for which this block is useful (common procedures but not exhaustive)[3,4]
    - Circumcision
    - Hypospadias repairs
    - Congenital chordee repair
    - Correction of penile angulation/torsion
    - Buried penis repair with or without scrotoplasty
- Contraindications[1]
  - Patient and/or family refusal
  - Allergy to the local anesthetic, though more commonly, aminoesters are metabolized into para-aminobenzoic acid (PABA)
  - Infection or sepsis
  - Skin and soft tissue infection (SSTI) over the injection site
  - Uncorrected coagulopathies
  - Altered local anatomy

- Material to prepare
    - Sterile gloves
    - Chlorohexidine or any sterile cleaning solution (if chlorohexidine is contraindicated)
    - Bump or stacks of towels to place under hips
    - Syringe and needle for drawing up local
    - Single-shot short nerve block needle (long may be needed for larger patients)
    - An assistant to help hold the legs while the proceduralist scans and performs the block
        - For ultrasound-guided technique:
            - Ultrasound- linear probe in most pediatric patients, can consider curvilinear in larger ones
            - Sterile probe cover
        - For nerve stimulation technique:
            - Electric nerve stimulator
- Local and dosing:
    - Bupivacaine 0.25%, or 0.2% Ropivacaine with epinephrine 1:200,000.[3]
    - Dosing: 0.3-0.5 mL/kg on each side (for either solution).[2]
    - Adjuvants- recent guidelines recommend only using alpha-2 adrenoceptor agonists to prolong peripheral nerve blocks.
- Positioning: an exaggerated lithotomy position accomplished with a bump under the hips and with legs flexed at the hip, forming a 90-degree angle, with the assistance of OR staff to hold legs in position (Figure 2A).[3]
- Nerve stimulator technique[2]
    - Landmark-based via identifying the anal sphincter and injecting at the 3 o'clock and 9 o'clock positions
    - The needle is advanced with nerve stimulation current of 2.5 – 5mA at 2Hz cephalad in a slight anterolateral direction until anal sphincter contraction "wink" is observed.
    - Optimization of the needle positioning by continuing to observe penile movement while simultaneously reducing current confirms proper placement with injection of 0.25 mL/kg of local (0.2% ropi)
- Ultrasound Guided-Transperineal Technique[3]
    - Place the probe at either the 3 or 9 o'clock position relative to the anus and scan for the ischial tuberosity.
    - The ischial tuberosity appears as a hyperechoic structure with hypoechoic dropout deeper to it. The pudendal canal is medial to the ischial tuberosity (Figure 2B).
    - Using an out-of-plane approach, the needle is inserted medial to the ischial tuberosity.
        - Needle tip visualization may be difficult with the out-of-plane approach, so it may be easier to "walk off" the ischial tuberosity to identify the correct needle position.



A B

Figure 2. (A) Positioning of patient and placement of linear ultrasound probe and needle for pudendal nerve block (B) Anatomic landmarks on ultrasound with the ischial tuberosity labeled and circled.

- Carefully watch tissue deformation and once felt to be in the ischiorectal fossa, aspirate prior to injecting local anesthetic, then slowly inject and watch for appropriate spread around the pudendal nerve.
- Local anesthetic spread typically highlights the nerve and surrounding structures, ensuring proper placement (Figure 3).

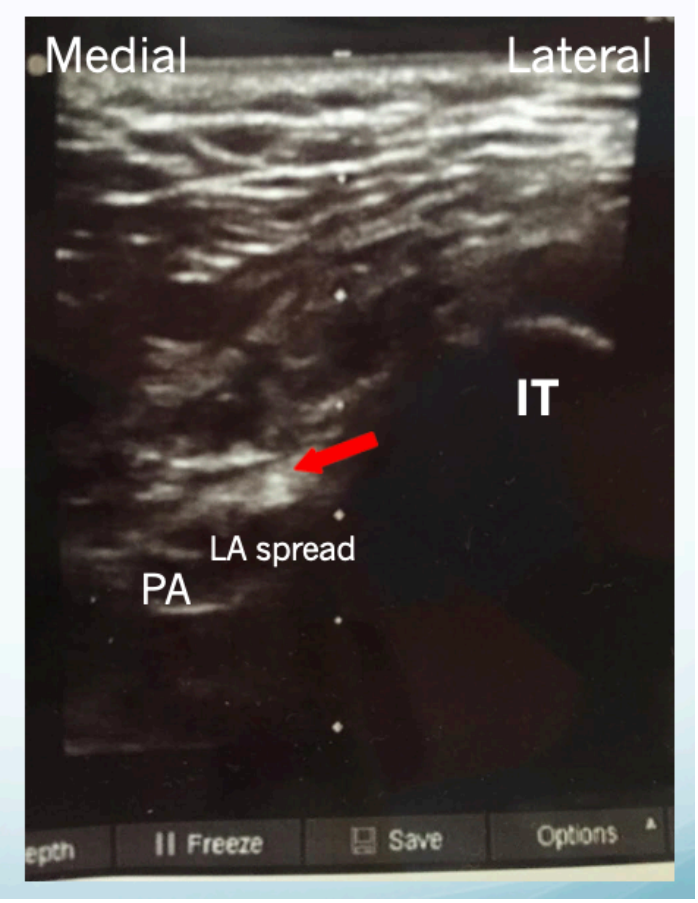


Figure 3. The red arrow indicates the pudendal nerve. IT = ischial tuberosity, PA = pudendal artery. Image from personal collection.

Intraoperative Considerations and Pearls

- Block is performed under general anesthesia, typically shortly after induction.
- Ultrasound grip is fully underhand with no fingers on the superior end of the probe to allow for needle manipulation.
- Passing through the perineal and sacrotuberous ligaments will often have a tactile pop when traversed.
- Local spread deep to the ischial tuberosity is characteristic of the local spreading in the correct plane.

Case-Specific Complications

- Ineffective block
- Bleeding and infection are not as common, but are possible.
- Injury to the pudendal nerve is a serious but rare event
- Other nearby structures at risk of injury include the bladder and rectum
- The pudendal artery runs close to the pudendal nerve, so aspiration before injection will reduce the risk of local anesthetic toxicity (LAST).

Recommended video guide: https://www.openanesthesia.org/vodcasts/ultrasound-guided-pudendal-nerve-block-for-children-in-the-lithotomy-position/?search_term=puden

References

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