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RECTUS SHEATH BLOCK

Surgical Specialty:	General Surgery
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Background:

- General Considerations
  - History
    - Rectus sheath block (RSB) has grown in popularity since the 1990s in the outpatient setting, mainly for umbilical procedures.
      - Pilot studies did not show superiority of the blind rectus sheath block over local infiltration by the surgeon. [1]
      - With the introduction of ultrasound guidance; however, newer studies showed significant evidence of efficacy.
    - A systemic review and meta-analysis of randomized trials by Hamil et al.[2] showed that RSB lowered pain scores immediately after the operation, reduced opioid consumption, and delayed the time to first rescue analgesia.
  - Indication
    - Bilateral RSB can provide pain relief for surgical procedures, specifically in pediatric patients involving the umbilicus and midline abdomen, such as:
      - Umbilical or ventral hernias
      - Laparoscopic surgery with umbilical port
      - Laparotomy with ventral incision
  - Anatomy & Distribution [3-4]
    - The rectus abdominis muscle is an oval-shaped muscle that is bordered by the linea alba medially and linea semilunaris laterally.
      - The rectus sheath surrounds the rectus abdominis muscle anteriorly and posteriorly.
      - The periumbilical area is innervated by the T9, T10, and T11 dermatomes.
    - Although hardly discernable on ultrasonography, the anterior rami of the 9th, 10th, and 11th intercostal nerves run in the plane between the rectus abdominis muscle and the posterior rectus sheath.
      - Epigastric arteries are also located in the same plane and can be detected using color Doppler.
    - Targeting the posterior rectus sheath provides a specific area of analgesia to the corresponding dermatomes.
    - The block does not provide any visceral coverage.

Anesthetic Planning:

- Pre-Anesthetic Evaluation
    - Discussions to have with family
        - Benefits and risks of the procedure
        - Alternatives for postoperative analgesia
- Specific or Unique Room Set-up Requirements
    - Equipment
        - Sterile gloves
        - Skin disinfectant
        - Ultrasound machine, linear high-frequency probe
            - Sterile sleeve and gel
        - Regional block tray
        - Local anesthesia syringes
        - 22 Gauge short-beveled needle, 50 -100 mm in length
    - Drugs
        - Normal saline 0.9% (NS)
        - Local anesthetic (LA)
            - Ropivacaine 0.2%-0.5% or Bupivacaine 0.2-0.5% [4]
                - Volume dependent block
                - For patient safety purposes, the maximum allowable local anesthetic dose should be calculated prior to administration of the intended dose.
    - Monitors
        - Standard ASA monitoring

Procedure Considerations:

- Patient positioning
    - Supine position
- Technique
    - Single shot [3-4]
        - The goal is to separate the posterior aspect of the rectus abdominis muscle from the posterior rectus sheath by the local anesthetic spread (Figure 1).

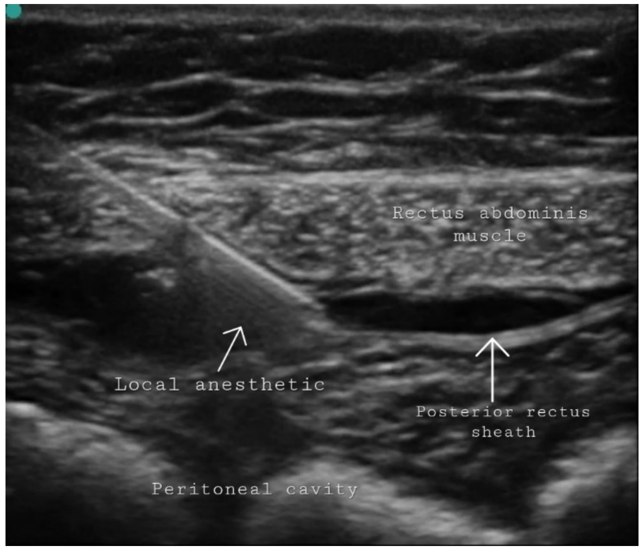

Figure 1. Ultrasound-guided rectus sheath block

- The abdomen is exposed and the skin surrounding the umbilicus is prepped in a sterile manner.
- The operator stands on one side of the patient, and the US machine is positioned directly opposite on the contralateral side.
  - The transducer is oriented in the transverse position above the umbilicus slightly lateral to midline.
- Identify the rectus abdominis muscle and move it to the center of the image.
  - The aponeuroses of the rectus abdominis muscle and the parietal peritoneum are very echoic.
    - This can be a challenge in obese patients or neonates.
- The needle punctures the skin approximately at a 45-degree angle in-plane technique.
  - The needle pierces the anterior rectus sheath, the body of the rectus abdominis muscle until it settles at the posterior rectus sheath.
    - It is crucial that the needle tip is identified.
- Hydrodisection technique can be utilized for accurate identification of the needle tip:
  - It entails injecting 1-2 ml of LA or NS to localize the needle tip.
  - If the LA/NS spreads in the muscle, then it is prudent to advance the needle 1-2 mm farther and reinject a similar amount to reestablish position of the needle tip.
    - It is imperative to know that any attempt at injecting LA should be preceded by aspiration to rule out intravascular injection.
- The same procedure should be repeated on the contralateral side.

- Catheter [4]
  - Catheter placement is done in the parasagittal direction preferably in the direction of the incision.
  - The catheter can be tunneled laterally away from the incision to avoid dislodgement or leak.

Complications/Pitfalls

- Considering that a rectus sheath block is performed in an area near the peritoneum and epigastric arteries, complications may include:
  - Local Anesthetic Systemic Toxicity (LAST)
    - Lipid emulsion 20% is the primary treatment of LAST. Each institution should ensure it is readily available and stored in a well-known location. A detailed, revised checklist for the treatment of LAST can be found on the American Society of Regional Anesthesia and Pain Medicine (ASRA) website. [5]
  - Hematoma
  - Peritoneal perforation
    - These complications are more common with the traditional technique of the fascial-click method to access the posterior rectus sheath.[3]
- Ultrasound utilization facilitates the administration of local anesthetic in the posterior rectus and decreases the risk of unintended peritoneal or vascular punctures.
  - Despite possible complications, ultrasound-guided RSB is a safe, easy, and reproducible procedure with evidence-based potency in a variety of surgical procedures.

References

1) Isaac LA, McEwen J, Hayes JA, Crawford MW. A pilot study of the rectus sheath block for pain control after umbilical hernia repair. Paediatr Anaesth. 2006 Apr;16(4):406-9. doi: 10.1111/j.1460-9592.2005.01785.x. PMID: 16618294. PubMed Link
2) Hamill JK, Rahiri J-L, Liley A, Hill AG. Rectus sheath and transversus abdominis plane blocks in children: A systematic review and meta-analysis of Randomized Trials. *Pediatric Anesthesia*. 2016;26(4):363-371. doi:10.1111/pan.12855 PubMed Link
3) Truncal and cutaneous nerve blocks. NYSORA. https://www.nysora.com/techniques/truncal-and-cutaneous-blocks/truncal-and-cutaneous-blocks/. Published February 1, 2022. Accessed October 1, 2022.
4) Davis PJ, Cladis FP, Smith RM. Regional Anesthesia . In: *Smith's Anesthesia for Infants and Children*. Amsterdam: Elsevier; 2022.
5) https://www.asra.com/news-publications/asra-updates/blog-landing/guidelines/2020/11/01/checklist-for-treatment-of-local-anesthetic-systemic-toxicity.

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