# Regional Anesthesia Simulation: The Use of Pork for Nerve Block Models

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Structured Abstract

**Background**

Ultrasound-guided regional anesthesia (UGRA) is an innovative method of providing perioperative pain management. Regional anesthesia minimizes perioperative opioid consumption, recovery time, and inpatient hospital stay. Typical UGRA simulation models do not possess human-like structures, making the simulation experience unrealistic. Pork meat models possess human-like anatomical landmarks which allow superior ultrasound-guided needle visibility and maneuvering. Regional anesthesia simulation is often used to develop student registered nurse anesthetists' knowledge, skills, and confidence, bridging the gap between initial training and clinical practice. The case report involved a 34-year-old Caucasian female diagnosed with left breast cancer. Bilateral mastectomy and breast reconstruction with tissue expanders were electively scheduled. Preoperatively, the patient underwent ultrasound-guided pectoralis and serratus plane nerve (PECS I & II) blocks. This student nurse anesthetist attempted the block on the right breast without success. The primary nurse anesthetist intervened and completed bilateral blocks. On induction of general anesthesia, the patient received fentanyl 100 mcg IV and an additional 50 mcg IV during maintenance. Emergence from general anesthesia was uneventful, with 0/10 postoperative pain. No additional narcotics were administered to the patient in the post-anesthesia care unit, and hospital admission began within one hour of arrival to the recovery room.

**Clinical Question**

Does using pork meat as a nerve block model, compared to other teaching simulation prototypes, influence students' nerve block performance in the clinical setting?

**Evidence-Based Discussion**

The ideal ultrasound-guided regional anesthesia simulation model should look, feel, and behave similarly to the intended educational focus. Simulation models that closely mimic human anatomy decrease error rates and increase the success rate and patient safety in the clinical setting. Studies demonstrate that animal meat models produce superior ultrasound images and allow in-plane needle discrimination compared to the blue phantom model. Regional anesthesia training is essential as target nerves are near blood vessels, organs, pleural space, and other nerves. The simulation experience allows students to learn procedural steps, dexterity, target identification, needle guidance, and proper hand-eye coordination.

While typical simulation phantoms can be long-lasting and easily stored, they lack human-like anatomical landmarks like nerves, fascial planes, and muscles. Additionally, rubber phantoms are costly and lack the capability to be injectable. The latter attribute entails obtaining accurate ultrasound images and the "feel" of needle manipulation. Human cadavers could be a precise,

realistic model, but the price, maintenance, storage, and ethical concerns make this an impractical option. The literature demonstrates that novices who train on meat models perform similarly to those who train on cadaveric models, including time taken to complete the block successfully, the number of errors made, and image quality scores.

Pork meat models closely resemble human-like anatomical landmarks under ultrasound imaging. The pork meat's fascial planes allow accurate reflection of ultrasound waves and needle maneuvering. In addition, animal meat can be frozen for future use and easily disposed of when no longer needed. Studies demonstrate that meat models facilitate the following four ultrasound-guided techniques: 1) an entire needle picture with the in-plane technique, 2) discrimination between injectable and non-injectable tissue, 3) hydro dissection, and 4) identification of potential needle tip locations.

Meat models can be constructed using pork tenderloin, yarn, meat glue (transglutaminase), and straws. The meat glue is used to bind two pieces of meat together. Gel-soaked yarn resembles nerves, and gel-filled straws resemble blood vessels. These items are placed between two pieces of meat to create a model that offers human-like anatomical landmarks. Regional anesthesia simulation more closely mimics a realistic experience utilizing this technique when using ultrasound guidance.

Ultrasound probe manipulation and maneuvering of the needle is of critical importance, as injecting a local anesthetic into a blood vessel or puncturing unintended tissue can lead to harmful consequences for the patient. Furthermore, regional anesthesia has rapidly become a mainstay in multimodal analgesia and enhanced recovery after surgery (ERAS). These attributes have reduced morbidity and mortality rates from cardiovascular, pulmonary, and gastrointestinal complications. Through simulation of UGRA on an ideal model, students can acquire the necessary skills and become confident before the actual delivery of anesthesia care in the clinical setting.

**Translation to Practice**

By allowing visualization of the block needle in and out of fascial planes, pork meat simulation models facilitate the skills necessary for handling the ultrasound probe and maintaining the needle "in-plane" view. Plain phantom models do not possess the fascial planes that enable this skill. The author of this case report proposes that nurse anesthesia programs implement pork meat training models in their skills lab curricula. Future research could evaluate students' trajectories through simulation labs using meat models and their success rates in the clinical setting after graduation.

Keywords: regional anesthesia, regional anesthesia simulation, facial plane blocks, pectoral nerve block, PECS block simulation, regional anesthesia meat model

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