

Background:

The origin of the superior gluteal nerve arises from the L4, L5, and S1 nerve roots in the sacral plexus. The superior gluteal nerve plays a significant role in the innervation of the pelvis by supplying multiple muscles used for gait stability. These muscles include the gluteus minimus, gluteus medius, tensor fasciae latae, and significant portions of the piriformis muscle. [1,2] This coalition of pelvic musculature plays a pivotal role in hip abduction and hip extension, thereby allowing stabilization of the pelvis throughout gait.

The anatomy of the superior gluteal nerve in relation to the pelvic musculature is also very important when considering it for regional anesthesia. First, it is the only nerve that exits the greater sciatic foramen superior to the piriformis muscle, thereby allowing easier visualization under ultrasound compared to other pelvic nerves such as the pudendal and inferior gluteal nerves. [1] Second, the nerve travels anterolaterally in the fascial plane between gluteus minimus and gluteus medius and is often accompanied by the superior gluteal artery. Finding these anatomical structures allow for a more reliable method to accomplish a regional anesthetic, as the nerve is often not directly visible due to its relative size and depth. [1]

Case Study:

A 74-year-old female with significant past medical history of atrial fibrillation on anticoagulation, obesity, OSA, chronic pain disorder, PONV, hypertension and GERD, presented to the emergency department with complaints of severe left hip pain status post pelvic rotation when exiting a vehicle. This patient had a notable surgical history of a prior tear of the left gluteus medius and minimus tendons multiple years prior to presentation that required surgical fixation. The patient was evaluated by the orthopedic team and imaging was performed. MRI revealed a full thickness tear of the left gluteus minimus and medius tendons that would require surgical repair. A neuraxial technique would have been ideal for this patient given her history of chronic pain and OSA, but her presenting anticoagulation status was a contraindication to this approach. the anesthesia team decided that general endotracheal anesthesia was the best and safest approach for this patient given her other comorbidities. However, regional anesthetic techniques to limit and reduce narcotic burden were also explored and an ultrasound guided superior gluteal nerve block was offered to the patient. Consent was obtained for general endotracheal anesthesia and a post-induction superior gluteal nerve block due to the extreme pain the patient experienced with any pelvic repositioning. Standard ASA monitors were applied and the patient was induced uneventfully, only being given 100 mcg of fentanyl to help blunt the sympathetic response to intubation. The patient was then positioned in right lateral decubitus position and was prepped and draped with sterile technique for the block

A curvilinear probe was placed caudal to the iliac crest and cephalically to the greater trochanter. The probe was oriented in the transverse plane to provide the best visualization of the relevant anatomy. Once the gluteus medius and minimus muscles were identified, the superior gluteal artery was appreciated in the medial aspect of the image. Upon confirmation of relevant structural anatomy, a 20 G, 6-inch stimuplex echogenic needle was inserted using an in-plane technique to the level between the gluteus medius and minimus. Hydro-dissection technique was used to confirm the appropriate end point positioning in the fascial plane between the aforementioned muscles. Once appropriate spread was noted, 20 cc of 0.25% ropivacaine was injected under ultrasound guidance with aspiration every 3 ml to reduce risk of intravascular injection due to the proximity of the superior gluteal artery. The remainder of the surgical repair was uneventful and without complication. The patient exhibited no sympathetic responses to surgical stimuli throughout the duration of the case and no additional narcotic was administered. Upon emergence, her hemodynamics remained stable and there were no physiologic indications that the patient was in pain. She was extubated uneventfully and taken to PACU.

Discussion:

Regional analgesic techniques have improved dramatically over the last 20 years with the advent of ultrasound guidance and their benefits have been very well documented in the literature. Their ability to reduce pain scores, improve patient satisfaction and dramatically reduce narcotic use in post-operative patients has brought them to the forefront of 21st century anesthesia. Moreover, their ability to repeatedly reduce morbidity and mortality in high-risk patients like the one described in this report cannot be ignored. As the ongoing opioid epidemic continues to worsen in the United States, continuously finding new and alternative ways to reduce narcotic burden have become a priority for all physicians, not just anesthesiologists.

Therefore, when we were approached by the surgical team regarding best practices for managing this complicated and high-risk patient post-operatively, we used our current understanding of sacral plexus anatomy in concurrence with their posterior surgical approach to develop an analgesic and anesthetic plan that placed an emphasis on reducing narcotic use. Although the available literature on ultrasound guided blocks of the sacral plexus was sparse, there was enough evidence to suggest that access to the superior gluteal nerve could be done successfully and that it could be anesthetized safely.

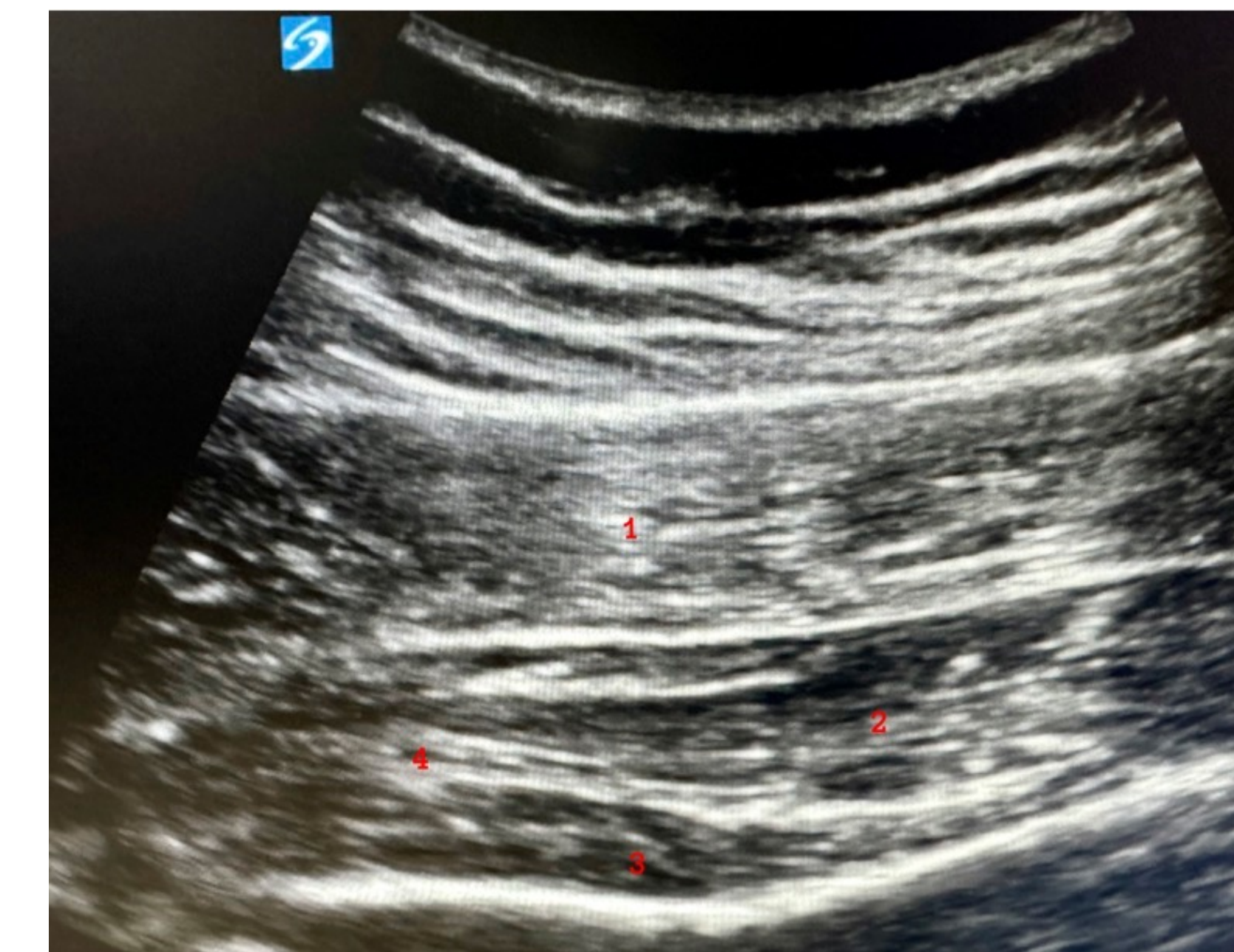


Image 1: 1 = gluteus maximus; 2 = gluteus medius ; 3 = gluteus minimus ; 4 = superior gluteal artery



Image 2: 1 = gluteus maximus ; 2 = gluteus medius ; 3 = gluteus minimus; * = superior gluteal nerve with perineural local anesthetic ; 4 = superior gluteal artery

Therefore, we proceeded with this block for the case using ultrasound guidance and carefully identified the relevant anatomical structures shown above (image 1, before the block). The outcomes we observed post-operatively (image 2, after the block) have demonstrated that this approach to the superior gluteal nerve block successfully provided anesthetic and analgesic care for a patient undergoing full thickness gluteus medius and minimus tear surgical fixation.

Lastly, even though this was a successful example of the superior gluteal nerve block, we recommend further research to evaluate the efficacy of this regional nerve block in a larger population sample size with better defined study parameters so that its clinical significance could be better understood.

References:

- [1] Lung K, Lui F. Anatomy, Abdomen and Pelvis: Superior Gluteal Nerve. [Updated 2023 Aug 14]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2024 Jan-.
- [2] Iwanaga, J., Eid, S., Simonds, E., Schumacher, M., Loukas, M., & Tubbs, R. S. (2018). The majority of piriformis muscles are innervated by the superior gluteal nerve. *Clinical Anatomy*, 32(2), 282–286.