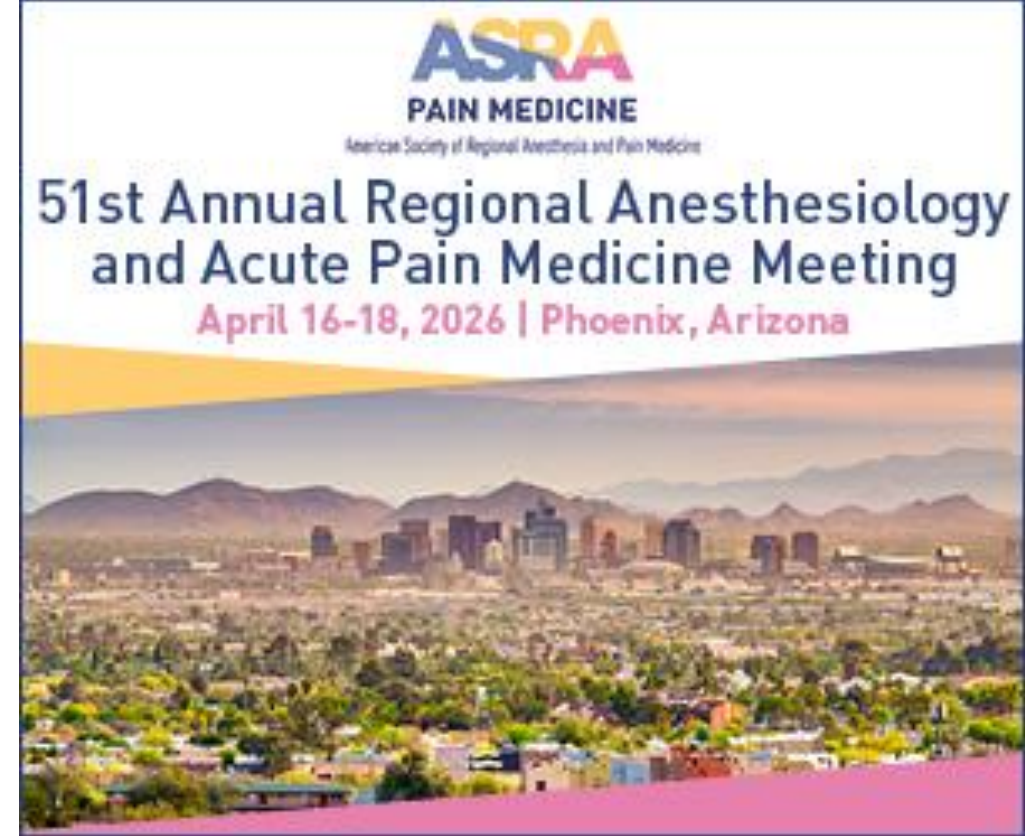


Cadaveric Dye Evaluation of the Geni-vs Block: An Anterior Peri-Femoral Approach to Genicular and Posterior Knee Innervation

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Introduction

Posterior knee pain following knee surgery remains difficult to address using anterior approaches while avoiding motor blockade. The Geni-vs block is an anterior medial peri-femoral injection intended to reach posterior knee structures and engage genicular and vastus-related articular branches. The anatomic spread patterns underlying posterior coverage from this approach are unknown. This cadaveric dye study evaluated distribution of methylene blue dye following the Geni-vs technique, with attention to genicular nerve planes and posterior-femoral periosteal spread.

Materials & Methods

This study was conducted on two GreenMBalmed cadavers (four thighs) through University of North Carolina body donation program. The study was IRB exempt with appropriate institutional permissions obtained.

- All blocks were performed supine using a 4-inch peripheral nerve block needle and a high-frequency linear ultrasound. 20 mL of 0.1% methylene blue was injected on the medial aspect of the femur in an oblique cranio-caudal orientation, deep to the vastus medialis and in contact with the femoral periosteum. (**Figures 1 – 2**).
- Cadaver thighs 1 & 2 had injections performed at ~ 6 cm (Distal injection) above femoral condyles. Cadaver thighs 3 & 4 had injections performed at 10 – 15 cm (Proximal Injection) above the femoral condyles.
- Layered dissection assessed dye spread relative to the femoral periosteum, genicular nerve trajectories, vastus-related articular branches, popliteal vessels, and sciatic nerve.



Figure 1: View of methylene blue injection into medial aspect of femur with patient supine

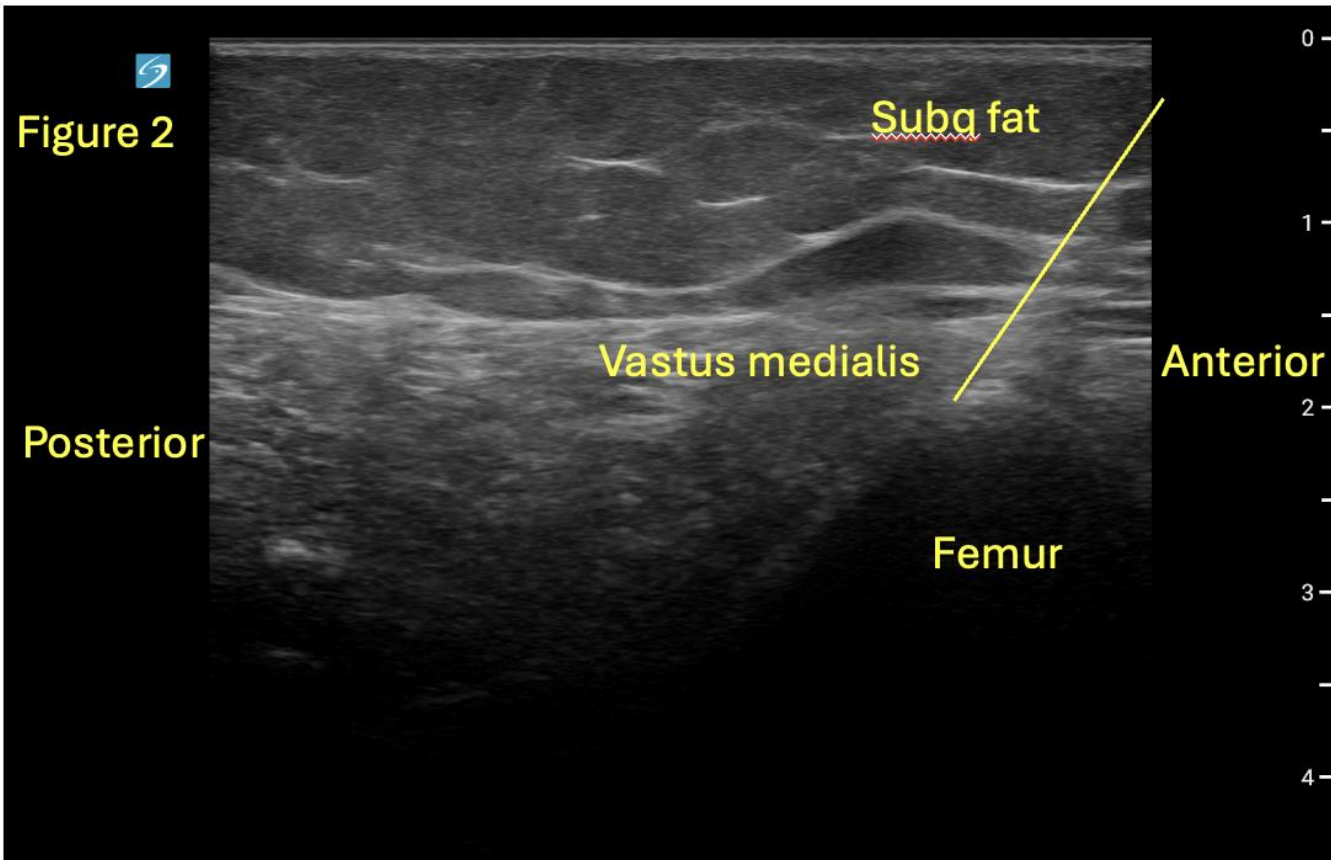


Figure 2: US view of injection site on femur in an oblique cranio-caudal direction, deep to vastus medialis

Results

Methylene blue injected via the Geni-vs anterior peri-femoral technique consistently produced medial periosteal staining beneath the vastus medialis (VM) with posterior distal femoral extension. Dye distribution differed significantly by injection level (**Table 1**).

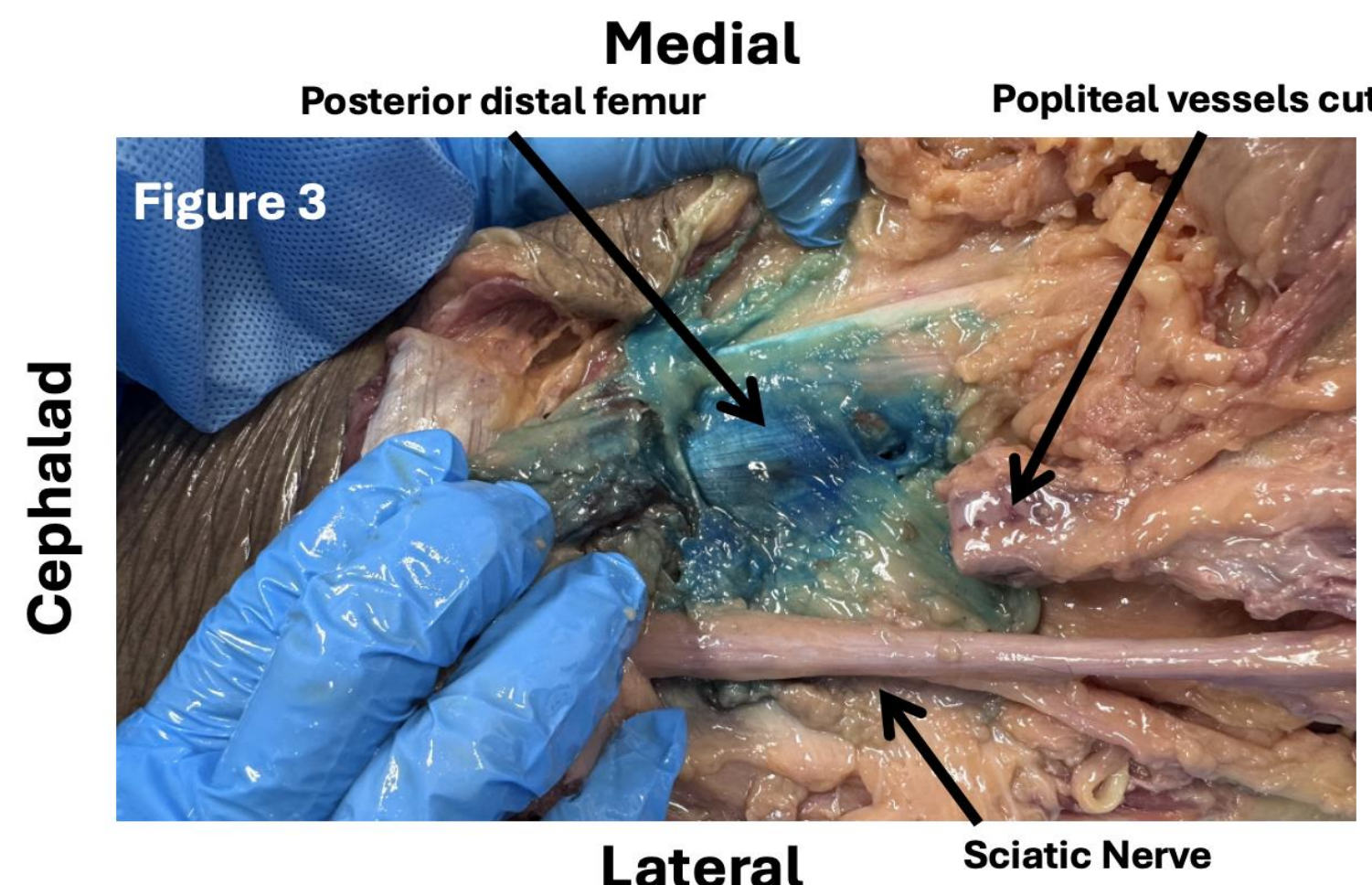


Figure 3. Dye stained on posterior distal femur of cadaver 1

Distal Injections (~ 6 cm above femoral condyle):

- Circumferential posterior periosteal staining (medial → lateral)
- Dense spread within popliteal tissue planes (iPACK-equivalent region)
- Tracking along genicular articular branches, including inferolateral genicular nerves at the fibular head
- No sciatic nerve or sheath staining**

Proximal Injections (~10 – 15 cm above femoral condyle):

- Dense longitudinal medial periosteal staining
- Extensive proximal spread (10 – 15+ cm)
- Limited posterior distal, condylar, and lateral engagement
- Minimal popliteal plane involvement

Table 1. Dye Distribution Patterns Following Geni-vs Anterior Peri-Femoral Injection

Anatomic Structure / Region	Distal Injection	Proximal Injection	Interpretation
Medial Periosteal Engagement	Dense staining beneath VM extending to distal condyles	Dense longitudinal staining	Consistent engaged
Posterior Distal Femur Coverage	Circumferential posterior staining (medial → lateral)	Minimal posterior distal femur spread	Distal placement enhances posterior access
Genicular Nerve Plane Involvement	Dye tracked along articular branches; inferolateral genicular nerve stained at fibular head	Limited genicular-adjacent spread	Distal injection more reliably engages genicular pathways
iPACK-Equivalent Tissue Plane	Dense staining around popliteal vessels	Minimal popliteal plane involvement	Posterior analgesia likely via fascial/periosteal spread
Lateral Femoral Spread	Variable but present along posterior lateral femur	Limited lateral dispersion	Injection level influences circumferential reach
Sciatic Nerve & Sheath	Not stained	Not stained	Posterior coverage without direct sciatic blockade
Long-Axis Spread	Moderate proximal extension	Extensive medial longitudinal spread	Proximal injection favors cranial periosteal tracking

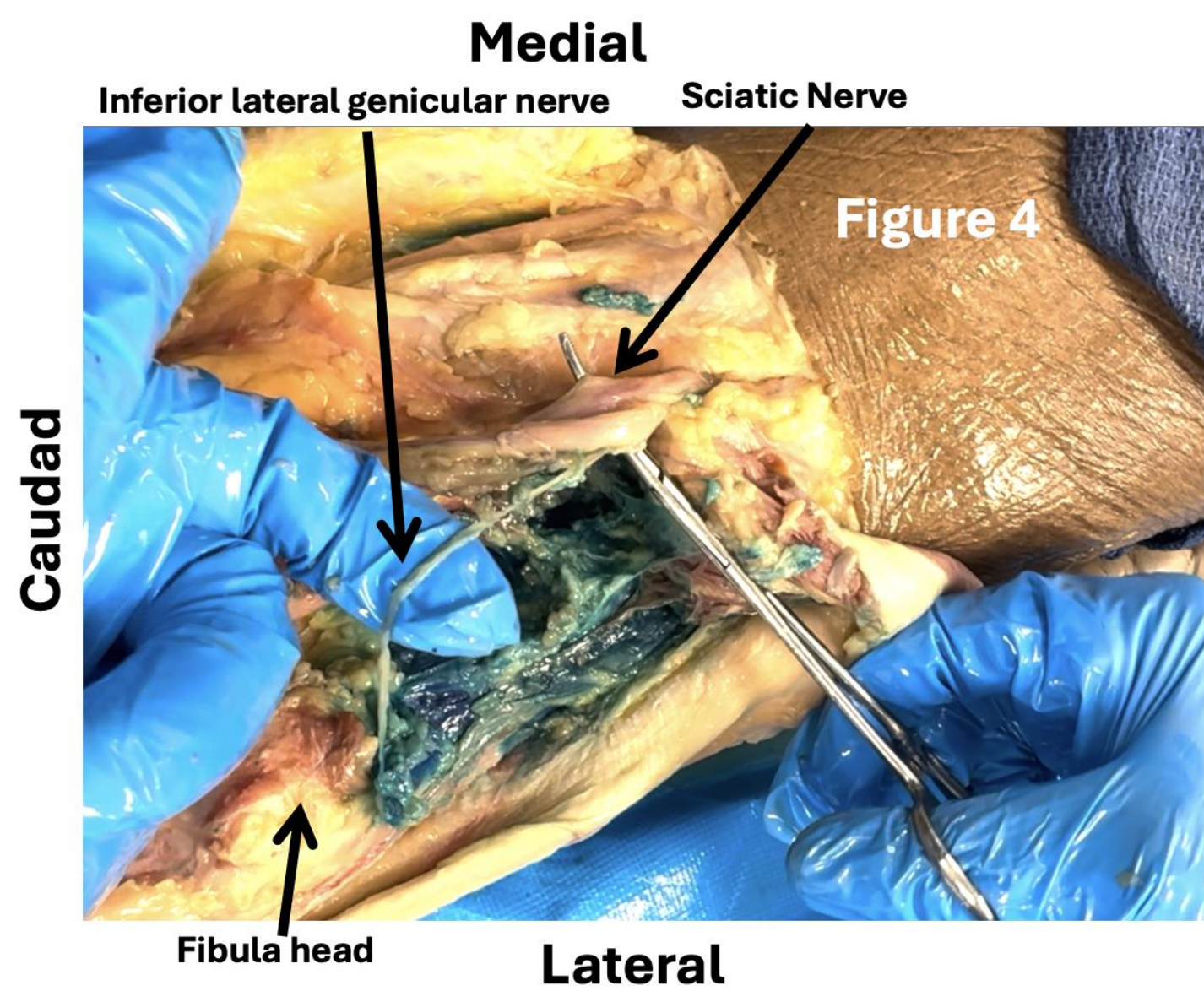


Figure 4. Inferior lateral genicular nerve stained on Cadaver 2

Conclusions

This cadaver study demonstrates that the single injection, Geni-vs block technique, can reliably engage medial periosteal and genicular-adjacent planes with dense posterior knee coverage, without direct sciatic nerve staining. Injection level also affects degree of spread, as more distal placement enhances posterior and circumferential spread. These findings support a distinct mechanism of posterior knee analgesia via an anterior approach that covers both periosteal and genicular planes similarly seen in iPACK and multi-injection genicular blocks.

At a Glance

Study Question:

- Does the Geni-vs anterior peri-femoral technique reach genicular adjacent planes and posterior knee?

Model:

- 2 cadavers, 4 thighs; methylene blue 0.1%, 20 mL.

Key Findings:

- Gen-vs single injection technique can reliably engage medial periosteal and genicular-adjacent planes with dense posterior knee coverage while sparing the sciatic nerve.
- Distal injections (6 cm above femoral condyle) provide superior coverage compared to proximal injection (10-15 cm above femoral condyle).

Potential Clinical Applications:

- Geni-vs technique may serve as a simplified alternative to iPACK and multi-injection genicular blocks to provide posterior knee analgesia following knee surgery.

Next Steps:

- Prospective clinical study evaluating analgesic efficacy, opioid use, and functional outcomes following Geni-vs block vs alternative techniques.

References

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