

Navigating CIED Interference: A Complex Case During Cervical Radiofrequency Ablation

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Introduction

- Chronic axial spinal pain is a significant contributor to disability and healthcare costs, with facet joints frequently being the source of the pain¹.
- Radiofrequency ablation (RFA) is a standard treatment for facet pain, particularly in the cervical region².
- Patients with cardiac implantable electronic devices (CIEDs) such as automated implantable cardioverter-defibrillators (AICDs) may experience electrical interference during RFA, leading to unnecessary pacing or shocks^{3, 5}.
- To prevent these issues, protective measures must be taken such as cardiology consultation, device reprogramming, magnet application, and continuous cardiac monitoring⁴.
- Recent guidelines further recommend more stringent selection criteria for cervical medial branch RFAs and explicit criteria to designate a block as positive⁶.

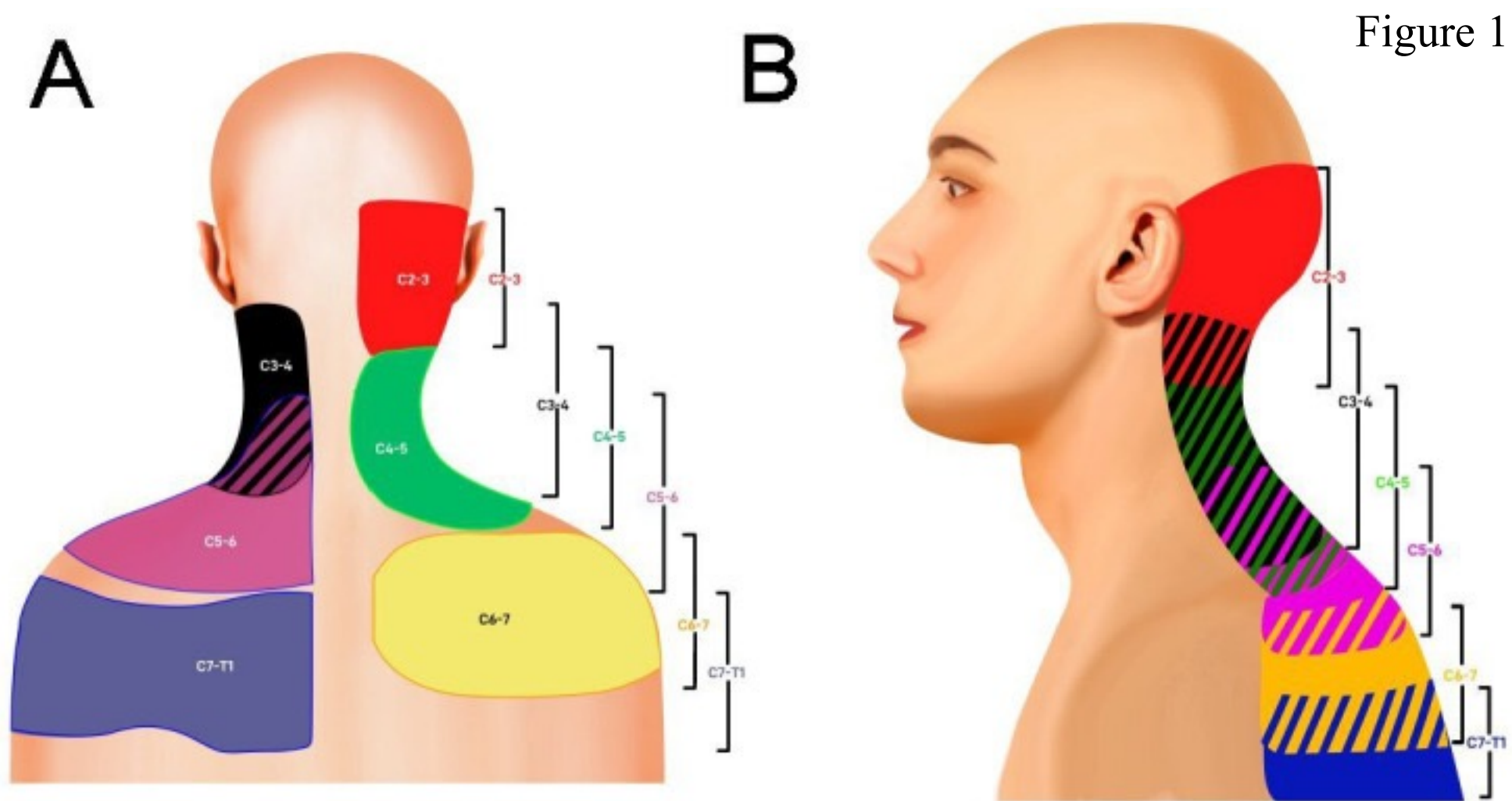


Figure 1. Posterior (A) and lateral (B) segmental maps showing pain referral patterns from the cervical facet joints (C2-3, red; C3-4, black; C4-5, green; C5-6, purple; C6-7, yellow; C7-T1, blue). Striped areas (hash marks) represent overlapping cervical facet joint pain maps.

"Consensus practice guidelines on interventions for cervical spine (facet) joint pain from a multispecialty international working group." Pain Medicine, 2022.

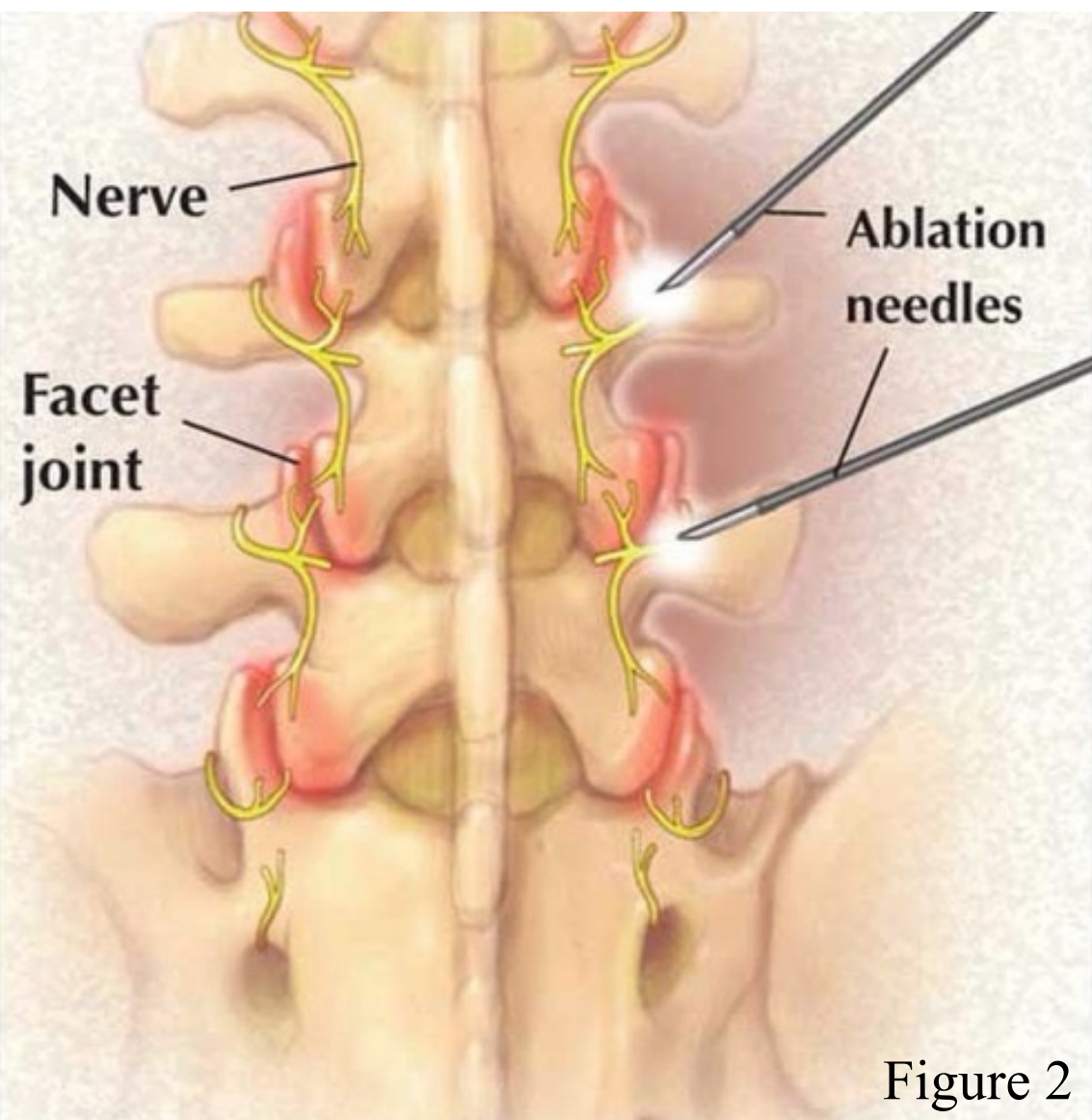
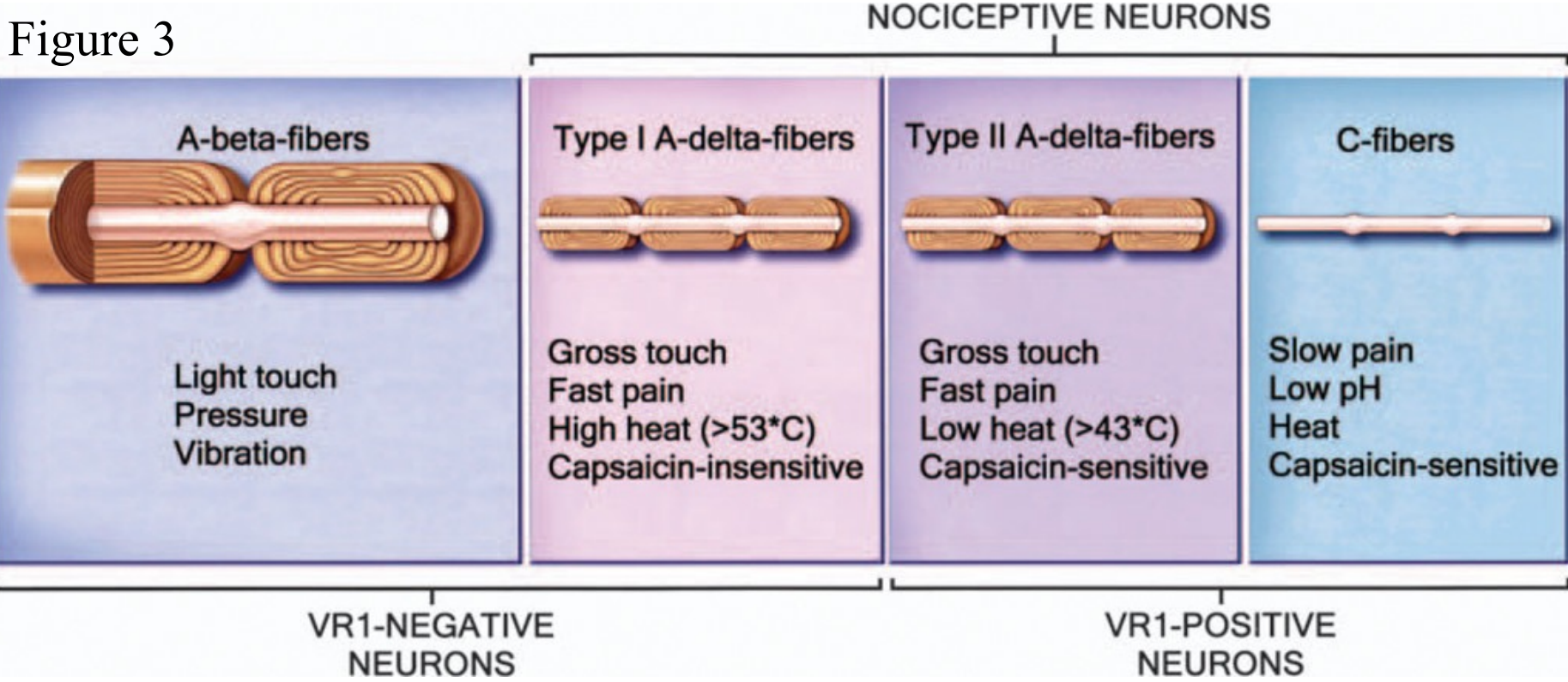


Figure 2. "Close Up of Skeletal Spine and Where Radiofrequency Ablation Occurs." Arizona Comprehensive Pain Management, <https://azcpm.com/radioAblation.php>.



Case Description

History of Presenting Illness:

- Patient is a 87-year-old male with a complex cardiac history, including coronary artery disease, two coronary bypass surgeries, hypertension, COPD from asbestos exposure, atrial fibrillation post-ablation surgery, and a BSC CRT-D for ischemic cardiomyopathy and chronic systolic congestive heart failure, with an ejection fraction of 30%.
- The patient underwent a cervical RFA procedure, preceded by a referral to cardiac electrophysiology for CIED interrogation during which the electrophysiology (EP) team recommended placement of a magnet over the device to minimize the risk of unintended shocks.
- Continuous EKG monitoring, blood pressure monitoring, and pulse oximetry were utilized throughout the procedure. The procedure was guided by fluoroscopy, employing a 22-gauge, 100mm SMK needle with an active tip, and a radiofrequency probe.
- Percutaneous advancement of the active tip targeted the C5, C6, and C7 medial branches, with a lateral fluoroscopic view confirming the needle tip's position at the articular pillar.
- A radiofrequency probe was introduced through the cannula following the removal of the stylet, with motor stimulation at 2 Hz and 2mV applied, triggering a multifidus muscle response without any upper extremity stimulation.
- Upon initiating denervation, the EKG displayed an absence of pulse or capture spikes from the AICD, suggesting potential interference with the cardiac device.

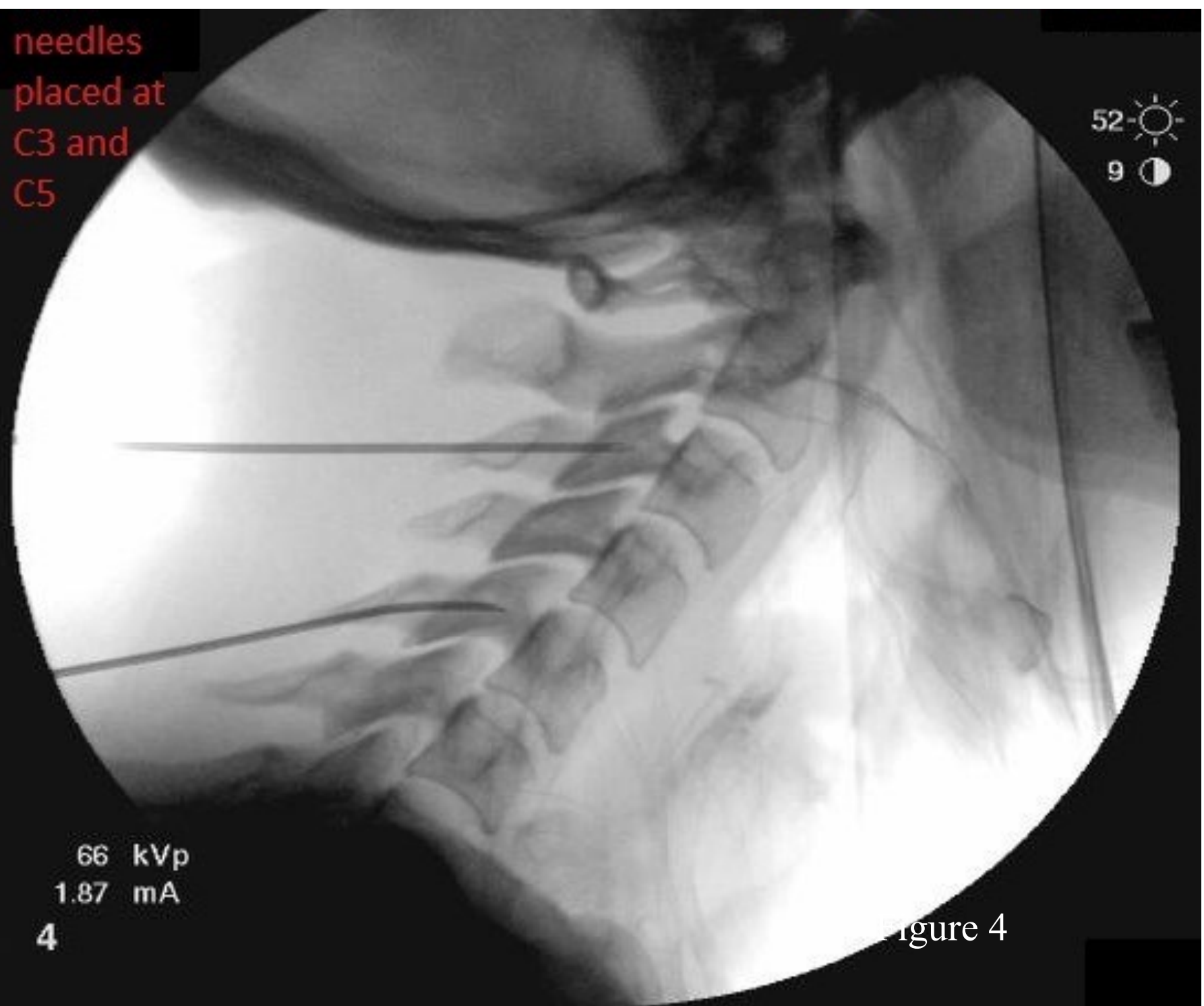


Figure 4. Example lateral fluoroscopic view with needle tips present in levels C3 and C5. "Fluoroscopic Guided Cervical Medial Branch Radiofrequency Ablation." *The Procedure Guide*. <https://theprocedureguide.com>.

- The procedure was immediately halted, following which capture spikes on the EKG resumed. The patient experienced no adverse events and did not report chest pain or palpitations during this interruption.
- A second attempt was made to proceed with the procedure; however, interference was observed again, leading to the termination of the procedure.

Discussion

- This case emphasizes the importance of collaboration between pain physicians and electrophysiologists for effectively management during the procedure with the ability to place the CIED into safe mode.
- The exact safe distance between RFA current and CIED is unstudied as it varies greatly per patient and per CIED manufacturer. Studies with active electrode tools identified 10cm as the distance greater than which there were no differences in electrical interference⁷.
- A notable strategy to minimize electrical interference during cervical RFA is the placement of the grounding pad on the opposite side of the body⁸.
- Utilizing bipolar radiofrequency, where both the active and return electrodes are placed in close proximity, can further reduce the risk of interference by confining current to a smaller area⁹.
- When cervical RFA isn't feasible, despite optimizing for electrical interference and magnet placement, medication management becomes a crucial alternative.
- Buprenorphine was initiated due to side effect profile.
- Although the exact cause of AICD interference during RFA remains elusive, a combination of continuous patient monitoring, collaboration, strategic grounding pad placement, and judicious use of medications significantly mitigates risks.

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