

Ultrasound-guided Scalp Block for an Awake Craniotomy

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INTRODUCTION

Awake craniotomies allow neurosurgeons to achieve a higher rate of brain tumor resection while minimizing significant neurological deficits. Anesthesiologists can play a crucial role by performing scalp blocks, which include seven bilateral nerves, implementing a sedative plan that maintains a patent airway and a plan that reduces interference with intraoperative neuromonitoring.

Awake craniotomies reduce the side effects of general anesthesia, promote early postoperative neurological evaluation, and improve resource utilization.¹

In this case report, we present a patient who underwent an awake craniotomy for a frontotemporal-occipital brain tumor.

PATIENT PRESENTATION

Our patient is a 74-year-old female (weight 100 kg and BMI 34) with significant past medical history of hypertension on metoprolol, aortic prosthetic mechanical valve on Warfarin, trigeminal neuralgia, and left temporo-occipital brain tumor associated with gait imbalance and memory and word-finding deficits. She presented for awake left-sided craniotomy with intraoperative brain mapping. Airway examination demonstrated Mallampati 2, thyromental distance >3 fingerbreadths, and full range of motion of the neck. An asleep-awake-asleep technique was implemented using general anesthesia with invasive monitoring, monitored anesthesia care, and regional anesthesia.

Standard ASA monitors were placed, and a time out was performed. After an uneventful induction and intubation, dexmedetomidine, propofol, and remifentanil infusions were started.

Ultrasound guided bilateral scalp blocks and superficial cervical plexus blocks were performed. The patient was positioned in the supine position and a total of 25 cc of 0.5% Bupivacaine was injected under ultrasound guidance. Bilateral supraorbital, supratrochlear, zygomaticotemporal, and greater occipital, nerves were individually blocked and the greater auricular and lesser occipital nerves were blocked via the superficial cervical plexus. A single intravenous dose of dexamethasone was given as an adjuvant to prolong the duration and improve the quality of analgesia provided by the ultrasound-guided scalp blocks.²

After completion of the ultrasound-guided nerve blocks, the patient was positioned for surgery and placed in pins with no change in vital signs. Additionally, vital signs remained unchanged following surgical incision with no adjustments to the propofol, remifentanil, and dexmedetomidine infusions.

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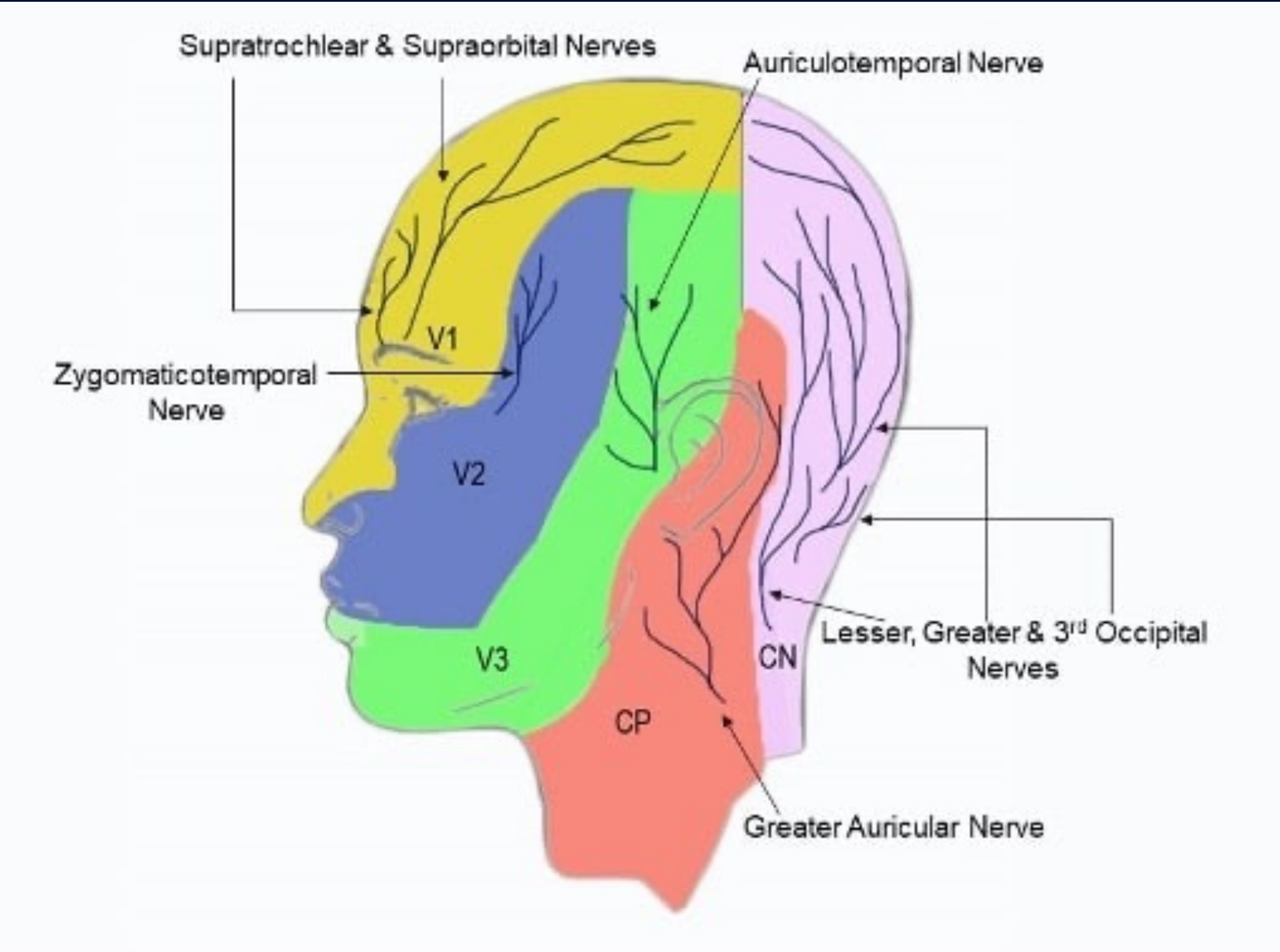


Figure 1: Dermatomes of the head and scalp. V1, V2, V3- Divisions of the Trigeminal nerve, CP- Cervical plexus, CN- Cervical spinal nerves.⁴

Origin	Nerve	Area Supplied
Branch of the Trigeminal nerve, V1 distribution	Supraorbital	Forehead, anterior part of the scalp, and top part of the head
Branch of the Trigeminal nerve, V1 distribution	Supratrochlear	Forehead and anterior part of the scalp
Branch of the Trigeminal nerve, V2 distribution	Zygomaticotemporal	Forehead and the temporal area
Branch of the Trigeminal nerve, V3 distribution	Auriculotemporal	Temporal areas, lower lip, lower face, auricle, and the scalp above the auricle
Cervical spinal nerves C1-C4	Superficial cervical plexus	Occipital region (lesser occipital nerve), outer ear & ear canal (great auricular), anterior aspect of neck (transverse cervical), shoulder, and upper thorax (supraclavicular)
Branch of the second and third cervical spinal nerves	Greater auricular	Over the parotid gland and mastoid process and auricle
Branch of the second and third cervical spinal nerves	Lesser occipital	Scalp in the lateral area of the head posterior to the auricle
Branch of the second cervical spinal nerve	Greater occipital	Skin along the posterior part of the scalp

Table 1: Scalp innervation⁵

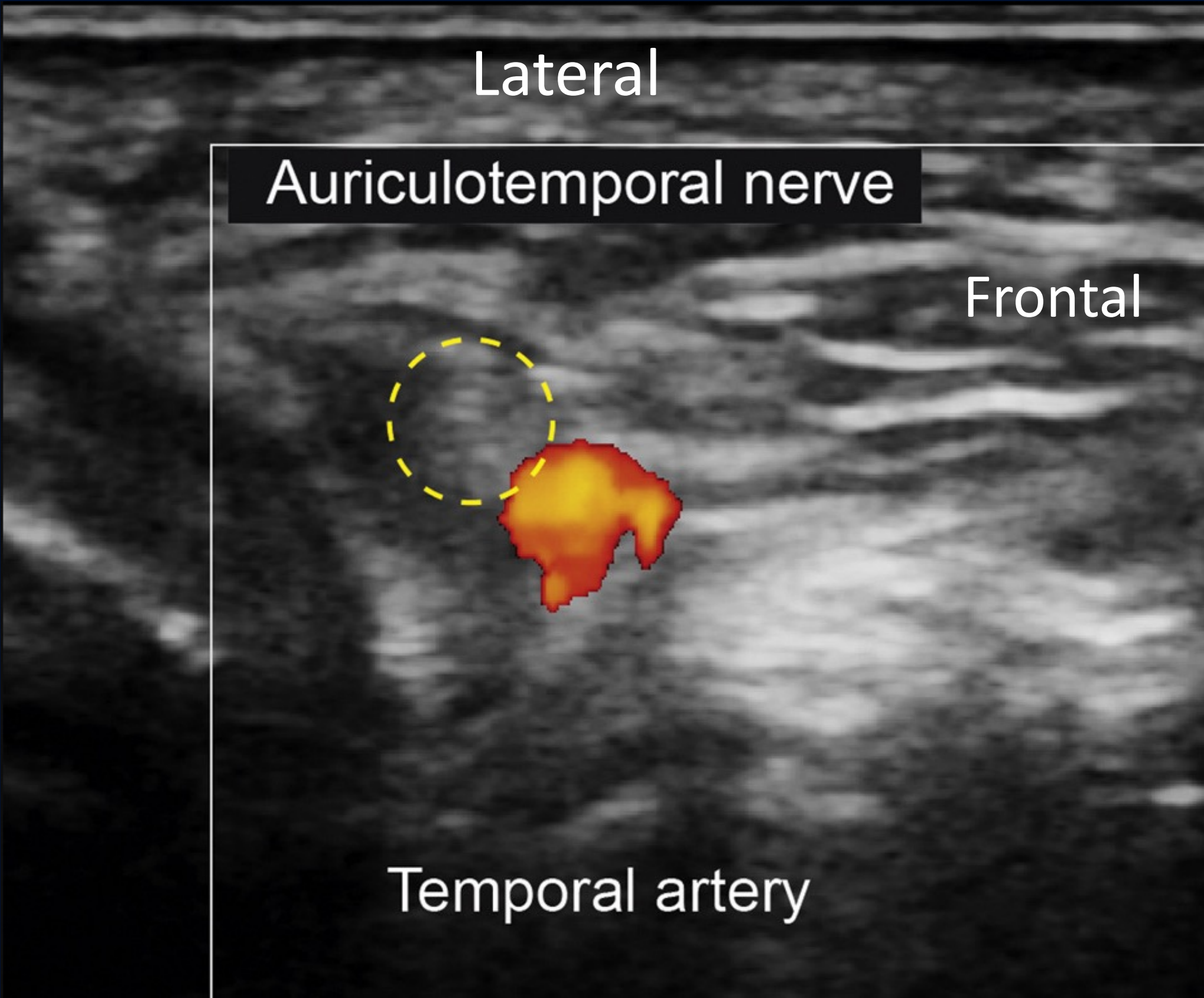


Figure 2: Ultrasound image showing auriculotemporal nerve posterior to temporal artery.⁷

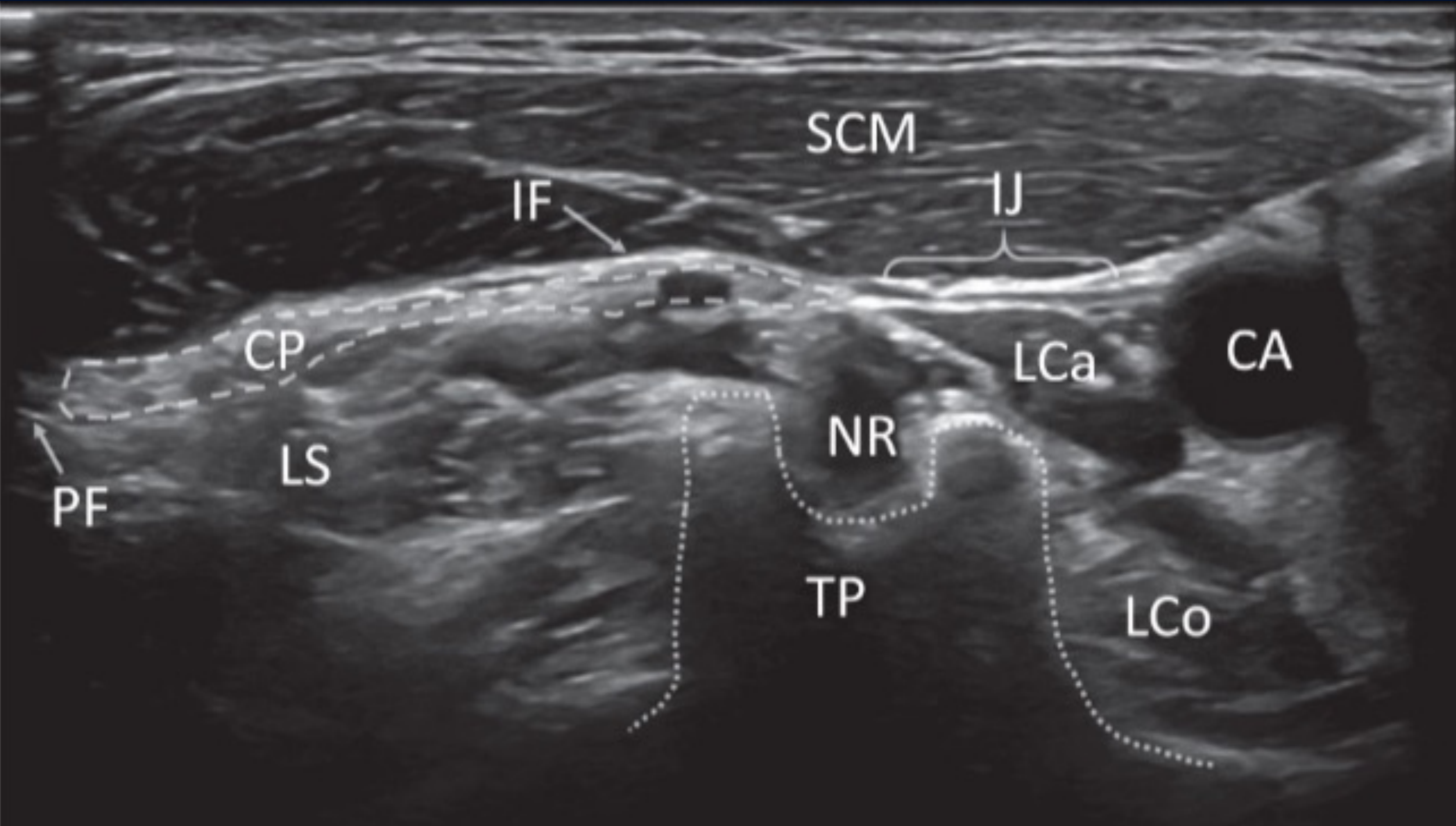


Figure 3: Cross sectional view of ultrasound image at the fourth cervical vertebrae level showing the cervical plexus (CP) in relation to carotid artery (CA), investing superficial fascia (IF), internal jugular vein (IJ), longus capitis (LCa), longus colli (LCo), levator scapulae (LS), C4 nerve root (NR), prevertebral fascia (PF), sternocleidomastoid (SCM), and edge of C4 transverse process (TP; dotted line).⁸

When it was time for the awake portion of the surgery, the patient underwent successful emergence and extubation. Awake language mapping was performed to maximize extent of resection and minimize functional deficits. The patient was cooperative, calm and pain-free throughout the awake portion of the procedure. At the conclusion of the awake portion of the surgery, the patient was induced and reintubated. Final motor analysis was performed, and the patient was extubated and transferred to the neurosurgical intensive care unit without complications. In the immediate post-operative period, the patient's pain scores ranged from 0-2/10 and required no additional analgesics.

DISCUSSION

The use of ultrasound allows for better visualization of anatomy and neurovascular distribution, in comparison to landmark-based scalp blocks, and may reduce volume and concentration of local anesthetic needed for an adequate block, thus reducing the risk of local anesthetic systemic toxicity (LAST).³ Complications from scalp blocks may include infection, hemodynamic changes and arrhythmias if epinephrine is used, vascular injury and hematoma, unilateral ptosis, facial nerve palsy, bradycardia and hypotension from the trigeminocardiac reflex, intracerebral or subarachnoid injection, anaphylactic response to local anesthetic, and LAST.⁴

CONCLUSION

Postcraniotomy pain is most significant within the first 48 hours post op and presents as a headache that is generalized and pounding or pulsatile. The pain is mostly superficial suggesting somatic rather than visceral pain.⁶ This case report demonstrates that ultrasound-guided scalp blocks provide the analgesia required to perform an awake craniotomy. A multidisciplinary team can interact with the awake patient with minimal discomfort and hemodynamic instability during pin application and scalp incision. Regional anesthesia can play an important role to reduce opioid requirements and allow for optimal conditions for a neurological assessment.

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