Published in final edited form as:

A A Pract. 2020 January 01; 14(1): 21–24. doi:10.1213/XAA.0000000000001134.

A Novel Approach to Postoperative Ear Pain—Greater Auricular Nerve Block Catheter: A Case Report

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Abstract

A 70-year-old man presented for repair of an ear avulsion injury sustained from an all-terrain vehicle accident. A continuous technique using a catheter for a greater auricular nerve (GAN) block was performed in the preoperative area followed by general anesthesia in the operating room. No opioids were administered during the surgical procedure or in the immediate postoperative period. The GAN catheter was kept in place for 3 days with near-complete pain relief per the patient. To our knowledge, there are no case reports that describe a continuous GAN technique for surgery and postoperative pain.

The greater auricular nerve (GAN) is the main sensory division of the cervical plexus, consisting of the second and third cervical nerves.¹ The GAN innervates a relatively large area including the angle of the mandible, the parotid gland, the skin overlying the mastoid process, and the inferior segments of the ear.^{1,2} The nerve travels superficially over the sternocleidomastoid muscle where it is easily imaged with a high-frequency linear ultrasound. Although initially described using a field block technique, the GAN is more reliably blocked with ultrasound guidance.^{1,3} The GAN block technique can be utilized in many diverse care settings including urgent care, emergency departments, and operating rooms. In some clinical scenarios, such as the one described in this case report, prolonged analgesia with a continuous GAN block technique may be optimal.

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The authors declare no conflicts of interest.

Written patient consent for this publication was obtained including the use of all photographs and ultrasound images.

CASE REPORT

A 70-year-old man was transported by ambulance as a level 1 trauma to our facility after an all-terrain vehicle accident. Although he was wearing a helmet, he sustained an avulsion of the left ear with exposed cartilage. His other injuries were a C2 lateral mass fracture and T8 burst fracture, which could be managed nonoperatively, but required cervical immobilization. On the day after the injury, the patient presented to the preoperative holding area for irrigation, debridement, and repair of his left ear. The surgeon reported that subsequent operations may be necessary. On arrival, he had a cervical collar in place and was complaining of excruciating left ear pain that was rated as 10 on the numeric pain rating scale. The patient's medical history was significant for coronary artery disease and diabetes mellitus type 2 treated with glargine insulin. His surgical history included coronary artery bypass grafting, and the patient had no history of anesthesia-related complications.

After an involved discussion with the patient regarding possible anesthetic and pain management options, written consents were obtained. Consent for general anesthesia and peripheral nerve block placement and a separate written consent for publication and the use of all photographic and ultrasound images were obtained. In the holding area, in the supine position, the cervical collar was removed, the skin was prepared, and in-line stabilization was achieved with the help of an assistant. Intravenous (IV) sedation was achieved with 2 mg of midazolam and 50 µg of fentanyl. A high-frequency linear ultrasound (SonoSite S-Nerve Ultrasound with L25× 13–6 Megahertz transducer; FUJIFILM SonoSite, Inc, Bothell, WA) was used by the anesthesiologist while standing above the patient and facing in the caudal direction. The GAN was identified by moving the ultrasound probe cranially from the superficial cervical plexus until the nerve was imaged on the anterior surface of the sternocleidomastoid (Figure 1). After ultrasound identification of the nerve, a 22-gauge IV catheter (BD Angiocath Autoguard Shielded IV Catheter; Becton, Dickinson and Company, Franklin Lakes, NJ) was advanced using an in-plane technique within millimeters of the GAN. The inner needle was retracted and 5 mL of 1% lidocaine and 5 mL of 0.25% bupivacaine were injected after negative aspiration through the catheter under direct ultrasound visualization (Figure 2). The catheter was connected to infusion tubing and a dressing was applied (Figure 3).

The patient was then taken to the operating room. After induction of general anesthesia with 100 mg of IV propofol, a supraglottic airway was inserted and general anesthesia was maintained with volatile anesthetic. No supplemental opioids or nonopioid pain medication were given during the case or in the postanesthesia care unit. While in the recovery room, the nerve block catheter was connected to an infusion of 0.25% bupivacaine at 2 mL/h.

The patient was evaluated daily while the nerve block catheter was in place and he reported no ear pain. The patient required no further surgeries but did have daily dressing changes for which he required no additional pain medications. On postoperative day 3, the nerve block catheter was removed at the request of the primary team in anticipation of hospital

discharge. He required no further opioid pain medications after removal of the catheter. The patient provided written consent to publish this case, including the use of all photographs and ultrasound images.

DISCUSSION

The GAN block has become a useful nerve block in many acute care settings, including the emergency department and operating room.⁴ The GAN provides sensory innervation to the antitragus, the tail of the helix, lobule of auricle, and segments of the external ear with variable supply to the spine of the helix, the tragus, and the concha.³ Comprised of the second and third cervical nerves, it also is the principal sensory branch of the cervical plexus.¹ The GAN ranges in size from 1.4 to 2.0 mm in diameter in anatomical studies, and variable nerve block success rates using landmark techniques have been reported.^{1,5} As a result of the nerve's small size and nonspecific anatomical landmarks, the GAN block has often been achieved via blockade of the entire superficial cervical plexus with large local anesthetic volumes.^{6,7} With the use of ultrasound, physicians are now able to directly image and block smaller nerves with reduced volumes of local anesthetics.³

In a study on healthy male volunteers, the GAN was easily imaged with ultrasound and nerve block success, as demonstrated by decreased pinprick sensation, approached 100%.¹ When compared to field block of the entire cervical plexus, selective GAN block resulted in fewer complications and side effects including vascular puncture and blockade of the phrenic, brachial plexus, and deep cervical plexus.⁷ With the increased accuracy and visualization that ultrasound provides, it has been shown that volumes as low as 0.1 mL can be effective for GAN block if administered under ultrasound guidance. Otherwise, superficial cervical plexus blockade can require up to 15–20 mL of local anesthetic to provide a similar effect.^{1,6}

To the best of our knowledge, continuous GAN block technique has not been described in the literature. Continuous GAN block may offer some of the same advantages of other continuous nerve blocks such as decreased opioid consumption, improved analgesia, less breakthrough pain, and fewer sleep disturbances.^{8,9} As described above, continuous GAN block technique can provide substantial pain control for patients who require multiple surgeries due to ear trauma. The technique may also benefit certain patients with uncommon syndromes such as tic douloureux and red ear syndrome.¹⁰ As stated in the article by Ritchie et al,³ the use of GAN block can provide pain relief for a wide variety of surgical procedures including drainage of auricular hematoma, laceration repair, removal of retained earrings, or cyst removal in the emergency room or office environment.^{10–12} The use of a peripheral nerve catheter in this patient significantly decreased his exposure to opioids, both in the intra-operative and postoperative period and may have decreased his future risk of developing opioid dependence.¹³

An IV catheter was selected for the continuous nerve block for this patient because, in the author's experience, over-the-needle catheters are less prone to insertion site medication leakage as compared to commonly used through-the-needle catheters, especially if the skin to nerve distance is very short. In addition, an IV catheter can be secured with inward

pressure using tape or similar material, as is commonly done during IV placement, and this may offer some protection against accidental dislodgement. Other types of catheters could have been used in this application and ultimately the choice of catheter depends on the experience and preference of the operator. It is also important to point out that it may have been possible to use less local anesthetic than we used; however, we wanted to be certain that the technique provided maximum analgesia for this patient. In addition, the patient had significant facial hair that extended onto his neck. Shaving the patient's beard with clippers before block placement may have offered some advantage in terms of procedure sterility and the neatness of the finished catheter dressing. However, peripheral nerve catheter infection is a rare event, with a reported incidence of 0%–3%.¹⁴

In summary, we have described what we believe is the first use of a continuous greater auricular block to provide extended regional anesthesia for a patient with an extremely painful ear injury. With the availability and wide use of ultrasound technology, we speculate that continuous GAN block technique can be useful in a variety of clinical scenarios.

GLOSSARY

GAN greater auricular nerve

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Figure 1.
The simulated image shows probe, needle, and proceduralist position.

Figure 2.

Ultrasound images of the GAN and surrounding anatomy. The image in (A) shows the catheter inserted from the top left of the image next to the GAN in the top center of the image as it lies on top of the sternocleidomastoid muscle. The image in (B) highlights the catheter (blue), the GAN (yellow), and the sternocleidomastoid muscle (red area). GAN indicates greater auricular nerve.

Figure 3.

Images of the left side of the patient's neck and face. The image in (A) shows the 22-gauge catheter connected to the infusion tubing and in place before dressing. The image in (B) depicts catheter in place with the sternocleidomastoid muscle (red area). The black rectangle represents the needle trajectory and distance traversed. The typical course of the greater auricular nerve (yellow line) superimposed on the image, and the blue-shaded area represents the sensory distribution of the nerve.