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Ultrasound-Guided Injection to the Fifth Cervical Spinal Nerve Root Level

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This feature is a unique combination of text (voice) and video that more clearly presents and explains procedures in musculoskeletal medicine. These videos will be available on the journal's Website. We hope that this feature will change and enhance the learning experience.

Walter R. Frontera, MD, PhD
Editor-in-Chief

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Cervical radicular pain is manifested as pain shooting down the upper limb induced by the irritation of the spinal nerve as it exits the neural foramina. Treatments include cervical traction, exercises, and analgesics.¹ Although surgery remains as the mainstream of treatment, its long-lasting efficacy is still unclear.² Cervical transforaminal steroid injection can be used to treat radicular pain caused by disc disorders. This is performed under fluoroscopy or computed tomography guidance.³ However, these imaging tools are not able to visualize small vessels, and incidences such as brainstem or spinal cord infarction may occur.⁴ These complications are believed to be caused by inadvertent injection of therapeutic agents into the vertebral or radicular arteries.⁵ Therefore, accidental puncture of vessels must be prevented when performing neck injection procedures.

Recently, high-resolution musculoskeletal ultrasound (US) can be used to identify the target root and the nearby vessels. The advantage of using US as a guidance tool is that it does not expose patients or medical personnel to radiation such as fluoroscopy or computed tomography guidance. Ultrasound

allows good visualization of the soft tissue such as abnormal blood vessels in the foramen and around the nerve root, which further enables accurate needle placement and avoids the risk of intravascular injections.⁵ As a result, US-guided cervical nerve root block (US-CRB) is a safe alternative treatment technique that can be used in the treatment of upper extremity radicular pain.⁶ It has been shown that US- and fluoroscopy-guided techniques for neck CRB showed no differences in efficacy.⁵

The objective of CRB is to place the needle in the intertubercular groove situated between the nerve root and the posterior tubercle.¹ After the injection, the injectate can then spread close to the target nerve, reducing inflammation of the injured nerve roots and suppressing the transmission of nociceptive C-fibers.^{1,4} This article demonstrates how US-guided injection is performed to the cervical spinal fifth nerve root level because this is the frequent site that causes radicular pain.

How It Is Performed

This study was approved by our institutional review board. In the video, the technique of US-CRB was performed to the right cervical spinal fifth nerve root level in a patient with narrowed fifth neuroforamen. The patient is placed in a lateral decubitus position and with the neck well supported. The US machine of Philips iU22 and a linear array transducer with a bandwidth of 5 to 12 MHz (Philips Medical Systems, Andover, MA) was used.

The transducer is placed transversely to the lateral aspect of the neck to obtain the US transverse axial view of the transverse process. The transverse process of the cervical vertebra is divided into anterior and posterior tubercles. The seventh cervical spinal level can be identified on the basis of its unique transverse process of having a prominent posterior tubercle but a rudimentary anterior tubercle.³ The sixth cervical level has a taller anterior tubercle but a much shorter posterior tubercle. Cervical fifth, fourth, and third levels have same heights of both tubercles, giving it the “2-humped camel” sign.³ The nerve root rises out from the trough of the transverse process in between the tubercles (Fig. 1).

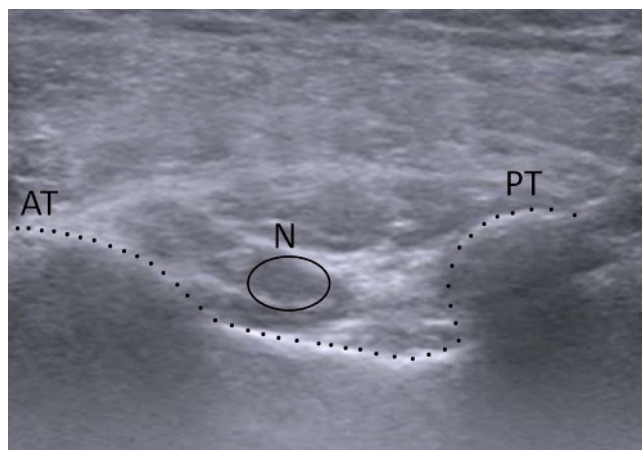


FIGURE 1. Transverse axial US image of the fifth cervical transverse process. The anterior and posterior tubercles have the same height, giving it the 2-humped camel sign. The nerve root is located between the tubercles. A: anterior tubercle; N: nerve root; P: posterior tubercle.

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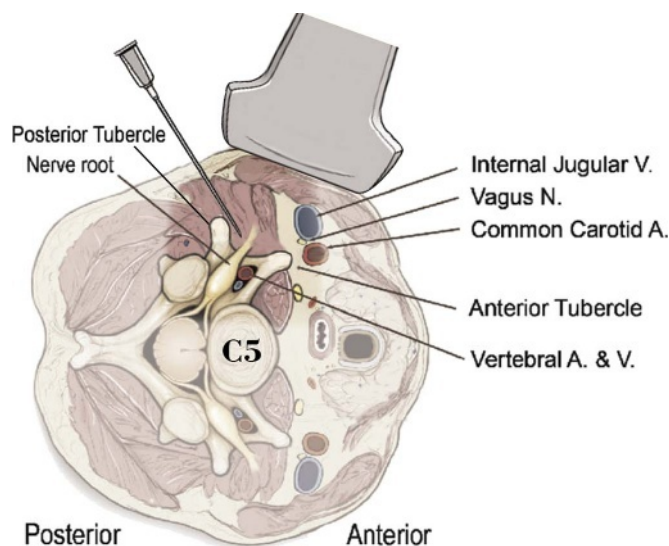


FIGURE 2. Modified illustration from Narouze et al.³ showing the relevant anatomy at C5 level and the orientation of the transducer to show the transverse axial view of the C5 transverse process. There must be a safe distance between the needle and the transducer to avoid possible infection.

The physiatrist performing the injection stands behind the patient. Strict sterile precautions are carried out throughout the entire injection procedure. When the appropriate cervical spinal level is identified, the needle is then inserted just lateral to the lateral end of the transducer. During US-guided injections, 21- or 23-gauge long needles are recommended when deeper joints and soft tissue structures are to be injected. The 21-gauge (21G \times 2 3/4 [0.80 \times 70 mm]) needle may be preferred because it is more rigid and can prevent excessive bending of the needle during injection as compared with the 23-gauge needle.⁷ The needle is then advanced in a posterior to anterior direction, in plane with the real-time US images, and guided toward the intertubercular groove. The injection target of US-CRB is the intertubercular groove between the posterior tubercle and the fifth nerve root (Fig. 2).^{1,3} This posterior to anterior injection approach is relatively safe as compared with the anterior to posterior approach or other injection techniques such as transforaminal epidural steroid injection.⁶ To date, there are no reported complications using such US-CRB injection approach.⁵

CONCLUSIONS

This video demonstrates how US-CRB is performed to the cervical spinal fifth nerve root level with the patient lying in the lateral decubitus position. Under this transverse axial view of the transverse process, the anterior and posterior tubercles as

well as the nerve roots can be visualized. Ultrasound is free in radiation and provides real-time images of needle advancement motion to the target site. Although this video gallery article is not a research on new injection technique and US-CRB is practiced by some anesthesiologists already but by knowing how this is performed, it may be a beneficial tool for physiatrists to treat patients with cervical radicular pain.

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