Ultrasound-Guided Interventions of the Cervical Spine and Nerves

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KEYWORDS

• Neck • Pain • Ultrasound • Nerve • Injection

KEY POINTS

- The cervical region has a complicated neurovascular network and familiarization with the regional sonoanatomy is the basis before proceeding to ultrasound (US)-guided injections.
- The in-plane technique with visualization of the whole needle should be preferred for the injection of cervical nerves.
- Comprehensive understanding of the cervical sonoanatomy should remain as the prerequisite before one can plan US-guided cervical interventions.

INTRODUCTION

Because high resolution ultrasound (US) promptly depicts muscles, tendons, ligaments, and peripheral nerves, it is among the best imaging modalities for guiding perineural injections.[1–8] Cervical sonoanatomy is actually quite complicated and several years of scanning experience on the extremities is required before practicing US-guided injections on the neck.[8–11] Additionally, awareness of the sonographic appearance and location of the vital structures (eg, trachea, carotid artery, vertebral artery, vagus nerve, and spinal cord) can significantly reduce the chance of collateral injury.[8] Although there are numerous US-guided regimens or techniques; that is, local anesthetics, corticosteroids, dextrose, platelet-rich plasma, and radiofrequency ablation, their effectiveness still heavily relies on the precision of the intervention. Although the comparison of efficacy among various injectates is not within the scope of this

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article, the risk of thrombosis due to intravascular administration of crystalloid corticosteroids is noteworthy in regard to cervical interventions.[12] Overall, the purpose of this article is to deliberate the sonoanatomy of the commonly intervened cervical structures and to illustrate how those procedures can safely and precisely be performed under US-guidance.

Selective Cervical Root Block

Indication

The selective cervical root block procedure is usually necessary in patients with cervical radiculopathy in association with a herniated disc or an osseous foraminal encroachment.[13]

Anatomy

The brachial plexus is composed of the ventral rami from the 5th cervical nerve (C) to the 1st thoracic nerve (T), and is divided into roots, trunks, divisions, cords, and peripheral nerves. The superior trunk is made of C5 and C6 nerve roots, C7 continues as the middle trunk, and C8 and T1 roots form the inferior trunk. Each trunk is then divided into the anterior and posterior divisions. The lateral cord receives nerve fibers from the anterior divisions of the superior and middle trunks, the medial cord is derived from the anterior division of the inferior trunk, and all the 3 posterior divisions merge to continue as the posterior cord. The lateral cord gives off the musculocutaneous and lateral pectoral nerves; the medial cord gives off the ulnar, medial pectoral, and medial cutaneous nerves of the upper limb; and the posterior cord gives off the upper and lower subscapular nerves, thoracodorsal, radial, and axillary nerves. The median nerve obtains its innervation from the medial and lateral cords.[8]

Sonoanatomy and technique

The patient is positioned supine with the head rotating to the contralateral side. The transducer is first placed on the supraclavicular fossa in the sagittal plane where the subclavian vessels and supraclavicular portion of the brachial plexus can be visualized. At this localization, the brachial plexus looks like grapes or a cluster of hypoechoic round structures, located dorsal and superior to the subclavian artery. Relocating the transducer more cranially, the brachial plexus can be followed in the interscalene region where the cervical nerve roots are arranged in a line between the anterior and medial scalene muscles. At this level, the most superficial is the C5 nerve root and the deepest is the T1 nerve root.[8]

Moving the transducer toward the head, the C7 transverse process can easily be recognized as having only 1 prominent posterior tubercle. Yet, its configuration is different from those of C3-C6, all of which have anterior and posterior tubercles. Because the vertebral artery enters the transverse foramina at the level of C6 in most people, the course of the artery can be confirmed at the level of C7 by using power Doppler US imaging. Herein, the short axis of the C7 nerve root can be visualized anterior to the C7 transverse process and posterior to the vertebral artery.[8] Further advancing the transducer more cranially, the C6 nerve root is seen emerging from the intertubercular groove, bordered by the anterior and posterior tubercles of the transverse process. The anterior tubercle of the C6 transverse process, also known as Chassaignac tubercle, is prominent in most people and is usually longer than the posterior tubercle of the same level. The C5 nerve root can be tracked by using the same approach.[8]

The patient is supine with the head rotated to the contralateral side and the injection is performed from lateral to medial using the in-plane approach (**Fig. 1**A). The needle can be introduced selectively at C5 (**Fig. 1**B), C6 (**Fig. 1**C), and C7 (**Fig. 1**D) levels until