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Essay

Ultrasound-guided stellate ganglion block☆

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ABSTRACT

The stellate ganglion block has multiple indications for pain management. The technique has evolved from using anatomical landmarks to image-guided puncture with fluoroscopy and ultrasound.

Ultrasonography is a very useful tool that allows for real time visualization of the vascular structures (carotid, vertebral artery), the visceral structures (esophagus) and thus helps in preventing puncture injuries. This article offers a description of the indications, the ultrasound-guided technique and complications under the author's point of view.

Bloqueo ganglio estrellado guiado por ultrasonografia

Palabras clave:
Ganglio estrellado
Dolor crónico
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RESUMEN

El bloqueo del ganglio estrellado tiene múltiples indicaciones para el manejo del dolor, para este fin la técnica ha evolucionado desde la realización por medio de referencias anatómicas, hasta la punción guiada por imágenes como son el fluoroscopio y la ecografía.

La ultrasonografía es una herramienta muy útil ya que se puede ver en tiempo real las estructuras vasculares (carótida, arteria vertebral), las estructuras viscerales (esófago) y así evitar puncionarlas. En el presente artículo se hará una descripción de las indicaciones, la técnica guiada por ultrasonografía y las complicaciones, bajo la perspectiva del autor.

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Introduction

The stellate ganglion block is a frequently used technique for the treatment of chronic pain. It was originally described in the 1930s by Leriche in the US and by Fontaine in Europe,[1] to relieve causalgic pain and the reflex sympathetic dystrophy of the upper limbs.

Whilst fluoroscopy is a reliable method for identifying the nerve structures, ultrasound allows for the identification of the vertebral vessels, the thyroid gland and vessels, the *longus colli* muscle, the nerve roots and the esophagus. Therefore, ultrasound may prevent the inadvertent puncture of these structures, a risk that may arise with the blind technique or via fluoroscopy.[2]

Several techniques have been used to block the lower sympathetic cervical chain. The 2 most frequent ones are the transverse process of C6 and the anterior or paratracheal approach at the level of C7, with or without fluoroscopy.[2]

Ultrasound is a tool to view the structures, guide the needle advancing in real time, and confirm the injection and distribution of the medication, avoiding both the health practitioner and the patient's exposure to radiation.[3]

The purpose of this article is to describe the most salient aspects of the stellate ganglion ultrasound-guided block, its indications, and contraindications.

Anatomy

Understanding the anatomy of the cervical-thoracic sympathetic chain and ganglion is key to determine whether the neural block was therapeutic and to avoid unnecessary nerve ablation procedures.[4]

The cervical sympathetic trunk or the cervical sympathetic chain is a cephalic continuation of the thoracic sympathetic trunk located in a bundle space.[5,6]

It is made up by three ganglia:[6]

- The superior cervical ganglion, the largest of the three ganglia, is spindle shaped, measures 2–5 cm long and is usually located across the first vertebra and is associated with the 4 superior cervical vertebrae.
- The middle cervical ganglion is occasionally absent, never exceeds 10 mm long and is placed below and in front of Chassaignac's tubercle at the level of the sixth cervical vertebra. When present it is associated with C5–C6.
- The inferior cervical ganglion is constant, usually located in front of the 7th cervical vertebra and the 1st thoracic vertebra, fused with the first thoracic ganglion forming an irregular mass con el primer (spider-like shape).[7]

In about 80% of the population this inferior cervical ganglion fuses with the first thoracic ganglion to form a single structure, the *cervical-thoracic ganglion or stellate ganglion*.[8,9]

The stellate ganglion is located medial to the scalene muscles, lateral to the *longus colli* muscle and the trachea, together with the laryngeal recurrent nerve, anterior to the transverse process; the inferior most section is located posteriorly to the superior margin of the first section of the subclavian artery and at the origin of the vertebral artery, posterior to the apex of the lung. At the level of C6 it is in close relation with the anterior tubercle of Chassaignac and at the level of C7 is more medial at the level of the anterolateral aspect of the vertebral body [10] (Fig. 1).

The stellate ganglion measures approximately 2.5 cm × 1 cm × 0.5 cm. It is located in front of the neck of the first rib extending to the union of the seventh cervical vertebra and the first thoracic vertebra. However, its shape and location vary depending on the individual. It is localized lateral and posterior to the lateral border of the long muscle of the neck.[11] The ganglion may have a spindle, triangular of globular shape.[9]

The most important vascular relationships are the carotid and vertebral arteries located at the level of C7. However, there can be a 10% anatomical variation when the vertebral artery enters above C7. It should be noted that incomplete osteogenesis might be present at the level of C7 so a medial-most approach should be maintained to prevent puncturing of the vertebral artery.[10]

The *longus colli* muscle is the muscular landmark usually lateral to the ganglion and varying in thickness from 5 to 10 mm in C6 and from 8 to 10 mm in C7. The total depth from the subcutaneous cell tissue to the transverse process at C6 usually does not exceed 16.6 mm.[10]

The sympathetic fibers of the head, neck and lower limbs cross the stellate or cervical-thoracic ganglion.[10,12]

The efferent postganglionic nerve fibers go cross the head, the neck, the upper limbs and the heart. The sympathetic postganglionic nerve endings release noradrenaline as the transmitter substance.[13,14]

The stellate ganglion block causes a more complete denervation of the head and neck structures. However, there are a considerable number of people in whom somatic intrathoracic branches of the second nerve come together with the first spinal thoracic nerve. These intrathoracic branches join

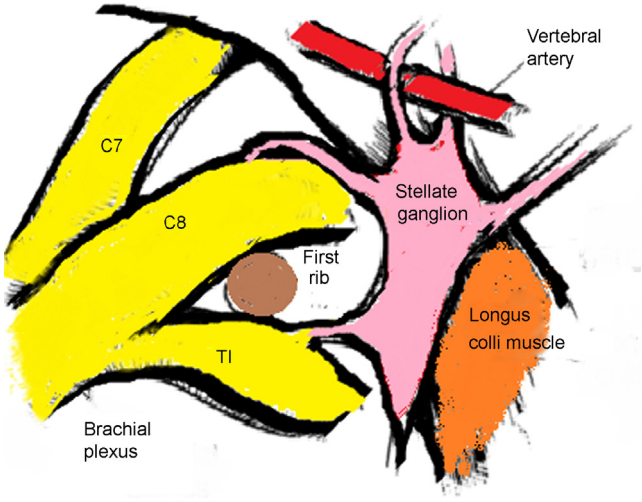

Fig. 1 – The stellate ganglion lateral longus Colli muscle and closely related to the brachial plexus, and the lower portion is situated back to the origin of the vertebral artery. Source: Author