EDITORIAL

Ultrasound-guided Greater Occipital Nerve Intervention: A Novel Technique for Diagnosis and Management of Headache Disorders

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Greater occipital nerve (GON) intervention is indicated for managing different types of headache disorder including chronic migraine, occipital neuralgia, cervicogenic headache, and cluster headache.[1] The hypothesis behind using this intervention in headache management comes from the evidence of the transmission of sensory information to the fifth nerve nucleus neurons from both cervical and trigeminal fibers, thereby resulting in an antagonizing "wind-up-like effect".[2] In the past, landmark-guided GON intervention, based on anatomy, has been performed, which yielded variable results. The classical method of anatomical or landmark-guided GON intervention involves initial palpation of occipital artery at the level of the superior nuchal line. Once pulsations of occipital artery are felt, thumb is placed over it and negative aspiration injection is performed from medial to artery (Fig. 1).

Now various studies have revealed that ultrasound-guided GON intervention is the gold standard, which not only helps the interventionist to exactly localize the nerve but also increases the success rate of this intervention with even the smallest amount of the local anesthetics. On the contrary, ultrasonography (USG) does not compromise patient safety when compared with landmark-guided procedures.

Anatomy of Greater Occipital Nerve

It is the sensory branch of the dorsal rami of the second spinal nerve, i.e., C2. Along with the lesser occipital nerve, it supplies the skin involving C2 and some part of C3 dermatome, i.e., areas adjoining the vertex.[3] After exiting the second spinal nerve, it appears at the lower border of the obliquus capitis inferior muscle (OCIM). Thereafter, it parallels between the OCIM and the semispinalis capitis muscle (SsCM). At last, it terminates in relation to trapezius and sternocleidomastoid, i.e., either penetrates the trapezius muscle or it travels as sandwiched between the trapezius muscle and the sternocleidomastoid muscle. In the short-axis view, the GON is seen as a hypoechoic structure sandwiched between the SsCM dorsally and the OCIM ventrally.[4]

Ultrasound-guided Intervention

- Place the patient in prone position with neck flexed on a head ring or pillow.
- Adjust the knobology component on the USG machine in terms of depth of gain and field to improve the image resolution.
- A high-frequency linear (10–12 MHz) USG probe is placed over the occiput to get a short-axis view. Image is adjusted, so that the external occipital protuberance lies in the midline.

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- Now probe is oriented in an oblique manner, so that medial part of the probe points toward the C2 spinous process, which can be identified as a bifid structure and the lateral part of probe is directed toward the transverse process of the C1 vertebrae.
- Now move the probe downwards to visualize the short-axis view of atlas to locate its arch.
- Move the probe further downward to the C2 level to obtain bifid spinous structure along with left and right tubercles. It confirms the axis vertebrae.

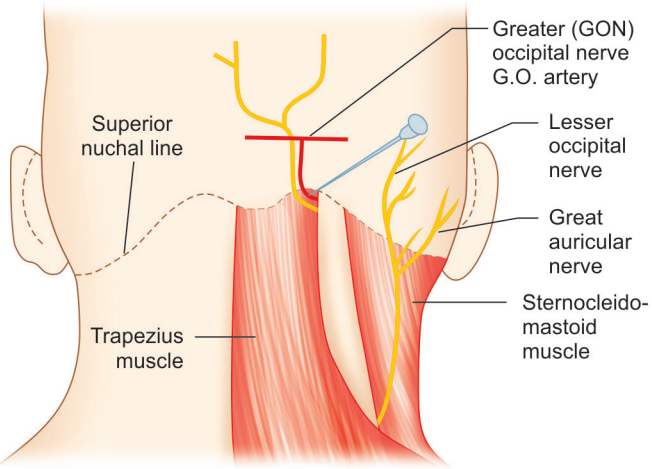

Fig. 1: Landmark-guided greater occipital nerve intervention

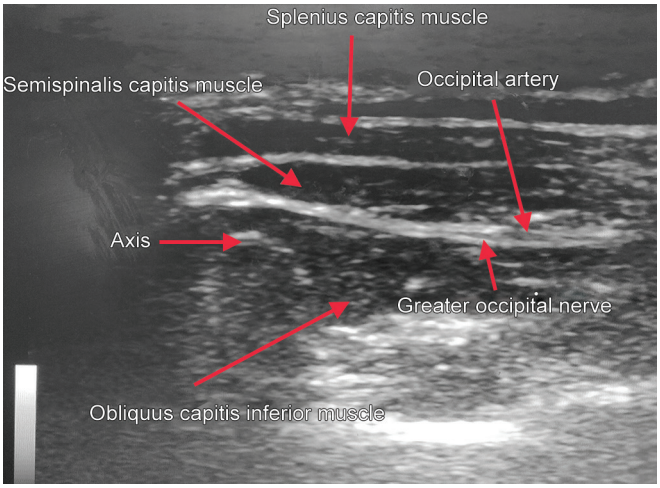

Fig. 2: Sonoanatomy of greater occipital nerve

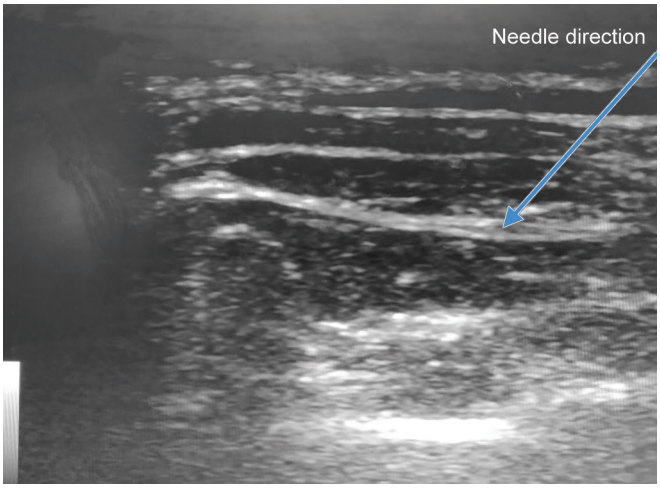

Fig. 3: Ultrasonograph demonstrating needle direction

- Once the spinous process of axis is identified, the probe is walked laterally to localize the OCIM, which can be seen ventral to the SsCM.
- Orient the probe in oblique fashion, so that the lateral part of the probe points superiorly toward the mastoid process.
- Probe is further advanced laterally till the point where spinous process of axis cannot be demonstrated.
- An oval- or flat-shaped hypoechoic popcorn-like structure sandwiched between the SsCM and OCIM, medial to occipital artery pulsation is identified. This hypoechoic structure is the GON. The arterial pulsation can be further confirmed with power Doppler mode (Fig. 2).
- Insert a 50 mm sonoplex/hypodermic needle in in-plane fashion. The needle is walked from lateral to medial direction, so that the final position of the needle tip lies in between the OCIM and SsCM (Fig. 3).
- Using normal saline, the plane is initially separated and the nerve is localized. We can further confirm the GON via nerve stimulation attached to the Stimuplex needle.
- Finally inject up to 5 mL of local anesthesia with or without nonparticulate steroid (20 mg of depot methylprednisolone) around the GON.

Radiofrequency Ablation of Greater Occipital Nerve

- Pulsed radiofrequency (RF) is recommended.
- Place a 22 G, 10 mm active tip radiofrequency probe in in-plane manner with the beam near to the GON.
- It is performed at a frequency of 2 Hz and duration of 20 milliseconds for 120 seconds at a temperature of 42°C.

Documented Indications

- Primary headache[5]
- Cervicogenic headache[6–8]
- Migraine[9,10]
- Occipital neuralgia[11]
- Tension headache[12]
- Cluster headache[13]
- As a component of scalp block for awake craniotomy.

Complications/Adverse Effects of Greater Occipital Nerve Interventions

Greater occipital nerve intervention is a very safe technique to alleviate headache. Few problems that have been encountered are:

- Vasovagal syncope
- Transient dizziness
- Tenderness after injection
- Hypersensitivity
- Worsening of migraine headache after injection
- Alopecia as a result of steroid addition[14]
- Others like transient facial nerve palsy[15]

In conclusion, an ultrasound-guided GON intervention is an effective intervention for managing headache disorder and its associated symptoms. Till now, this intervention has yielded satisfactory results, but further randomized controlled trials are required to support indications of GON interventions for headache disorders.

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