Greater Occipital Nerve Block - Extra-Foraminal Sonoanatomy

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Abstract

The Greater Occipital Nerve (GON) can be sonographically localized by consistent identifiable musculature and boney landmarks. Under ultrasound guidance the GON can be identified as is exits the C2 neural foramen and followed both transversely as well as longitudinally as it turns posteriorly and superiorly over the obliquus capitis inferior muscle. With the GON well localized, the radicular and suboccipital arteries adjacent the GON are then identified using low flow Doppler.

This study demonstrates the technique and significant advantages when the GON is visualized extra-foraminally in not only in transverse but in longitudinal. The GON block can then be inspected longitudinally to confirm proper bolus flow from the extra-foraminal peri-neural location toward the occiput.

This advanced sonoanatomy can, not only improve the chances of a "complete" block, but reduce the chance of retrograde peri-neural anesthetic flow and/or inadvertent vascular inject.

Keywords: ultrasonography; greater occipital nerve; obliquus capitis inferior muscle; rectus capitis posterior major muscle

Objectives

The purpose of this investigation is to demonstrate the feasibility of ultrasound guided GON blocks more proximal than the standard blinded technique, present the pertinent sonoanatomy to perform the “transverse” GON approach and the advanced sonoanatomy to support the innovative “long” GON approach.

Traditional GON Blocking

IThe standard approach for blocking the greater occipital nerve (GON) is to blindly inject just medial to the palpable occipital artery just above the superior nuchal line. With the addition of ultrasound guidance to the standard approach, the occipital artery can be identified but the GON is often obscured by the acoustic coupling artifacts caused by overlying hair.

Injection around the origin of the greater occipital nerve

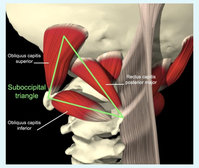
The more proximal ultrasound guided approach to blocking the GON is a paramedian approach to the GON in transverse just superficial to the obliquus capitis inferior (OCI) muscle. This more proximal ultrasound guided “transverse” GON approach has been shown to be very precise and efficacious. The transverse GON approach can be performed “in-plane” (long-axis) or “out-of-plane” (short-axis) successfully but has limited visualization of the GON.

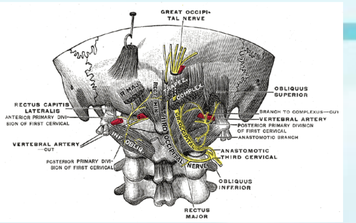
Moreover, the small acoustic window in traditional ultrasound guided GON hydro-disection limits the ability to observe the haloing of the bolus surrounding the transverse GON and lacks visualization of the real-time extent and direction of bolus flow above and below the nerve which can only be observed in the longitudinal GON image.

Long GON Blocking

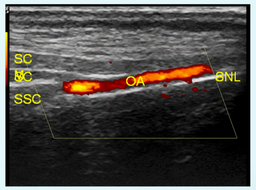
IThe innovative “long” GON approach is performed by visualizing the track of the GON in longitudinal as it arises between the C1 and C2 vertebrae and lies superficially over the OCI and rectus capitis posterior major (RCPM) muscles. The long GON approach can also be performed in both approach planes or axes, but, when utilizing a oblique out-of plane or “short-long axis” approach to the GON, the bolus can then be visualized in real-time both longitudinal and transverse to the GON.

Anatomy of Greater Occipital Nerve

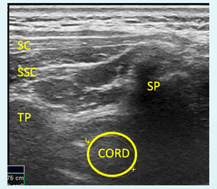




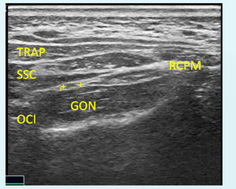
Ultrasound of Greater Occipital Nerve



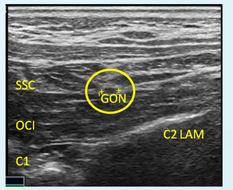
Occipital artery traversing superior nuchal line from lateral to medial



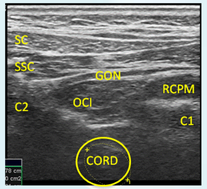
Mid cervical vertebra with multiple facial layers within the laminar gutter and spinal cord with canal



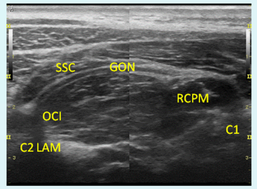
Paramedian GON approach



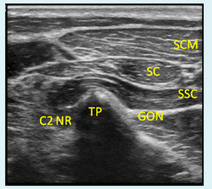
Longitudinal OCI with true transverse GON



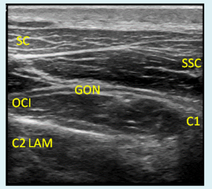
C2 with GON longitudinal and spinal cord within canal



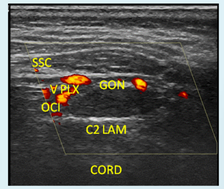
Composite Longitudinal of Greater Occipital Nerve



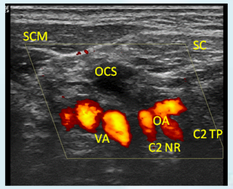
Greater Occipital Nerve Lateral at its Origin



Longitudinal Mid Upper Greater Occipital Nerve and Artery



GON longitudinal with Venous plexus evident with doppler and valsalva



Arterial plexus lateral to C2 transverse process tubercles