Greater occipital nerve

see Occipital nerve entrapment.

There is an extensive convergence of cutaneous, tooth pulp, visceral, neck, and muscle afferents onto nociceptive and non-nociceptive neurons in the spinal trigeminal nucleus. In addition, nociceptive input from trigeminal, meningeal afferents projects into trigeminal nucleus caudalis and dorsal horn of C1 and C2. Together, they form a functional unit, the trigeminocervical complex (TCC). The nociceptive inflow from suboccipital and high cervical structures is mediated with small-diameter afferent fibers in the upper cervical roots terminating in the dorsal horn of the cervical cord extending from the C2 segment up to the medullary dorsal horn. The major afferent contribution is mediated by the spinal root C2 that is peripherally represented by the greater occipital nerve (GON). Convergence of afferent signals from the trigeminal nerve and the GON onto the TCC is regarded as an anatomical basis of pain referral in craniofacial pain and primary headache syndrome. Ipsilateral limb pain occurs long before the onset of the referred facial pain. The subsequent severe hemifacial pain suggested GON entrapment. The occipital nerve block provided temporary relief from facial and extremity pain. Imaging studies found a benign osteoma in the ipsilateral suboccipital bone, but no direct contact with GON was identified. During GON decompression, severe entrapment of the GON was observed by the tendinous aponeurotic edge of the trapezius muscle, but the osteoma had no contact with the nerve. Following GON decompression, the referred trigeminal and extremity pain completely disappeared. The pain referral from GON entrapment seems to be attributed to the sensitization and hypersensitivity of the trigeminocervical complex (TCC). The clinical manifestations of TCC hypersensitivity induced by chronic entrapment of GONs are diverse when considering the occurrence of extremity pain as well as facial pain [1)]

The greater occipital nerve is a branch of the C2 dorsal ramus and is the largest purely afferent nerve in the body. The nerve crosses deep to the semispinalis capitis muscle and emerges in the back of the head above the superior nuchal line. It enters the scalp between the semispinalis capitis and trapezius muscles.

This nerve arises from between the first and second cervical vertebrae, along with the lesser occipital nerve. It ascends after emerging from below the suboccipital triangle beneath the obliquus capitis inferior muscle. It then passes through the trapezius muscle and ascends to innervate the skin along the posterior part of the scalp to the vertex. It innervates the scalp at the top of the head, over the ear and over the parotid glands.

Injury to the greater occipital nerve (GON) during suboccipital/retrosigmoid craniectomy (SOC) has been postulated as an etiology of postoperative headaches (HAs). We hypothesized that severe postoperative HAs may be due to the division of the GON during dissection.

To determine whether the GON plays an important role in the development of postoperative HAs.

A retrospective review of prospectively accrued patients undergoing SOC by 1 neurosurgeon at Johns Hopkins from 1995 to 2009 was performed. A total of 280 patients were included in the study. HA was categorized into 3 groups according to the severity and impact on daily activities. Data were analyzed using a stepwise multivariate logistic regression analysis to identify independent factors associated with HA development. Patients with a history of preoperative HAs and migraine were excluded from the analysis.

In this cohort, new postoperative severe HAs at last follow-up visit were found in 19% of patients. By multivariate analysis, only GON preservation (relative risk: 1.49; 95% confidence interval: 1.00-2.34; P = 0.05) and wound infection (relative risk: 2.29; 95% confidence interval: 0.91-4.25; P = 0.07) were statistically significant. By univariate analysis, positive dependent associations included GON preservation (P < .01), reconstruction of the porus with hydroxyapatite cement (P = 0.02), and wound infection (P < 0.01). Statistically significant differences in the incidence of HA after surgery were found in patients in whom the GON was preserved compared with patients in whom the GON was divided (P = 0.035).

Postoperative debilitating HAs are a common complication after SOC. Although these HAs are probably multifactorial in nature, preservation of the GON during SOC is independently associated with postoperative debilitating HAs [2].

1)
Son BC, Lee C. Ipsilateral Limb Extension of Referred Trigeminal Facial Pain due to Greater Occipital Nerve Entrapment: A Case Report. Case Rep Neurol Med. 2022 Dec 2;2022:9381881. doi: 10.1155/2022/9381881. PMID: 36505755; PMCID: PMC9734007.
2)
Garzon-Muvdi T, Jackson C, See AP, Woodworth GF, Tamargo RJ. Preservation of the greater occipital nerve during suboccipital craniectomy results in a paradoxical increase in postoperative headaches. Neurosurgery. 2015 Apr;76(4):435-40. doi: 10.1227/NEU.0000000000000625. PubMed PMID: 25599212.