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IDEAS AND INNOVATIONS

Reconstructive

Alternative Approach for Occipital Headache Surgery: The Use of a Transverse Incision and "W" Flaps

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Summary: The most commonly used approach for a greater occipital nerve decompression is through a vertical midline incision, with multiple authors reporting favorable long-term outcomes. A transverse approach to the occipital nerves has been described, yet it does not include the use of fat flaps to insulate the decompressed nerves. In this study, we describe the use of a single transverse incision with modified "W" fat flaps to decompress both the greater and lesser occipital nerves. This allows for wider exposure of the nerves without the need for an additional incision to access the lesser occipital nerve. The described technique provides increased reach and versatility of the fat flap, allowing for coverage over a longer course of the nerve and further cephalad, close to the bony skull base. In addition, the fat flaps cover the greater occipital nerve closer to its native position, as opposed to bringing the nerve into a subcutaneous position. This, theoretically, keeps the nerve in a more protected deep position and technically makes it easier to avoid any tendency for kinking the nerves while wrapping them with the fat flap. Our experience has demonstrated that this modified technique is not only safe but also efficacious in affecting a statistically significant reduction (70% improvement, $P = 0.004$) in migraine headache index and HIT-6 scores. This study provides further evidence that nerve decompression for headache following the principles described by Guyuron is an efficacious and reproducible procedure and that a proper nerve decompression is effective in reducing headache. *(Plast Reconstr Surg Glob Open 2019;7:e2176; doi: 10.1097/GOX.0000000000002176; Published online 25 April 2019.)*

INTRODUCTION

The most common surgical approach for occipital headache surgery was first described by Guyuron,[1] with later studies demonstrating long-term efficacy[2] and encouraging results reported by multiple authors.[3] Briefly, through a vertical midline incision, the greater occipital nerve (GON) is decompressed along 6 potential compression points.[4] A fat flap, based inferiorly, is then passed under the nerve bringing it to a subcutaneous position. The lesser occipital nerve (LON) is approached through a separate incision along the posterior border of sternocleidomastoid (SCM).

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One report describes using a transverse incision to decompress both the GON and the LON. This approach did not include a fat flap to wrap the nerve after its release.[5] We believe that a transverse incision has distinct advantages and that wrapping the decompressed nerves can further improve outcomes. In this study, we describe the use of a single transverse incision with modified fat flaps to decompress both the greater and the LONs.

METHODS

We performed a retrospective review of all patients undergoing occipital nerve decompression at our institution.

Surgical Technique

The incision is designed 2.5 cm caudal to the external occipital protuberance and extends, for bilateral cases, from the posterior edge of one SCM to the other. The skin is elevated cephalically and caudally in the plane just deep to the hair follicles, sparing the fat over the trapezius fascia (Fig. 1A). This deep fat is raised as a rectangular

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flap off of the trapezius fascia, leaving the base of the flap attached medially to the deeper tissues over the nuchal ligament.[6] Flap elevation stops 1 cm lateral to the midline. The flaps usually measure roughly 4 cm in length and 2 cm in width. The trapezius fascia and muscle are then divided vertically just lateral to the base of the flap. The GON is identified, and the rest of the surgery proceeds as previously described (Fig. 1B).[1] The LON is identified at the posterior border of SCM just deep to the deep fascia and 2.5 cm caudal to the nuchal ridge, and a neurectomy or decompression was performed according to the size of the nerve. The fat flaps are then used to wrap the GON. The flap is passed deep, then lateral, and then superficial to the nerve, using the distal edge of the flap to cover the nerve as it crosses the nuchal ridge (Fig. 1C, 2 and 3). However, there is significant versatility in using this flap as it can be used to cover the nerve at the site of the resected semispinalis muscle (compression points 2 and 3) and/or used more distally at the crossing of the nerve over the nuchal ridge (points 4–6). Thicker flaps can be split into two equal thickness flaps and used to sandwich the nerve by positioning them along both the superficial and deep surfaces of the nerve. The flaps go down around the nerve in its native course, and it is not the nerve that goes up to the flap. The lateral end of the flap is sutured to itself or to the deep tissues around the nerve at its crossing over the nuchal ridge.

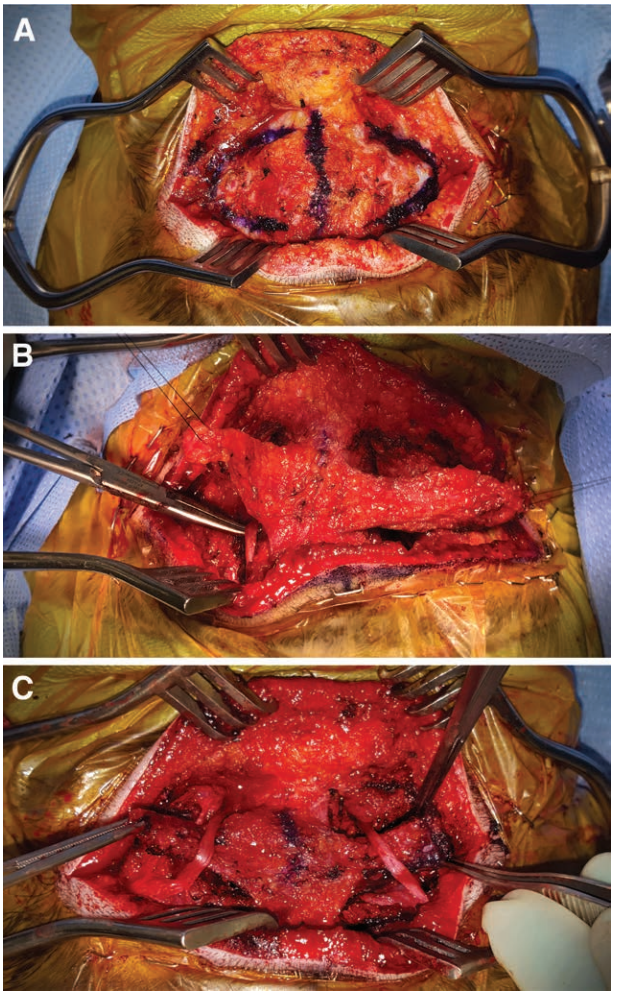

Fig. 1. Intraoperative photographs of (A) the flap markings on the deep fat before flap elevation, (B) the flaps after being raised off of the trapezius fascia, maintaining its base attached medially, and (C) the flaps passing under the nerve. Note that there is a sufficient length in the flap, which will allow it to cover the nerve more superiorly. The length of the skin incision is adjusted accordingly if it is unilateral surgery.

This study was approved by the Institutional Review Committee at the University of Wisconsin, Madison, Wisc.

RESULTS

This technique was used in 71 patients between 2014 and 2017. There was 1 case of wound infection, but no cases of seroma or alopecia. Sixty-six percent of patients (n = 47) underwent LON surgery as well. Thirty-two patients (30 bilateral and 2 unilateral) had greater than 6 months of follow-up with complete records for evaluation of their outcomes. The mean duration of migraine symptoms before their surgery was 21 years, and mean follow-up was 8 months. Average migraine headache index was 191 preoperatively and 55 postoperatively ($P = 0.004$), with a mean improvement of 70%. Ninety-two percent of patients experienced at least a 50% reduction in migraine headache index. Migraine frequency, intensity, and duration improved by a mean of 44.25 % ($P = 0.0008$), 51% ($P = 0.01$), and 58.4% ($P = 0.1$), respectively. Mean Headache Impact Test (HIT-6) score improved from 67 preoperatively to 57 postoperatively ($P < 0.0001$).

DISCUSSION

This study and those of many others provide further evidence that the occipital nerve decompression described by Guyuron in 2005 is effective with reproducible outcomes. Our technical modification produces outcomes comparable to established techniques,[2] and the transverse incision provides ample exposure of both the GON and the LON. In addition, with this approach, the surgeon can tailor the flap's course to cover the nerve at the site of the removed semispinalis muscle, at the crossing over the nuchal ridge, or both. It is unclear which of the compression points is the most significant, but some surgeons believe that where the nerve crosses the nuchal ridge is most crucial.[7] This location coincides with compression points 4 and 5 (trapezius muscle), 6 (occipital artery), the edge of the skull, and a tight fascial band that is usually located directly over the nerve. The design of the flap allows for easy coverage of the nerve in this area. Coverage at this distal location is difficult with the use of a vertical incision, which has prompted some surgeons to use a flap of trapezius muscle for coverage at this spot.[8] The transverse approach provides the additional advantages of a well-hidden scar above the hairline and the ability to avoid going through the same scar in patients with a previous vertical approach to the cervical spine.

The design of our flap brings the flap down to cover the nerve at its anatomic location. We commonly refer to

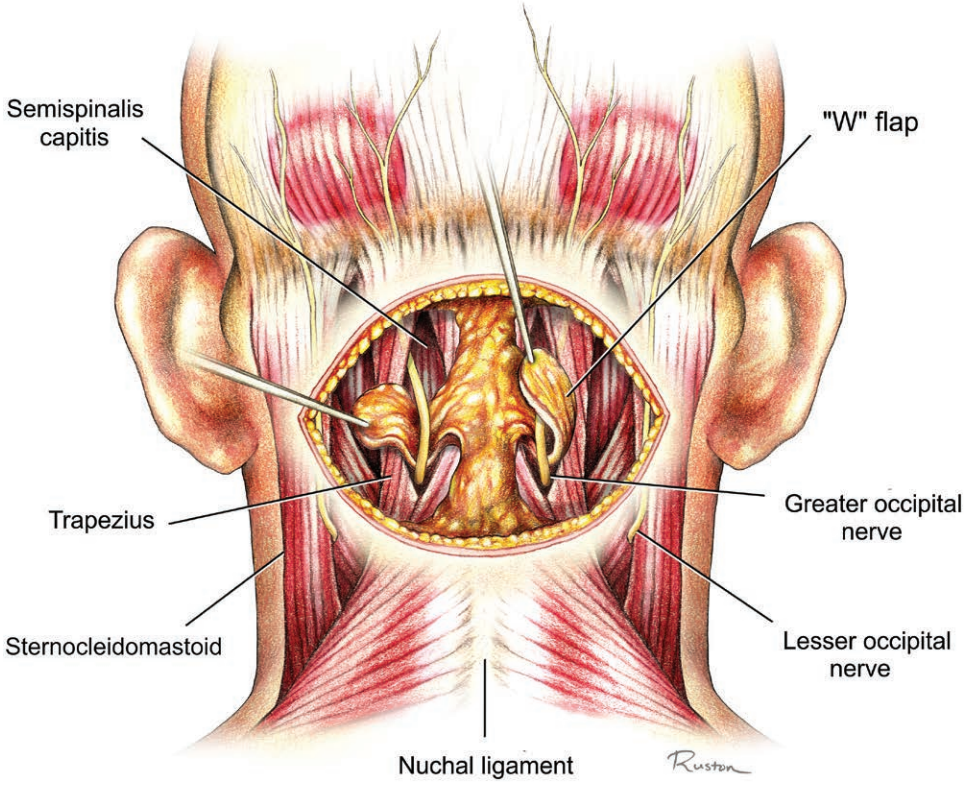

Fig. 2. Illustration of the design and course of the flap after passing it under the nerve (left side) and after turning it over to cover the nerve more cephalically (right side).

the flaps as "W" flaps not only in reference to the University of Wisconsin but also because bilateral flaps form a W when viewed in an axial section, traveling deep then lateral to the nerve. This supports the nerve in a rather straight course avoiding any sharp turns (Fig. 3).

CONCLUSIONS

The vertical approach to GON decompression has the longest track record, making it the standard of care. However, we believe our described modification to be easy, reproducible, and safe. Our results provide further evidence supporting the surgical principles for occipital nerve surgery and suggesting that it is an effective headache treatment in properly selected patients.

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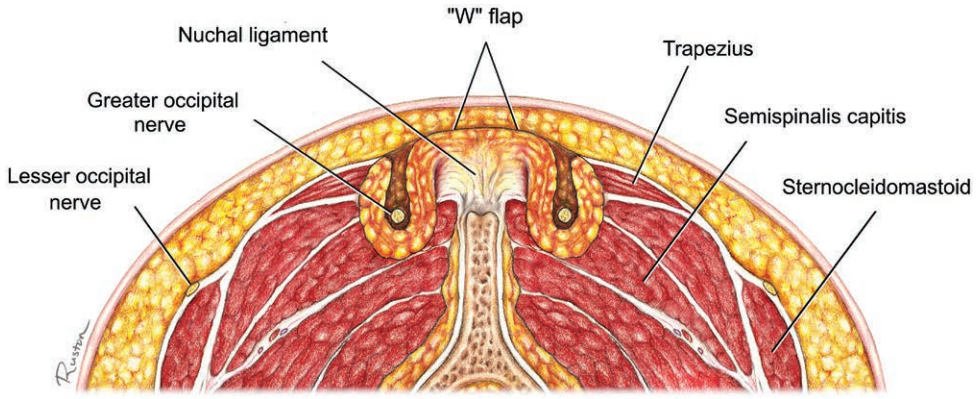

Fig. 3. Axial section showing how the W flaps actually come down to cover the nerve in its position, rather than bringing the nerve up to the subcutaneous position. This makes it easier to wrap the nerve without creating any kinks in the course of the nerve.

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