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Treatment of dopplerable nummular headache with minimally invasive arterectomy under local anesthesia

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KEYWORDS
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Summary *Objective:* The objective of the current study is to elucidate the potential role of surgery in the treatment of nummular headache (NH).
Background: NH is a disorder in which pain is localized to a specific area. Treatment has traditionally been medical, with the recent addition of nerve blocks and botox injection with equivocal results.
Design: Forty-nine patients were identified using the International Classification of Headache Disorders, third edition, beta version. Patients were asked to identify the area of maximal pain. Patients who had an associated Doppler signal within the area of pain underwent surgical arterectomy using local anesthesia. Preoperative and postoperative headache frequency, severity, duration, and headache-free days were analyzed.
Results: There were a total of 49 patients included in the study (42F:7M) with an average age of 45 years (21–65 years). The average follow-up period was 16 months with a range of 8–33 months. There was a significant reduction in the frequency (-10.7 days; $p < 0.001$), severity (-3.5; $p < 0.001$), and duration (-0.3 hours; $p = 0.4$) of the headache. There was a significant increase in the number of headache-free days per month (10 vs. 21; $p < 0.001$). Headache index decreased by 39.6%, from an average of 378.6 to 228.4 ($p < 0.05$). Twelve patients (24.5%) were free from NH and able to discontinue their medications. There were no complications identified during the follow-up period.

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Conclusion: NH, although rare, can be associated with significant disability despite current treatment modalities. In select patients, surgical arterectomy is a safe, minimally invasive, and effective treatment for NH.
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Introduction

Nummular Headache (NH) is a rare disorder occurring with an estimated incidence rate of 6.4–9/100,000 in a hospital-based series.[1,2] The International Classification of Headache Disorders (ICHD-3), third edition, beta, describes NH as a sharply contoured pain, often chronic, of highly variable duration, in a small, circumscribed area (1 to 6 cm) of the scalp. The area of pain has often a round or elliptical shape, and typically occurs in the parietal region and tends to be "side-locked".[3] Over-the-counter (OTC) analgesics are usually adequate to treat the majority of patients with NH,[2] but there is a subset of patients whose symptoms are recalcitrant, thus necessitating additional modalities and in some cases, continuous prophylaxis.[4] These additional, previously described therapies include tricyclic antidepressants, gabapentin, nerve blocks, and onobotulinum toxin A (Botox®), all with varying efficacies.[5–13] Although there remains controversy regarding a "central" vs. "peripheral" etiology of NH, it is largely thought to be related to a peripheral source. There are a number of case reports and series demonstrating patients who have developed or had their NH exacerbated by associated vascular lesions.[14]

The lead author (B.G.) has extensive experience in the surgical treatment of migraine headaches (MH). In particular, peripheral trigger sites have been successfully treated using surgical arterectomy with local anesthesia.[15] This has been further improved by including a preoperative Doppler examination to identify the surgical target.[16] Therefore, it was postulated whether surgical treatment could also be effective in the treatment of NH. Thus, the objective of the current study was to assess whether surgical arterectomy under local anesthesia could be effective in the treatment of NH.

Methods

Forty-nine patients were identified using the International Classification of Headache Disorders classification in the lead author's practice by a trained, board-certified neurologist (Co-author D.R.). Site-specific preoperative NH frequency, severity, duration, and headache-free days were obtained. Before undergoing surgery, patients were asked to identify the area of maximum pain. All patients had an associated Doppler signal within the area of pain and subsequently underwent surgical arterectomy by administering local anesthesia. For some patients, the ultrasound Doppler was maneuvered around within several millimeters of the area of pain indication to detect the Doppler signal. In most patients, the Doppler signal was identified with ease and at the exact site where the patients identified pain with an index finger. In patients who had headache at the time of examination, a nerve block was achieved with almost invariable success. However, a negative result of nerve block did not deter the lead author from proceeding with surgery.

After the surgical site was identified and consent obtained, the patient was brought to the procedure room and placed on an adjustable procedure chair. Patients with anxiety were administered preoperatively with either a narcotic or anxiolytic agent. However, the overwhelming majority of the patients did not require any additional treatments. The patient's face was prepped and draped using a dilute solution of Betadine and sterile drapes/towels. For those with pain in the hair-bearing region, a small area around the Doppler signal site was shaved using surgical clippers. The previously marked site of pain and associated Doppler signal was injected with lidocaine 1% with epinephrine (1:100,000). For patient comfort, a small, half-inch, 30-gauge needle was used and the injection was administered slowly with single skin penetration. The patients who had pain at the time of surgery were asked to report their pain level both before and after injection on a scale of 1–10. However, not necessarily, pain relief following injection was considered a positive prognostic factor. While awaiting medication onset, an incision of approximately 0.6 to 1.2 cm in length was made over the identified Doppler signal area. A No. 15 blade was used to make an incision through the epidermis and dermis of the skin. Dissection was performed using a 0.5-cm mosquito hemostat. Once the artery was identified, it was dissected both proximally and distally to obtain a segment for removal. Larger arteries required ligation using 5-0 or 6-0 Monocryl sutures, whereas smaller arteries were adequately treated by targeted cauterization. The entire intervening segment of the artery and small, intimately associated nerves were removed. Larger nerves required to be divided and the cut end was buried into the temporalis muscle to minimize the potential for a neuroma formation. Following meticulous hemostasis, the incision was closed, and typically, a space obliterating stitch was placed first. In the hair-bearing areas, a 5-0 plain gut suture was used, whereas in more cosmetically sensitive areas, a 6-0 fast gut was used (**Video 1**). Antibiotic ointment was applied on the incision and thereafter, patients were advised to apply two times a day for 5 to 7 days. Patients were allowed to take shower and cleanse the area gently after 24–48 hours. Patients were allowed to return to work and resume routine activity the same day or the day after the procedure. Narcotic medication was rarely necessary. Infrequently, patients experienced an acute worsening in their pain the night following the procedure, but this was rare and self-limiting. Patients refrained from nonsteroidal anti-inflammatory drug (NSAID) use one week before and two to three weeks after the procedure. Patients were typically followed up for one day, one week, one month, three months, six months, and one year postoperatively. Postoperative follow-up communication was set up through FaceTime, Skype or phone for out-of-town patients. Data of postoperative headache frequency, severity, duration, and

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