

Migraine Surgery Practice Patterns and Attitudes

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Approval for this study was obtained from the University of Michigan Institutional Review Board (HUM00045676).

Statement of financial disclosure

The authors have no related financial interests to disclose.

Funding for study

This article did not require any sources of funding.

Structured Abstract

Background: Minimally invasive techniques have been developed to treat migraine headache and several reports have shown efficacy in treating select patients who are refractory to conventional therapies. Although there is growing evidence supporting migraine surgery, no study has examined its adoption by plastic surgeons in the United States.

Methods: A web-based survey consisting of 17 ad hoc questions was designed in order to ascertain respondents' demographics, experience, knowledge, and attitudes regarding migraine surgery. After pilot testing, the survey was distributed via email to the entire membership of the American Society of Plastic Surgeons (ASPS).

Results: A total of 3747 ASPS members were surveyed and 193 surveys were completed for a response rate of 5.2%. Thirty-four respondents (18%) had performed surgery to treat migraine headache. Among those who have performed migraine surgery, over 80% reported improvement in patient symptoms. Of those who have not performed migraine surgery, 60% would be interested if an appropriate patient was referred to them by a neurologist.

Conclusions: Although there is interest in migraine surgery among a subset of plastic surgeons, significant barriers to performing migraine surgery include deficient referral patterns from neurologists and lack of familiarity with the concept and techniques of migraine surgery.

Clinical Question/Level of Evidence: Not Ratable.

Migraine headache is a debilitating disorder which affects approximately 35 million Americans and has a prevalence that is far greater than diabetes or asthma in the United States.¹⁻³ Migraine headache is routinely treated with pharmacologic and behavioral interventions with varying success. While some patients experience sufficient relief from conventional therapies, there is a known population of migraine patients who do not adequately respond to these treatments and are therefore considered refractory to standard medical therapy.⁴ Recent insights into the pathophysiology of migraine headache have revealed a new mechanism whereby compressed peripheral nerves initiate migraine attacks.⁵ This peripheral theory has been corroborated by the use of botulinum toxin injection at specific cervicofacial locations to treat migraine headache. However, the effects of botulinum toxin are temporary and its use is not a permanent solution to migraine headache. In recent years, botulinum toxin injection has been utilized to detect known migraine trigger points which are amenable to decompression using minimally invasive surgical techniques as described by multiple anatomic studies.⁶⁻¹¹ Due to the significant individual and social burden of severe migraine headache, surgical treatment may offer enormous potential to appropriately selected patients who are refractory to medical management.

Evidence in support of migraine surgery is steadily growing. Several clinical studies have demonstrated the efficacy of surgical intervention; the available literature suggests a response rate of 80-90% for carefully selected patients with refractory migraine headache.¹²⁻¹⁸ In one clinical trial, surgical intervention for migraine headache has shown a sustained benefit over a five year follow-up period.¹⁹ Although there is increasing interest in the field of migraine surgery, some disagree with the concept of using surgical methods to treat migraine headache

and do not recommend its practice until further evidence substantiates efficacy and safety.²⁰⁻²¹

As with any new surgical treatment, the practice patterns and attitudes of providers should be evaluated. To date, no research has examined the adoption of migraine surgery by plastic surgeons in the United States. This study surveys members of the American Society of Plastic Surgeons (ASPS) to determine the current perspectives of plastic surgeons who support or oppose migraine surgery and to identify factors which serve to either facilitate or hinder its practice.

Methods

Approval for this study was obtained from the University of Michigan Institutional Review Board (HUM00045676).

A web-based survey consisting of 17 ad hoc questions was designed in order to ascertain respondents' demographics, experience, knowledge, and attitudes regarding migraine surgery. The survey was constructed using a commercially available survey tool (<http://www.zoomerang.com>) and stipulated that the surgeon could only log on to the survey once from their computer in order to prevent multiple entries by one individual. Survey logic was employed at several points within the questionnaire so that respondents would be led to different questions depending on their previous answers. For example, when asked "Have you used surgical methods to treat migraine headaches?" the subject would be forwarded to specific questions depending on a "yes" or "no" selection to better elicit the motivation behind each response. Pilot testing was performed to ensure survey usability and the questions were revised accordingly.

Since the field of migraine surgery is relatively nascent and likely few plastic surgeons have adopted its practice, the authors anticipated a low response rate and thus elected to survey the entire ASPS membership as opposed to a specific subgroup. The ASPS website was accessed during the month of December 2010 and was used to identify ASPS member surgeons practicing in the United States. For some members, contact information included only a URL to their practice website or an incomplete email address was provided; these surgeons were excluded from the study. However, many surgeons designated email addresses of their offices (e.g. info@practicename.com) or office staff (e.g. officemanager@practicename.com) and these were included in the study. An invitation to participate and a link to access the secure web-based survey were emailed to ASPS members. Participants were notified prior to commencement of the survey that the study was voluntary and personal information would not be linked to any responses. The survey was opened for a total of five weeks during April and May of 2011. A reminder email was sent two weeks after the survey was deployed.

At the conclusion of the study, data were exported to a spreadsheet program (Microsoft Excel). Partially completed survey information was not included in the final analysis. Descriptive statistical analysis was subsequently performed.

Results

A total of 4088 ASPS members practicing in the United States were identified using the ASPS website. After the survey was deployed via email, 341 returned an auto-response or were returned as undeliverable. Therefore, a total of 3747 surgeons were surveyed and 193 surveys were completed for a response rate of 5.2%. There were 318 recorded visits to the website and 15 partially complete surveys, which were omitted from analysis.

Academic surgeons represented 25% (48/193) of the respondents to this survey and non-academic surgeons comprised 75% (145/193). A majority of respondents (76%) reported a practice that included a combination of reconstruction and cosmetic surgery, while 10% and 14% indicated an entirely reconstructive and cosmetic practice, respectively. At least one or more fellowships had been completed by 99 respondents (51%); these include craniofacial (10%), hand (19%), cosmetic (9%), and microsurgery (13%) fellowships.

Because injection of botulinum toxin is prevalent among plastic surgery practices, surgeons were queried on their usage of botulinum toxin and their knowledge of its use for migraine headache. A vast majority of the respondents (92%) had used botulinum toxin injections to treat facial rhytids and nearly all (99%) reported awareness that botulinum toxin is being used to treat migraine headache. When asked about familiarity with research that examines the efficacy of botulinum toxin injection for migraine headache, 36% respondents reported that they were “very familiar,” while 55% were “somewhat familiar” and 9% were “not at all familiar.”

Plastic surgeons who have used surgical methods to treat migraine headache comprised 18% (34/193) of survey participants. Of these surgeons, 82% reported improvement of migraine symptoms in their patients, while 3% reported unchanged migraine symptoms, and 15% stated they had an insufficient number of patients to conclude. None of these surgeons reported worsening of migraine symptoms in their patients.

Subgroup analysis was performed on the 82% (159/193) of respondents who have not used surgical methods to treat migraine headache. In this group, 25% were “very familiar” and 46% “somewhat familiar” with literature that demonstrates the efficacy of migraine surgery.

Interestingly, 60% (96/159) of these surgeons indicated that they would be interested in offering migraine surgery if an appropriate patient was referred to them by a board-certified neurologist (Table 1). The 63 respondents who would not offer migraine surgery despite appropriate referral were asked to expound on their response by selecting from a list of options (Table 2). The most common replies of this group included: not wanting to include migraine headache patients into their practice (60%), not familiar enough with the techniques of migraine surgery (46%), not familiar enough with the disorder of migraine headache (37%), not familiar enough with the concept of migraine surgery (35%), and believing that there is insufficient data in support of migraine surgery (17%). Some surgeons opted to specify other reasons, such as unknown reimbursement status of migraine surgery, a dedication to sub-specialized practice (e.g. hand surgery only), a predominantly pediatric patient population, and personal experience with successful non-invasive therapy for migraine headache.

Of all study participants, 67% were unaware that some major insurance carriers, including Medicare, are currently reimbursing for migraine headache procedures. Surgeons were then presented with a scenario where migraine surgery was not covered by insurance and a patient was required to pay out-of-pocket. Although 18% of respondents stated that this would increase their interest in performing migraine surgery, 76% stated that reimbursement had no effect on whether or not they would perform migraine surgery.

Discussion

This study explores the practice patterns and attitudes of plastic surgeons in the United States regarding migraine surgery and demonstrates several barriers to offering this new treatment. Migraine surgery is a novel approach to the patient with incapacitating episodes of migraine headache. Importantly, surgery for migraine headache is not first-line therapy, but reserved only for those patients who are inadequately treated with conventional regimens that include multiple attempts with pharmacologic and behavioral interventions. In addition, because migraine attacks have been associated with a variety of causes, patients qualify for migraine surgery only if discrete peripheral nerve trigger points are identified by injection of botulinum toxin and careful physical examination. Injection of botulinum toxin leads to chemical decompression of these peripheral nerves and thus the inciting stimuli for migraine attacks in these patients are diminished. Alternatively, some surgeons have used injections of local anesthetic to chemically deactivate the instigating peripheral nerves directly. Migraine surgery is not indicated for treatment of acute migraine headache and should instead be viewed as a prophylactic measure. On October 15, 2010, the U.S. Food and Drug Administration approved the administration of botulinum toxin (onabotulinum toxin A) to prevent migraine episodes in adults diagnosed with chronic migraines. This endorsement lends credibility to the peripheral theory of migraine headache and naturally prompts consideration of migraine surgery for select patients who possess migraine trigger points because surgical intervention would result in more permanent peripheral nerve decompression.

Academic surgeons were over-represented in this survey study (25%), as recent data indicate that 12.6% of ASPS members are identified as academic practitioners.²² It is possible that academic surgeons are more familiar with the concept of migraine surgery and this could

explain a greater proportion of study participation by these individuals compared to non-academic surgeons. We speculated that completion of certain fellowships, such as cosmetic or craniofacial fellowships, years out of practice, and a particular case mix of reconstructive/cosmetic surgery would be associated with performance of migraine surgery. However, when these demographic variables were compared between subgroups, no clear associations were identified between surgeons who have and have not performed migraine surgery. Additionally, respondents were asked to identify the state where their practice was located, but analysis revealed no regional differences to suggest a geographic predilection to performing migraine surgery. Distinct differences can be elucidated by performing further survey studies that are targeted at specific subgroups to improve comparisons.

The most interesting finding of this study was that 60% of respondents who have not performed migraine surgery would consider it if an appropriate patient was referred to them by a board-certified neurologist. Although this number was likely influenced by response bias, we believe that this demonstrates a genuine interest in migraine surgery among some plastic surgeons. In order to further the practice of migraine surgery, several obstacles must be overcome. Many neurologists are hesitant to accept a peripheral mechanism for migraine headache and therefore referrals of suitable surgical patients to plastic surgeons are currently at a minimum. Development of referral patterns depends greatly on recognition of the burden of those with refractory migraine headache and the potential efficacy of surgical treatment. Although a handful of publications report impressive response rates for surgical intervention, critics point out that many of these studies are limited by retrospective nature or design flaws such as lack of control groups. Confirmation of efficacy through well-designed randomized controlled clinical trials is needed to reinforce the role of migraine surgery for patients who do

not adequately respond to standard treatment protocols. In addition, increased education among plastic surgeons regarding the concepts and techniques of migraine surgery will improve familiarity and facilitate practice for those who are interested in this field. Respondents to our study indicate that nearly all are accustomed to using botulinum toxin and express a significant awareness of the available literature regarding migraine surgery, even among those who do not perform migraine surgery. It is important to recognize that botulinum toxin injection protocols for cosmetic patients are not the same as those for identifying migraine trigger points and surgeons contemplating migraine surgery must first familiarize themselves with these differences. Nonetheless, we believe that plastic surgeons in general are poised to adopt migraine surgery if the existing barriers can be addressed.

The reimbursement status of migraine surgery was uncertain for many plastic surgeons. As the practice of migraine surgery continues to evolve, so will the policies of insurance carriers and this may affect enthusiasm to offer surgical intervention for migraine headache. Some insurance companies consider migraine surgery experimental and therefore do not extend coverage for surgical treatment, leaving policy holders to pay out-of-pocket. The authors suspected that self-payment would lead to increased interest among surgeons but were surprised to discover that the majority of study respondents cited that reimbursement status had no effect on the decision to offer migraine surgery.

This study has several limitations, including biases that are common with web-based survey studies such as response bias and recall bias.²³ Firstly, surgeons who are more familiar with migraine surgery may have been more inclined to participate and fully complete the study. This would have skewed the results in favor of performing migraine surgery. Secondly, the response rate of the study was only 5.2% which can be attributed to two major factors: 1)

Migraine surgery is a controversial subject within plastic surgery with relatively low clinical relevance to the typical U.S. plastic surgeon; 2) Many of the ASPS members never received the survey because it was automatically redirected to an office manager or it was deleted by an e-mail filtering system. During the study period, we received multiple emails from clinical staff declining participation in the study, stating that the surgeon did not perform migraine surgery. One method to reduce this occurrence would have been to attempt to validate a surgeon's reported email address before sending an invitation to participate in the survey study. However, this in itself would introduce selection bias, as those individuals who take time to validate an email address for a study on migraine surgery may in fact be more interested or familiar with migraine surgery. Taken together, these limitations prevent generalization of our findings to plastic surgeons as a whole. However, in spite of these issues, the authors emphasize that one purpose of this study was to gain an impression of the practice patterns and attitudes of plastic surgeons who either support or oppose migraine surgery. For example, it was interesting that 82% of respondents who have performed migraine surgery reported improvement in their patients' symptoms. Although this data is not statistically significant, this finding suggests that more than a few plastic surgeons have experienced success with migraine surgery and serves to stimulate further investigation of migraine surgery outcomes through appropriately designed clinical trials.

Conclusion

There is interest in migraine surgery among a subset of plastic surgeons who affirm understanding of the available evidence supporting its practice. Many of those who have performed migraine surgery report favorable outcomes. A significant barrier to performing migraine surgery appears to be referral pattern, because 60% of study respondents who do not currently offer migraine surgery expressed interest if an appropriate patient was referred to them. Increased referral of suitable patients by neurologists and improved familiarity with the concept and techniques of migraine surgery may motivate more plastic surgeons to perform migraine surgery. Future research examining the adoption of migraine surgery should strive to analyze specific sub-specialties within plastic surgery, such as craniofacial or peripheral nerve surgery, and how these specializations may facilitate the surgical treatment of migraine headache.

REFERENCES

1. Bigal ME, Lipton RB. The epidemiology, burden, and comorbidities of migraine. *Neurol Clin.* 2009;27:321–234.
2. American Diabetes Association. 2011 Diabetes Statistics. Available at: <http://www.diabetes.org/diabetes-basics/diabetes-statistics>. Accessed July 10, 2011.
3. Centers for Disease Control and Prevention. Asthma Prevalence, Disease Characteristics, and Self-Management Characteristics – United States, 2001-2009. Available at: <http://www.cdc.gov/mmwr/preview/mmwrhtml/mm6017a4.htm>. Access July 10, 2011.
4. Schulman EA, Lake AE, Goadsby PJ, et al. Defining refractory migraine and refractory chronic migraine: proposed criteria from the Refractory Headache Special Interest Section of the American Headache Society. *Headache.* 2008;48:778-782.
5. Kung TA, Guyuron B, Cederna PS. Migraine surgery: A plastic surgery solution for refractory migraine headache. *Plast Reconstr Surg.* 2011;127:181-189.
6. Janis JE, Ghavami A, Lemmon JA, Leedy JE, Guyuron B. Anatomy of the corrugator supercilii muscle: Part I. Corrugator topography. *Plast Reconstr Surg.* 2007;120:1647-1653.
7. Janis JE, Ghavami A, Lemmon JA, Leedy JE, Guyuron B. The anatomy of the corrugator supercilii muscle: Part II. Supraorbital nerve branching patterns. *Plast Reconstr Surg.* 2008;121:233-240.
8. Totonchi A, Pashmini N, Guyuron B. The zygomaticotemporal branch of the trigeminal nerve: An anatomical study. *Plast Reconstr Surg.* 2005;115:273-277.
9. Mosser SW, Guyuron B, Janis JE, Rohrich RJ. The anatomy of the greater occipital nerve: Implications for the etiology of migraine headaches. *Plast Reconstr Surg.* 2004;113:693-697.
10. Dash KS, Janis JE, Guyuron B. The lesser and third occipital nerves and migraine headaches. *Plast Reconstr Surg.* 2005;115:1752-1758.
11. Ducic I, Moriarty M, Al-Attar A. Anatomical variations of the occipital nerves: Implications for the treatment of chronic headaches. *Plast Reconstr Surg.* 2009;123:859-863.
12. Guyuron B, Varghai A, Michelow BJ, Thomas T, Davis J. Corrugator supercilii muscle resection and migraine headaches. *Plast Reconstr Surg.* 2000;106:429-434.
13. Guyuron B, Tucker T, Davis J. Surgical treatment of migraine headaches. *Plast Reconstr Surg.* 2002;109:2183-2189.

14. Dirnberger F, Becker K. Surgical treatment of migraine headaches by corrugator muscle resection. *Plast Reconstr Surg.* 2004;114:652-657.
15. Guyuron B, Kriegler JS, Davis J, Amini SB. Comprehensive surgical treatment of migraine headaches. *Plast Reconstr Surg.* 2005;115:1-9.
16. Poggi JT, Grizzell BE, Helmer SD. Confirmation of surgical decompression to relieve migraine headaches. *Plast Reconstr Surg.* 2008;122:115-122.
17. Guyuron B, Reed D, Kriegler JS, Davis J, Pashmini N, Amini S. A placebo-controlled surgical trial of the treatment of migraine headaches. *Plast Reconstr Surg.* 2009;124:461-468.
18. Janis JE, Dhanik A, Howard JH. Validation of the peripheral trigger point therapy of migraine headaches: single-surgeon experience using botulinum toxin and surgical decompression. *Plast Reconstr Surg.* 2011;128:123-131.
19. Guyuron B, Kriegler JS, Davis J, Amini SB. Five-year outcome of surgical treatment of migraine headaches. *Plast Reconstr Surg.* 2011;127:603-608.
20. Solomon S. Re: A placebo-controlled surgical trial of the treatment of migraine headaches. *Plast Reconstr Surg.* 2010;125:1041-1042.
21. Gaul C, Holle D, Sandor PS, et al. The value of “migraine surgery.” Overview of the pathophysiological concept and current evidence. *Nervenarzt.* 2010;81:463-470.
22. Keith Hume, ASPS Vice President of Research and Development, personal communication, July 2011.
23. Oppenheimer AJ, Pannucci CJ, Kasten SJ, Haase SC. Survey says? A primer on web-based survey design and distribution. *Plast Reconstr Surg.* 2011;128:299-304.

LEGENDS

Table 1. Of those plastic surgeons who have not performed migraine surgery (N=159), 60% stated that they would be interested in offering migraine surgery if a suitable patient was referred to them.

Would you be interested in offering migraine surgery if an appropriate patient was referred to you by a board-certified neurologist?	N	%
Yes	96	60%
No	63	40%

Table 2. Surgeons who have not performed migraine surgery and would not perform it even if an appropriate patient was referred to them (N = 63) explained their rationale.

Please provide the reason(s) why you would NOT offer migraine surgery (check all that apply)	Number of responses	%
I do not want to include this patient population into my practice.	38	60%
I am not familiar enough with the techniques of migraine surgery.	29	46%
I am not familiar enough with the disorder of migraine headache.	23	37%
I am not familiar enough with the concept of migraine surgery.	22	35%
I believe there is insufficient data in support of migraine surgery.	11	17%
I believe pharmacologic and/or behavioral intervention can adequately treat migraine headache.	8	13%
I believe surgery is too invasive for treatment of migraine headache.	7	11%
I believe migraines are caused by pathology of intracranial vessels and thus peripheral nerve surgery would not benefit patients.	4	6%
I believe migraine surgery is ineffective in alleviating migraine symptoms.	2	3%
Other, please specify.	11	17%