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Trigger Site Deactivation Surgery for Headaches is Associated with Decreased Postoperative Medication Use

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Background: Patients with chronic headaches suffer debilitating pain, which often leads to the use of numerous medications. Trigger site deactivation surgery has emerged as an effective treatment for select headache patients. This study aims to describe the preoperative and postoperative medication use among patients undergoing trigger site deactivation.

Methods: One-hundred sixty patients undergoing trigger site deactivation surgery between September 2012 and November 2017 were prospectively enrolled. Information on medication use, including type, dose, and frequency of use, was collected. Follow-up surveys were sent to all patients 12 months postoperatively.

Results: One-hundred twenty-nine patients met the inclusion criteria. At the time of screening, 96% of patients described taking prescription medication for their headache pain. The type of medication varied among patients but included preventative in 55%, abortive in 52%, rescue in 54%, and antiemetic in 18%. Thirty-one percent of patients reported using opioid medication for their headache pain. At 12 months postoperatively, 68% of patients reported decreased prescription medication use. Patients reported a 67% decrease in the number of days they took medication. Twenty-three percent stopped medications altogether. Fifty percent of patients reported that their migraine medication helped them more compared with preoperatively.

Conclusions: Trigger site deactivation surgery has been associated with improvements in headache symptoms. We now show that it is also associated with a significant decrease in medication use. *(Plast Reconstr Surg Glob Open 2021;9:e3634; doi: 10.1097/GOX.0000000000003634; Published online 15 June 2021.)*

INTRODUCTION

The surgical deactivation of headache trigger sites by plastic surgeons has emerged as an effective treatment for chronic forms of headache.[1–5] Most commonly, this includes patients with chronic migraine and occipital neuralgia. Although not all headache patients may be candidates for surgical treatment, the literature suggests that surgical treatment is effective in reducing pain.[3,6–8] Studies have also shown that surgery is associated with improvements in quality of life and activities of daily living.[9,10] Further, surgery is cost-effective by reducing both direct and indirect healthcare costs associated with chronic headache.[9] However, there has been a paucity of studies investigating medications in patients undergoing trigger site deactivation surgery. As physicians caring for chronic headache patients, we must know the disease and its therapies beyond surgery. Pharmaceutical management is an important component of chronic headache, and previous data have suggested that the drugs a patient takes can affect surgical outcomes.[11]

Chronic headache medications can be divided into acute and preventative categories. Acute medications can be further subdivided into abortive, rescue, and antiemetic.[12] The vast majority of chronic migraine patients use medication.[13] However, the response to individual treatments is idiosyncratic, and drugs that work well in one patient may not work in another.[14] The varying

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effectiveness of medications often leads patients to polypharmacy. Overuse of medications, particularly abortive and rescue, can worsen pain and lead to a separate entity known as medication overuse headache.[15] This condition can result in endless cycles of pain, medication, and further pain.

To improve preoperative counseling for surgery, it is critical to understand expected outcomes, including changes in medication use. Thus, this study aimed to describe preoperative and postoperative medication use among patients undergoing trigger site deactivation surgery.

METHODS

Institutional review board approval was obtained at the Massachusetts General Hospital in Boston, Massachusetts. One-hundred sixty patients undergoing trigger site deactivation surgery between September 2012 and November 2017 were prospectively enrolled in this study. Inclusion criteria included a diagnosis of chronic headache by a neurologist and failure of conservative management before presentation, defined as a failure of treatment with 3 or more different types of medication. Exclusion criteria included incomplete medication data at screening. Headache severity was quantified using the Migraine Headache Index (MHI), which was defined as the product of headache frequency (days per month), duration (fraction of 24 hours), and average pain severity (rated from 0 to 10).[5]

Preoperatively, patients were asked to complete a detailed headache history using REDCap (version 8.1.20; Vanderbilt University, Nashville, Tenn.) electronic data capture tools hosted at the Massachusetts General Hospital.[16] Information on medication use, including type and frequency of use, was collected. The senior author (WGA) performed all surgical procedures, using an open approach, as described in prior publications.[17]

Follow-up surveys were sent to all patients at 12 months following surgery. Data on medication use and medication effectiveness were collected. Our primary endpoint was the number of days a patient was on medication per month. Secondary endpoints included the proportion of patients on daily medication and the MHI.

Data Analysis

Data were analyzed with STATA, version 13.0 (StataCorp, College Station, Tex.). Descriptive statistics were computed for all variables. Categorical variables were described using frequencies and percentages. We described continuous variables with normal distribution using means and SDs and analyzed them using a two-tailed *t*-test. We described continuous variables with a nonnormal distribution using medians and interquartile ranges (IQR) and analyzed them using the Wilcoxon signed-rank test. Associations between categorical variables were analyzed using the Chi-square and Fisher exact tests. Comparisons between paired dichotomous variables, such as daily medication use preoperatively versus postoperatively, were performed using the McNemar test. Statistical significance was set at $P < 0.05$.

RESULTS

One-hundred twenty-nine patients met the inclusion criteria. One-hundred and six (82%) were women, with an average age of 45 years (±13 years). On average, patients reported that their headaches occurred on 19 (±9.1) days per month, lasted 16 (±8.3) hours, and were ranked a 7.7 (±1.4) out of 10 on a pain severity scale.

At the time of screening, 124 patients (96%) reported taking prescription medication for their headache pain. Five patients (3.9%) were not using prescription medication at the time of screening but reported prior use of multiple prescription medications. The type of medication varied among patients but included preventative in 70 (55%), abortive in 66 (52%), rescue in 68 (54%), and antiemetic in 23 (18%) (Fig. 1).

When asked, "how many days in the last month did you take prescription medication?," the median number of days reported was 30 (IQR 15–30). Seventy-six patients (59%) reported using daily medication. Of patients taking daily medication, 23 (31%) patients were not taking preventative medications. Daily medication users not on preventative medication had significantly poorer preoperative headache symptoms (MHI 148 ± 20) when compared with daily medication users on preventative medication (MHI 92 ± 11) ($P = 0.0096$). Seventy-two patients (59%) reported using over-the-counter medications and did so at a median frequency of 15 days (IQR 4–30) in the previous month.

Thirty-nine (31%) patients who underwent surgery reported using opioid medication to treat their headache pain at the time of screening. Patients reporting opioid use had a mean preoperative MHI of 123 ± 16 versus 94 ± 80 for those not reporting opioid use ($P = 0.08$). Patients taking opioid medications used prescription medication at a significantly higher frequency (median 30, IQR 22–30

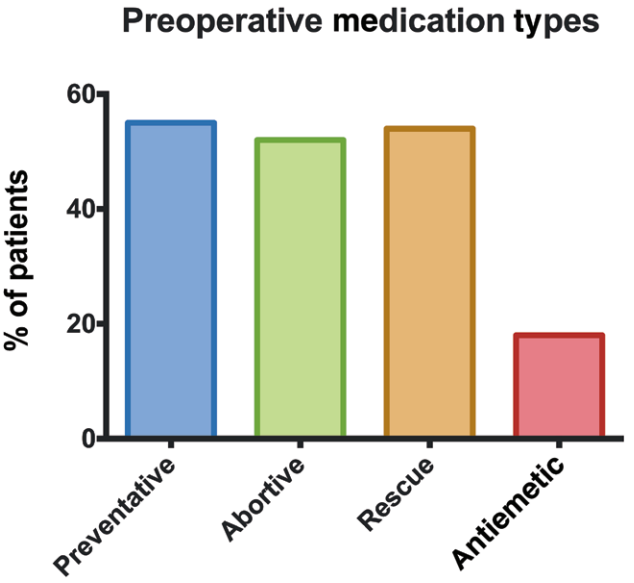

Fig. 1. The various medications that patients were taking for their headaches at the preoperative visit.

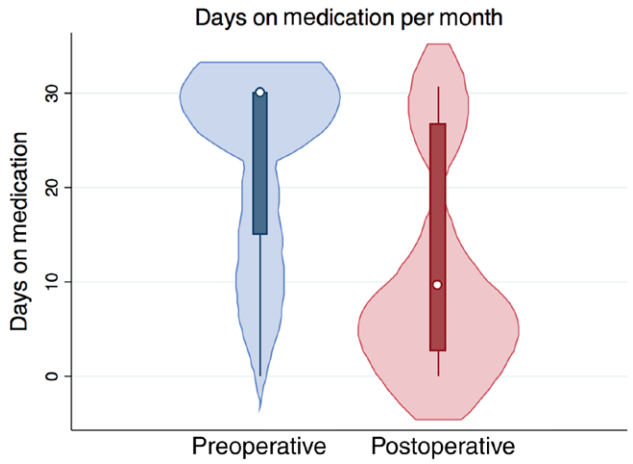

Fig. 2. When patients were asked about the number of days they used prescription medication in the previous month, there was a significant decrease at 12 months postoperatively.

days) than patients not on opioid medications (median 30, IQR 12–30 days) ($P = 0.049$).

There was a 75% (n = 97) response rate to the follow-up surveys at 12 months. Postoperatively, 77 patients (79%) reported a decrease in the frequency of their headaches, 64 patients (66%) reported a decrease in their duration, and 65 patients (67%) reported a decrease in pain level. Patients reported an average difference of −11 (±11) headache days, −6.8 (±10) hours of headache duration, and −2.6 (±3.2) pain level. Seventy-three patients (75%) reported at least a 50% decrease in their MHI.

Postoperatively, patients reported using prescription medications at a median frequency of 10 days (IQR 2.7–27) per month, a 67% decrease compared with preoperative values of 30 days (IQR 15–30) ($P < 0.001$; Fig. 2). Forty-four patients (68%) reported using less prescription medication. Fifteen patients (23%) reported no prescription medication use at 12 months. Fifteen patients (23%) were using daily medication at 12 months, a significant decrease from 59% at screening ($P < 0.001$; Fig. 3). These 15 patients reported a significantly higher average MHI (58 ± 22) when compared with those not using daily medication at 12 months (20 ± 33) ($P = 0.0099$). When asked, "Does your migraine medication help more compared to before surgery?," 50% (n = 32) stated yes.

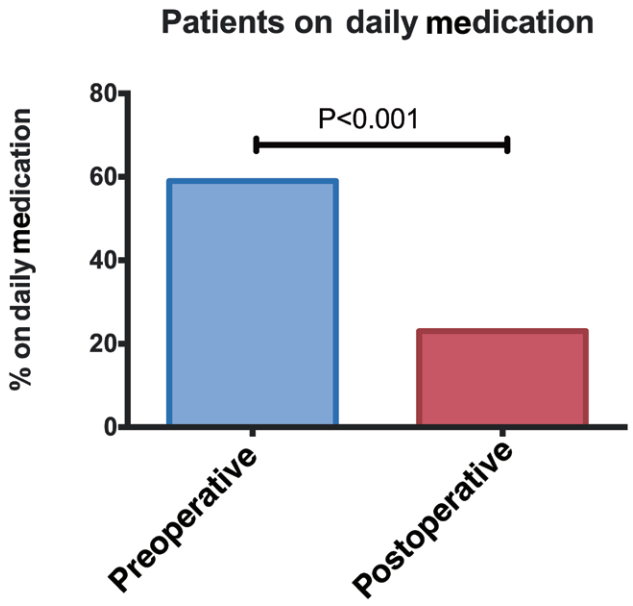

Fig. 3. The percentage of patients reporting daily medication use at 12 months postoperatively significantly decreased compared with preoperatively.

Postoperative medication use was associated with improvement in MHI, such that patients who had at least a 50% decrease in MHI used medications at a significantly lower frequency (5.3 days [IQR 1.3–16]) compared with patients who did not achieve this decrease in MHI (20 days [IQR 10–30]) ($P = 0.018$).

Postoperatively, patients who reported opioid use had significantly higher mean MHI scores (51 ± 77) than nonopioid users (25 ± 43 points, $P = 0.039$). The proportion of patients who experienced at least a 50% MHI improvement per group was: 68% of patients within the opioid cohort and 79% within the nonopioid cohort ($P = 0.20$). The proportion of patients who experienced at least an 80% MHI improvement per group was: 56% of patients within the opioid cohort and 65% within the nonopioid cohort ($P = 0.37$). Patients who reported opioid medication use at screening used prescription medication at a median frequency of 11 (IQR 4–22) days postoperatively compared with a median frequency of 9.3 (IQR 2.3–27) days in patients who did not report opioid medication use ($P = 0.49$).

DISCUSSION

As surgeons caring for chronic headache patients, we must familiarize ourselves with the disease beyond a purely surgical scope. This study describes patients who have undergone trigger site deactivation surgery and their medication use, both preoperatively and postoperatively at 1 year. We found that (1) most patients undergoing trigger site deactivation surgery take medication daily, (2) surgery is associated with decreased medication use postoperatively, and (3) opioid use is associated with poorer postoperative outcomes.

In this study, we found that patients reported a high frequency of medication use preoperatively, with the majority using daily medication. This finding was consistent with the typical clinical history of most of our patients. Anecdotally, patients seeking surgery have often tried many medications, other interventions, and often seek surgery as a "last resort." The level of medication use in these patients is in accord with their frequency of headache episodes, on average occurring 19 days per month.

This study found that surgery is associated with decreased medication use at 1 year postoperatively. Patients reported a 67% decrease in the number of days on medication per month, from 30 days to 10 days. Patients who had a successful surgery, defined by at least a 50% reduction in MHI, reported a median medication use of 5 days per month. Although prior studies have shown that

surgery is associated with improved pain symptoms,[3,6–8] it is important to highlight its effect on medication use, especially because a patient's daily disease burden often revolves around medication. Reducing polypharmacy is additionally important because medication overuse is a major risk factor for the transformation of episodic to chronic migraine.[18,19]

The demonstration that surgery is associated with decreased medication use adds to the body of evidence supporting the use of surgery in patients with chronic refractory pain. Prior studies have demonstrated that trigger site deactivation surgery is associated with improvements in pain-coping ability and daily function.[10] Faber et al demonstrated that surgery is associated with fewer primary care visits, emergency department visits, alternative treatment visits, missed workdays, and medical treatments, contributing to decreased direct and indirect costs of chronic headache.[9]

This study demonstrated that a high prevalence (30%) of patients undergoing trigger site deactivation surgery use opioid medications to treat their headache pain preoperatively. Buse et al showed that 16% of general migraine patients use prescription opioid medication to treat their headache pain.[20] Other studies looking specifically at chronic migraine patients using acute medications have reported opioid use as high as 36.3%.[21] These studies have demonstrated that a reduction in migraine pain is associated with decreased opioid use.[20]

Our finding that opioid users had poorer postoperative symptoms is in accord with prior studies investigating opioid use among migraine patients undergoing surgery. A study by Adenuga et al investigating narcotic users found that these patients may be predisposed to worse outcomes postoperatively.[11] These findings are consistent with other interventions like spine surgery, which have shown worse postoperative outcomes for patients using opioids.[22] We have previously investigated other patient groups, such as those with a history of head trauma and psychiatric comorbidities.[23,24] Patients using opioids are the only cohort shown to have poorer postoperative outcomes compared with the general population. Patients using opioids for their headaches should therefore be counseled about its possible effect on surgical outcomes.

In patients taking daily medication, it was interesting to find that 31% were not taking preventative medications, and these patients reported significantly worse headache symptoms when compared with daily medication users on preventative medications. Prior studies have shown that many patients who could benefit from preventative medication do not receive it.[25] Further, patients who start preventative medication tend to discontinue it shortly after.[26] We recommend asking potential surgical patients about their prior preventative medication use and encouraging them to speak with their neurologist about these medications, if they have not done so already.

There were limitations to this study, and we will highlight a few of them here. We did not investigate which medication types a patient took at 1 year follow-up, as these questions were not included as part of the survey. It is possible that patients switched to more effective long-term medication or other interventions like botulinum toxin. Additionally, we did not have a control group of patients without surgery to compare outcomes, and this could have revealed other confounding variables. Future studies should investigate the types of medication a patient takes at follow-up and specifically the effect of surgery on postoperative opioid use.

Successful trigger site deactivation surgery for chronic headache relies heavily on selecting appropriate candidates and preoperative counseling. This study provides insights into the medications used by surgical patients. We demonstrated that surgery is associated with decreased medication use in most of those who undergo deactivation of their triggers. This study provides further information to surgeons and their patients living with chronic headache pain.

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