

# 07.01.66 Treatments for Occipital Neuralgia, Chronic Headaches and Persistent Idiopathic Facial Pain\*

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### Related Policies:

- [02.01.52 Injection Therapy for Headache Management](#)
- [07.01.41 Pulsed Radiofrequency Ablation](#)
- [07.01.51 Occipital Nerve Stimulation](#)
- [07.01.58 Radiofrequency Ablation and Alternative Methods for Chronic Facet Joint Mediated Neck, Back and Sacroiliac Joint Pain\\*](#)
- [07.01.73 Ablative Procedures of the Peripheral Nerves to Treat Pain\\*](#)

### Summary

### Description

Ablative and surgical treatments have been proposed for the treatment of individuals with occipital neuralgia and/or chronic headaches or persistent idiopathic facial pain (PIFP).

## **Summary of Evidence**

### **Ablative Treatments**

#### **Cervicogenic Headache and Occipital Neuralgia**

For individuals who have occipital neuralgia or cervicogenic headache who receive radiofrequency ablation (RFA) or cryoneurolysis of peripheral nerves, the evidence includes randomized controlled trials (RCTs) and systematic reviews of RCTs. Relevant outcomes are symptoms, functional outcomes, and quality of life (QOL). No RCTs of RFA for chronic occipital neuralgia have been identified. Three RCTs of RFA for a cervicogenic headache have been published, none of which were high quality. Pain is a subjective, patient-reported measure that is particularly susceptible to a placebo effect. RCTs with sham or active controls are needed to evaluate the efficacy of this treatment. One controlled trial found a temporary benefit of cryoneurolysis for cervicogenic headache, but the effect was not significantly better than injection of corticosteroid and local anesthetic. The evidence is insufficient to determine that the technology results in an improvement in the net health outcome.

For individuals who have occipital neuralgia or cervicogenic headache who receive chemical neurolysis (alcohol, phenol, glycerol) no published literature was identified in-regards to individuals receiving this ablative treatment for this condition. Relevant outcomes include symptoms, functional outcomes, and QOL. RCTs are needed to determine the efficacy of this ablative methods in the treatment of occipital neuralgia or cervicogenic headache. The evidence is insufficient to determine the effects of this technology on net health outcomes.

#### **Persistent Idiopathic Facial Pain (PIFP)**

For individuals with persistent idiopathic facial pain (PIFP) receiving RFA (standard, cooled, and pulsed), the available evidence includes systematic review. Relevant outcomes are symptoms, functional outcomes, and QOL. A systematic review evaluating the use of RFA (continuous and pulsed) for the management of chronic facial pain which may have shown promising results with short-term pain relief with acute resolution of symptoms immediately after the procedure with values of 89%, 91%, 99% and 100%. Other studies concluded resolution of symptoms at 100% in 3 days, 100% between 7 days and 3 months, and 85% in 5.2 weeks post-procedure and the presence of symptoms 6 months post-procedure were 41%, 85%, and 90% across different studies. However, at 6 months, NRS scores decreased by greater than 50% in 39% of patients in one study, whereas it decreased by 33% in another study. Long-term pain relief and varied between studies most likely due to various modalities of treatment involving duration, temperature and voltage. Resolution of symptoms 1-year post procedure varied between 60% and 95.1% throughout the studies. Limitations of this systematic review included variable definitions of trigeminal neuralgia, RFA technique, and patient selection bias. Further randomized comparative studies are needed with larger sample sizes, longer follow-up, and standardization RFA treatment protocols related to duration, temperature and voltage. The evidence is insufficient to determine the effects of the technology on net health outcomes.

For individuals who have PIFP who receive chemical neurolysis (alcohol, phenol, glycerol) no published literature was identified in individuals receiving this ablative treatment for this condition. Relevant outcomes include symptoms, functional outcomes, and QOL. RCTS are needed to determine the efficacy of this ablative methods in the treatment of PIFP. The evidence is insufficient to determine the effects of this technology on net health outcomes.

## Surgical Treatments

For individuals with occipital neuralgia and/or chronic headaches who receive surgical treatment (resection or repositioning of musculature or soft tissue; neuroplasty, neurectomy and ganglionectomy; decompression, transection or avulsion of any facial or occipital nerves), the available evidence includes RCTs, nonrandomized controlled trials, case series, retrospective studies and systematic reviews. Relevant outcomes are symptoms, functional outcomes, and QOL. Although a 2019 meta-analysis of 3 RCTs found significantly greater odds of migraine elimination at 1 year with surgical treatment, these results are inconclusive due to important design and conduct limitations, including imprecision and inadequate information about potentially confounding patient comorbidities and concomitant medication use. No RCTs were identified that evaluated surgical treatments for occipital neuralgia or PIFP. RCTs with longer follow up and larger patient populations are needed to determine safety and efficacy. The evidence is insufficient to determine the effects of the technology on net health outcomes.

## Additional Information

Not applicable

## OBJECTIVE

The first objective of this evidence review is to determine whether the use of radiofrequency ablation (standard, cooled or pulsed), chemical neurolysis (alcohol, phenol, glycerol) or cryoneurolysis (cryoablation, cryoanalgesia) of peripheral nerves improves the net health outcome in individuals with occipital neuralgia and/or chronic headaches or persistent idiopathic facial pain (PIFP) (atypical facial pain).

The second objective of this evidence review is to determine whether the use of surgical treatments including but not limited to the following improves the net health outcomes in individuals with occipital neuralgia and/or chronic headaches or persistent idiopathic facial pain (PIFP) (atypical facial pain):

- Resection or repositioning of musculature or soft tissue;
- Neuroplasty, neurectomy and ganglionectomy;
- Decompression, transection or avulsion of any facial or occipital nerves.

## PRIOR APPROVAL

Prior approval is required.

**Note:** Refer to [Wellmark Authorization Table](#) to determine applicable prior approval requirements for the procedure code(s) to be performed and the medical necessity clinical coverage criteria using InterQual® criteria.

## POLICY

## Ablative Treatments

Radiofrequency ablation (standard, cooled, pulsed), cryoneurolysis (cryoablation, cryotherapy, cryoanalgesia) or chemical neurolysis (alcohol, phenol, glycerol) of the peripheral nerves to treat pain including but not limited to the following is considered **investigational** because the evidence is insufficient to determine the effects of this technology on net health outcomes:

- Cervicogenic headache
- Occipital neuralgia
- Persistent idiopathic facial pain (PIFP)

## Surgical Treatments

Surgical treatments including but not limited to the following for the treatment of occipital neuralgia and/or chronic headaches or persistent idiopathic facial pain (PIFP) is considered **investigational**, because the evidence is insufficient to determine the effects of this technology on net health outcomes:

- Resection or repositioning of musculature or soft tissue;
- Neuroplasty, neurectomy and ganglionectomy;
- Decompression, transection or avulsion of any facial or occipital nerves.

## POLICY GUIDELINES

### Coding

See the [Codes](#) table for details.

## BACKGROUND

### Ablative Treatments

#### Nerve Radiofrequency Ablation

Nerve radiofrequency ablation (RFA) is a minimally invasive method that involves the use of heat and coagulation necrosis to destroy tissue. A needle electrode is inserted through the skin and into the tissue to be ablated. A high-frequency electrical current is applied to the target tissue and a small sphere of tissue is coagulated around the needle by the heat generated. It is theorized that the thermal lesioning of the nerve destroys peripheral sensory nerve endings, resulting in the alleviation of pain. Cooled RFA is a variation of nerve RFA using a water-cooled probe that applies more energy at the desired location without excessive heat diffusing beyond the area, causing less tissue damage away from the nerve (see Table 1). The goal of ablating the nerve is the same.

RFA is also distinguished from pulsed radiofrequency (RF) treatment, which has been investigated for different types of pain. The mechanism of action of pulsed RF treatment is uncertain but it is thought not to destroy the nerve. It does produce some degree of nerve destruction but is thought to cause less damage than standard RFA. Some studies refer to pulsed RF treatment as ablation.

For the indications assessed in this evidence review, nerve RFA should be distinguished from RF energy applied to areas other than the nerve to cause tissue damage.

**Table 1. Types of Radiofrequency Ablation**

| Type                | Procedure                                                  | Tissue Temperature | Key Differences                                                                                                  |
|---------------------|------------------------------------------------------------|--------------------|------------------------------------------------------------------------------------------------------------------|
| <b>Standard RFA</b> | Electrode tip provides thermal energy for 90 – 130 seconds | 70 – 90° C         | Longer term pain relief but with more adjacent thermal tissue injury and limitation in size and shape of lesion. |
| <b>Pulsed RFA</b>   | Non-ablative - provides 20 ms pulses every 30 seconds      | 42° C              | Limits tissue damage but results in shorter duration of pain relief.                                             |
| <b>Cooled RFA</b>   | Water circulates through RF electrode to cool the tip      | 60° C              | Larger lesion with limited thermal injury to tissue. Longer term pain relief.                                    |

RF: radiofrequency; RFA: radiofrequency ablation  
Adapted from Oladeji et al (2019)<sup>3</sup>.

## Cryoneurolysis

Cryoneurolysis is being investigated to alleviate pain. Temperatures of -20° to -100°C applied to a nerve cause Wallerian (anterograde axonal) degeneration, with disruption of nerve structure and conduction but maintenance of the perineural and epineural elements of the nerve bundle. Wallerian degeneration allows complete regeneration and recovery of nerve function in about 3 to 5 months. The iovera<sup>®</sup> cryoablation system is a portable handheld device that applies percutaneous and targeted delivery of cold to superficial peripheral nerves.

## Chemical Neurolysis

Chemical neurolysis (phenol, alcohol, glycerol) may be utilized as an option to provide pain relief and maintain mobility. Chemical neurolysis causes nerve destruction and has a local anesthetic effect on smaller nerve fibers.

## Surgical Treatments

Surgical treatments have been proposed for the treatment of occipital neuralgia and/or chronic headaches or PIFP (atypical facial pain) to include resection or repositioning of musculature or soft tissue, neuroplasty, neurectomy and ganglionectomy and decompression, transection or avulsion of any facial or occipital nerves. Surgical interventions are utilized as a treatment option to relieve impingement of the nerve root(s) and thereby eliminate symptoms caused by compression and injury to the cervical nerves.

## Regulatory Status

A number of RF generators and probes for the peripheral nervous system have been cleared for marketing by the U.S. Food and Drug Administration (FDA) through the 510(k) process. Some examples are listed in Table 2.

In 2017, the COOLIEF Cooled Radiofrequency Probe (Avanos, previously known as Halyard Health) was cleared for marketing by the FDA through the 510(k) process to be used in conjunction with a radiofrequency generator to create lesions in nervous tissue (K163461).

**Table 2. Radiofrequency and Cryoneurolysis Devices**

| Device                                       | Manufacturer                     | Date |
|----------------------------------------------|----------------------------------|------|
| SInergy®/Baylis Pain Management Probe        | Kimberly-Clark/Baylis            | 2005 |
| NeuroTherm® NT 2000                          | NeuroTherm                       | 2011 |
| iovera°                                      | Pacira (formerly Myoscience)     | 2014 |
| COOLIEF® Cooled Radiofrequency Kit           | Avanos (formerly Halyard Health) | 2016 |
| COOLIEF® Cooled RF Probe                     | Avanos (formerly Halyard Health) | 2017 |
| Rulo(TM) Radiofrequency Lesion Probe         | Epimed International             | 2019 |
| Intrasept Intraosseous Nerve Ablation System | Relievent Medsystems, Inc        | 2022 |
| Device                                       | Manufacturer                     | Date |
| Apex 6 Radiofrequency Lesion Generator       | RF Innovations, Inc              | 2023 |

## RATIONALE

This evidence review was created in November 2014 and has been updated regularly with searches of the PubMed database. The most recent literature update was performed through November 2025.

Evidence reviews assess the clinical evidence to determine whether the use of technology improves the net health outcome. Broadly defined, health outcomes are the length of life, quality of life (QOL), and ability to function—including benefits and harms. Every clinical condition has specific outcomes that are important to individuals and managing the course of that condition. Validated outcome measures are necessary to ascertain whether a condition improves or worsens; and whether the magnitude of that change is clinically significant. The net health outcome is a balance of benefits and harms.

To assess whether the evidence is sufficient to draw conclusions about the net health outcome of technology, 2 domains are examined: the relevance, and quality and credibility. To be relevant, studies must represent 1 or more intended clinical use of the technology in the intended population and compare an effective and appropriate alternative at a comparable intensity. For some conditions, the alternative will be supportive care or surveillance. The quality and credibility of the evidence depend on study design and conduct, minimizing bias and confounding that can generate incorrect findings. The randomized controlled trial (RCT) is preferred to assess efficacy; however, in some circumstances, nonrandomized studies may be adequate. RCTs are rarely large enough or long enough to capture less common adverse events and long-term effects. Other types of studies can be used for these purposes and to assess generalizability to broader clinical populations and settings of clinical practice.

## Ablative Treatments

# **Radiofrequency Ablation or Cryoneurolysis for Occipital Neuralgia and Cervicogenic Headache**

## ***Clinical Context and /Therapy Purpose***

The purpose of radiofrequency ablation (RFA) and cryoneurolysis in individuals who have occipital neuralgia or a cervicogenic headache is to provide a treatment option that is an alternative to or an improvement on existing therapies.

The following PICO was used to select literature to inform this review.

## ***Populations***

The relevant population of interest is individuals with occipital neuralgia or cervicogenic headache

Occipital neuralgia is a specific type of headache that is located on one side of the upper neck, back of the head, and behind the ears, and sometimes extending to the scalp, forehead, and behind the eyes. The pain, which may be piercing, throbbing, or electric-shock-like, follows the course of the greater and lesser occipital nerves. Occipital neuralgia is believed to occur due to pressure or irritation to the occipital nerves, which may result from injury, entrapment by tight muscles, or inflammation.

Cervicogenic headache is a headache that is secondary to a disorder of the cervical spine. The pain may be referred from facet joints, intervertebral discs, or soft tissue. The pain is constant rather than throbbing and may be aggravated by movements of the neck or pressure to certain areas on the neck. The first 3 cervical spinal nerves can refer pain to the head. The C1 suboccipital nerve innervates the atlanto-occipital joint; the C2 spinal nerve and the C3 dorsal ramus have close proximity to and innervate the C2-C3 facet joint. The C2-3 facet joint is the most frequent source of a cervicogenic headache. A diagnosis of a cervicogenic headache may be confirmed by an anesthetic block of the lateral atlanto-axial joint, the C2-3 facet joint, or the C3-4 facet joint.

## ***Interventions***

The therapy being considered is RFA or cryoneurolysis. These treatments involve the percutaneous insertion of a catheter that is directed toward the nerve of interest and are used to ablate the nerve by thermal lesioning.

## ***Comparators***

Treatment for occipital neuralgia may include massage and rest, muscle relaxants, nerve blocks, and injection of steroids directly into the affected area.

Treatment for cervicogenic headache may include nerve blocks, physical therapy, and exercise.

## ***Outcomes***

The most clinically relevant outcome measures for pain treatments are measures of pain severity and functional limitations. Pain is most commonly measured with a Visual Analog Score (VAS) or Numeric Rating Scale (NRS). Quantifiable pre- and posttreatment measures of functional status are also used, such as the 12-Item and 36-Item Short-Form Health Survey. The time for follow-up is within days to determine the procedural success and months to years to evaluate durability.

## Study Selection Criteria

We selected methodologically credible studies, using these principles:

- To assess efficacy outcomes, we sought comparative controlled prospective trials, with a preference for RCTs with a minimum of 6 months of outcomes, and systematic reviews of RCTs. It is preferred to have double-blinded sham interventions to control for placebo effects.
- To assess long-term outcomes and adverse effects, we sought single-arm studies with longer periods of follow-up and/or larger populations.
- Within each category of study design, we included studies with larger sample sizes and longer duration.

## Review of Evidence

### Systematic Reviews

Grandhi et. al. (2018) conducted a systematic review of RFA for the treatment of a cervicogenic headache. Ten studies met selection criteria, including 3 RCTs, 3 prospective studies, and 4 retrospective studies. There were no high-quality RCTs. Two of the RCTs evaluated RFA of the facet joints and failed to find a benefit of RFA. The third RCT compared RFA with steroid injection of the greater occipital nerve, finding no difference between the groups in the short term, but a longer duration of pain control in the RFA group.

A systematic review by Ducic et al (2014) did not identify any RCTs assessing RFA for chronic occipital neuralgia. Reviewers identified 3 case series (total N=131) on pulsed RF treatment. Success rates in these series ranged from 51% to 100%, with an overall success rate of 55%. Follow-up ranged from 3 to 10 months.

### Randomized Controlled Trials

A double-blinded RCT of 52 individuals with cervicogenic headache who were treated with cryoneurolysis or injection of corticosteroid and local anesthetic in a tertiary pain clinic was reported by Kvarstein et al (2019). The investigators noted a temporary benefit of both treatments for cervicogenic headache, but there was no additional benefit for the more invasive procedure. A possibility of adverse effects of repeated occipital cryoneurolysis were noted to include scar and neuroma formation and a risk of neuropathic pain.

### Section Summary: Radiofrequency Ablation or Cryoneurolysis for Occipital Neuralgia and Cervicogenic Headache

No RCTs of RFA for chronic occipital neuralgia have been identified. A systematic review identified 3 RCTs of RFA for a cervicogenic headache, none of which were high quality. Pain is a subjective, patient-reported measure that is particularly susceptible to a placebo effect. Trials with sham or active controls are needed to evaluate the efficacy of this treatment. One RCT of individuals with cervicogenic headache that compared cryoneurolysis with injection of corticosteroid and local anesthetic found no significant improvement with the more invasive treatment.

## **Ablative Treatments for Persistent Idiopathic Facial Pain**

### ***Clinical Context and /Therapy Purpose***

The purpose of RFA (standard, cooled and pulsed), cryoneurolysis (cryoablation, cryoanalgesia) and chemical neurolysis (alcohol, phenol, glycerol) in individuals who have persistent idiopathic facial pain (PIFP) is to provide a treatment option that is an alternative to or an improvement on existing therapies. The following PICO was used to select literature to inform this review.

### ***Populations***

The relevant population of interest is individuals with PIFP.

The pathophysiology of PIFP is unknown. The available literature suggests that abnormal sensitization of the trigeminal nociceptive system may play a crucial role in the development of PIFP.

PIFP is characterized by persistent facial pain that does not have the characteristics of cranial neuralgias and cannot be attributed to a different disorder. The pain is usually of long duration, lasting most of the day (if not continuous), is generally limited to one particular area on one side of the face at onset, is deep and poorly localized, and is not associated with sensory loss or other neurologic deficits. Investigations including x-ray of the face and jaw or cranial computed tomography (CT) or magnetic resonance imaging (MRI) do not demonstrate any relevant abnormality. The pain may be initiated by surgery or injury to the face, teeth, or gums, but it persists without any demonstrable cause. Persistent idiopathic facial pain (atypical facial pain) is rare, and studies are limited.

### ***Interventions***

The therapy being considered is RFA (standard, cooled and pulsed), cryoneurolysis (cryoablation, cryoanalgesia) and chemical neurolysis (alcohol, phenol, glycerol).

### ***Comparators***

Treatment for PIFP includes anticonvulsants and antidepressants (e.g., tricyclic antidepressants, selective serotonin uptake inhibitors and norepinephrine reuptake inhibitors).

### ***Outcomes***

The most clinically relevant outcome measures for pain treatments are measures of pain severity and functional limitations. Pain is most commonly measured with a VAS or RNS. Quantifiable pre- and posttreatment measures of functional status are also used, such as the 12-Item and 36-Item Short-Form Health Survey. The time for follow-up is within days to determine the procedural success and months to years to evaluate durability.

### **Study Selection Criteria**

We selected methodologically credible studies, using these principles:

- To assess efficacy outcomes, we sought comparative controlled prospective trials, with a preference for RCTs with a minimum of 6 months of outcomes, and systematic reviews of RCTs. It is preferred to have double-blinded sham interventions to control for placebo effects.

- To assess long-term outcomes and adverse effects, we sought single-arm studies with longer periods of follow-up and/or larger populations.
- Within each category of study design, we included studies with larger sample sizes and longer duration.

## Review of Evidence

### Systematic Review

Orhurhu et. al. (2020) conducted a systematic review on the use of radiofrequency ablation for the management of chronic facial pain. This review included 44 studies, comprised of 18 retrospective, 18 prospective, and 8 RCTs (see Table 3 for characteristics of these RCTs). The trigeminal nerve was the most commonly targeted nerve using continuous radiofrequency (CRF) or pulsed radiofrequency (PRF) treatment. Another group of nerves identified as sphenopalatine ganglion, infraorbital nerve, and glossopharyngeal nerve were also ablated in 3 publications included in this review. Pain outcomes were reported as Visual Analog Scale (VAS), Numeric Rating Scale (NRS) scores or Barrow Neurological Institute (BNI). The most commonly reported secondary outcomes included patient satisfaction, quality of life improvements, decrease in oral medication use, and recurrence rates. The authors stated, “short-term pain relief displayed promising result in the studies but did not necessarily correlate with good long-term outcomes.” There was acute resolution of symptoms immediately after the procedure with values of 89%, 91%, 99% and 100%. Other studies concluded resolution of symptoms at 100% in 3 days, 100% between 7 days and 3 months, and 85% in 5.2 weeks post-procedure. The presence of symptoms 6 months post-procedure was 41%, 85%, and 90% across different studies. At 6 months, NRS scores decreased by greater than 50% in 39% of patients in one study, whereas it decreased by 33% in another study. Long-term pain relief varied between studies most likely due to various modalities of treatment regimens involving duration, temperature, and voltage. Resolution of symptoms 1- year post procedure varied between 60% and 95.1 % throughout different studies. The commonly assessed secondary outcomes patient satisfaction, quality of life (QOL) improvements, decrease in oral medication and use and recurrence rates found that satisfaction levels were consistent with CRF more than PRF, most satisfactory with combination therapy CRF and PRF, studies involving high-voltage PRF groups showed a reduction in oral medication use post-procedure and QOL improvements were significant across all treatment groups. Recurrence rates post-procedure was consistently higher in treatment groups receiving lower temperature regimens. Thirty-two out of 44 studies 72.7% reported complications including facial numbness, masseter weaknesses, cheek hematomas, diminished corneal reflex and dry eyes. Limitations of this systematic review included variable definitions of trigeminal neuralgia, RF technique, and patient selection bias. While this systematic review may have shown promise with short-term pain relief further randomized comparative studies are needed with larger sample sizes, longer follow-up, and standardization RF treatment protocols related to duration, temperature and voltage.

**Table 3. Characteristics of Randomized Controlled Trials**

| Study                | Diagnosis | Sample Size = n | Study Design                 | Ablation Technique                  | Ablated Nerve    | Duration Pain                           | Secondary Outcome                               | Side Effect            | Conclusion                                                 |
|----------------------|-----------|-----------------|------------------------------|-------------------------------------|------------------|-----------------------------------------|-------------------------------------------------|------------------------|------------------------------------------------------------|
| Elawamy et al (2017) | TN        | 43              | Randomized prospective study | CRF 75°C for 270s<br>PFRs; 42°C for | Trigeminal nerve | VAS scores most reduced in CPRF group > | CPRF had highest satisfaction rates > PRF > CRF | Numbness and weakness, | Pain relief was best in CPRF group, followed by CRF group, |

| Study            | Diagnosis                                  | Sample Size = n | Study Design                 | Ablation Technique                                                                | Ablated Nerve      | Duration Pain                                                                                                                                                                                                                      | Secondary Outcome                                                                                                                                                                                                                       | Side Effect                                                                                                                                                                                      | Conclusion                                                                                                                                                                                                   |
|------------------|--------------------------------------------|-----------------|------------------------------|-----------------------------------------------------------------------------------|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                  |                                            |                 |                              | 10 minutes                                                                        |                    | CRF > PRF<br>CPRF: 9.15 +/- 1.13 pre-intervention; 0 after 24 months                                                                                                                                                               | Patients in PRF group continued to use carbamazepine after procedure; patients in CPRF and CRF groups stopped using carbamazepine by 6-months follow-up                                                                                 | parathesia                                                                                                                                                                                       | followed by PRF group                                                                                                                                                                                        |
| Luo et al (2017) | Refractory neuralgia of infraorbital nerve | 60              | Randomized prospective study | Std V group: 42°C, 2Hz, 120s, 2 times<br>High V group: 42°C max V, 1020s, 2 times | Infraorbital nerve | In the standard voltage group, response rate was 67% at one month, 67% at 3 months, 63% at 6 months and 60% at 1 year post therapy in the high-voltage group, response rate was 90% after one month, 3 months, 6 months and 1-year | Among the patients in the high voltage group who responded to the high voltage PFR, 74% had complete pain relief and thus discontinued anti-epileptic carbamazepine and did not experience recurrent pain during the one year follow-up | Four patients (13%) in the standard voltage group and 8 patients (27%) in the high voltage group experienced mild numbness in the innervation area of the infraorbital nerve after the operation | High voltage radiofrequency was effective and safe for patients with refractory neuralgia of the infraorbital nerve could become a treatment option in patients who do not respond to conservative treatment |
| Yao et al (2016) | TN                                         | 54              | Randomized clinical          | N/A                                                                               | Trigeminal nerve   | Immediately complete                                                                                                                                                                                                               | Annual recurrence rate in the                                                                                                                                                                                                           | No side effect and                                                                                                                                                                               | Neuronavig ator-guided RF is a safe                                                                                                                                                                          |

| Study            | Diagnosis | Sample Size = n | Study Design                         | Ablation Technique                                                        | Ablated Nerve    | Duration Pain                                                                                                                                                                                                                                                      | Secondary Outcome                                                                                  | Side Effect                                                                           | Conclusion                                                                                                                                                 |
|------------------|-----------|-----------------|--------------------------------------|---------------------------------------------------------------------------|------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                  |           |                 | controlled trial                     |                                                                           |                  | pain-relief rate of the navigation group was 100%, whereas it was 95% in the control. The proportion of the sustained pain-relief rates 12, 24 and 36 months after the procedure were 85%, 77% and 62% in the navigation group and 54%, 40% and 35% in the control | first and second years were 15% and 23% in the navigation group, and 46%, 60% in the control group | complication was noted in the navigation group except minimal facial hypesthesia      | and promising method for treatment of intractable TN with better short- and long-term outcomes and lower complication rate than RF without neuronavigation |
| Yao et al (2016) | TN        | 56              | Randomized clinical controlled trial | CRF 62°C for 240-360s<br>CRF + PRF;<br>CRF followed by 42°C for 8 minutes | Trigeminal nerve | In groups A and B a BNI score of 1 was found in 81.6% and 92.0% at 1 year, 68.4%                                                                                                                                                                                   | HRQoL scores of all the study patients were low before the thermal ablation procedures and high    | 14 patients had corneal hyposthesia (11 and 3 group A and group B patients; P, 0.05). | PRF can decrease the recurrence rate of TN, decrease the incidence rate and shorten the recovery time of                                                   |

| Study             | Diagnosis | Sample Size = n | Study Design                 | Ablation Technique                                                                             | Ablated Nerve    | Duration Pain                                                                                                                                                                        | Secondary Outcome                                                                                                                                                                                                      | Side Effect                                                                                                                          | Conclusion                                                                                                     |
|-------------------|-----------|-----------------|------------------------------|------------------------------------------------------------------------------------------------|------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------|
|                   |           |                 |                              |                                                                                                |                  | and 92.0% at 2 years, and 68.4% and 83.6% at 3 years                                                                                                                                 | after the procedures                                                                                                                                                                                                   | Facial numbness was observed in 3 (10.7%) and 2 (7.1%) groups A and B patients (P >0.05)                                             | corneal hypoesthesia, and lead to increased quality of life                                                    |
| Fang et al (2015) | TN        | 60              | Randomized prospective study | Std V; 42°C for 240s<br>High V; max 42°C for 240s                                              | Trigeminal nerve | Standard voltage: 11 (41%) patients had favorable outcome up to 6 months; 5 patients achieved total pain relief. 16 (59%) patients did not achieve any relief. High voltage 18 (69%) | Standard voltage: 6 patients achieved numeric rating scale relief > 50% and their carbamazepine dose was reduced. High voltage: 13 of 18 patients who had significant pain score decreases stopped using carbamazepine | In non-reponders who underwent RF thermocoagulation, hypesthesia in the trigeminal area and masticatory muscle weakness was reported | High voltage RFA is as safe as standard voltage RFA and is more effective in treating TN                       |
| Li et al (2012)   | TN        | 60              | Randomized prospective study | Short duration CRF; 75°C for 120-180s<br>long-duration CRF: 75°C for 240-300s<br>PRF: 42°C for | Trigeminal nerve | Short duration CRF: pain persisted in 3 patients at 1 day, 1 patient at 7 days and 4 patients at 6 months.                                                                           | There were no significant differences in quality of life at three, six, and 12-months after RF treatment between groups (p > 0.05)                                                                                     | All patients (100%) experienced facial dysesthesia on the day following the RF procedure, one patient in                             | A shorter CRF exposure time may result in less damage to the ganglion with comparable efficacy for pain relief |

| Study               | Diagnosis | Sample Size = n | Study Design                 | Ablation Technique                       | Ablated Nerve    | Duration Pain                                                                                                                                                                                        | Secondary Outcome                                                                                                                                                                          | Side Effect                                                                                                                | Conclusion                                       |
|---------------------|-----------|-----------------|------------------------------|------------------------------------------|------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------|
|                     |           |                 |                              | 10 minutes                               |                  | Long-duration CRF: pain persisted 11 patient at 1 day, 1 patient in 7 days and 3 patients at 6 months<br>PRF: Pain persisted in 5 patients at 1 day, 0 patients at 7 days and 3 patients at 6 months |                                                                                                                                                                                            | each group had mild discomfort in the ipsilateral eye                                                                      |                                                  |
| Erdine et al (2007) | TN        | 40              | Randomized prospective study | CRF; 70°C for 60s<br>PRF; 42°C, 2 bursts | Trigeminal nerve | CRF: Median VAS was 1 at 1 day post therapy.<br><br>At 3 months, median VAS was 0.5. PRF only 2/20 (10%) patients had decreased VAS 1 day post-therapy, with median VAS of 8.                        | CRF: pre-therapy median patient satisfaction score (PSS) was 1.5; post-therapy day 1 PSS was 8; PRF: pre-therapy median PSS was 1; post-therapy day 1 PSS was 1. After this group received | Moderate headache for 24h. In all patients who received CRF, mild hypesthesia and paresthesia occurred after the procedure | CRF is superior to PRF for pain management of TN |

| Study           | Diagnosis | Sample Size = n | Study Design                         | Ablation Technique | Ablated Nerve | Duration Pain                                                                                                                                                                                                                                                   | Secondary Outcome                                                                                                            | Side Effect                                                                                         | Conclusion                                                                                                                                                                                   |
|-----------------|-----------|-----------------|--------------------------------------|--------------------|---------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                 |           |                 |                                      |                    |               | At 3-months median VAS was 8.5 these patients then received CRF and median VAS at 6 months was 1                                                                                                                                                                | CRP, PSS was 8.                                                                                                              |                                                                                                     |                                                                                                                                                                                              |
| Xu et al (2006) | TN        | 54              | Randomized clinical controlled trial | N/A                | Trigeminal    | Immediate complete pain-relief rate of the navigation group was 100% whereas it was 95% in the control.<br><br>The proportion of sustained pain-relief rates at 12, 24 and 36 months after the procedure were 85%, 77% and 62% in the navigation group and 54%. | Annual recurrence rate in the first and second years were 15% and 23% in navigation group, and 46%, 60% in the control group | No side effect and complication was noted in the navigation group except minimal facial hypesthesia | Neuronavigator-guided RF is a safe and promising method for treatment of intractable TN with better short and long-term outcomes and lower complication rate than RF without neuronavigation |

| Study | Diagnosis | Sample Size = n | Study Design | Ablation Technique | Ablated Nerve | Duration Pain              | Secondary Outcome | Side Effect | Conclusion |
|-------|-----------|-----------------|--------------|--------------------|---------------|----------------------------|-------------------|-------------|------------|
|       |           |                 |              |                    |               | 40% and 35% in the control |                   |             |            |

## Section Summary: Persistent Idiopathic Facial Pain (PIFP)

A systematic review evaluating the use of RFA (continuous and pulsed) for the management of chronic facial pain which may have shown promising results with short-term pain relief with acute resolution of symptoms immediately after the procedure with values of 89%, 91%, 99% and 100%. Other studies concluded resolution of symptoms at 100% in 3 days, 100% between 7 days and 3 months, and 85% in 5.2 weeks post-procedure and the presence of symptoms 6 months post-procedure were 41%, 85%, and 90% across different studies. However, at 6 months, NRS scores decreased by greater than 50% in 39% of patients in one study, whereas it decreased by 33% in another study. Long-term pain relief and varied between studies most likely due to various modalities of treatment involving duration, temperature and voltage. Resolution of symptoms 1-year post procedure varied between 60% and 95.1% throughout the studies. Limitations of this systematic review included variable definitions of trigeminal neuralgia, RFA technique, and patient selection bias. Further randomized comparative studies are needed with larger sample sizes, longer follow-up, and standardization RFA treatment protocols related to duration, temperature and voltage.

## Surgical Treatments

### *Clinical Context and Therapy Purpose*

The purpose of surgical treatments in individuals who have occipital neuralgia, chronic headaches or PIFP is to relieve impingement of the nerve root(s) and thereby eliminate symptoms caused by compression and injury to the nerves to include the cranial nerves.

The following PICO was used to select literature to inform this review.

### *Populations*

The relevant population of interest is individuals with occipital neuralgia, chronic headaches or PIFP.

### *Interventions*

The therapy being considered is the surgical treatments:

- Resection or repositioning of musculature or soft tissue.
- Neuroplasty, neurectomy and ganglionectomy.
- Decompression, transection or avulsion of any facial or occipital nerves.

## Comparators

The following therapy is currently being used to occipital neuralgia, chronic headaches or PIFP: Conservative management, which may include pharmacological treatment with oral analgesics, anti-inflammatory medications, tricyclic antidepressants, and anticonvulsant medications. Other treatment modalities are the use of nerve blocks, cervical collar during the acute phase; physical therapy with stretching and strengthening exercises; postural training; relaxation exercises; transcutaneous nerve stimulation (TENS); and manual therapy including spinal manipulation and spinal mobilization.

## Outcomes

The most clinically relevant outcome measures for pain treatments are measures of pain severity and functional limitations. Pain is most commonly measured with a VAS or NRS. Quantifiable pre- and posttreatment measures of functional status are also used, such as the 12-Item and 36-Item Short-Form Health Survey. The time for follow-up is within days to determine the procedural success and months to years to evaluate durability.

## Study Selection Criteria

We selected methodologically credible studies, using these principles:

- To assess efficacy outcomes, we sought comparative controlled prospective trials, with a preference for RCTs with a minimum of 6 months of outcomes, and systematic reviews of RCTs. It is preferred to have double-blinded sham interventions to control for placebo effects.
- To assess long-term outcomes and adverse effects, we sought single-arm studies with longer periods of follow-up and/or larger populations.
- Within each category of study design, we included studies with larger sample sizes and longer duration.

## Review of Evidence

### Resection, Manipulation or Repositioning of Musculature Surgery or Nerve Resection for Chronic Headaches

#### Systematic Reviews

A 2019 meta-analysis by Vincent et. al. evaluated the current available evidence for the surgical treatment of migraine headache (MH) and to determine the effect of this treatment regarding elimination of MH after migraine trigger site surgery and whether surgery compared to sham or no surgery is more effective in the elimination of MH. A total number of 627 individuals were included in the analysis including treatment and control groups. The sample size varied from 18 to 108 patients and follow-up period ranged from 6 months in three studies to 1- year or more in other studies. The age of study participants ranged from 18 to 80 years. The general characteristics of the included studies are summarized in Table 4. Two separate meta-analyses were performed, a meta-analysis of the proportion of patients with elimination of symptoms at follow-up and meta-analysis of the treatment effect of migraine surgery in the included randomized controlled trials. Surgical approaches to the four distinct trigger sites were either through an open approach with skin incision, or via endoscopic approach, also used for cosmetic surgical applications. A total Number of 565 patients treated with migraine surgery was included in the analysis a summary is given in Table 5., showed a proportion of 0.38 of patients (random effects model, 95%

confidence interval [0.30–0.46], heterogeneity:  $I^2 = 49\%$  [5%; 72%],  $p = 0.02$ ) reported elimination of MH at follow-up. The significant p-value for  $I^2$  suggests heterogeneity of the data. This heterogeneity is mainly due to two outliers with stricter handling of the definition of elimination, namely Janis et al. and Poggi et al. Meta-analysis with exclusion of these studies led to an I-squared value of 26% [0%; 62%],  $p = 0.19$  and a proportion of elimination of 0.41 [0.35; 0.46]. A second sensitivity analysis excluding the RCTs from the meta-analysis led to a proportion of 0.38 [0.29; 0.49] of patients with elimination of MH (Random effects model,  $I^2 = 54.0\%$  [9.1%; 76.7%],  $p = 0.020$ ). What is not reported, however, is whether these patients still had migraine originating from other trigger sites, which could mean that in some patients the migraine headaches did not fully disappear but for the mentioned trigger site. Guyuron et al. compared two surgical approaches at the temporal site and showed for both approaches a high percentage of elimination. This could either be due to selection of the patients or perhaps to a high chance of success of this particular surgical site.

**Table 4. Characteristics of Included Studies**

| Study                               | Sample Size (n)<br>Mean Age (Years), [Range] | Follow-up (Months) | Study Design         | Migraine Subtype            | Trigger Sites | Surgical Approach                               |
|-------------------------------------|----------------------------------------------|--------------------|----------------------|-----------------------------|---------------|-------------------------------------------------|
| Guyuron et. al. (USA 2000)          | 39 / 56 [32-70]                              | 47                 | Retrospective cohort | Migraine                    | F             | Skin incision/endoscopic/open forehead approach |
| Guyuron et. al. (USA 2002)          | 22 / (44.9 [24-80])                          | 12                 | Prospective cohort   | Migraine (moderate-severe)  | F and T       | Skin incision/endoscopic                        |
| Behin (USA 2004)                    | 21 / 45 [21-73]                              | 6-62               | Retrospective cohort |                             | N             | Endoscopic                                      |
| Dimberger and Becker (Austria 2004) | 60 / [24-80]                                 | 6                  | Prospective cohort   | Migraine                    | F             | Skin incision                                   |
| Guyuron et. al. (USA 2005)          | 108/ 4.34 $\pm$ 1.1                          | 12                 | RCT                  | Migraine (moderate-severe)  | F, T, O and N | Skin incision/endoscopic                        |
| Poggi et. al. (USA 2008)            | 18 / 41 [22-53]                              | 16                 | Retrospective cohort | Migraine                    | F, T and O    | Skin incision/endoscopic                        |
| Guyuron et. al. (USA 2009)          | 75 / 44.9 [26-76]                            | 12                 | RCT                  | Migraine (moderate-severe)  | F, T and O    | Skin incision/endoscopic                        |
| Janis et. al. (USA 2011)            | 24 / 44.4 [23-66]                            | 22                 | Retrospective cohort | Migraine                    | F, T, O and N | Skin incision/endoscopic                        |
| Gfrerer et. al. (USA 2014)          | 35 / 46.1 [20-72]                            | 12                 | Prospective cohort   | Chronic refractory migraine | F and T       | Skin incision                                   |

|                                 |                     |      |                    |                             |               |                          |
|---------------------------------|---------------------|------|--------------------|-----------------------------|---------------|--------------------------|
| Guyuron et. al. (USA 2015)      | 19 / 38.2 [19-62]   | 12   | RCT                | Migraine                    | T             | Skin incision            |
| Raposo and Caruana (Italy 2015) | 43 / [18-72]        | 6    | Prospective cohort | Migraine                    | F             | Endoscopic               |
| Omranifard et. al. (Iran 2016)  | 50 / 42.2 $\pm$ 6.9 | 12   | RCT                | Migraine                    | F, T, O and N | Skin incision/endoscopic |
| Jose et. al. (India 2017)       | 33 / 36.4 $\pm$ 9.2 | 11.1 | Prospective cohort | Migraine                    | F and T       | Skin incision            |
| Gfrerer et. al. (USA 2018)      | 83 / 45 [18-73]     | 12.3 | Prospective cohort | Chronic refractory migraine | F, T, O and N | Skin incision            |

Table RCT (randomized controlled trials). F, frontal; T, temporal; O, occipital; N, nasal.

**Table 5. Outcomes after Migraine Surgery**

| Study                               | n Treated | Elimination Percentage | Improvement Percentage | No Improvement Percentage |
|-------------------------------------|-----------|------------------------|------------------------|---------------------------|
| Guyuron et. al. (USA 2000)          | 39        | 15 (38.5)              | 16 (41)                | 8 (20.5)                  |
| Guyuron et. al. (USA 2002)          | 22        | 10 (45.5)              | 11 (50)                | 1 (4.5)                   |
| Behin (USA 2004)                    | 21        | 9 (42.9)               | 7 (33.3)               | 5 (23.8)                  |
| Dimberger and Becker (Austria 2004) | 60        | 19 (31.7)              | 16 (26.7)              | 25 (41.7)                 |
| Guyuron et. al. (USA 2005)          | 89        | 31 (35)                | 51 (57)                | 7 (8)                     |
| Poggi et. al. (USA 2008)            | 18        | 3 (16.7)               | 13 (72.2)              | 2 (11.1)                  |
| Guyuron et. al. (USA 2009)          | 49        | 28 (57.1)              | 13 (26.5)              | 8 (16.3)                  |
| Janis et. al. (USA 2011)            | 24        | 2 (8.3)                | 17 (70.8)              | 5 (20.8)                  |
| Gfrerer et. al. (USA 2014)          | 43 sites  | 20 (46.5)              | 19 (44.2)              | 4 (9.3)                   |
| Guyuron et. al. (USA 2015)          | 19        | 10 (52.6)              | 6 (31.6)               | 3 (15.8)                  |

|                                  |    |           |           |          |
|----------------------------------|----|-----------|-----------|----------|
| Raposio and Caruana (Italy 2015) | 43 | 17 (39.5) | 18 (41.9) | 8 (18.6) |
| Omrarifard et. al. (Iran 2016)   | 25 | 9 (36.0)  | 10 (40)   | 6 (24)   |
| Jose et. al. (India 2017)        | 30 | 14 (46.7) | 14 (46.7) | 2 (6.6)  |
| Guyuron et. al. (USA 2005)       | 83 | 43 (52)   | 43 (52)   | 15 (18)  |

Outcome data at follow-up is summarized in this table. In the first column, the number of patients or surgery sites treated with migraine surgery in the study is reported. The second column states the number of patients with elimination of migraine headache with percentage of total treated patients between brackets. Gfrerer et al. (46) is reported in number of surgical sites because of lacking individual patient outcomes. The third column reports patients with improvement of symptoms defined as 50–99% improvement of migraine headache symptoms. Patients reporting

In migraine surgery versus sham or no surgery at 1-year follow-up three studies performed an RCT comparing surgical treatment to sham or no surgery, with several notable differences in methodology. Guyuron et. al. compared migraine surgery to sham surgery; patients were randomly assigned to treatment groups in a two-third (treatment) vs. one-third (sham) ratio and patients and investigators (independent of the surgical team) were blinded to their treatment group until data collection was finalized. Manifer et. al. randomly assigned patients in a 1 to 1 ratio and the control group did not receive surgery but continued standard therapy with medication. Guyuron et. al. randomly assigned patients in a 4 to 1 ratio; control patients were given a saline injection and did not receive sham surgery, no data on continued pharmacological treatment during follow-up period in control patients was given. The calculated odds ratio for elimination of migraine headache at 1-year follow-up is 21.46 (random effects model, 95% CI [5.64–81.58], heterogeneity:  $I^2 = 0\%$  [0%; 62%],  $p = 0.8396$ ) for patients receiving migraine surgery compared to sham or no surgery. Of the 163 patients receiving surgery, 68 (41.7%) reported elimination after 1 year. Of the 70 control patients, only two patients reported elimination after sham or no surgery. Of the 163 patients receiving surgical treatment, 21 (12.5%) reported  $\leq 50\%$  improvement of symptoms, considered to be “no improvement,” compared to 52.8% (37 of 70) of the control patients. In the study of Guyuron et al. percentage of 57.7% of patients reported significant improvement in the sham group compared to 83.7% in the treatment group. This high percentage of improvement in the sham group was not further explained but could be partly due to a rather large placebo effect. In Guyuron et al. the percentage of improvement in the sham group was 15.8% (3 of 19 patients). In the study of Omranifard et. al. 40% (10 out of 25) of patients in the control group (which received only medication treatment) experienced improvement. Several studies reported adverse events after surgery, and the most frequent being temporary swelling, numbness or shooting pain postoperatively.

In this systematic review and meta-analysis of migraine trigger site surgery, studies demonstrated that in selected migraine patients with identifiable extracranial trigger points, the odds ratio for elimination of migraine headache after surgery is 21.46 for surgically treated patients compared to controls. Also, reported that the average proportion of patients having elimination of MH post-surgery was 38% after 6–12 months follow-up. In the remaining proportion of patients that did not experience full elimination of headaches, there was still a substantial proportion that reported 50–99% reduction in duration, intensity, and/or frequency of their headaches. Logically, a significant reduction of MH (but no elimination) can still lead to considerably less use of migraine medication and higher quality of life. However, the documentation of quality of life after migraine surgery is scarce and has been reported by few groups. Given the results of this study, it is an important factor that should be considered in future studies investigating the effects of surgery. Limitations included no data available describing possible changes in character of the MH after surgery, low number of studies and patients, and limitations in methodology and

risk of multiple forms of bias, including, but not limited to, selection and observer bias. An important limitation of the included surgical articles is a lack of transparent patient selection methods with the obvious risks of selection bias and lack of detailed patient characteristics before/after surgery. There was often absence of clearly defined and widely used outcome measures and accurate description of pharmacological treatment during the full study period. Furthermore, the lack of clear definitions for the sham groups and their (however logical due to ethical considerations) small group size with uneven allocation of patients to treatment and control groups lead to a considerable expectancy effect in the sham groups. The authors cautiously concluded “that a subset of selected migraine patients with distinctly identifiable extracranial MH trigger sites may benefit from surgical decompression of the neurovasculature. However, it is important to state that only a minority of migraine patients with specific trigger sites may benefit from this treatment and current selection procedures for treatment need optimization and further investigation.” Standardization of surgical approaches is of key importance for a further assessment of the real effect of this treatment. Well-performed and documented RCTs with larger sample size, longer follow-up, reported functional outcomes and QOL, and standardization of surgical approaches are needed to determine the safety and efficacy of this surgical treatment of chronic headaches.

Other systematic reviews of studies evaluating surgery for migraine surgery (Huayllani, 2022; Mangialardi, 2020; Nagori, 2019) did not conduct any pooled analyses comparing outcomes in individuals who had surgery compared with a comparison intervention.

## Randomized Controlled Trial

Bajaj et.al. (2021) in this RCT compared surgical peripheral neurectomies compared to conservatively treated patients in 26 individuals with migraines who benefitted from a local bupivacaine block, 13 individuals underwent neurectomy of the affected area. The primary outcome assessed was pain outcomes of migraine surgery using visual analogue scale (VAS) and migraine headache index (MHI). The secondary outcomes assessed were the functional outcomes of migraine surgery using the migraine disability assessment test (MIDAS) and the pain self-efficacy questionnaire (PSEQ) and complications of migraine surgery. For the three frontal region migraines, both supraorbital and supratrochlear sites were the triggers, and they underwent supraorbital and supratrochlear neurectomies. Four patients underwent ZTN neurectomy. Three patients underwent ATN neurectomy. Two patients underwent lesser occipital, and one bilateral greater occipital neurectomy. Comparison was made between baseline and 6 months follow-up. There was a significant improvement in pain scores judged with VAS, MHI, and PSEQ scores. At baseline, the VAS ( $P = 0.07$ ), MHI ( $P = 0.66$ ), MIDAS ( $P = 0.5$ ), and PSEQ scores ( $P = 0.98$ ) were similar in both the groups. At 6 months, these were significantly different between the groups ( $P = <0.001$  for all). In the operative group, the VAS decreased from  $8.3 \pm 0.85$  to  $2.0 \pm 0.81$ , MHI decreased from  $335.3 \pm 52.59$  to  $14.84 \pm 7.85$  ( $P = <0.001$ ), and the PSEQ scores increased from  $5.08 \pm 0.99$  to  $56.30 \pm 2.35$  ( $P = <0.001$ ). Migraine freedom: In the operative group, 11/13 (84.61%) patients reported a positive response ( $>50\%$  improvement) and 4/13 (30.76%) reported complete freedom at 6 months. No patient of the conservative arm had migraine freedom. Migraine disability test: At baseline, the MIDAS score was also similar in both groups ( $P = 0.5$ ) but was significantly different in the postoperative period ( $P = <0.001$ ). In the operative group, the MIDAS score significantly decreased from  $21.00 \pm 6.05$  to  $3.61 \pm 2.32$  ( $P = <0.001$ ). In a comparative analysis of preoperative and postoperative indices at baseline, 1, 3, and 6 months it shows an improvement in all the indices in the operative group, immediately after the surgery that remains sustained until the last follow-up at six months. Drug freedom: All patients of the surgery group got free from prophylactic migraine treatment; however, 11 out of 13 operated patients still need occasional use of analgesics (paracetamol/diclofenac). The medical group had no drug freedom. Complications: One patient in the surgery group complained of transient numbness in the temporal region. There was no other complication. Limitations of this RCT included small sample size which made

it difficult to rule out the placebo effect of surgery, lack of consensus among neurologists and neurosurgeons for its efficacy is another reason and the inclusion of only those patients into the surgical arm who were consenting for it and comparing them with those who did not give consent may create selection bias. There is a need to establish evidence-based migraine surgery protocols for drug-refractory and chronic migraines.

## **Decompression**

In a retrospective, descriptive study, Poggi et al (2008) evaluated the effectiveness of surgical decompression of multiple migraine trigger sites in a clinical practice setting and compared the results to those previously published. A total of 18 patients who had undergone various combinations of surgical decompression of the supraorbital, supratrochlear, and greater occipital nerves and zygomaticotemporal neurectomy were included in this analysis. All patients had been diagnosed with migraine headaches according to neurological evaluation and had undergone identification of trigger sites by botulinum toxin type A injections. Following surgical decompression, the number of migraines per month and the pain intensity of migraine headaches decreased significantly. Three patients (17 %) had complete relief of their migraines, and 9 of 18 (50 %) had at least a 75 % reduction in the frequency, duration, or intensity of migraines; and 39 % of patients have discontinued all migraine medications. Mean follow-up was 16 months (range of 6 to 41 months) after surgery. All subjects stated they would repeat the surgical procedure. The authors concluded that the findings of this study supported the theory that peripheral nerve compression triggers a migraine cascade. They verified a reduction in duration, intensity, and frequency of migraine headaches by surgical decompression of the supraorbital, supratrochlear, zygomaticotemporal, and greater occipital nerves. They stated that a significant amount of patient screening is needed for proper patient selection and trigger site identification for surgical success. These findings need to be validated by well-designed studies.

## **Surgical Treatments for Occipital Neuralgia**

Various surgical treatments have been proposed for treatment of occipital neuralgia, however, the published literature addressing these treatments consists of small, nonrandomized studies, case reports and case series, as well as retrospective studies and reviews.

## **Neurolysis**

Choi and Jeon (2016) stated that occipital neuralgia is defined by the International Headache Society as paroxysmal shooting or stabbing pain in the dermatomes of the greater or lesser occipital nerve. Various treatment methods exist, from medical treatment to open surgical procedures. Local injection with corticosteroid can improve symptoms, though generally only temporarily. More invasive procedures can be considered for cases that do not respond adequately to medical therapies or repeated injections. Radiofrequency lesioning of the greater occipital nerve can relieve symptoms, but there is a tendency for the pain to recur during follow-up. There also remains a substantial group of intractable patients that do not benefit from local injections and conventional procedures. Moreover, treatment of occipital neuralgia is sometimes challenging. More invasive procedures, such as C2 gangliotomy, C2 ganglionectomy, C2 to C3 rhizotomy, C2 to C3 root decompression, neurectomy, and neurolysis with or without sectioning of the inferior oblique muscle, are now rarely performed for medically refractory patients. Recently, a few reports have described positive results following peripheral nerve stimulation of the greater or lesser occipital nerve. Although this procedure is less invasive, the significance of the results is hampered by the small sample size and the lack of long-term data. Clinicians should always remember that destructive procedures carry grave risks: once an anatomic structure is destroyed, it cannot be easily recovered, if at all, and with any destructive procedure there is always the risk of the

development of painful neuroma or causalgia, conditions that may be even harder to control than the original complaint.

In a retrospective chart review, Ducic et. al. (2009) reported on 206 consecutive subjects undergoing neurolysis of the greater or, less commonly, excision of the greater and/or lesser occipital nerves. Preoperative and postoperative visual analogue pain scores and migraine headache indices were measured. Success was defined as a reduction in pain of 50% or greater. Minimum duration of follow-up was 12 months. Of the 206 subjects, 190 underwent greater occipital nerve neurolysis (171 bilateral), 12 subjects underwent greater and lesser occipital nerve excision and 4 underwent lesser occipital nerve excision alone. The authors found that 80.5% of the subjects experienced at least 50% pain relief and 43.4% of the subjects experienced complete relief of headache. Mean preoperative pain score was  $7.9 \pm 1.4$ . Mean postoperative pain was  $1.9 \pm 1.8$ . This study is limited by lack of a control group.

A much smaller case series was published by Gille et. al. 2004 examined surgical treatment of greater occipital neuralgia by neurolysis of the greater occipital nerve and sectioning of the inferior oblique muscle in 10 individuals. Of this group, 3 individuals had anatomic anomalies. Mean follow-up was 37 months. The results of the treatment were assessed according to three criteria: (1) degree of pain on a VAS; (2) consumption of analgesics; and (3) the degree of satisfaction at follow-up. The mean VAS score was 80/100 before surgery and 20/100 at last follow-up. Consumption of analgesics decreased in all individuals. The small size, short follow-up and lack of a control group limits the validity of the results of this study.

## **Decompression**

In 2023, Pietramaggiori et al conducted a retrospective chart review of 87 individuals (32 had unilateral occipital neuralgia and 55 were affected bilaterally) who underwent surgical decompression of the occipital nerves for the treatment of headache at a single center. The minimum follow-up time was 12 months (average, 18.5 months). Pain was assessed using visual analogue scale (VAS) and at follow-up all patients had to bring their migraine journal detailing the day, intensity of the crisis and background pain, duration of pain, and type and quantity of drugs used. Preoperative and postoperative levels were compared. Also, the Migraine Headache Index was measured [days/months with pain x intensity (0 to 10) x duration (fraction of 24 hours) and was compared to baseline preoperative index value. Chronic pain days decreased from an average of 25 days per month to 4.3 days per month ( $p < 0.01$ ). Individuals reported that pain intensity decreased from an average of 3.7 out of 10 to 0.7 out of ten ( $p < 0.01$ ). In addition, use of nonsteroidal anti-inflammatory drugs decreased from 25 pills per month to 8 pills per month ( $p < 0.01$ ). The short follow-up and lack of control group limits the validity of the results in this study. Controlled studies are needed to determine whether decompression surgery improves outcomes in individuals with neuralgia related chronic headaches.

Miller et. al. 2016 reviewed microvascular decompression (MVD) surgical outcomes in an analytic cross-sectional study of 95 treatment-naïve patients with trigeminal neuralgias type 1 (TN1) and type 2 (TN2); 28 (29%) study participants were diagnosed with TN2. Pain relief was the primary clinical outcome of interest, as measured through patient self-report. After 36 or more months following the surgical procedure, seven (25%) TN2 patients were pain-free without medication (excellent outcome), 11 (39%) patients had mild or intermittent pain controlled with low-dose medication (good outcome), and 10 (36%) patients experienced severe persistent pain or need for additional surgical treatment (poor outcome). The authors concluded that the proportion of patients with TN2 pain who experienced long-term pain relief following MVD was low.

In 2011, Ducic et.al. reported on 25 individuals with documented bilateral occipital neuralgia-related chronic headaches who underwent peripheral nerve surgery with decompression of the greater occipital

nerve bilaterally, including the area of its intersection with the occipital artery. All individuals were evaluated intraoperatively for evidence of arterially mediated greater occipital nerve compression and the configuration of the nerve-vessel intersection. Pathologic evaluation of the occipital artery from 15 individuals showed vasculitis. The purpose of the study was to show that mechanical (and not primary inflammatory) irritation of the nerve by the occipital artery is an important theoretical cause for otherwise idiopathic cases. It was not designed to evaluate the efficacy of decompression surgery. Controlled studies are needed to determine whether decompression surgery improves outcomes in individuals with neuralgia-related chronic headaches.

Degn et. al. 2010 reported on pain relief following surgical intervention with percutaneous glycerol injection (GI), microvascular decompression (MVD), or rhizotomy (RIZ) in a retrospective chart review study of 70 patients with trigeminal neuralgias type 1 (TN1) and type 2 (TN2); 22 (31%) sample participants were diagnosed with TN2. In this file review study, clinically significant pain relief ranged from complete pain relief to low-grade chronic dull pain, and was measured by a visual numerical rating scale or vector-based diagram. Findings revealed that one year after the procedure, 73%, 33%, and 30% of patients with TN2 experienced a clinically significant positive effect following MVD, RIZ, and GI, respectively. After three years, the percentage of TN2 patients with a clinically significant positive effect decreased to 28%, 0% and 14% following MVD, RIZ, and GI, respectively; the number of TN2 patients receiving each procedure or multiple procedures was not specified. Furthermore, the number of TN1 and TN2 patients who experienced treatment-related complications was generally low, with the exception of 89% of overall patients with RIZ-related postoperative facial hypoesthesia. The authors concluded that while MVD and RIZ may be considered reasonably safe and effective among TN1 patients, the surgical outcomes among TN2 patients are still very poor.

## **Ganglionectomy**

Choi and Jeon (2016) stated that more invasive procedures, such as C2 gangliotomy, C2 ganglionectomy, C2 to C3 rhizotomy, C2 to C3 root decompression, neurectomy, and neurolysis with or without sectioning of the inferior oblique muscle, are now rarely performed for medically refractory patients.

Pisapia et. al. (2012) examined the effectiveness of C2 nerve root decompression and C2 dorsal root ganglionectomy for intractable ON and C2 ganglionectomy after pain recurrence following initial decompression. A retrospective review was performed of the medical records of patients undergoing surgery for ON. Pain relief at the time of the most recent follow-up was rated as excellent (headache relieved), good (headache improved), or poor (headache unchanged or worse). Telephone contact supplemented chart review, and patients rated their pre-operative and post-operative pain on a 10-point numeric scale. Patient satisfaction and disability were also examined. Of 43 patients, 29 (67 %) were available for follow-up after C2 nerve root decompression (n = 11), C2 dorsal root ganglionectomy (n = 10), or decompression followed by ganglionectomy (n = 8). Overall, 19 of 29 patients (66 %) experienced a good or excellent outcome at most recent follow-up. Among the 19 patients who completed the telephone questionnaire (mean follow-up of 5.6 years), patients undergoing decompression, ganglionectomy, or decompression followed by ganglionectomy experienced similar outcomes, with mean pain reduction ratings of 5 +/- 4.0, 4.5 +/- 4.1, and 5.7 +/- 3.5. Of 19 telephone responders, 13 (68 %) rated overall operative results as very good or satisfactory. The authors concluded that in the third largest series of surgical intervention for ON, most patients experienced favorable post-operative pain relief. For patients with pain recurrence after C2 decompression, salvage C2 ganglionectomy is a viable surgical option and should be offered with the potential for complete pain relief and improved quality of life. Only 10 patients with C2 dorsal root ganglionectomy were available for follow-up. The moderate rate of follow-up (67 %) may have skewed these results.

Acar et al (2008) noted that surgical removal of the second (C2) or third (C3) cervical sensory dorsal root ganglion is an option to treat occipital neuralgia (ON). These investigators evaluated the short-term and the long-term effectiveness of these procedures for management of cervical and occipital neuropathic pain. A total of 20 patients (mean age of 48.7 years) were identified who had undergone C2 and/or C3 ganglionectomies for intractable occipital pain and a retrospective chart review undertaken. Patients were interviewed regarding pain relief, pain relief duration, functional status, medication usage and procedure satisfaction, pre-operatively, immediately post-operative, and at follow-up (mean of 42.5 months). C2, C3 and consecutive ganglionectomies at both levels were performed on 4, 5, and 11 patients, respectively. All patients reported pre-operative pain relief following cervical nerve blocks. Average VAS scores were 9.4 pre-operatively and 2.6 immediately after procedure. Ninety-five percent of patients reported short-term pain relief (less than 3 months). In 13 patients (65 %), pain returned after an average of 12 months (C2 ganglionectomy) and 8.4 months (C3 ganglionectomy). Long-term results were excellent, moderate, and poor in 20, 40 and 40 % of patients, respectively. Cervical ganglionectomy offers relief to a majority of patients, immediately after procedure, but the effect is short-lived. Nerve blocks are helpful in predicting short-term success, but a positive block result does not necessarily predict long-term benefit and therefore cannot justify surgery by itself. However, since 60 % of patients report excellent-moderate results, cervical ganglionectomy continues to have a role in the treatment of intractable ON. The findings of this small study need to be validated by well-designed studies.

### **Section Summary: Surgical Treatments for Chronic Headaches, Occipital Neuralgia and Persistent Idiopathic Facial Pain (PIFP)**

For individuals with occipital neuralgia and/or chronic headaches who receive surgical treatment (resection or repositioning of musculature or soft tissue; neuroplasty, neurectomy and ganglionectomy; decompression, transection or avulsion of any facial or occipital nerves) the available evidence includes RCTs, nonrandomized controlled trials, case series, retrospective studies and systematic reviews. Relevant outcomes are symptoms, functional outcomes, and QOL. Although a 2019 meta-analysis of 3 RCTs controlled trials found significantly greater odds of migraine elimination at 1 year with surgical treatment, these results are inconclusive due to important design and conduct limitations, including imprecision and inadequate information about potentially confounding patient comorbidities and concomitant medication use. No RCTs were identified that evaluated surgical treatments for occipital neuralgia.

Based on review of the current peer reviewed medical literature for surgical treatments for PIFP no studies were identified microvascular decompression was mentioned in the treatment of PIFP but no studies included RCTs were found. RCTs are needed to determine the safety and efficacy of surgical treatments for the treatment of PIFP.

## **SUPPLEMENTAL INFORMATION**

The purpose of the following information is to provide reference material. Inclusion does not imply endorsement or alignment with the evidence review conclusions.

### **Practice Guidelines and Position Statements**

Guidelines or position statements will be considered for inclusion in 'Supplemental Information' if they were issued by, or jointly by, a US professional society, an international society with US representation, or National Institute for Health and Care Excellence (NICE). Priority will be given to guidelines that are

informed by a systematic review, include strength of evidence ratings, and include a description of management of conflict of interest.

### ***American Association of Neurological Surgeons (AANS)***

The American Association of Neurological Surgeons (AANS) patient website on occipital neuralgia states: “Treatment of occipital neuralgia aims to alleviate the pain, however, it is not a cure. Interventions can be surgical or non-surgical. Surgical treatment can include C2,3 Ganglionectomy – This treatment involves the disruption of the second and third sensory dorsal root ganglion.” This information does not mention ablative treatments. Accessed November 2025

### ***American Society of Anesthesiologists Task Force and American Society of Regional Anesthesia and Pain Medicine***

In 2010, the American Society of Anesthesiologists Task Force and American Society of Regional Anesthesia and Pain Medicine issued a practice guideline for chronic pain management which included the following:

Ablative techniques include chemical denervation, cryoneurolysis or cryoablation, thermal intradiscal procedures (i.e., intervertebral disc annuloplasty (IDET), transdiscal bioaculopathy), and radiofrequency ablation.

Recommendations for Ablative Techniques:

- Chemical denervation: (e.g., alcohol, phenol, or high concentration local anesthetic) should not be used in the routine care of patients with chronic non-cancer pain.
- Cryoablation: may be used in the care of selected patients (e.g., post-thoracotomy pain syndrome, low back pain (medial branch), and peripheral nerve pain)

### ***American Society of Pain and Neuroscience***

The American Society of Pain and Neuroscience (2021) issued consensus guidelines using U.S. Preventive Services Task Force (USPSTF) grading criteria on the use of RFA to treat various pain conditions. The guidelines stated that genicular RFA may be used for the treatment of osteoarthritis-related and post-surgical knee joint pain (Grade B), and may be selectively offered for the treatment of occipital neuralgia pain when greater or lesser nerves have been identified as the etiology of pain via diagnostic blocks (Grade C).

### **Ongoing and Unpublished Clinical Trials**

Some currently ongoing and unpublished trials that might influence this review can be located at [clinicaltrials.gov](https://clinicaltrials.gov).

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## CODES

To report provider services, use appropriate CPT codes, HCPCS codes, Revenue codes, and/or ICD diagnosis codes.

| Codes      | Number | Description |
|------------|--------|-------------|
| <b>CPT</b> |        |             |

|                        |         |                                                                                                                                                                                                                                                            |
|------------------------|---------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                        | 14040   | Adjacent tissue transfer or rearrangement, forehead, cheeks, chin, mouth, neck, axillae, genitalia, hands and/or feet; defect <b>10</b> sq cm or less                                                                                                      |
|                        | 14041   | Adjacent tissue transfer or rearrangement, forehead, cheeks, chin, mouth, neck, axillae, genitalia, hands and/or feet; defect <b>10.1</b> sq cm to <b>30.0</b> sq cm                                                                                       |
|                        | 14060   | Adjacent tissue transfer or rearrangement, eyelids, nose, ears and/or lips; defect 10 sq cm or less                                                                                                                                                        |
|                        | 14061   | Adjacent tissue transfer or rearrangement, eyelids, nose, ears and/or lips; defect 10.1 sq cm to 30.0 sq cm                                                                                                                                                |
|                        | 64600   | Destruction by neurolytic agent, trigeminal nerve; supraorbital, infraorbital, mental, or inferior alveolar branch (when specified cryoneurolysis or chemical denervation for occipital neuralgia, headaches and persistent idiopathic facial pain (PIFP)) |
|                        | 64633   | Destruction by neurolytic agent, paravertebral facet joint nerve(s), with imaging guidance (fluoroscopy or CT); cervical or thoracic, single facet joint (when specified for occipital neuralgia, headaches and persistent idiopathic facial pain (PIFP))  |
|                        | 64640   | Destruction by neurolytic agent; other peripheral nerve or branch (when specified cryoneurolysis or chemical denervation for occipital neuralgia, headaches and persistent idiopathic facial pain (PIFP))                                                  |
|                        | 64716   | Neuroplasty and/or transposition; cranial nerve (specify)                                                                                                                                                                                                  |
|                        | 64722   | Decompression; unspecified nerve(s) (specify)                                                                                                                                                                                                              |
|                        | 64732   | Transection or avulsion of; supraorbital nerve                                                                                                                                                                                                             |
|                        | 64734   | Transection or avulsion of; infraorbital nerve                                                                                                                                                                                                             |
|                        | 64744   | Transection or avulsion of; greater occipital nerve                                                                                                                                                                                                        |
|                        | 64771   | Transection or avulsion of other cranial nerve, extradural                                                                                                                                                                                                 |
|                        | 64772   | Transection or avulsion of other spinal nerve, extradural                                                                                                                                                                                                  |
|                        | 64999   | Unlisted procedure, nervous system (when specified as pulsed radiofrequency treatment)                                                                                                                                                                     |
| <b>HCPCS</b>           |         |                                                                                                                                                                                                                                                            |
|                        | None    |                                                                                                                                                                                                                                                            |
| <b>Type of Service</b> | Surgery |                                                                                                                                                                                                                                                            |

|                         |                      |  |
|-------------------------|----------------------|--|
| <b>Place of Service</b> | Outpatient/Inpatient |  |
|-------------------------|----------------------|--|

## POLICY HISTORY

| <b>Date</b>   | <b>Action</b>  | <b>Action</b>              |
|---------------|----------------|----------------------------|
| November 2025 | Annual Review  | Policy Renewed             |
| November 2024 | Annual Review  | Policy Renewed             |
| November 2023 | Annual Review  | Policy Revised             |
| July 2023     | Annual Review  | Policy Revised             |
| July 2022     | Annual Review  | Policy Revised             |
| March 2022    | Interim Review | Policy Revised             |
| July 2021     | Annual Review  | Policy Renewed             |
| July 2020     | Annual Review  | Policy Renewed             |
| July 2019     | Annual Review  | Policy Revised             |
| August 2018   | Annual Review  | Policy Revised             |
| August 2017   | Annual Review  | Policy Revised             |
| October 2016  | Annual Review  | Policy Revised             |
| October 2015  | Annual Review  | Policy Revised             |
| November 2014 |                | New Medical Policy Created |

New information or technology that would be relevant for Wellmark to consider when this policy is next reviewed may be submitted to:

Wellmark Blue Cross and Blue Shield  
 Medical Policy Analyst  
 PO Box 9232  
 Des Moines, IA 50306-9232

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