Expert panel’s guideline on cervicogenic headache: The Chinese Association for the Study of Pain recommendation

Hong Xiao, Bao-Gan Peng, Ke Ma, Dong Huang, Xian-Guo Liu, Yan Lv, Qing Liu, Li-Juan Lu, Jin-Feng Liu, Yi-Mei Li, Tao Song, Wei Tao, Wen Shen, Xiao-Qiu Yang, Lin Wang, Xiao-Mei Zhang, Zhi-Gang Zhuang, Hui Liu, Yan-Qing Liu

ORCID number: Hong Xiao 0000-0001-9828-5814; Bao-Gan Peng 0000-0003-1667-4125; Ke Ma 0000-0002-5603-9321; Dong Huang 0000-0002-4880-2438; Xian-Guo Liu 0000-0002-4352-8687; Yan Lv 0000-0002-2868-2352; Qing Liu 0000-0003-3733-9078; Li-Juan Lu 0000-0002-6571-8529; Jin-Feng Liu 0000-0002-3459-3962; Yi-Mei Li 0000-0002-1954-5903; Tao Song 0000-0001-7929-2074; Wei Tao 0000-0002-9077-299X; Wen Shen 0000-0002-2818-0256; Xiao-Qiu Yang 0000-0003-3108-1029; Lin Wang 0000-0001-5438-6932; Xiao-Mei Zhang 0000-0002-4056-5183; Zhi-Gang Zhuang 0000-0002-6038-7628; Hui Liu 0000-0002-9599-6853; Yan-Qing Liu 0000-0002-7347-0789.

Author contributions: Xiao H, Liu H and Liu YQ conceived the idea, designed and performed research, analyzed data, wrote the paper and reviewed the manuscript; Peng BC, Ma K, Huang D, Liu XG, Lv Y, Liu Q, Lu LJ, Liu JF, Li YM, Song T, Tao W, Shen W, Yang XQ, Zhang XM and Zhuang ZG performed research, reviewed the literature and drafted the Chinese version of the manuscript; All authors read and approved the final manuscript.

Supported by Sichuan Science and Technology Program, No. 2018SZ0386.

Hong Xiao, Hui Liu, Department of Algology, West China Hospital, Sichuan University, Chengdu 610041, Sichuan Province, China

Bao-Gan Peng, Department of Orthopedics, The Third Medical Center, General Hospital of the Chinese People’s Liberation Army, Beijing 100039, China

Ke Ma, Department of Algology, Xinhua Hospital Affiliated to Shanghai Jiao Tong University School of Medicine, Shanghai 200092, China

Dong Huang, Department of Algology, The Third Xiangya Hospital of Central South University, Changsha 410013, Hunan Province, China

Xian-Guo Liu, Department of Physiology and Pain Research Center, Sun Yat-Sen University, Guangzhou 510080, Guangdong Province, China

Yan Lv, Department of Algology, Xijing Hospital, Air Force Medical University, Xi'an 710032, Shaanxi Province, China

Qing Liu, Department of Algology, The Affiliated T.C.M Hospital of Southwest Medical University, Luzhou 646000, Sichuan Province, China

Li-Juan Lu, Department of Algology, Nanjing Drum Tower Hospital, The Affiliated Hospital of Nanjing University Medical School, Nanjing 210008, Jiangsu Province, China

Jin-Feng Liu, Department of Algology, The Second Affiliated Hospital of Harbin Medical University, Harbin 150001, Heilongjiang Province, China

Yi-Mei Li, Department of Algology, The First Affiliated Hospital of Xinjiang Medical University, Urumqi 830011, Xinjiang, China

Tao Song, Department of Algology, The First Affiliated Hospital of China Medical University, Shenyang 110001, Liaoning Province, China

Wei Tao, Department of Neurosurgery, Shenzhen University General Hospital, Shenzhen 518055, Guangdong Province, China

Wen Shen, Department of Algology, The Affiliated Hospital of Xuzhou Medical University, Xuzhou 221002, Jiangsu Province, China

Xiao-Qiu Yang, Department of Algology, The First Affiliated Hospital of Chongqing Medical
Conflict-of-interest statement: The authors disclose no conflict of interest.

Open-Access: This article is an open-access article that was selected by an in-house editor and fully peer-reviewed by external reviewers. It is distributed in accordance with the Creative Commons Attribution NonCommercial (CC BY-NC 4.0) license, which permits others to distribute, remix, adapt, build upon this work non-commercially, and license their derivative works on different terms, provided the original work is properly cited and the use is non-commercial. See: http://creativecommons.org/Licenses/by-nc/4.0/

Manuscript source: Unsolicited manuscript

Specialty type: Anesthesiology

Country/Territory of origin: China

Peer-review report’s scientific quality classification
Grade A (Excellent): 0
Grade B (Very good): B, B
Grade C (Good): 0
Grade D (Fair): D
Grade E (Poor): E

Received: November 28, 2020
Peer-review started: November 28, 2020
First decision: February 12, 2021
Revised: February 25, 2021
Accepted: March 18, 2021
Article in press: March 18, 2021
Published online: March 26, 2021

P-Reviewer: Bai G, Qiao BG, Sillevis R
S-Editor: Wang JL
L-Editor: Filipodia
P-Editor: Xing YX

University, Chongqing 400016, China

Lin Wang, Department of Algology, The Affiliated Hospital of Guizhou Medical University, Guiyang 550004, Guizhou Province, China

Xiao-Mei Zhang, Department of Algology, The First Affiliated Hospital of Kunming Medical University, Kunming 650032, Yunnan Province, China

Zhi-Gang Zhuang, Department of Algology, The Second Affiliated Hospital of Zhengzhou University, Zhengzhou 450014, Henan Province, China

Yan-Qing Liu, Department of Algology, Beijing Tiantan Hospital, Capital Medical University, Beijing 100070, China

Corresponding author: Hui Liu, MD, PhD, Professor, Department of Algology, West China Hospital, Sichuan University, No. 37 Guo Xue Xiang, Wuhou District, Chengdu 610041, Sichuan Province, China. 18980601547@qq.com

Abstract

Cervicogenic headache (CEH) has been recognized as a unique category of headache that can be difficult to diagnose and treat. In China, CEH patients are managed by many different specialties, and the treatment plans remain controversial. Therefore, there is a great need for comprehensive evidence-based Chinese experts’ recommendations for the management of CEH. The Chinese Association for the Study of Pain asked an expert panel to develop recommendations for a series of questions that are essential for daily clinical management of patients with CEH. A group of multidisciplinary Chinese Association for the Study of Pain experts identified the clinically relevant topics in CEH. A systematic review of the literature was performed, and evidence supporting the benefits and harms for the management of CEH was summarized. Twenty-four recommendations were finally developed through expert consensus voting for evidence quality and recommendation strength. We hope this guideline provides direction for clinicians and patients making treatment decisions for the management of CEH.

Key Words: Cervicogenic headache; Expert recommendation; Expert panel’s guideline; Chinese Association for the Study of Pain; Chronic pain

©The Author(s) 2021. Published by Baishideng Publishing Group Inc. All rights reserved.

Core Tip: Cervicogenic headache (CEH) was recognized as a unique category of headache. The treatments of CEH remain controversial among different disciplines. The Chinese Association for the Study of Pain asked a multidisciplinary expert group identified the clinically relevant topics in CEH. Twenty-four recommendations were finally developed through expert consensus voting for evidence quality and recommendation strength. This guideline provides direction for clinicians and patients making treatment decisions for the management of CEH.

Citation: Xiao H, Peng BG, Ma K, Huang D, Liu XG, Lv Y, Liu Q, Lu LJ, Liu JF, Li YM, Song T, Tao W, Shen W, Yang XQ, Wang L, Zhang XM, Zhuang ZG, Liu H, Liu YQ. Expert panel’s guideline on cervicogenic headache: The Chinese Association for the Study of Pain recommendation. World J Clin Cases 2021; 9(9): 2027-2036
URL: https://www.wjgnet.com/2307-8960/full/v9/i9/2027.htm
DOI: https://dx.doi.org/10.12998/wjcc.v9.i9.2027
INTRODUCTION

Cervicogenic headache (CEH), characterized by pain starting in the neck or occipital area that can move to other areas of the head, is a relatively common clinical challenge\(^3\). However, controversies related to the management of CEH continue to exist between different disciplines\(^3\). In China and other developed countries, patients with CEH are typically managed by doctors of several different specialties, including general practitioners, neurologists and pain and rehabilitation physicians. Doctors from different disciplines are only rarely concentrated in highly specialized centers\(^4\). In addition, patients with CEH are likely to be treated with several different pharmacological and nonpharmacological interventions, often in combination. Therefore, the Chinese Association for the Study of Pain (CASP) has organized an expert group to develop guidelines for the management of CEH\(^6\).

CEH DEFINITION AND DIAGNOSIS

The two conflicting viewpoints when defining CEH are as follows: (1) Relying on the clinical features, CEH is said to be characterized by unilateral head pain of fluctuating intensity that is increased by movement of the head, and the pain radiates from the occipital to the frontal regions; and (2) Relying on establishing the diagnosis involves demonstrating a cervical source of head pain and confirming the diagnosis by using anesthetic blocks that pinpoint the sources of pain in the upper cervical joints\(^5-7\). In accordance with the current International Headache Society criteria, the CASP expert group defines CEH as any headache caused by a disorder of the cervical spine or its components, such as bone, disc and/or soft tissue elements that is usually but not invariably accompanied by neck pain.

The diagnostic criteria recommended by the International Classification of Headache Disorders 3rd edition\(^8,9\) are as follows: (1) Any headache fulfilling criterion (3); (2) Clinical, laboratory and/or imaging evidence of a disorder or lesion within the cervical spine or soft tissues of the neck that can cause headache; (3) Evidence of causation demonstrated by at least two of the following findings: (a) Headache developed in temporal relation to the onset of cervical disorder or appearance of the lesion; (b) Headache that significantly improved or resolved along with an improvement in or the resolution of cervical disorder or lesion; (c) The cervical range of motion is reduced, and the headache is significantly aggravated by provocative maneuvers; and (d) Headache disappears after diagnostic block to the suspected cervical spine structure or its supply nerve; and (4) Headache that is not better accounted for by another International Classification of Headache Disorders-3 diagnosis.

ANATOMY AND PATHOPHYSIOLOGY

The anatomic locus for CEH is the trigeminocervical nucleus in the upper cervical spinal cord, the convergence between the upper cervical nociceptive afferents and the trigeminal nociceptive afferents in the trigeminocervical complex\(^10\). This approach allows for pain arising from the upper cervical nerves to be referred to the regions of the head innervated by trigeminal afferents, such as the orbital, frontal and parietal regions\(^11,12\).

CEH is believed to be caused by referred pain from the cervical nerves and upper cervical joints\(^13\). Pathological changes in the cervical zygapophyseal joints can generate pain in the areas innervated by the trigeminal nerve (e.g., the frontal and periorbital regions) or the upper three cervical spinal nerves (e.g., the occipital and auricular regions). Involvement of the C2-3 zygapophyseal joint and atlantoaxial joint is the most frequent source of CEH. Impairment of the C2-3 zygapophyseal joint reportedly caused CEH in 70% of all patients, of whom 27% could be diagnosed with third occipital neuropathic headache\(^14\).

CLINICAL FEATURES AND EXAMINATION

CEH is a chronic unilateral head pain of fluctuating intensity that is increased by movement of the head and radiates from occipital to frontal regions\(^15\). The pain is
typically nonthrobbing, nonlancinating, of moderate to severe intensity and of variable duration. Patients with CEH may have restricted neck range of motion and may have ipsilateral neck, shoulder or arm pain. Most patients also show concomitant symptoms of nausea, tinnitus, dizziness, phonophobia, photophobia, blurred vision or disordered sleep\(^\text{[16]}\).

A detailed history and examination should be the starting point for the clinicians. Patients with CEH are more likely to have myofascial trigger points on the transverse processes of the second cervical vertebra that can spread to the head and splenius capitis, trapezius, sternocleidomastoid and suboccipital muscles\(^\text{[6]}\). Additional maneuvers on physical examination should include movement tests of the cervical spine, such as passive flexion, extension and rotation and segmental palpation of the cervical facet joints. Imaging (through X-rays, computed tomography and magnetic resonance imaging) is considered useful to evaluate cervical disc degeneration, herniation and the degenerative changes in the atlantoaxial, zygapophyseal and uncovertebral joints. Although imaging can be employed to exclude certain diseases from probable diagnosis, it should not be considered a diagnostic modality for CEH\(^\text{[17]}\).

**MANAGEMENT**

Despite the availability of several different treatment modalities, no proven effective treatment for CEH has yet been established. By using the Grading of Recommendations, Assessment, Development and Evaluation (GRADE) methods\(^\text{[18]}\), a group of 19 experts worked on questions that are considered essential for daily clinical management of patients with CEH and have developed recommendations accordingly.

**Methods**

This method consists of the identification of clinically relevant questions, followed by a systematic literature search and summary of the evidence with final recommendations being moderated by feedback from experts.

**Multidisciplinary expert panel:** The CASP organized an expert panel consisting of 19 professionals working in the field of pain medicine, neurology, neurosurgery and rehabilitation from China. Fourteen of them were pain physicians, two were neurologists, one was a rheumatologist, one was an orthopedist and one was a neuroscientist.

**Organizers and experts’ coordinators:** Yan-Qing Liu, Hui Liu, Hong Xiao, Bao-Gan Peng.

**Organizational committee:** The CASP.

**CASP experts:** Hong Xiao, Bao-Gan Peng, Ke Ma, Dong Huang, Xian-Guo Liu, Yan Lu, Qing Liu, Li-Juan Lu, Jin-Feng Liu, Yi-Mei Li, Song Tao, Tao Wei, Wen Shen, Xiao-Qiu Yang, Lin Wang, Xiao-Mei Zhang, Zhi-Gang Zhuang, Hui Liu, Yan-Qing Liu.

**Scope determination:** A modified Delphi method was employed to establish the guideline related to the target topics in the management of CEH using the population, intervention, comparator and outcomes method\(^\text{[19]}\). The scope of these recommendations includes different treatments for CEH. The users are expected to be physicians (mainly pain physicians) and other healthcare professionals who care for patients with CEH. The core leadership team supervised and coordinated the project and established the following clinical questions: (1) What is the role of pharmacological therapy for CEH? Among nonsteroidal anti-inflammatory drugs (NSAIDs), muscle relaxants, antiepileptic drugs and antidepressants, which of the drugs have shown efficacy in the long-term treatment of CEH? (2) Should nerve block, minimally invasive intervention and surgical procedures be considered if the medical treatment is not effective or tolerated? What are the outcomes of invasive operation under the guidance of imaging technologies such as ultrasound, X-ray and computed tomography? What are the indications, therapeutic effects, and complications of joint injections or nerve blocks such as atlantoaxial joint injection, C2-3 zygapophyseal joint injection, cervical spinal nerve root block, third occipital nerve block and occipital nerve block? What are the indications, therapeutic effects and complications of minimally invasive interventions or surgical techniques such as radiofrequency thermocoagulation and pulse radiofrequency, ozone injection and percutaneous laser disc decompression?, and (3) Can nonpharmacological and nonsurgical therapies, such
as physical therapy, traditional Chinese medicine, health education and psychological treatment, be considered as complementary management modalities for CEH?

**Literature search:** The literature review group members were assigned topics based on expertise, and 3-4 experts were responsible for 2-3 clinical questions. Papers published in peer-reviewed journals were identified using the PubMed/MEDLINE, Embase, Cochrane, China National Knowledge Infrastructure and WanFang Library. Systematic reviews, randomized and nonrandomized controlled trials, observational cohorts and case series limited to English or Chinese language publications were included. GRADE method was used to separately determine the quality of available evidence (rated as high, moderate, low or very low) based on the risk of bias, imprecision and inconsistency (Table 1). One or more recommendations were drafted for each topic.

**Recommendation making:** The expert panel assessed the feedback on the recommendations and evidence provided from the literature review group, and they rated the necessity for each item and selected recommendations in the first-round meeting. Recommendations due to poor-quality or conflicting evidence were eliminated, rephrased or combined. During the second round, according to the GRADE approach, the expert voting panel made recommendations (strong or weak/for or against) on the basis of the balance between desirable and undesirable effects, quality of evidence, values and preferences and costs (Table 2). To achieve consensus, an a priori decision was made to conduct up to three rounds of anonymous voting or until consensus was achieved (defined a priori as consensus agreement at ≥ 70% with a minimal response rate of 70%) for each draft recommendation, whichever came first[18]. Much of the evidence proved to be indirect, given that it did not specifically address the population, intervention, comparator and outcomes question as written and was of low-to-moderate quality.

**Recommendations**

After the synthesis of our experts’ work and the implementation of the GRADE method, 24 recommendations were formalized by the organizational committee (Table 3).

**Pharmacologic management:** Pharmacologic treatment is recommended as the first-line therapy for CEH (Evidence quality: moderate; Recommendation strength: strong).

Pharmacologic treatments for CEH are largely based on case reports and a lack of convincing clinical evidence on effective medications for CEH. Despite that, pharmacotherapy remains among the best available treatments[20]. The medications used include NSAIDs, muscle relaxants, antiepileptic drugs and antidepressants[21]. Before using analgesic therapy for CEH, the patients require comprehensive education around safe limitations for medication use and prevent medication-induced headache.

NSAIDs are recommended for patients with CEH (Evidence quality: low; Recommendation strength: weak).

NSAIDs such as nonselective COX and selective COX-2 inhibitors can be effective treatment modalities for CEH[2]; however, owing to the low quality of evidence, the recommendation for NSAID administration is relatively weak. Clinical considerations aimed at risk mitigation for the safe use of NSAIDs include appropriate patient selection, regular monitoring for the development of potential adverse gastrointestinal, cardiovascular and renal side-effects and potential drug interactions.

Muscle relaxants are recommended for patients with CEH (Evidence quality: moderate; Recommendation strength: strong).

Muscle relaxants such as tizanidine, baclofen, and eperisone hydrochloride have central action mechanisms aimed at providing analgesic effects in the acute phase and for prevention[22,23]. Tizanidine can be combined with NSAIDs due to its gastroprotective effect and good safety profile.

Antiepileptic drugs are conditionally recommended for patients with CEH (Evidence quality: low; Recommendation strength: weak).

Common antiepileptic drugs include gabapentin and pregabalin, which can be used in patients with neuropathic pain[24].

Antidepressants are recommended for CEH patients with severe anxiety and depression (Evidence quality: low; Recommendation strength: strong).

The evidence for these drugs is limited. However, considering its clinical efficacy in the treatment of headache, patients also presenting with severe anxiety and depression are recommended to use amitriptyline, venlafaxine or duloxetine[25]. When used alone or in combination with other drugs, the tolerability and side effects should be
| Quality of evidence | Definition |
|---------------------|------------|
| High quality        | Further research is very unlikely to change confidence in the estimate of effect |
| Moderate quality    | Further research is likely to have an important impact on confidence in the estimate of effect and may change the estimate |
| Low quality         | Further research is very likely to have an important impact on confidence in the estimate of effect and is likely to change the estimate |
| Very low quality    | Any estimate of effect is very uncertain |

| Recommendation strength | Definition |
|-------------------------|------------|
| Strong                  | When the desirable effects of an intervention clearly outweigh the undesirable effects or clearly do not |
| Weak ("conditional" or "discretionary") | When the trade-offs are less certain either because of low-quality evidence or because evidence suggests that desirable and undesirable effects are closely balanced |

Anesthetic blockade: Anesthetic joint injections or nerve blocks are often used both diagnostically and therapeutically (Evidence quality: moderate; Recommendation strength: strong). Anesthetic injections of the lateral atlantoaxial joint, the C2-3 zygapophyseal joint (and the overlying third occipital nerve) and/or the C3-4 zygapophyseal joint can temporarily reduce or relieve pain and may allow greater participation in physical treatments[26]. Patients with suboccipital or occipital pain aggravated by cervical rotation or pain due to inflammatory stimuli are expected to benefit from atlantoaxial joint injection (Evidence quality: low; Recommendation strength: weak). One study showed that injection to the atlantoaxial joint was effective in 81.2% of all cases[27]. C2-3 zygapophyseal joint injection can be considered for patients with upper neck pain spreading to the occipital region or pain that increases when the neck is rotated or when the back is stretched (Evidence quality: low; Recommendation strength: weak). Selective nerve root injection reportedly showed 50% pain relief after 12 mo[28]; therefore, it can be used in patients with cervical spondylotic radiculopathy (Evidence quality: low; Recommendation strength: strong). The third occipital nerve block can be used to diagnose CEH and predict the efficacy of radiofrequency treatment (Evidence quality: low; Recommendation strength: strong). The occipital nerve injection is used to diagnose and treat occipital pain (Evidence quality: low; Recommendation strength: strong). In addition, imaging technologies (ultrasound[29], X-ray and computed tomography) are recommended for guiding invasive therapies (Evidence quality: high; Recommendation strength: strong).

Administration of glucocorticoid injections is recommended for CEH (Evidence quality: low; Recommendation strength: strong). There are no controlled trials evaluating glucocorticoid injections for CEH. However, the results from small retrospective studies suggested that some patients may achieve pain relief through the administration of intra-articular glucocorticoid injections[30].

Minimally invasive interventional management: Radiofrequency intervention is conditionally recommended for patients with intractable CEH (Evidence quality: moderate; Recommendation strength: strong). Percutaneous radiofrequency neurotomy can be considered for CEH arising from the C2-3 or C3-4 zygapophyseal joint if diagnostic anesthetic nerve blockade is temporarily successful in providing complete pain relief. However, the available evidence is limited and conflicting[31]. None of the supplied evidence indicates that radiofrequency ablation or pulsed radiofrequency therapy was effective for CEH. However, three small nonrandomized studies[32-34] on radiofrequency ablation and one study[35] on pulsed radiofrequency therapy suggested that these techniques were effective for CEH. Pulse radiofrequency is a type of neuromodulation therapy, and it has fewer complications than radiofrequency thermocoagulation[36]. Thus, pulse radiofrequency is preferred over ablation as a recommendation for patients with
**Table 3 Chinese Association for the Study of Pain recommendations for the management of cervicogenic headache**

| Item                        | Recommendation                                                                 | Quality | Strength |
|-----------------------------|-------------------------------------------------------------------------------|---------|----------|
| Pharmacological management  | Pharmacologic treatment is recommended as the first-line therapy for CEH        | Moderate| Strong   |
|                             | NSAIDs are recommended for patients with CEH                                  | Low     | Weak     |
|                             | Muscle relaxants are recommended for patients with CEH                        | Moderate| Strong   |
|                             | Antiepileptic drugs are conditionally recommended for patients with CEH       | Low     | Weak     |
|                             | Antidepressants are recommended for CEH patients with severe anxiety and depression | Low   | Strong   |
| Anesthetic blockade         | Anesthetic joint injection or nerve block are often used both diagnostically and therapeutically | Moderate| Strong |
|                             | Atlantoaxial joint injection for patients with suboccipital or occipital pain aggravated by cervical rotation or pain due to inflammatory stimuli | Low | Weak |
|                             | C2-C3 zygapophyseal joint injection can be considered for patients with upper neck pain spreading to the occipital region or pain that increases when the neck is rotated or back is stretched | Low | Weak |
|                             | Selective nerve root injection could be used in patients with cervical spondylotic radiculopathy | Low | Strong |
|                             | Third occipital nerve block can be used to diagnose CEH and predict the efficacy of radiofrequency treatment | Low | Strong |
|                             | The occipital nerve injection is used to diagnose and treat occipital pain.   | Low     | Strong   |
|                             | Imaging technology (ultrasound, X-ray and CT) are recommended for guidance of invasive therapies | High | Strong |
|                             | Glucocorticoid injection is recommended for CEH                              | Low     | Strong   |
| Minimally invasive          | Radiofrequency intervention is conditionally recommended for patients with persistent CEH | Moderate| Strong |
| interventional management   | Pulse radiofrequency is preferred over ablation for patients with persistent CEH | Low     | Strong   |
|                             | Ozone injection is recommended for CEH                                        | Low     | Strong   |
|                             | PLDD is conditionally recommended for CEH                                     | Low     | Weak     |
| Surgical procedures         | Surgery is not recommended for CEH unless there is compelling evidence of a surgically amenable lesion causing the cervicogenic headache that is refractory to all reasonable nonsurgical treatments | Low | Strong |
|                             | Nonpharmacological and nonsurgical therapy is recommended as a complementary management for CEH | Low | Strong |
| Physical therapy            | Physical therapy is the preferred initial treatment recommended for CEH       | Moderate| Weak     |
|                             | Cervical manipulation and mobilization are recommended for CEH                | Moderate| Strong   |
| TCM                         | TCM is conditionally recommended for CEH                                     | Low     | Weak     |
| Psychological therapy       | Patients with refractory severe CHE need psychological assessment and intervention | Low | Strong |
| Health education            | Health education is recommended for CEH                                      | Low     | Strong   |

CEH: Cervicogenic headache; CT: Computed tomography; NSAIDs: Nonsteroidal anti-inflammatory drugs; PLDD: Percutaneous laser disc decompression; TCM: Traditional Chinese medicine.

Persistent CEH (Evidence quality: low; Recommendation strength: strong).

Ozone injection is recommended for CEH (Evidence quality: low; Recommendation strength: weak).

Ozone possesses strong anti-inflammatory and analgesic effects that can benefit patients in whom the use of glucocorticoid is contraindicated\[^{37}\]. However, there is limited evidence showing that the ozone injection has potential benefits for CEH patients.

Percutaneous laser disc decompression is conditionally recommended for CEH (Evidence quality: low; Recommendation strength: weak).

Percutaneous laser disc decompression is effective in patients with cervical disc herniation, protrusion or disc degeneration along with neck and shoulder pain with nerve root symptoms[^{38}].

**Surgical procedures:** Surgery is not recommended for CEH unless there is compelling evidence indicating the presence of a surgically amenable lesion causing CEH that is refractory to all reasonable nonsurgical treatments (Evidence quality: low;
Numerous surgical interventions have been performed for presumed cases of CEH. Available data are limited to small retrospective studies\(^{[39,40]}\), but they suggest that surgery may be beneficial for the following three specific etiologies of CEH: (1) C2 spinal nerve compression by vascular/ligamentous structures; (2) osteoarthritis of the lateral atlantoaxial joint; and (3) upper cervical intervertebral disc pathology.

Nonpharmacological and nonsurgical therapies are recommended as a complementary management for CEH (Evidence quality: low; Recommendation strength: strong).

**Physical therapy:** Physical therapy is the preferred initial treatment recommended for CEH (Evidence quality: moderate; Recommendation strength: weak).

Physical therapy has been shown to provide the most long-term relief of CEH\(^{[41]}\). This may include cervical traction, massage and strengthening. A systematic review and meta-analysis revealed that physical therapy led to a statistically significant benefit for reduced pain, frequency and duration of CEH\(^{[42]}\).

Cervical manipulation and mobilization are recommended for CEH (Evidence quality: moderate; Recommendation strength: strong).

In a large clinical trial\(^{[43]}\), which evaluated 200 patients with CEH, patients assigned to 6 wk of active treatment with either manipulative therapy, low-load endurance exercise therapy or a combination of both therapies showed a significant reduction in headache frequency at 12 mo. The effect size was reported as moderate and clinically relevant\(^{[44]}\).

**Traditional Chinese medicine:** Traditional Chinese medicine is conditionally recommended for CEH (Evidence quality: low; Recommendation strength: weak).

Traditional Chinese medicine treatments include acupuncture, silver needle, internal hot needle and other forms of Chinese medicine. However, the relevant research and the evidence are limited\(^{[45]}\). The overall quality of the evidence for traditional Chinese medicine in CEH management is generally low and occasionally moderate.

**Psychological therapy:** Patients with refractory severe CHE need psychological assessment and intervention (Evidence quality: low; Recommendation strength: strong).

Studies have indicated that the incidence of depression and generalized anxiety disorder is high in headache patients\(^{[46,47]}\). Patients with refractory severe CHE need psychological assessment, including past medical history, psychological status and the risk factors affecting prognosis. Past studies have indicated that the addition of psychological therapy on the basis of regular drug therapy can play a more significant therapeutic effect on headache. Psychotherapy includes listening, headache education, cognitive behavior therapy, biofeedback therapy and relaxation training\(^{[48]}\).

**Health education:** Health education is recommended for CEH (Evidence quality: low; Recommendation strength: strong).

Neurophysiological pain education strategy addressing neurophysiology and neurobiology of pain can have a positive effect on pain\(^{[49]}\). Health education includes maintaining a good posture, keeping the neck and shoulder warm and appropriate neck exercises (such as neck flexion, neck rotation and Alexander’s fitness)\(^{[41]}\).

**CONCLUSION**

The CASP asked an expert panel to develop recommendations for a series of questions that are essential for daily clinical management of patients with CEH. A systematic review of the literature was performed, evidence supporting the benefits and harms for the management of CEH were summarized. Finally, 24 recommendations were developed through expert consensus voting for evidence quality and recommendation strength. We hope this guideline provides direction for clinicians and patients making treatment decisions for the management of CEH.

**REFERENCES**

1. Bogduk N, Govind J. Cervicogenic headache: an assessment of the evidence on clinical diagnosis,
invasive tests, and treatment. *Lancet Neurol* 2009; 8: 959-968 [PMID: 19747657 DOI: 10.1016/S1474-4422(09)70209-1]

2 Al Khalili Y, Ly N, Murphy PB. Cervicogenic Headache. Treasure Island: StatPearls Publishing, 2021

3 Gallagher RM. Cervicogenic headache. *Expert Rev Neurother* 2007; 7: 1279-1283 [PMID: 17939766 DOI: 10.1586/14737175.7.1279]

4 Xiao H, Peng B, Ma K, Huang D, Liu X, Lu Y, Liu Q, Lu L, Liu J, Li Y, Song T, Tao W, Shen W, Yang X, Wang L, Zhang X, Zhuang Z, Liu H, Liu Y. The Chinese Association for the Study of the Pain (CASP): Expert Consensus on the Cervicogenic Headache. *Pain Res Manag* 2019; 2019: 9617280 [PMID: 31065305 DOI: 10.1155/2019/9617280]

5 Antonaci F, Bonò G, Chimento P. Diagnosing cervicogenic headache. *J Headache Pain* 2006; 7: 145-148 [PMID: 16575502 DOI: 10.1007/s10194-006-0277-3]

6 Barnhnerzig R, Kingston W. Occipital Neuralgia and Cervicogenic Headache: Diagnosis and Management. *Curr Neurol Neurosci Rep* 2019; 19: 20 [PMID: 30888540 DOI: 10.1007/s11910-019-0937-8]

7 Biondi DM. Cervicogenic headache: a review of diagnostic and treatment strategies. *J Am Osteopath Assoc* 2005; 105: 16S-22S [PMID: 15928349]

8 Lai J, Harrison RA, Plecash A, Field TS. A Narrative Review of Persistent Post-Stroke Headache - A New Entry in the International Classification of Headache Disorders, 3rd Edition. *Headache* 2018; 58: 1442-1453 [PMID: 30152015 DOI: 10.1111/head.13382]

9 Headache Classification Committee of the International Headache Society (IHS). The International Classification of Headache Disorders, 3rd edition (beta version). *Cephalalgia* 2013; 33: 629-808 [PMID: 23771270 DOI: 10.1111/j.1468-2982.2008.01606.x]

10 Inan N, Ateý Y. Cervicogenic headache: pathophysiology, diagnostic criteria and treatment. *Agri* 2005; 17: 23-30 [PMID: 16552647]

11 Goadsby PJ, Bartusch T. On the functional neuroanatomy of neck pain. *Cephalalgia* 2008; 28 Suppl 1: 1-7 [PMID: 18494984 DOI: 10.1111/j.1468-2982.2008.01606.x]

12 Bogduk N. Cervicogenic headache: anatomic basis and pathophysiologic mechanisms. *Curr Pain Headache Rep* 2001; 5: 382-386 [PMID: 11403743 DOI: 10.1007/s11916-001-0029-7]

13 Bogduk N. The anatomical basis for cervicogenic headache. *J Manipulative Physiol Ther* 1992; 15: 67-70 [PMID: 1746655]

14 Dwyer A, April C, Bogduk N. Cervical zygapophysial joint pain patterns. I: A study in normal volunteers. *Spine (Phila Pa 1976)* 1990; 15: 453-457 [PMID: 2402682 DOI: 10.1097/00007632-199006000-00004]

15 Frese A, Schilgen M, Husstedt IW, Evers S. [Pathophysiology and clinical manifestation of cervicogenic headache]. *Schmerz* 2003; 17: 125-130 [PMID: 12695893 DOI: 10.1007/s00482-002-0194-6]

16 Mariano da Silva H Jr, Bordini CA. Cervicogenic headache. *Curr Pain Headache Rep* 2006; 10: 306-311 [PMID: 16834947 DOI: 10.1007/s11916-006-0037-8]

17 Shen YF, Zhou QY, Li SL, Jia Y, Qiu ZY. [Clinical manifestations and imaging analysis of cervicogenic headache]. *Zhongguo Gu Shang* 2019; 32: 130-135 [PMID: 30884928 DOI: 10.3969/j.issn.1003-0034.2019.02.007]

18 Guyatt GH, Osman AD, Vist GE, Kunz R, Falck-Ytter Y, Alonso-Coello P, Schünemann HJ; GRADE Working Group. GRADE: an emerging consensus on rating quality of evidence and strength of recommendations. *BMJ* 2008; 336: 924-926 [PMID: 18436948 DOI: 10.1136/bmj.39489.470347.AD]

19 Haas M, Bromfort G, Evans RL, Leininger B, Schmitt J, Levin M, Westrom K, Goldsmith CH. Spinal rehabilitative exercise or manual treatment for the prevention of cervicogenic headache in adults. *Cochrane Database Syst Rev* 2016; 2016 [PMID: 28090192 DOI: 10.1002/14651858.CD012205]

20 Martelletti P, van Suyliekom H. Cervicogenic headache: practical approaches to therapy. *CNS Drugs* 2004; 18: 793-805 [PMID: 15377169 DOI: 10.2165/00002821-200418120-00004]

21 Shimohata K, Shimohata T. [Clinical Aspects of Cervicogenic Headache]. *Brain Nerve* 2020; 72: 251-258 [PMID: 32152258 DOI: 10.11477/mf.1416201514]

22 Ghanavatian S, Derian A. Tizanidine. Treasure Island: StatPearls Publishing, 2021

23 Matharu M. Cluster headache. *BMJ Clin Evid* 2010; 2010 [PMID: 21718584]

24 Boudreau GP, Marchand L. Pregabalin for the management of cervicogenic headache: a double blind study. *Can J Neurol Sci* 2014; 41: 603-610 [PMID: 25373811 DOI: 10.1007/j.cnj.2014.2]

25 Burch R. Antidepressants for Preventive Treatment of Migraine. *Curr Treat Options Neurol* 2019; 21: 18 [PMID: 30895386 DOI: 10.1007/s11940-019-0557-9]

26 He MW, Ni JX, Guo YN, Wang Q, Yang LQ, Liu JJ. Continuous epidural block of the cervical vertebrae for cervicogenic headache. *Chin Med J (Eng)* 2009; 122: 427-430 [PMID: 19302749]

27 Narouze SN, Casanova I, Mekhail N. The longitudinal effectiveness of lateral atlantoaxial intrarticular steroid injection in the treatment of cervicogenic headache. *Pain Med* 2007; 8: 184-188 [PMID: 17305689 DOI: 10.1111/j.1526-4437.2006.00247.x]

28 Hamer JF, Purath TA. Response of cervicogenic headaches and occipital neuralgia to radiofrequency ablation of the C2 dorsal root ganglion and/or third occipital nerve. *Headache* 2014; 54: 500-510 [PMID: 24433241 DOI: 10.1111/head.12295]

29 Wu B, Yue L, Sun F, Gao S, Liang B, Tao T. The Feasibility and Efficacy of Ultrasound-Guided C2 Nerve Root Coblation for Cervicogenic Headache. *Pain Med* 2019; 20: 1219-1226 [PMID: 30561695]
Xiao H et al. CASP recommendations for cervicogenic headache

DOI: 10.1093/pm/pny227

30 Wang E, Wang D. Treatment of cervicogenic headache with cervical epidural steroid injection. Curr Pain Headache Rep 2014; 18: 442 [PMID: 25091129 DOI: 10.1007/s11916-014-0442-3]

31 Gupta R, Fisher K, Pyati S. Chronic Headache: a Review of Interventional Treatment Strategies in Headache Management. Curr Pain Headache Rep 2019; 23: 68 [PMID: 31392357 DOI: 10.1007/s11916-019-00806-9]

32 Haspeslagh SR, Van Suijlekom HA, Lamé JE, Kessels AG, van Kleef M, Weber WE. Randomised controlled trial of cervical radiofrequency lesions as a treatment for cervicogenic headache [ISRCTN07444684]. BMC Anesthesiol 2006; 6: 1 [PMID: 16483374 DOI: 10.1186/1471-2253-6-1]

33 Stovern LJ, Kolstad F, Helde G. Radiofrequency denervation of facet joints C2-C6 in cervicogenic headache: a randomized, double-blind, sham-controlled study. Cephalalgia 2004; 24: 821-830 [PMID: 15377312 DOI: 10.1111/j.1468-2982.2004.00773.x]

34 Lord SM, Barnsley L, Wallis BJ, McDonald GJ, Bogduk N. Percutaneous radio-frequency neurotomy for chronic cervical zygapophyseal-joint pain. N Engl J Med 1996; 335: 1721-1726 [PMID: 8929263 DOI: 10.1056/NEJM199612053352302]

35 Gabrhelík T, Michálek P, Adamus M. Pulsed radiofrequency therapy versus greater occipital nerve block in the management of refractory cervicogenic headache - a pilot study. Prag Med Rep 2011; 112: 279-287 [PMID: 22142523]

36 Abd-Elsayed A, Nguyen S, Fiala K. Radiofrequency Ablation for Treating Headache. Curr Pain Headache Rep 2019; 23: 18 [PMID: 30830462 DOI: 10.1007/s11916-019-0955-3]

37 Smith NL, Wilson AL, Gandhi J, Vatista S, Khan SA. Ozone therapy: an overview of pharmacodynamics, current research, and clinical utility. Med Gas Res 2017; 7: 212-219 [PMID: 29152215 DOI: 10.4103/mg.2014.9912.215752]

38 Manchikanti L, Boswell MV, Singh V, Benyamin RM, Fellows B, Abdi S, Buenaventura RM, Conn A, Datta S, Derby R, Falco FJ, Erfurt S, Diwan S, Hayek SM, Helm S, Parr AT, Schultz DM, Smith HS, Wolfer LR, Hirsch JA. ASIPP-IPM. Comprehensive evidence-based guidelines for interventional techniques in the management of chronic spinal pain. Pain Physician 2009; 12: 699-802 [PMID: 19644537]

39 Shimohata K, Hasegawa K, Onodera O, Nishizawa M, Shimohata T. The Clinical Features, Risk Factors, and Surgical Treatment of Cervicogenic Headache in Patients With Cervical Spine Disorders Requiring Surgery. Headache 2017; 57: 1109-1117 [PMID: 28581034 DOI: 10.1111/head.13123]

40 Schrot RJ, Mathew JS, Li Y, Beckett L, Bae HW, Kim KD. Headache relief after anterior cervical discectomy: post hoc analysis of a randomized investigational device exemption trial: clinical article. J Neurosurg Spine 2014; 21: 217-222 [PMID: 24836655 DOI: 10.3171/2014.4.SPINE13669]

41 Fernández-de-Las-Peñas C, Cuadrado ML. Physical therapy for headaches. Cephalalgia 2016; 36: 1134-1142 [PMID: 26660851 DOI: 10.1177/0333102415596445]

42 Luedtke K, Allers A, Schulte LH, May A. Efficacy of interventions used by physiotherapists for patients with headache and migraine-systematic review and meta-analysis. Cephalalgia 2016; 36: 474-492 [PMID: 26229071 DOI: 10.1177/0333102415597889]

43 Juli G, Trotti P, Potter H, Zito G, Niere K, Shirley D, Emerson J, Marschner I, Richardson C. A randomized controlled trial of exercise and manipulative therapy for cervicogenic headache. Spine (Phila Pa 1976) 2002; 27: 1835-43; discussion 1843 [PMID: 12221344 DOI: 10.1097/00007632-200209010-00004]

44 Fernández M, Moore C, Tan J, Lian D, Nguyen J, Bacon A, Christie B, Shen I, Waldie T, Simonet A, Bussières A. Spinal manipulation for the management of cervicogenic headache: A systematic review and meta-analysis. Eur J Pain 2020; 24: 1687-1702 [PMID: 32621321 DOI: 10.1002/epj.1632]

45 Millstine D, Chen CY, Bauer B. Complementary and integrative medicine in the management of headache. BMJ 2017; 357: j1805 [PMID: 28512119 DOI: 10.1136/bmj.j1805]

46 Chen SP, Ayata C. Spreading Depression in Primary and Secondary Headache Disorders. Curr Pain Headache Rep 2016; 20: 44 [PMID: 27215627 DOI: 10.1007/s11916-016-0574-8]

47 Torelli P, Lambru G, Manzoni GC. Psychiatric comorbidity and headache: clinical and therapeutic aspects. Neurol Sci 2006; 27 Suppl 2: S73-S76 [PMID: 16688633 DOI: 10.1007/s10072-006-0574-2]

48 Haldeman S, Dagenais S. Choosing a treatment for cervicogenic headache when? Spine J 2010; 10: 169-171 [PMID: 20004621 DOI: 10.1016/j.spinee.2009.10.013]

49 Tegner H, Frederiksen P, Esbensen BA, Juul C. Neuropsychological Pain Education for Patients With Chronic Low Back Pain: A Systematic Review and Meta-Analysis. Clin J Pain 2018; 34: 778-786 [PMID: 29443723 DOI: 10.1097/AJP.0000000000000594]
