

REVIEW ARTICLE

New International Classification of Orofacial Pain: What Is in It For Endodontists?

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ABSTRACT

Pain is a common symptom in endodontic conditions, but differential diagnostic procedures are often needed to exclude other pain origins. Thus, general dentists and endodontists need to be aware of alternative painful orofacial conditions and be able to identify them. The new International Classification of Orofacial Pain (ICOP) is the first comprehensive classification that uniquely deals with orofacial pain. The ICOP is a hierarchical classification modeled on the International Classification of Headache Disorders and covers pain in dentoalveolar and anatomically related tissues, muscle pain, temporomandibular joint pain, neuropathic pain affecting cranial nerves, pain resembling primary headaches, and idiopathic pain in the orofacial region. A description of each condition is given, and structured diagnostic criteria for each condition are proposed based on research data when available. This narrative review aims

(1) to give an overview and brief explanation of the ICOP system,
 (2) to describe and give examples of how it can be of use to general dentists and endodontists with special attention to differential diagnosis of tooth pain, and
 (3) to highlight how endodontic research can contribute to validation and improvement of the classification. A comparison to other classification and diagnostic systems is also included. (*J Endod* 2021; ■:1–13.)

KEY WORDS

Classification; diagnostic criteria; differential diagnosis; pain; taxonomy

How do we interpret pain in our patients, and how important is it that we understand what is really going on? Misinterpretation of the pain origin can lead to misdiagnosis and to subsequent mismanagement. In many clinical endodontic cases, painful as well as nonpainful, the diagnosis is fairly obvious and the treatment decision not challenging. Other cases are less straightforward, and careful differential diagnosis is needed. When there is pain, there is a sense of urgency; “wait and see” is not an option that the patient may be willing to accept, but, on the other hand, it is important to get it right. Every dentist needs to be aware of a multitude of conditions that may cause the symptom of pain and how differently patients may be experiencing and expressing their pain. For endodontists, it is especially important to be able to distinguish when pain is of endodontic origin from pain resulting from other orofacial conditions because these other conditions cannot be successfully managed with endodontic procedures.

To ensure understanding between health care practitioners and researchers, a widely accepted orofacial pain classification would be helpful. We need to speak the same language and use the same definitions for pain conditions, but currently there is a lot of variation in the literature and therefore ambiguity. Classifications provide common ground regarding terminology, which is a prerequisite for clear and unambiguous communication. Another important feature is universal agreement on diagnostic criteria, which has the additional and very important benefit of improving case selection for a wide range of research, such as observational studies on specific patient groups, experimental studies on pain mechanisms, and clinical studies on diagnostic validity (eg, within endodontics) or trials on treatment efficacy. This would ultimately benefit patients as well as improve the understanding of orofacial pain itself.

In 2020, the International Classification of Orofacial Pain (ICOP) was published¹; this is the first comprehensive classification that uniquely deals with orofacial pain. It is the result of an international

SIGNIFICANCE

This review article describes a new comprehensive classification covering definitions and diagnostic criteria of orofacial pain disorders. The topic is highly relevant to clinical diagnosis and management as well as research focusing on tooth-related pain.

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collaborative effort involving the Orofacial and Head Pain Special Interest Group of the International Association for the Study of Pain, the International Network for Orofacial Pain and Related Disorders Methodology of the International Association for Dental Research, the American Academy of Orofacial Pain, and the International Headache Society. The new orofacial pain classification is modeled on the International Classification of Headache Disorders (ICHD) (3rd edition, ICHD-3), which is widely accepted and used globally by clinicians and researchers.² Since 1992, the ICHD has been incorporated in the *International Classification of Diseases, Tenth Revision*, now the *International Classification of Diseases, 11th Revision (ICD-11)*, and it is considered the official classification of headaches by the World Health Organization. At present, orofacial pains are incompletely covered in the ICHD-3 within 2 different chapters. With the ultimate goal being to eventually merge the 2 classifications, the ICOP followed the ICHD structure as much as possible.

The ICOP provides a comprehensive description of pain conditions affecting the orofacial region and diagnostic criteria for such conditions. Aiming to be all-inclusive, its 6 chapters cover pain in dentoalveolar and anatomically related tissues, muscle pain, temporomandibular joint (TMJ) pain, neuropathic pain affecting cranial nerves, pain resembling primary headaches, and idiopathic pain (Table 1). It comprehends primary pain (ie, pain that is not attributable to another disorder) as well as secondary pain (ie, pain caused by another identified disorder such as inflammation [eg, due to infection, trauma, or

autoimmune disorder], sensitization of the tissues, structural changes, muscle spasm, or injury). Furthermore, several of the chapters subdivide the pain conditions based on duration into acute and chronic types, defining chronic pain as pain lasting 3 months or longer.

The purposes of this article were to

- (1) provide an overview and brief explanation of the ICOP system,
- (2) describe how it can be of use to general dentists and endodontists with special attention to differential diagnosis of tooth pain, and
- (3) highlight how endodontic research can contribute to validation and improvement of the classification. The authors contributed as work group members to the development of the ICOP, and we present some examples of diagnostic categories and criteria with the purpose to visualize the structure of the ICOP and emphasize the conditions of special interest for this journal's readership; thus, the list of criteria is not complete. Boxed criteria are reproduced with permission from the original publication.¹

HOW DOES THE ICOP WORK? STRUCTURE AND CRITERIA

The ICOP is a hierarchical classification system. The main categories (Table 1) branch into subcategories (Figs. 1 and 2), sometimes several times. The highest number of subcategory levels within a main category is 6, thus rendering classification codes with a maximum of 7 digits (Table 2). The number of

levels is based on the existing knowledge about the topic and the perceived utility by the developers of each section. If the treatment or prognosis was perceived to differ between possible subcategories, the classification was expanded into 1 more digit level. As an example, 1.1.1.1.3 *Pulpal pain attributed to dental procedure* is further subcategorized to differentiate between pain due to 1.1.1.1.3.1 *Pulpal pain attributed to extensive removal of dentin*, 1.1.1.1.3.2 *Pulpal pain attributed to placement of a restoration* and 1.1.1.1.3.3 *Pulpal pain attributed to hyperocclusion or hyperarticulation following dental restorative procedure* because these 3 possible cases would conceivably be managed differently and differ in prognosis. If no such differences were anticipated, no further subcategorization was made.

Thus, the level of detail in the diagnosis can be identified by the number of digits in the classification code and may vary depending on the situation. This means that, in general dentistry, it may be convenient to use first- to third-digit diagnoses; the dental or medical specialist may need to use third- to fifth-digit diagnoses, whereas a researcher may need to specify the case further and use fifth- to seventh-digit diagnoses. For example, a dental practitioner suspecting that his or her patient is suffering from the neuropathic pain condition trigeminal neuralgia may be able to identify the case as 4.1.1 *Trigeminal neuralgia* based on the presentation fulfilling the diagnostic criteria (see 4 *Orofacial pain attributed to lesion or disease of the cranial nerves*). The patient is then referred to an orofacial pain specialist, who may be able to exclude an underlying disease as the cause, and therefore will

TABLE 1 - The International Classification of Orofacial Pain Includes 6 Chapters Covering Orofacial Pain Conditions and 1 Chapter on the Assessment of Psychosocial Factors Relevant to Pain

Chapter/main category	Explanation
1. Orofacial pain attributed to disorders of dentoalveolar and anatomically related structures	Pain caused by disease, injury, or abnormal functioning of the tooth pulp, periodontium, gingiva(e), oral mucosa, salivary glands, or jawbone tissue or pain arising from normal functioning of the tooth pulp signaling risk of tooth damage
2. Myofascial orofacial pain	Pain localized to the masticatory muscles, with or without functional impairment
3. Temporomandibular joint (TMJ) pain	Pain localized to the TMJ, occurring at rest or during jaw movement or palpation
4. Orofacial pain attributed to lesion or disease of the cranial nerves	Pain localized in the distribution area of 1 of the sensory cranial nerves (ie, the trigeminal and glossopharyngeal nerve) with a history of trauma or disease known to cause nerve injury
5. Orofacial pains resembling presentations of primary headaches	Pain in the orofacial area, resembling 1 of the primary headache types in pain character, duration, and intensity with or without the associated symptoms of these headache types but without concomitant headache
6. Idiopathic orofacial pain	Unilateral or bilateral intraoral or facial pain in the distribution(s) of 1 or more branches of the trigeminal nerve(s) for which the etiology is unknown
7. Psychosocial assessment of patients with orofacial pain	NA

NA, not applicable.

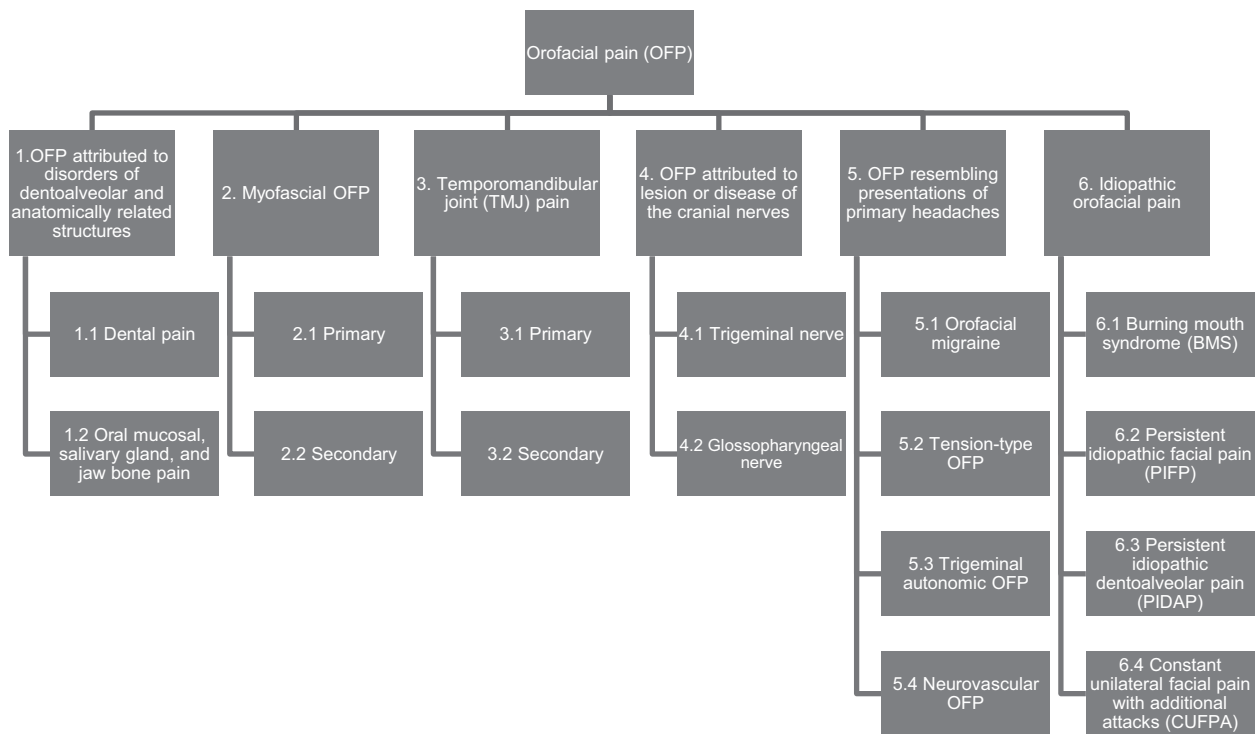


FIGURE 1 – The hierarchical structure of the ICOP. The classification comprehends 6 main categories of orofacial pain, each branching into subcategories. The level of detail in the diagnoses is indicated by the number of digits, which ranges from 1–7. Levels 1 and 2 are displayed here.

subcategorize the case as *4.1.1.1 Classical trigeminal neuralgia*. If a researcher studying pain management on different subtypes of the disorder would see the same patient, he or she may consider it relevant to subcategorize further based on the pain pattern and conclude that it is a case of *4.1.1.1.2 Classical trigeminal neuralgia with concomitant continuous pain*. All 3 diagnoses are correct, and the level of detail selected is determined by the situational need.

In agreement with the ICHD-3, the diagnostic criteria in the ICOP follow a fixed structure (A–D; for primary pains, usually A–C), in some cases followed by specifying notes and explanatory comments as follows:

- Criterion A depicts the pain and states that the condition fulfils the criteria for the immediately superior category and any other given criteria.
- Criterion B identifies the presumed cause; a condition known to be able to cause pain has been diagnosed (criterion only valid for secondary pains).
- Criterion C stipulates (if possible) that causation of A by B is plausible based on anatomic, functional, and/or temporal association.
- Criterion D supports the causation criterion C by stating that all other causes for the pain have been eliminated with reasonable certainty.

The following 2 examples visualize the concept:

1.1.1 Pulpal pain

Description:

Pain caused by a lesion or disorder involving the tooth pulp.

Diagnostic criteria:

- Any pain in a tooth fulfilling criterion C
- Clinical, laboratory, imaging and/or anamnestic evidence of a lesion, disease or trauma¹ known to produce pulpal pain
- Evidence of causation demonstrated by both of the following:
 - location of the pain corresponds to the site(s) of the lesion, disease or trauma²
 - either or both of:
 - pain developed in temporal relation to the appearance of the lesion or onset of the disease or trauma, or led to its discovery
 - pain is exacerbated by physical stimulus³ applied to the affected tooth
- Not better accounted for by another ICOP diagnosis.

Notes:

- The lesion, disease or trauma is specified in each subform.
- Pain may also refer and/or radiate to other ipsilateral orofacial locations.
- The stimulus may be mechanical, thermal or chemical, as specified in some subforms.

Comment:

Pulpal pain may be associated with any type of pulpal injury or disease. The pain is predominantly inflammatory and secondary to external or internal events.

This is an example of a 3-digit level diagnosis, which is often enough for clinical purposes. The pain origin is simply identified as coming from a vital pulp, which may or may not need treatment as clarified by the relevant subcategorization. For the endodontist, this ICOP diagnosis may be considered redundant since it is the endodontic diagnosis that usually forms the basis for treatment decision (Fig. 3).

1.1.2.1.2.2.1 Periodontal pain attributed to intraradicular endodontic infection

Diagnostic criteria:

- Pain fulfilling criteria for *1.1.2.1.2.2 Periodontal pain attributed to endodontic infection*
- A tooth has root canal infection¹
- Not better accounted for by another ICOP diagnosis.

Note:

- The infection may be bacterial, viral, fungal, or other.

Comments:

In most teeth with infected necrotic pulp, the infection is confined to the root canal system. Successful infection treatment usually results in pain resolution.

This is an example of a very detailed diagnosis, identifiable by the 7-digit code, which may be needed for research purposes (eg, in a clinical trial on the efficacy of analgesics). In this case, stipulating causation due to anatomic, functional, and/or temporal association between the pain onset and the onset of the underlying cause is not possible because of the fact that apical periodontitis can be present for a long time without pain. Therefore, the causation relies on clinical plausibility plus the absence of other conditions that may explain the pain (criterion C). Thus, considering differential diagnosis is always necessary for correct classification.

THE CLASSIFICATION CATEGORIES

This section lists the classification categories as they are presented in the original publication and provides a brief explanation for each. For an overview of the main ICOP categories, see [Figure 1](#) and [Table 1](#). The diagnostic criteria of the main categories are directly reproduced

from the original publication (boxes). For specific codes and criteria of every subcategory (digit level), the reader is referred to the original publication¹.

1 Orofacial Pain Attributed to Disorders of Dentoalveolar and Anatomically Related Structures

1.1 Dental Pain

The ICOP defines dental pain as “pain caused by lesions or disorders affecting one or more teeth and/or immediately surrounding and supporting structures: the tooth pulp, periodontium and gingivae”¹. For a complete list of the ICOP codes and diagnoses for dental pain conditions, see [Table 2](#).

1.1.1 Pulpal pain is defined as pain caused by a lesion or disorder involving the tooth pulp. The diagnostic criteria for the main category *1.1.1. Pulpal pain* were presented earlier. Pulpal pain is further subcategorized based on the underlying cause as follows: hypersensitivity of the pulp, pulp exposure due

to trauma, pulpitis (pulpal inflammation), or systemic cause.

- *Pulpal pain attributed to hypersensitivity of the pulp (1.1.1.1)* indicates pain from a vital, normal pulp. It is further subcategorized based on the cause for the hypersensitivity as follows: crack in the enamel (1.1.1.1.1), exposed dentin (due to tooth wear/abrasion, fracture, or developmental defect; 1.1.1.1.2.1–1.1.1.1.2.3), dental procedure (due to extensive removal of dentin, placement of restoration, or hyperocclusion/hyperarticulation; 1.1.1.1.3.1–1.1.1.1.3.3), central sensitization (1.1.1.1.4), or other cause (1.1.1.1.5). The fracture subcategory (1.1.1.1.2.2) comprehends fractures of the enamel, root cementum, dentin, or any combination thereof.
- *Pulpal pain attributed to pulp exposure due to dental trauma (1.1.1.2)* comprehends the dental trauma diagnoses complicated

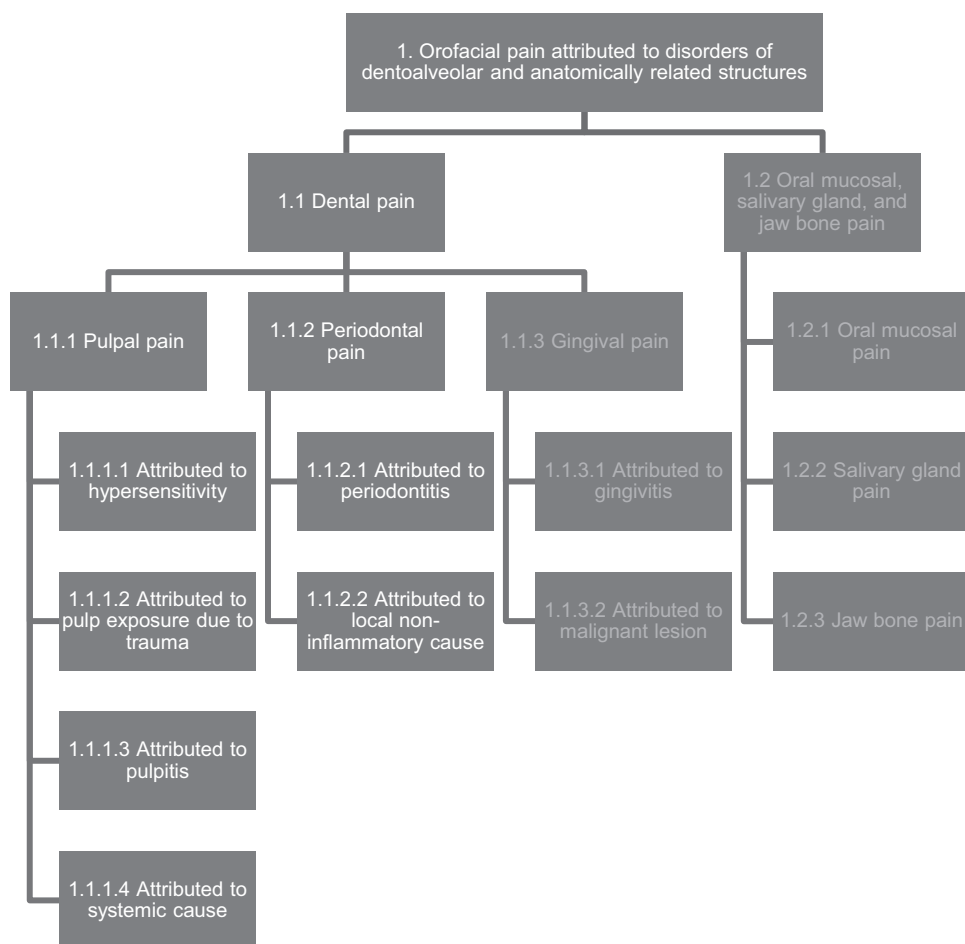


FIGURE 2 – The figure shows the category orofacial pain attributed to disorders of dentoalveolar and anatomically related structures. Pain of endodontic origin is categorized under dental pain (1.2) and includes pulpal pain (1.2.1) and periodontal pain (1.2.2). Diagnostic levels 3 and 4 are displayed (nondental pain in contrasting color and with level 4 omitted).

TABLE 2 - The International Classification of Orofacial Pain List of Codes and Diagnoses Includes 6 Main Categories with Several Levels of Subcategories (Figure 1 and Table 1)**ICOP code and diagnosis**

1. Orofacial pain attributed to disorders of dentoalveolar and anatomically related structures
 - 1.1 Dental pain
 - 1.1.1 Pulpal pain
 - 1.1.1.1 Pulpal pain attributed to hypersensitivity
 - 1.1.1.1.1 Pulpal pain attributed to a crack in the enamel
 - 1.1.1.1.2 Pulpal pain attributed to exposed dentin
 - 1.1.1.1.2.1 Pulpal pain attributed to tooth wear or abrasion
 - 1.1.1.1.2.2 Pulpal pain attributed to fracture resulting in exposed dentin
 - 1.1.1.1.2.3 Pulpal pain attributed to developmental dental hard-tissue defect
 - 1.1.1.1.3 Pulpal pain attributed to dental procedure
 - 1.1.1.1.3.1 Pulpal pain attributed to extensive removal of dentin
 - 1.1.1.1.3.2 Pulpal pain attributed to placement of a restoration
 - 1.1.1.1.3.3 Pulpal pain attributed to hyperocclusion or hyperarticulation following dental restorative procedure
 - 1.1.1.1.4 Pulpal pain attributed to central sensitization
 - 1.1.1.1.5 Pulpal pain attributed to hypersensitivity due to other cause
 - 1.1.1.2 Pulpal pain attributed to pulp exposure due to dental trauma
 - 1.1.1.3 Pulpal pain attributed to pulpitis (pulpal inflammation)
 - 1.1.1.3.1 Pulpal pain attributed to reversible pulpitis due to infection of dentin
 - 1.1.1.3.1.1 Pulpal pain attributed to reversible pulpitis due to caries not extending to the pulp
 - 1.1.1.3.1.2 Pulpal pain attributed to reversible pulpitis due to dental hard-tissue fracture with exposure of dentin
 - 1.1.1.3.1.3 Pulpal pain attributed to reversible pulpitis due to a tooth crack without evidence of missing tooth substance
 - 1.1.1.3.2 Pulpal pain attributed to irreversible pulpitis due to infection of dentin
 - 1.1.1.3.2.1 Pulpal pain attributed to irreversible pulpitis due to caries extending to the pulp
 - 1.1.1.3.2.2 Pulpal pain attributed to irreversible pulpitis due to dental hard-tissue fracture without pulp exposure
 - 1.1.1.3.2.3 Pulpal pain attributed to irreversible pulpitis due to tooth crack without evidence of missing tooth substance
 - 1.1.1.3.3 Pulpal pain attributed to irreversible pulpitis due to infection of the dental pulp
 - 1.1.1.3.3.1 Pulpal pain attributed to irreversible pulpitis due to carious pulp exposure and infection of the pulp
 - 1.1.1.3.3.2 Pulpal pain attributed to irreversible pulpitis due to dental hard-tissue fracture with pulp exposure
 - 1.1.1.3.4 Pulpal pain attributed to pulpitis due to external cervical root resorption
 - 1.1.1.3.5 Pulpal pain attributed to pulpitis due to other cause
 - 1.1.1.4 Pulpal pain attributed to systemic cause
 - 1.1.2 Periodontal pain
 - 1.1.2.1 Periodontal pain attributed to periodontitis (periodontal inflammation)
 - 1.1.2.1.1 Periodontal pain attributed to traumatically induced periodontal inflammation
 - 1.1.2.1.1.1 Periodontal pain attributed to hyperocclusion or hyperarticulation
 - 1.1.2.1.1.2 Postoperative periodontal pain
 - 1.1.2.1.1.3 Periodontal pain attributed to accidental dental trauma
 - 1.1.2.1.1.4 Periodontal pain attributed to other trauma or injury
 - 1.1.2.1.1.2 Periodontal pain attributed to apical periodontitis due to endodontic disease
 - 1.1.2.1.2.1 Periodontal pain attributed to pulpal inflammation
 - 1.1.2.1.2.2 Periodontal pain attributed to endodontic infection
 - 1.1.2.1.2.2.1 Periodontal pain attributed to intraradicular endodontic infection
 - 1.1.2.1.2.2.2 Periodontal pain attributed to extraradicular endodontic infection
 - 1.1.2.1.2.3 Periodontal pain attributed to periodontal disease
 - 1.1.2.1.3.1 Periodontal pain attributed to chronic periodontitis
 - 1.1.2.1.3.2 Periodontal pain attributed to aggressive periodontitis
 - 1.1.2.1.3.3 Periodontal pain attributed to periodontitis as a manifestation of systemic disorder
 - 1.1.2.1.3.3.1 Periodontal pain attributed to haematological disorder
 - 1.1.2.1.3.3.2 Periodontal pain attributed to genetic disorder
 - 1.1.2.1.3.3.3 Periodontal pain attributed to unspecified systemic disorder
 - 1.1.2.1.3.4 Periodontal pain attributed to necrotizing ulcerative periodontitis (NUP)
 - 1.1.2.1.3.5 Periodontal pain attributed to periodontal abscess

(continued on next page)

crown fracture, root fracture, and combined crown-root fracture.

- *Pulpal pain attributed to pulpitis (1.1.1.3)* is further subcategorized based on
 - (1) the severity of inflammation (reversible/irreversible; 1.1.1.3.1 and 1.1.1.3.2, respectively) and
 - (2) the cause for the inflammation including infection of dentin (due to caries, fracture with exposure of dentin, or tooth crack; 1.1.1.3.1.1–1.1.1.3.1.3 and 1.1.1.3.2.1–1.1.1.3.2.3, respectively) and infection of the pulp (due to caries or fracture; 1.1.1.3.3.1–1.1.1.3.3.2). The final 2 categories do not rely on the severity of inflammation: pulpal pain attributed to pulpitis due to external cervical root resorption (1.1.1.3.4) and attributed to pulpitis due to other cause (1.1.1.3.5).
- *Pulpal pain attributed to systemic cause (1.1.1.4)* includes conditions in which a systemic disease induces a change in the pulp that causes pain. This type of pain is likely very uncommon; the best known example is sickle cell anemia³.

It is well-known that there is scant evidence that the severity of pulpal inflammation can be determined clinically (eg, based on signs and symptoms such as the intensity or duration of pain)⁴. The true meaning of irreversible pulpitis would be that no intervention (available now or in the future) will be successful in treating the inflammation and preventing pulp necrosis. Currently, no clinical method or algorithm that can determine the level of inflammation with a high level of certainty has been identified^{4,5}. For clinical as well as research purposes, it was deemed necessary to separate between reversible pulpitis and irreversible pulpitis in the ICOP, and an ad hoc division was suggested based on the depth of the caries lesion; if there is clinical and/or radiographic evidence that the lesion extends to the pulp, the pulpitis may be assumed to be irreversible, and if there is no such evidence, a reversible condition should be assumed. The proposed diagnostic criteria also include clinical observations of signs such as pain on biting, thermal hypersensitivity, and lingering pain after stimulation, none of which are based on a high level of evidence. It should be recognized that these criteria are based on expert opinion, and scientific validation is needed. Standardized diagnostic tests procedures and interpretations may be a way to achieve this.

1.1.2 Periodontal pain is defined as pain caused by a lesion or disorder of the periodontal tissues (ie, the periodontal ligament and adjacent bone).

TABLE 2 - Continued

ICOP code and diagnosis

- 1.1.2.1.4 Periodontal pain attributed to apical and marginal periodontitis due to combined endodontic infection and periodontal disease
- 1.1.2.1.5 Periodontal pain attributed to infective peri-implantitis
- 1.1.2.2 Periodontal pain attributed to local non-inflammatory cause
- 1.1.3 Gingival pain
- 1.1.3.1 Gingival pain attributed to gingivitis (gingival inflammation)
- 1.1.3.1.1 Gingival pain attributed to trauma
- 1.1.3.1.2 Gingival pain attributed to infection*
- 1.1.3.1.3 Gingival pain attributed to autoimmunity
- 1.1.3.1.4 Gingival pain attributed to hypersensitivity or allergic reaction
- 1.1.3.1.5 Gingival pain attributed to gingival inflammation due to other cause
- 1.1.3.2 Gingival pain attributed to malignant lesion

The table shows 1.1 Dental pain with all subcategories. Please see the original publication (*Cephalalgia* 2020;40:129–221) for a complete list of all International Classification of Orofacial Pain diagnostic codes.

1.1.2 Periodontal pain**Diagnostic criteria:**

- A. Any pain in the periodontium¹ fulfilling criterion C
- B. Clinical, laboratory, imaging and/or anamnestic evidence of a lesion, disease or trauma² known to be able to cause periodontal pain
- C. Evidence of causation demonstrated by both of the following:
 1. location of the pain corresponds to the site of the lesion, disease or trauma¹
 2. pain is exacerbated by physical stimulus³ applied to the affected tooth (horizontally or vertically) or to the tissue overlying the root
- D. Not better accounted for by another ICOP diagnosis.

Notes:

1. Pain may also refer and/or radiate to other ipsilateral orofacial locations.
2. The lesion, disease or trauma is specified in each subform.
3. The stimulus may be mechanical, thermal or chemical, as specified in some subforms.

Comment:

Periodontal pain may be associated with all types of periodontal injury or disease. The pain is predominantly inflammatory, and secondary to external or internal events.

Periodontal pain is further subcategorized based on the underlying condition as follows: periodontitis (periodontal inflammation, 1.1.2.1) or a local noninflammatory cause (1.1.2.2).

“Periodontitis” should here be understood in its literal meaning (ie, inflammation of the periodontium). Thus, the category includes pain due to inflammation induced by any possible cause, including trauma, endodontic disease, periodontal

disease, combined endodontic and periodontal disease, and peri-implant disease.

- *Periodontal pain attributed to traumatically induced periodontal inflammation* (1.1.2.1.1) is further subcategorized based on the type of trauma as follows: minor (hyperocclusion/hyperarticulation, 1.1.2.1.1.1), surgical (postoperative, 1.1.2.1.1.2), accidental (dental trauma, 1.1.2.1.1.3), or other trauma or injury (1.1.2.1.1.4).
- *Periodontal pain attributed to apical periodontitis due to endodontic disease* (1.1.2.1.2) is further subcategorized based on the location of the infection and thus the pain-causing inflammation as follows: vital inflamed pulp (1.1.2.1.2.1) or necrotic pulp with concomitant apical periodontitis (1.1.2.1.2.2), which includes intraradicular infection (1.1.2.1.2.2.1) and extraradicular infection (1.1.2.1.2.2.2).
- *Periodontal pain attributed to periodontal disease* (1.1.2.1.3) is subcategorized based on the following local and systemic etiologic factors: chronic periodontitis (1.1.2.1.3.1); aggressive periodontitis (1.1.2.1.3.2); periodontitis as a manifestation of systemic disorder (1.1.2.1.3.3), which includes hematologic disorder (1.1.2.1.3.3.1), genetic disorder (1.1.2.1.3.3.2), and unspecified systemic disorder (1.1.2.1.3.3.3); necrotizing ulcerative periodontitis (1.1.2.1.3.4); and periodontal pain attributed to periodontal abscess (1.1.2.1.3.5).
- *Periodontal pain attributed to combined endodontic and periodontal disease* (1.1.2.1.4) indicates pain from a tooth diagnosed with partial or total pulp necrosis (or previously root canal treated) and simultaneous periodontal disease when the pain origin is not possible to attribute to any single one of the conditions.

- *Periodontal pain attributed to infective peri-implantitis* (1.1.2.1.5) follows the same criteria as 1.1.2.1 Periodontal pain attributed to periodontitis, except that it involves an implant and not a natural tooth.

The final category, *Periodontal pain attributed to local noninflammatory cause* (1.1.2.2), includes pain due to noninflammatory conditions that are usually asymptomatic but may infrequently cause pain after expansion, such as periodontal cysts, radicular cysts, and tumors.

The category periodontal pain includes many different causes of pain. The pain intensity ranges from mild to severe, and the presentation pattern ranges from only appearing on provocation of the tooth to constant, spontaneous pain exacerbated on provocation of the area. For research purposes, specification of the periodontal pain type is likely to be necessary.

1.1.3. *Gingival pain* is defined as pain caused by a lesion or disorder involving the gingival tissue. It is subcategorized based on the causing condition (ie, gingivitis [gingival inflammation] and malignant lesion).

- *Gingival pain attributed to gingivitis* (1.3.1.1) is further subcategorized based on the cause of the inflammation as follows: trauma (1.1.3.1.1); infection (1.1.3.1.2), which comprehends bacterial (1.1.3.1.2.1), viral (1.1.3.1.2.2), and fungal (1.1.3.1.2.3) infections; autoimmunity (1.1.3.1.3); hypersensitivity or allergic reaction (1.1.3.1.4); and other cause (1.1.3.1.5).
- *Gingival pain attributed to malignant lesion* (1.3.1.2)

It is worth emphasizing that although gingivitis is most often not painful, pain may occur in acute inflammatory states due to trauma, infection, and systemic or local immunoreactions. The infections include the more common pericoronitis and periodontal and endodontic infections that affect the gingival tissue but also acute necrotizing ulcerative gingivitis and several other specific infections. Immunosuppression increases the probability of infection and pain. This type of pain is inflammatory in nature and often coexists with periodontal pain or mucosal pain.

Neuropathic and idiopathic pain may also be located to the gingivae, and these pain origins are described in separate sections. For the endodontist, this is especially noteworthy because in cases of nonodontogenic “tooth pain,” patients often express that the pain is located not “in” the tooth but rather “between,” “behind,” or “under” the tooth, and the gingivae may be very tender to pressure or periodontal probing despite the absence of

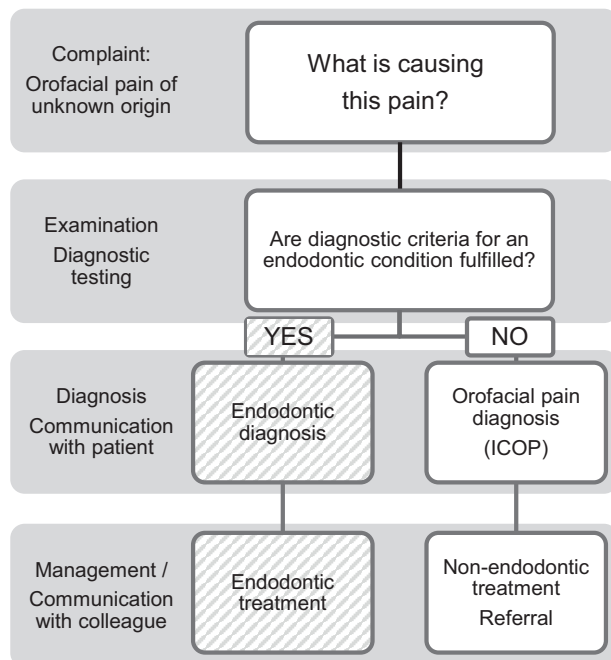


FIGURE 3 – Proposed application of the ICOP in endodontic specialist care. From a pain perspective, the primary concern of the endodontist is to identify and manage endodontic pain. With a confirmed endodontic diagnosis suggesting pain of clearly endodontic origin, an ICOP diagnosis is not required but may be helpful to verify that the proposed treatment is appropriate and to monitor the outcome. If the pain is not of endodontic origin, tentative or confirmed ICOP diagnoses may be useful to indicate possible strategies forward and to support a clear communication with patient and colleagues.

common clinical inflammatory markers such as redness, swelling, or bleeding.

1.2 Oral Mucosal, Salivary Gland, and Jaw Bone Pains

This category includes pain caused by a lesion or disorder affecting the nondental oral and perioral tissues, including the oral mucosa, the salivary glands, and the jawbone tissues.

1.2.1 Oral mucosal pain is defined as pain caused by a disease or disorder involving the oral mucosa. It is subcategorized based on the underlying condition, which includes inflammation and malignant lesion.

- *Oral mucosal pain attributed to oral mucosal inflammation (1.2.1.1)* is further subcategorized based on the cause of the inflammation as follows: trauma or injury (1.2.1.1.1), which comprehends noniatrogenic trauma or injury (1.2.1.1.1.1), surgical or other local iatrogenic injury (1.2.1.1.1.2), and radiation/chemotherapy (1.2.1.1.1.3); infection (1.2.1.1.2), which comprehends bacterial (1.2.1.1.2.1), viral (1.2.1.1.2.2), and fungal (1.2.1.1.2.3) infections; autoimmunity (1.2.1.1.3); hypersensitivity or allergic reaction (1.2.1.1.4); and oral mucosal inflammation due to other cause (1.2.1.1.5).

- *Oral mucosal pain attributed to malignant lesion (1.2.1.2).*

Neuropathic and idiopathic pain can also be located to the oral mucosa and is described under these sections, respectively.

1.2.2 Salivary gland pain is defined as pain caused by a lesion or disorder involving the salivary glands. It is subcategorized based on the underlying cause as follows: obstruction of the salivary duct (1.2.2.1); infection (1.2.2.2), which comprehends bacterial (1.2.2.2.1) and viral (1.2.2.2.2) infections; recurrent juvenile parotitis (1.2.2.3); immunologic disorder (1.2.2.4); and other cause (1.2.2.5).

This type of pain seldom presents a differential diagnostic dilemma in the context of tooth pain, but an acute infection of a salivary gland (eg, acute bacterial sialadenitis) may produce a painful swelling that could be mistaken for an abscess of dental origin and may be accompanied by malaise, fever, and cervical lymphadenopathy. Painful viral infections include mumps, human immunodeficiency virus, and cytomegalovirus infection. Obstruction of the salivary gland or duct may induce pain and causes include sialolithiasis, space-occupying lesion (benign or malignant tumor), and traumatic/iatrogenic injury.

1.2.3 Jawbone pain is defined as pain caused by a lesion or disorder involving the jawbone tissue. It is subcategorized based on the underlying cause as follows: trauma or injury (1.2.3.1); infection (1.2.3.2), which comprehends bacterial (1.2.3.2.1), viral (1.2.3.2.2), and fungal (1.2.3.2.3) infections; local benign lesion (1.2.3.3); malignant lesion (1.2.3.4), which is further subcategorized based on location (ie, local [1.2.3.4.1] and remote [1.2.3.4.2] malignancy); therapy (1.2.3.5); and systemic disease (1.2.3.6).

Jaw injuries related to sports injuries or motor vehicle accidents may cause pain, and fractures, especially of the mandible, can be difficult to identify. An undiagnosed fracture may mimic pain from a tooth. If the anamnestic information suggests a recent trauma to the jaws, this cause for pain should be excluded before invasive dental treatment (endodontic treatment or extraction).

Another differential diagnosis of interest to the endodontist is infection of the jawbone, which may cause unusual dental complications including devitalization of dental pulp and subsequent apical periodontitis, sometimes with root resorptions. The infection is often bacterial (eg, osteomyelitis, a severely painful condition that may or may not be a sequel to an odontogenic infection and may induce osteonecrosis of the jaws). Among the therapy-related painful conditions, medication-related osteonecrosis of the jaw is important to be aware of because it typically presents as pain, infection, and necrotic bone in patients treated with bisphosphonate or other antiresorptive or antiangiogenic medications. There is risk of misdiagnosis as dental pain. Periapical pathology and dentoalveolar surgery are risk factors⁶, and to eliminate persistent infection and avoid extraction, the indications for nonsurgical endodontic retreatment may be expanded.

2 Myofascial Orofacial Pain

2.1 Primary myofascial orofacial pain is pain in masticatory muscles, with or without functional impairment, not attributable to another disorder.

2.1 Primary myofascial orofacial pain

Diagnostic criteria:

- Myofascial pain fulfilling criteria B–D
- Occurring in one or more episodes,¹ or unremitting
- Reported in the jaw, temple, ear and/or in front of ear, with both of the following:
 - confirmation on examination of location(s) in the temporalis and/or masseter muscle(s)

2. provoked by either or both of:
 - a) palpation of the temporalis and/or masseter muscle(s)
 - b) maximum unassisted or assisted jaw opening movement(s)
- D. Modified² by jaw movement, function or parafunction (e.g. tooth-grinding or clenching)
- E. Not better accounted for by another ICOP diagnosis.

Notes:

1. Episodes may be single or recurrent within any day, each lasting at least 30 minutes and with a total duration within the day of at least 2 hours.
2. Pain may be increased or decreased.

Primary myofascial orofacial pain is subcategorized based on duration into acute (2.1.1) and chronic (2.1.2) subforms. It is further subcategorized based on frequency as follows: infrequent (2.1.2.1), frequent (2.1.2.2), which includes pain without pain referral (2.1.2.2.1) and with pain referral (2.1.2.2.2); and highly frequent (2.1.2.3) which includes pain without pain referral (2.1.2.3.1) and with pain referral (2.1.2.3.2).

2.2 Secondary myofascial orofacial pain is myofascial pain caused by an underlying disorder (inflammation, infection, or muscle spasm).

2.2 Secondary myofascial orofacial pain
Diagnostic criteria:

- A. Myofascial pain in any masticatory muscle, fulfilling criteria C and D
- B. An underlying disorder known to be able to cause myofascial pain¹ has been diagnosed
- C. Myofascial pain has both of the following characteristics:
 1. reported in the jaw, temple, ear and/or in front of ear, with both of the following:
 - a) confirmation on examination of location(s) in the affected muscle(s) or tendon(s)
 - b) provoked by palpation of the affected tendon(s) and/or maximum unassisted or assisted jaw opening movement(s)²
 2. modified³ by jaw movement, function or parafunction (e.g. tooth-grinding or clenching)
- D. Evidence of causation has been demonstrated⁴
- E. Not better accounted for by another ICOP diagnosis.

Notes:

1. The disorder is specified in each subform.
2. These signs may be demonstrated during physical examination or, in the case of pain that has already resolved, reported in the history.

3. Pain may be increased or decreased.
4. The necessary evidence is specified in each subform.

Secondary myofascial orofacial pain is subcategorized based on underlying cause as follows: tendonitis (2.2.1), myositis (2.2.2), and muscle spasm (2.2.3).

The main feature of myofascial orofacial pain is increased pain during provocation with jaw movements or palpation of the masticatory muscles.

From the endodontist's perspective, it is very important to be able to correctly identify pain of muscular origin because it may masquerade as odontogenic pain⁷. The main reason for this is to be able to distinguish pain from a local cause from referred pain. A tender tooth is often interpreted as periodontal pain due to endodontic disease, but a large proportion of patients with myofascial orofacial pain also experience tooth pain⁸ originating in adjacent muscles. Given that myofascial orofacial pain is so common in the adult population, many teeth may receive needless root canal treatments due to misdiagnosis. If the patient with a tender tooth has a temporomandibular disorder (TMD) pain diagnosis, referred pain should be excluded before invasive dental treatment unless clear signs of tooth pathosis are present. The universally accepted Diagnostic Criteria for Temporomandibular Disorders (DC/TMD) provide a structured examination protocol that enables the dentist to exclude referred pain from orofacial muscular sites⁹, but palpation of additional muscles is needed to assess all muscles known to refer pain that is perceived at "tooth" pain¹⁰.

3 Temporomandibular Joint Pain

3.1 Primary temporomandibular joint pain is pain localized to the temporomandibular joint (TMJ), occurring at rest or during jaw movement or palpation, with no known causative disorder.

3.1 Primary temporomandibular joint pain
Diagnostic criteria:

- A. Pain in and/or in front of the ear(s), fulfilling criteria B–D
- B. Occurring in one or more episodes,¹ or unremitting
- C. Both of the following:
 1. confirmation on examination of location in the area(s) of one or both temporomandibular joint(s)
 2. provoked by either or both of:

- a) palpation of and/or around the lateral pole(s) of the mandibular condyle(s)
- b) maximum unassisted or assisted jaw opening, right or left lateral and/or protrusive movement(s)
- D. Modified² by jaw movement, function or parafunction (e.g. tooth-grinding or clenching)
- E. Not better accounted for by another ICOP diagnosis.

Notes:

1. Episodes may be single or recurrent within any day, each lasting at least 30 minutes and with a total duration within the day of at least 2 hours.
2. Pain may be increased or decreased.

Primary TMJ pain is subcategorized based on duration into acute (3.1.1) and chronic (3.1.2) subforms. The chronic form is further subcategorized based on frequency as follows: infrequent (3.1.2.1), frequent (3.1.2.2), which includes pain without pain referral (3.1.2.2.1) and with pain referral (3.1.2.2.2); and highly frequent (3.1.2.3), which includes pain without pain referral (3.1.2.3.1) and with pain referral (3.1.2.3.2)

3.2 Secondary temporomandibular joint pain is pain localized to the TMJ and caused by another identified disorder.

3.2 Secondary temporomandibular joint pain
Diagnostic criteria:

- A. Pain in the jaw, temple(s), ear(s) and/or in front of the ear(s), fulfilling criteria C and D
- B. An underlying disorder known to be able to cause temporomandibular joint (TMJ) pain¹ has been diagnosed²
- C. The pain has all the following 3 characteristics:
 1. located in the area(s) of the TMJ(s), with confirmation on examination
 2. provoked by either or both of:
 - a) palpation of and/or around the lateral pole(s) of the mandibular condyle(s)³
 - b) maximum unassisted or assisted jaw opening, right or left lateral and/or protrusive movement(s)³
 3. modified⁴ by jaw movement, function or parafunction (e.g. tooth-grinding or clenching)
- D. Evidence of causation demonstrated by at least 2 of the following:⁵
 1. the pain has developed in temporal relation to onset or substantial worsening of the presumed causative disorder, or has led to its discovery
 2. the pain has significantly⁶ worsened in parallel with progression of the presumed causative disorder

3. the pain has significantly⁶ improved or resolved in parallel with improvement in or resolution⁷ of the presumed causative disorder

E. Not better accounted for by another ICOP diagnosis.

Notes:

1. The disorder is specified in each subform.
2. Diagnosis is according to the Expanded DC/TMD Taxonomy definition.
3. These signs may be demonstrated during physical examination or, in the case of pain that has already resolved, reported in the history.
4. The pain may be increased or decreased.
5. Additional and/or alternative evidence of causation is specified in some subforms.
6. Such that the patient describes a step-change in intensity.
7. Spontaneously or through treatment.

Secondary temporomandibular joint pain is subcategorized based on the underlying disorder as follows: inflammation (arthritis; 3.2.1), structural changes (3.2.2–3.2.3), or injury (3.2.4).

- Temporomandibular joint pain attributed to arthritis (3.2.1) is further based on the type of arthritis, nonsystemic (3.2.1.1) and systemic (3.2.1.2). Nonsystemic arthritis includes inflammation due (for example) to trauma, infection, crystal deposition, or autoimmune disorder.
- *Temporomandibular joint pain attributed to disc displacement (3.2.2)* is further subcategorized based on the type of disc displacement, with reduction (3.2.2.1; subtype: with intermittent locking, 3.2.2.1.1) and without reduction (3.2.2.2).
- *Temporomandibular joint pain attributed to degenerative joint disease (3.2.3)*
- *Temporomandibular joint pain attributed to subluxation (3.2.4)*

The main feature of TMJ pain is increased pain during provocation with jaw movements or palpation of the TMJ area.

Temporomandibular joint pain, like myofascial orofacial pain, can refer to the dentoalveolar region, although this is less common than for muscle pain. The DC/TMD protocol is recommended to identify TMJ arthralgia, arthritis, and joint disorders of diagnostic interest⁹. A clinical diagnostic algorithm for TMJ arthritis has also been proposed¹¹.

4 Orofacial Pain Attributed to Lesion or Disease of the Cranial Nerves

This category includes neuropathic pain in the distribution of the trigeminal and

glossopharyngeal nerves. Other, less common clinical pain entities involving other cranial nerves are not included; these are classified in the ICHD-3².

4.1 Pain attributed to lesion or disease of the trigeminal nerve is facial or intraoral pain in the distribution of 1 or more branches of the trigeminal nerve, indicative of neural damage and not caused by another disorder. Common causes for nerve damage are demyelination, space-occupying lesion, chemotherapy, and trauma.

Trigeminal nerve pain is subcategorized based on the underlying neuropathic condition as follows: trigeminal neuralgia (4.1.1), which comprehends classical (4.1.1.1), secondary (4.1.1.2), and idiopathic (4.1.1.3) types. Trigeminal neuropathic pain other than trigeminal neuralgia is subcategorized based on the underlying cause including herpes zoster (4.1.2.1), postherpetic neuralgia (4.1.2.2), posttraumatic trigeminal neuropathic pain (4.1.2.3; with subcategory probable posttraumatic trigeminal neuropathic pain, 4.1.2.3.1); other disorder (4.1.2.4); and idiopathic neuropathic pain (4.1.2.5)

- Classical trigeminal neuralgia is further subcategorized based on clinical presentation (ie, purely paroxysmal type [4.1.1.1.1] and paroxysmal with concomitant continuous pain [4.1.1.1.2]).
- Secondary trigeminal neuralgia is further subcategorized based on underlying cause (ie, multiple sclerosis [4.1.1.2.1], space-occupying lesion [4.1.1.2.2], and other cause [4.1.1.2.3]).
- Idiopathic trigeminal neuralgia is further subcategorized based on clinical presentation (ie, purely paroxysmal type [4.1.1.3.1] and paroxysmal with concomitant continuous pain [4.1.1.3.2]).

Posttraumatic trigeminal neuropathic pain (4.1.2.3) occurs after injury of the peripheral nerve branches, typically accidental trauma or surgical injury, which may include root canal treatment. It is worth special attention from the perspective of differential diagnosis of tooth pain because the symptoms alone may closely resemble inflammatory tooth pain (pulpitis and apical periodontitis), and it is often misdiagnosed as such despite the lack of clinical signs of pathology or inflammation. Persistent pain in a previously treated tooth is often interpreted as remaining root canal infection, suggesting that orthograde or retrograde retreatment or extraction of the tooth will be effective to alleviate the pain. However, this is not the case if the pain is neuropathic; instead, the pain may increase because the new trauma to the nerve

branches will induce further damage, and invasive treatments should be avoided.^{12,13} This type of pain was previously termed anesthesia dolorosa, painful posttraumatic trigeminal neuropathy, and primary persistent dentoalveolar pain disorder¹⁴.

4.1.2.3 Post-traumatic trigeminal neuropathic pain

Diagnostic criteria:

- A. Pain, in a neuroanatomically plausible area within the distribution(s) of one or both trigeminal nerve(s), persisting or recurring for >3 months and fulfilling criteria C and D
- B. Both of the following:
 1. history of a mechanical, thermal, radiation or chemical injury to the peripheral trigeminal nerve(s)
 2. diagnostic test confirmation¹ of a lesion of the peripheral trigeminal nerve(s) explaining the pain²
- C. Onset within 6 months after the injury³
- D. Associated with somatosensory symptoms and/or signs⁴ in the same neuroanatomically plausible distribution
- E. Not better accounted for by another ICOP or ICHD-3 diagnosis⁵.

Notes:

1. Tests that confirm a relevant lesion or disease affecting the trigeminal nerve may, for example, be surgical or radiological confirmation of nerve compression or lesion, nerve conduction study, laser-evoked potentials, blink reflex or skin biopsy confirmation of reduced nerve fibre terminals. Positive findings in these investigations may provide important diagnostic hints at the source of pain. However, all clinical and diagnostic aspects of the pain need to be considered.
2. The severity of nerve injuries may range from mild to severe. They include external trauma and iatrogenic injuries from dental treatments such as local anaesthetic injections, root canal therapies, extractions, oral surgery, dental implants, orthognathic surgery and other invasive procedures.
3. Specifically following radiation-induced postganglionic injury, neuropathic pain may appear after >3 months.
4. Somatosensory symptoms or signs may be negative (e.g. hypoesthesia and/or hypoalgesia) and/or positive (e.g. hyperalgesia and/or allodynia). Note that positive somatosensory signs are not specific to neuropathy. Negative or positive somatosensory signs consistent with the distribution of the pain may be sufficient to indicate the presence of a lesion of the trigeminal nerve. The clinical examination is supplemented by laboratory tests such as quantitative sensory testing.

4.2 Pain attributed to a lesion or disease of the glossopharyngeal nerve is pain in the distribution of the glossopharyngeal nerve, indicative of neural damage and not caused by another disorder.

Glossopharyngeal nerve pain comprehends classical glossopharyngeal neuralgia (4.2.1.1), secondary glossopharyngeal neuralgia (4.2.1.2), and idiopathic glossopharyngeal neuropathic pain (4.2.1.3). The conditions are infrequent, and from a tooth pain perspective, the differential diagnostic interest is limited.

5. Orofacial pains resembling presentations of primary headaches have the characteristics and associated features of primary headaches as described in the ICHD-3 but with no head pain. For endodontists, these conditions are important to be aware of because tooth pain can be a part of the clinical presentation and sometimes the only finding¹⁵⁻¹⁷. Moreover, the clinical presentation may be very misleading, having signs and symptoms similar to pulpitis¹⁸. Therefore, it behooves the thoughtful endodontist to explore for associated symptoms to ensure the complaint of tooth pain is not part of a headache or orofacial pain disorder.

Orofacial pains resembling presentations of primary headaches are subcategorized based on the headache condition as follows: orofacial migraine (5.1), including episodic (5.1.1) and chronic (5.1.2) types; tension-type orofacial pain (5.2); and trigeminal autonomic orofacial pain (5.3), further subcategorized based on clinical presentation as orofacial cluster attacks (5.3.1) of episodic (5.3.1.1) and chronic (5.3.1.2) types, paroxysmal hemifacial pain (5.3.2) of episodic (5.3.2.1) and chronic (5.3.2.2) types, short-lasting unilateral neuralgiform facial pain attacks with cranial autonomic symptoms (SUNFA; 5.3.3) of episodic (5.3.3.1) and chronic (5.3.3.2) types, hemifacial continuous pain with autonomic symptoms (5.3.4), and finally neurovascular orofacial pain (5.4) including short-lasting (5.4.1) and long-lasting (5.4.2) types.

Of special interest to the endodontist because of the clinical presentation, which can be mistaken for inflammatory dental pain, is neurovascular orofacial pain (5.4).

5.4 Neurovascular orofacial pain

Diagnostic criteria:

- A. At least five attacks of unilateral intraoral pain¹ of variable duration, without head pain, fulfilling criteria B–D
- B. Pain has both of the following characteristics:
 1. moderate or severe intensity

2. either or both of the following qualities:
 - a) toothache-like
 - b) pulsating
- C. Pain is accompanied by at least one of the following:
 1. ipsilateral lacrimation and/or conjunctival injection
 2. ipsilateral rhinorrhoea and/or nasal congestion
 3. ipsilateral cheek swelling
 4. photophobia and/or phonophobia
 5. nausea and/or vomiting
- D. Pain is unexplained by any local cause, and clinical and radiographic examinations are normal
- E. Not better accounted for by another ICOP or ICHD-3 diagnosis.

Note:

1. Although essentially an intraoral pain, there may be referral and/or radiation to adjacent sites, particularly when pain is severe. This phenomenon needs to be carefully followed and documented.

Neurovascular orofacial pain (NVOP) may imitate dental pulpitis of infectious/inflammatory origin and is important for the endodontist to be aware of for diagnostic and therapeutic purposes¹⁸. The hypothesized mechanism is neurogenic inflammatory activation within the space confined by dentin around the dental pulp, expressed in strong paroxysmal pain and typical allodynia to cold foods¹⁹. The clinical presentation differs from *pain attributed to pulpitis* (1.1.1.3) mainly by the presence of autonomic and systemic accompanying signs. NVOP is amenable to abortive and prophylactic antimigraine therapies, distinguishing NVOP from *posttraumatic trigeminal neuropathic pain* (4.1.2.3)²⁰.

6. Idiopathic orofacial pain is unilateral or bilateral intraoral or facial pain in the distribution(s) of 1 or more branches of the trigeminal nerve(s) for which the etiology is unknown. It is subcategorized based on clinical presentation as follows: burning mouth syndrome (6.1) without somatosensory changes (6.1.1) or with somatosensory changes (6.1.2) and with a special category for identical symptoms but with pain duration <3 months (6.1.3), persistent idiopathic facial pain (6.2) without somatosensory changes (6.2.1) or with somatosensory changes (6.2.2) and pain with duration <3 months (6.2.3), persistent idiopathic dentoalveolar pain (6.3) without somatosensory changes (6.3.1) or with somatosensory changes (6.3.2) and pain with duration <3 months (6.3.3), and constant unilateral facial pain with additional attacks (CUFPA; 6.4)

Although burning mouth syndrome, persistent idiopathic facial pain, and constant unilateral facial pain with additional attacks

seldom present differential diagnostic difficulties for the endodontist, *persistent idiopathic dentoalveolar pain* (6.3) is of great differential diagnostic interest because the presentation resembles inflammatory dental pain and also has clear similarities with *posttraumatic trigeminal neuropathic pain* (4.1.2.3). Anamnestic information is characterized by a long duration of pain, the presence of psychological conditions and local and/or distant comorbid chronic pain conditions, and multiple interventions often involving several different health providers²¹. A history of local trauma may be reported but in unclear temporal relation to the onset of pain. Somatosensory changes may occur but not spatially confined to neuroanatomically relevant areas. Idiopathic orofacial pain is poorly understood, but findings from recent studies suggest neuropathic involvement in the pathophysiology of these conditions²². However, the evidence is inconclusive given that case selection in some studies have included patients with a history of a trauma as well as those without an identified trauma.

This type of pain was previously termed atypical odontalgia, primary persistent dentoalveolar pain disorder, and phantom tooth pain^{23,24}.

6.3 Persistent idiopathic dentoalveolar pain

Diagnostic criteria:

- A. Intraoral dentoalveolar pain fulfilling criteria B and C
- B. Recurring daily for >2 hours/day for >3 months¹
- C. Pain has both of the following characteristics:
 1. localized to a dentoalveolar site (tooth or alveolar bone)²
 2. deep, dull, pressure-like quality³
- D. Clinical and radiographic examinations are normal,⁴ and local causes have been excluded
- E. Not better accounted for by another ICOP or ICHD-3 diagnosis.⁵

Notes:

1. Prior to 3 months, if all other criteria are fulfilled, code as 6.3.3 *Probable persistent idiopathic dentoalveolar pain*.
2. Pain is rarely in multiple sites. With time, it may spread to a wider area of the craniocervical region.
3. A wide variety of words are used to describe the character and quality of the pain. It may be described as either deep or superficial, and adjunctive symptom description may be employed to explain the complexity of sensations associated with this disorder. Furthermore, the pain can have exacerbations and be aggravated by stress.
4. Clinical somatosensory assessment with pinprick or light touch perception only

very rarely reveals sensory abnormalities. Nociceptive pain reflecting altered processing in the somatosensory system may be present, and related to alteration in the modulatory pain inhibitory system.

5. Quantitative sensory testing differentiates the 2 subtypes. A diagnosis of 6.3 *Persistent idiopathic dentoalveolar pain* implies that quantitative sensory testing has not been performed. Once it has, either of the 2 subtypes 6.3.1 *Persistent idiopathic dentoalveolar pain without somatosensory changes* or 6.3.2 *Persistent idiopathic dentoalveolar pain with somatosensory changes* should be diagnosed.

DISCUSSION

Clear terminology within a classification system allows for improved communication between and within dental and medical specialties for clinical and research purposes, which has been achieved with the development of the ICOP. Besides this obvious achievement, having both diagnoses of painful odontogenic and painful nonodontogenic disorders with criteria based on the best available evidence list in 1 classification system provides the dental clinician with a single-source document to refer to when assessing their patients. Although dentists will not need to refer to this document for routine care, they will find it valuable in guiding thinking when encountering less routine and diagnostically challenging situations. The endodontist who is not familiar with diagnosing nonodontogenic etiologies for “toothache” complaints, which is common in endodontic practice^{8,25}, is provided a way to at least categorize the etiology for their patients’ pain complaint and a clue to how best to manage them, such as identifying the appropriate provider to refer to. Furthermore, the inclusion of chapter 7, which deals with psychosocial assessment, helps guide the dentist in taking these important factors into consideration diagnostically and management-wise because they are known to affect pain in general²⁶ and orofacial pains in specific^{9,27}.

The ICOP has purposefully adopted the same format as the headache disorder classification (ie, ICHD-3), thus providing commonality across disciplines. This is advantageous in that our physician colleagues will be able to understand, and maybe even use, the ICOP. A less obvious benefit is that these diagnoses are written to be mutually exclusive, meaning that our physician colleagues would technically need to rule out ICOP diagnoses that may account for pain complaints when considering an ICHD-3 diagnosis.

Both the ICOP and the ICHD-3 classification systems are embedded within the International Association for the Study of Pain (IASP) pain classification system²⁸ and *ICD-11*²⁹. This is an exceptionally important step because the *ICD* classification system, which covers all health diagnoses, will comprehensively include dental pain diagnoses. The *ICD* system is the ubiquitous coding system used by commercial electronic health records, medical health insurance companies, and policy makers, and, therefore, representation within this universally accepted coding system allows for pain dental diagnoses to be included in the same records as all other medical diagnoses. This is important in the current climate of “big data,” meaning large databases of health records, because inclusion of painful dental diagnoses allow for the assessment of the impact dental conditions have on overall health.

The *ICD* system provides the diagnostic codes for Systematized Nomenclature of Medicine (SNOMED), and associated findings, signs and symptoms, and outcomes are mapped. Also important is that ADA endorses and maintains Systematized Nomenclature of Dentistry (SNODENT)³⁰, a dentistry-related subset of SNOMED. Therefore, it is expected that ICOP diagnoses that are now within *ICD-11* and part of SNOMED will at some time be cross-referred within SNODENT. What the reader needs to know is that SNOMED (and thus SNODENT) is a polyhierarchical lexicon that includes all components of a health record, whereas the diagnostic coding is only 1 part of this lexicon. The terminology for some diagnoses within the ICOP, namely myofascial pain (chapter 2) and TMJ pain (chapter 3), are already represented within SNODENT using similar terminology, whereas others, such as neuropathic pain (chapter 4) and orofacial pain resembling primary headaches (chapter 5), are not included within SNODENT. Orofacial pain attributed to disorders of the dentoalveolar and anatomically relevant structures (chapter 1) is represented in SNODENT but with partially different terminology. SNODENT has an existing process that allows for updating and curating their lexicon as well as the mapping related to the hierarchical relationships. The ICOP, which provides diagnostic criteria and some organizational structure, can provide guidance to those involved in SNODENT curation to more fully develop this area.

The ICOP nomenclature is fairly well aligned with the diagnostic terminology recommended by the American Association of Endodontists, but although the American Association of Endodontists’ diagnoses aim to identify pathologic conditions of the pulp and periapical tissues that are often but not

always associated with pain as a symptom, ICOP uses as the starting point the occurrence of the pain itself and instead identifies which tissue states and events the pain can likely be attributed to. This can appear to be of limited usefulness in the clinic because the endodontic diagnosis will in many cases provide sufficient direction for a treatment decision. However, 1 of the most debated endodontic dilemmas is how to distinguish reversible pulpitis from irreversible pulpitis. We know that the presence, duration, or characteristics of pain fail to provide reliable diagnostic information⁴, and, indeed, new research seems to suggest that cases that we traditionally would identify as “irreversible pulpitis” may in fact be reversible given the optimal treatment³¹. Therefore, what we currently perceive as characteristic features may also need to be revised. In the ICOP, a biologically based cutoff measure for reversibility was adopted using the depth of the caries lesion (likely presence/absence of a functional barrier against invading microorganisms by the pulp-dentin complex) rather than clinical signs and symptoms.

Like all diagnostic classification systems, the ICOP was developed from expert opinions using available data. Diagnostic criteria were derived from the best available knowledge. Validated criteria were used if available, and, if absent, criteria were formulated by the workgroup discipline specialists and supplemented with the comment that data-driven criteria (validated through high-quality studies on diagnostic accuracy) are so far lacking, and there is thus a need for focused research. Given that the ICOP is newly developed, it is expected that there are instances in which criteria are not perfectly crafted and nomenclature is less than ideal, which is the biggest limitation with the ICOP. In parallel with other diagnostic classification systems, such as the American Psychiatric Association’s *Diagnostic and Statistical Manual of Mental Disorders*³², it is expected that refinements are made with each iteration. Therefore, we need to use it, test it, and discuss it in education (dental schools and postgraduate programs) settings as well as other clinical settings. Problems need to be identified and suggestions developed through research. Of greatest interest to endodontics is chapter 1, and because the current level of scientific support for endodontic diagnostic procedures is low, it would be ideal for leaders and researchers in this field to take an interest and develop the evidence that is also needed to refine and improve the ICOP for the betterment of dentistry.

ACKNOWLEDGMENTS

The authors wish to acknowledge the co-chairmen of the Orofacial Pain Classification Committee, Drs Rafael Benoliel (United States), Arne May (Germany), and Peter Svensson (Denmark), for their engaged leadership in developing the ICOP and the members of all workgroups for their expertise and extensive work. The collaborating associations providing support were the

Orofacial and Head Pain Special Interest Group of the International Association for the Study of Pain, the International Network for Orofacial Pain and Related Disorders Methodology of the International Association of Dental Research, the American Academy of Orofacial Pain, and the International Headache Society.

We also wish to thank Dr Mark Jurkovich, for his support in the discussion

related to SNODENT. Dr Jurkovich leads the International Health Terminology Standards and Development Organization's Dentistry Clinical Reference Group. The Clinical Reference Group provides expertise in the development of Systematized Nomenclature of Medicine Clinical Terms terminology related to dental care. He is also a member of the Standards Committee on Dental Informatics.

The authors deny any conflicts of interest related to this study.

REFERENCES

1. International Classification of Orofacial Pain, 1st edition (ICOP). *Cephalalgia* 2020;40:129–221.
2. Headache Classification Committee of the International Headache Society (IHS) The International Classification of Headache Disorders, 3rd edition. *Cephalalgia* 2018;38:1–211.
3. Demirbas Kaya A, Aktener BO, Unsal C. Pulpal necrosis with sickle cell anaemia. *Int Endod J* 2004;37:602–6.
4. Mejare IA, Axelsson S, Davidson T, et al. Diagnosis of the condition of the dental pulp: a systematic review. *Int Endod J* 2012;45:597–613.
5. Levin LG, Law AS, Holland GR, et al. Identify and define all diagnostic terms for pulpal health and disease states. *J Endod* 2009;35:1645–57.
6. Ruggiero SL, Dodson TB, Fantasia J, et al. American Association of Oral and Maxillofacial Surgeons position paper on medication-related osteonecrosis of the jaw—2014 update. *J Oral Maxillofac Surg* 2014;72:1938–56.
7. Wright EF. Referred craniofacial pain patterns in patients with temporomandibular disorder. *J Am Dent Assoc* 2000;131:1307–15.
8. Nixdorf DR, Law AS, John MT, et al. Differential diagnoses for persistent pain after root canal treatment: a study in the National Dental Practice-based Research Network. *J Endod* 2015;41:457–63.
9. Schiffman E, Ohrbach R, Truelove E, et al. Diagnostic Criteria for Temporomandibular Disorders (DC/TMD) for Clinical and Research Applications: recommendations of the International RDC/TMD Consortium Network* and Orofacial Pain Special Interest Groupdagger. *J Oral Facial Pain Headache* 2014;28:6–27.
10. Mattscheck D, Law AS, Nixdorf DR. Diagnosis of nonodontogenic toothache. In: Berman LH, Hargreaves KM, editors. *Cohen's Pathways of the Pulp Expert Consult*. 11th ed. St Louis, MO: Mosby (imprint); 2015. p. 684–705.
11. Alstergren P, Pigg M, Kopp S. Clinical diagnosis of temporomandibular joint arthritis. *J Oral Rehabil* 2018;45:269–81.
12. Durham J, Exley C, John MT, Nixdorf DR. Persistent dentoalveolar pain: the patient's experience. *J Orofac Pain* 2013;27:6–13.
13. Baad-Hansen L, Benoliel R. Neuropathic orofacial pain: facts and fiction. *Cephalalgia* 2017;37:670–9.
14. Nixdorf DR, Drangsholt MT, Ettlin DA, et al. Classifying orofacial pains: a new proposal of taxonomy based on ontology. *J Oral Rehabil* 2012;39:161–9.
15. Alonso AA, Nixdorf DR. Case series of four different headache types presenting as tooth pain. *J Endod* 2006;32:1110–3.
16. Nixdorf DR, Velly AM, Alonso AA. Neurovascular pains: implications of migraine for the oral and maxillofacial surgeon. *Oral Maxillofac Surg Clin North Am* 2008;20:221–35. vi–vii.
17. Lambrou G, Elias LA, Yakkaphan P, Renton T. Migraine presenting as isolated facial pain: a prospective clinical analysis of 58 cases. *Cephalalgia* 2020;40:1250–4.
18. Czerninsky R, Benoliel R, Sharav Y. Odontalgia in vascular orofacial pain. *J Orofac Pain* 1999;13:196–200.

19. Sharav Y, Katsarava Z, Charles A. Facial presentations of primary headache disorders. *Cephalgia* 2017;37:714–9.
20. Haviv Y, Zini A, Keshet N, et al. Features of neurovascular orofacial pain compared to painful posttraumatic trigeminal neuropathy. *J Oral Facial Pain Headache* 2020;34:121–8.
21. Baad-Hansen L, Leijon G, Svensson P, List T. Comparison of clinical findings and psychosocial factors in patients with atypical odontalgia and temporomandibular disorders. *J Orofac Pain* 2008;22:7–14.
22. Forssell H, Jaaskelainen S, List T, et al. An update on pathophysiological mechanisms related to idiopathic oro-facial pain conditions with implications for management. *J Oral Rehabil* 2015;42:300–22.
23. Nixdorf D, Moana-Filho E. Persistent dento-alveolar pain disorder (PDAP): working towards a better understanding. *Rev Pain* 2011;5:18–27.
24. Baad-Hansen L. Atypical odontalgia - pathophysiology and clinical management. *J Oral Rehabil* 2008;35:1–11.
25. Linn J, Trantor I, Teo N, et al. The differential diagnosis of toothache from other orofacial pains in clinical practice. *Aust Dent J* 2007;52(Suppl):S100–4.
26. Campbell CM, Edwards RR. Mind-body interactions in pain: the neurophysiology of anxious and catastrophic pain-related thoughts. *Transl Res* 2009;153:97–101.
27. Sharma S, Breckons M, Bronnimann Lambelet B, et al. Challenges in the clinical implementation of a biopsychosocial model for assessment and management of orofacial pain. *J Oral Rehabil* 2020;47:87–100.
28. Benoliel R, Svensson P, Evers S, et al. The IASP classification of chronic pain for ICD-11: chronic secondary headache or orofacial pain. *Pain* 2019;160:60–8.
29. ICD-11. *Lancet* 2019;393:2275.
30. ADA. SNODENT systematized nomenclature of dentistry. 2020. Available at: <https://www.ada.org/en/member-center/member-benefits/practice-resources/dental-informatics/snodent>. Accessed January 16, 2021.
31. Lin LM, Ricucci D, Saoud TM, et al. Vital pulp therapy of mature permanent teeth with irreversible pulpitis from the perspective of pulp biology. *Aust Endod J* 2020;46:154–66.
32. American Psychiatric Association. *Diagnostic and Statistical Manual of Mental Disorders (DSM)*. 5th ed. Arlington, VA: American Psychiatric Association Publishing; 2013.