

Referred otalgia

Common causes and evidence-based strategies for assessment and management

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Abstract

Objective To provide family physicians and general otolaryngologists with a practical, evidence-based, and comprehensive approach to the management of patients presenting with suspected referred otalgia.

Sources of information The approach described is a review based on the authors' clinical practices along with research and clinical review articles published between 2000 and 2020. MEDLINE and PubMed were searched using the terms *otalgia*, *referred otalgia*, and *secondary otalgia*. Current guidelines for the management of referred otalgia were also reviewed.

Main message Otalgia is defined as pain localized to the ear. It is one of the most common head and neck presentations in primary care, otolaryngology, and emergency medicine. Secondary otalgia arises from nonotologic pathology and represents nearly 50% of otalgia cases. Otalgia in the absence of other otologic symptoms is highly indicative of a secondary cause. A thorough assessment of patients presenting with referred otalgia requires an understanding of the possible causes of this condition, including dental and oral mucosal pathologies, temporomandibular joint disorders, cervical spine pathology, sinusitis, upper airway infection, and reflux, as well as head and neck malignancy. This paper aims to highlight the most common causes of referred otalgia, their presentations, and initial options for assessment and management.

Conclusion The prevalence of referred otalgia makes this an important condition for family physicians to be able to assess, manage, and triage based on patient presentation and examination. Understanding the common causes of referred otalgia will help reduce wait times for specialist assessment and allow ease and speed of access to management options for patients in community clinics.

Otalgia is subjective pain localized to the ear and can be categorized into 2 subtypes: primary and secondary (also known as referred) otalgia. Primary otalgia is pain resulting from pathology within the inner, middle, or external ear and is most often associated with additional otologic symptoms such as hearing loss, tinnitus, otorrhea, or vertigo.^{1,2} Secondary otalgia results from nonotologic pathology arising from outside of the ear, and represents nearly 50% of otalgia cases.² Subjective otalgia in the absence of other otologic symptoms is highly indicative of a secondary cause. There are 4 cranial nerves (CN V, CN VII, CN IX, and CN X) and 2 upper cervical nerves (C2 and C3) that contribute to sensory innervation of the ear.³ The converging neural pathways from the ear and other organs lead to numerous potential causes of secondary otalgia. A thorough assessment of patients presenting with secondary otalgia requires an understanding of possible causes of this referred condition, including head and neck malignancy, oral and dental causes such as temporomandibular disorder (TMD), cervical spine pathology, sinusitis, upper airway infection, and laryngopharyngeal reflux.

Editor's key points

- ▶ A complete examination of the head and neck should be performed for all patients presenting with otalgia, including palpation of the neck, examination of the oral cavity and oropharynx, anterior rhinoscopy, examination of cranial nerves, and otoscopy. Determining whether otalgia is best explained by a primary or secondary cause is essential.
- ▶ Primary causes of otalgia include hearing loss, tinnitus, otorrhea, vertigo, or previous otologic history. Secondary causes include dental and oral mucosal pathologies, temporomandibular joint disorders, cervical spine pathology, sinusitis, upper airway infection, and reflux, as well as head and neck malignancy.
- ▶ Head and neck cancer is the most critical diagnosis to exclude in patients presenting with suspected secondary causes of otalgia.
- ▶ Dental pathology is the most common cause of referred otalgia. Dental causes of otalgia can be difficult to diagnose in primary care settings and may require referral to a dental specialist.

Case description

A 34-year-old woman presents with a 3-month history of right-sided otalgia. She describes this as being deep within the ear canal and quantifies the intensity as ranging from 3 to 6 out of 10. She denies a history of hearing loss, otorrhea, or tinnitus. She denies odynophagia, dysphagia, or dysarthria. Her past medical history includes migraine headaches, for which she takes a triptan and anti-inflammatories. She denies a history of allergies or a family history of hearing loss at an early age. She is a non-smoker, tends to consume 1 drink per week, and denies the use of other recreational substances.

Sources of information

The review is based on the authors' clinical practices along with research and clinical review articles published between 2000 and 2020. MEDLINE and PubMed were searched using the terms *otalgia*, *referred otalgia*, and *secondary otalgia*. Current guidelines for the management of referred otalgia were reviewed. Guidelines for the evaluation and management of otalgia have been published by Ely et al⁴; however, these guidelines do not specifically focus on referred otalgia and include both primary and secondary causes of otalgia.

Main message

General patient evaluation. The first step when assessing a patient with otalgia should be to determine whether the cause is primary or secondary. In the absence of additional otologic symptoms—such as hearing loss, tinnitus, otorrhea, vertigo, or previously known otologic history (eg, previous ear surgery, recurrent ear infections, history of ear tubes, radiation to the head and neck)—a secondary cause should be considered. When taking a patient's history, clinicians should pay careful attention to the quality of the patient's pain, duration (time course and pattern), radiation to surrounding structures, and localization of the patient's otalgia (localized or diffuse, and location of localization).² When characterizing the timing of a patient's presentation, clinicians should explore the onset of the patient's pain, any associated factors or triggers (eg, upper respiratory tract infection, head trauma, recent surgery or medical intervention), and duration of symptoms.⁴ A complete examination of the head and neck is of utmost importance and should be performed for all patients presenting with otalgia,⁵ including palpation of the neck, examination of the oral cavity and oropharynx, anterior rhinoscopy (which can be performed using an otoscope), cranial nerve examination, and otoscopy.⁶ The tympanic membrane and middle ear structures should be evaluated using an otoscope with special attention paid to signs of infection, effusion, tympanic membrane integrity, or cholesteatoma.

Head and neck malignancy. Head and neck cancer is the most critical diagnosis to exclude in patients presenting with suspected referred sources of otalgia.⁴ Malignancies arising from the nasopharynx, hypopharynx, oropharynx, oral cavity, and larynx should be ruled out. Red flag features based on history that may increase the clinician's suspicion of malignancy include dysphonia (voice changes), dysphagia (difficulty swallowing), odynophagia (painful swallowing), dyspnea (shortness of breath), new neck mass, and history of smoking or alcohol use.^{4,7} Complete head and neck examination is critical in the evaluation of patients with suspected malignancies. In patient presentations with a high suspicion of malignancy, computed tomography imaging (with contrast) of the neck (soft tissue) and referral to an otolaryngologist for assessment with flexible nasopharyngoscopy should be considered.

Oral mucosal lesions. Benign and malignant lesions within the oral cavity may result in patient-reported otalgia.^{8,9} The trigeminal nerve (CN V) supplies sensation to both the ear and the mucosal surfaces of the oral cavity. This shared pathway results in infection and inflammatory disorders of the oral cavity manifesting clinically with otalgia, such as aphthous ulceration and malignancy.⁹ Careful examination of the mucous membranes of the oral cavity should be undertaken for all patients presenting with otalgia. As these lesions are readily visible on examination of the oral cavity, no further imaging is required for these lesions. Biopsies and referral to an otolaryngologist should be considered if malignancy is suspected as the cause of an oral cavity mucosal ulceration.

Dental pathology. The most common cause of non-otologic ear pain is dental pathology. The ear, mucosal surfaces of the oral cavity, and dentition share an embryologic origin in the first branchial arch and common innervation through the neural pathway of CN V.¹⁰ As the maxillary and mandibular branches of CN V supply mucous membranes of the oral cavity, gingiva, and dentition, dental pathology often manifests with ear pain given the shared innervation.

There are several potential contributors to dental origin of otalgia, including pulpitis, apical periodontitis, and pericoronitis. Pulpal pain arises secondary to inflammation of the dental pulp, which can occur because of thermal, chemical, or infective insults. The most common cause of pulpitis is dental caries.¹⁰ Apical periodontitis results from irreversible pulpitis, pulp necrosis, and subsequent extrusion of necrotic and inflammatory material into the apical periodontal tissues.¹⁰ Finally, pericoronitis arises from inflammation and infection due to accumulation of food and bacterial plaque in the space between the crown of the partially exposed tooth and the overlying flap of soft tissue of the wisdom teeth. These specific diagnoses, particularly when chronic, can result in radiation of pain to the ear.^{8,10}

If a dental cause of otalgia is suspected, clinicians can inspect the oral cavity for dental caries and look for any edematous soft tissue. Palpation of the gingiva and teeth can help differentiate pulpitis from apical periodontitis.¹⁰ Clinicians can also consider percussing the teeth using either a gloved finger or the blunt end of an instrument, such as a dental mirror, on the incisal and occlusal edges of teeth to test for pain or increased sensitivity.¹¹ It is worth noting that these presentations can be difficult to diagnose specifically in the primary care setting, and patients requiring further workup and management of otalgia with suspected dental causes should be referred to a dental specialist.

Temporomandibular disorders. *Temporomandibular disorder* is used to classify pathology related to the broad group of musculoskeletal and neuromuscular conditions of the temporomandibular joint (TMJ), muscles of mastication (lateral pterygoid, medial pterygoid, masseter, and temporalis muscles), and associated structures. These disorders affect up to 15% of adults and 7% of adolescents, and they represent the most common orofacial pain condition.¹² The causes of TMD include direct trauma to the mandible or TMJ, indirect trauma (eg, acceleration-deceleration injury, prolonged mouth opening during a dental or surgical procedure), repetitive microtrauma (eg, nail biting, bruxism), and systemic factors (eg, joint hypermobility, inflammatory arthritis). Bruxism is a common predisposing and exacerbating factor of TMD, with nearly half of patients with TMD reporting a history of bruxism.¹²

There are 3 cardinal features associated with TMDs: joint pain or pain associated with the muscles of mastication, joint noise (clicking, grinding, or clunking), and trismus. Pain associated with TMDs is often described as diffuse pain around the jaw joint, often radiating up to the temple and down to the neck. Variation in pain presentations is common and includes dull otalgia, which may be associated with aural fullness, headaches, or facial pain. Nighttime bruxism often leads to pain that predominates in the morning and decreases during the day, while stress-related clenching or bruxism during the day presents with nocturnal pain.

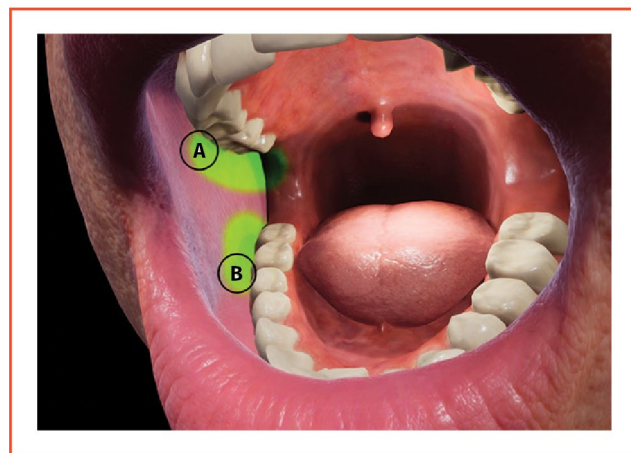
Dedicated examination of the TMJ is warranted in patients who present with TMD as the suspected cause of otalgia. Clinicians should assess for tenderness to palpation of the muscles of mastication both in the relaxed position and when the patient is clenching.¹² The lateral and medial pterygoid muscles can be palpated intraorally to elicit masticatory muscle tenderness (**Figure 1**). Range of mobility of the TMJ can be assessed by looking for abnormal lateral movements of the lower jaw on opening and closing of the mouth. Patients should also be assessed for trismus, which may be due to anteromedial displacement of the joint meniscus. When assessing patients in whom bruxism is thought to be the cause of TMD, clinicians should look for common features

consistent with bruxism, including worn incisal edges, flattened occlusal surfaces of the molars, scalloping of the lateral borders of the tongue, and ridging of the buccal mucosa at the occlusal line. The diagnostic burden for TMDs falls on the clinician's ability to take a history and conduct a physical examination, as there is no routine role for imaging in the investigation of TMD. Indications for imaging include suspected disc displacement, possible intra-articular inflammation or arthritis, failure or poor response to medical treatment, and surgical planning by an oral and maxillofacial surgeon.

The mainstay of treatment for patients with TMD is conservative therapy. The goals of treatment in this patient population are to decrease pain, restore function, and improve quality of life. Patients with myofascial pain without frank joint dysfunction benefit from conservative management including warm compresses, isometric jaw exercises, and nonsteroidal anti-inflammatory drugs. Patients may also benefit from the use of adjunct therapies. Physicians may consider referral to a physical therapist with TMJ expertise or to a dentist for fitting for a night guard to combat nocturnal bruxism, and they may consider cognitive behavioural therapy for mood disorders contributing to grinding and clenching of the jaw. Image-guided injection of the inferior joint space with corticosteroids is indicated when pain is a predominant feature and when imaging demonstrates an abnormal TMJ. For patients who are nonresponsive to conservative therapy, referral to an oral and maxillofacial surgeon may be considered for surgical intervention.

Cervical spine pathology. Cervical spine causes are often overlooked as possible sources of referred otalgia.¹³ In affected patients, pain is usually described as

Figure 1. Areas of lateral and medial pterygoid muscles to palpate intraorally to assess for tenderness related to otalgia: "A" indicates the area for superior and posterior palpation behind the last molars, localizing the lateral pterygoid muscle; "B" indicates the area for inferior and posterior palpation of the oral cavity along the medial aspect of the mandible, localizing the medial pterygoid muscle.



constant and retro-auricular or infra-auricular in location, with positional changes causing exacerbations.¹³ Cervical spine pathology related to referred otalgia is often due to cervical spine degenerative disease, which includes diagnoses of osteoarthritis, spondylosis, cervical facet syndrome, and herniation or stenosis of the cervical vertebrae. Other causes of otalgia related to cervical spine pathology include trauma to the cervical neck, such as whiplash.¹³ Cervical spine causes of otalgia have the potential to improve with physical therapy, including cervicothoracic stabilization and aerobic conditioning programs.¹² Failure of conservative measures may warrant referral to a spine specialist for evaluation.⁵

Sinusitis. Cross-innervation between the maxillary and ethmoid sinuses⁹ and the ear, via the trigeminal nerve, presents another possible source of referred otalgia. Patients with acute or chronic sinusitis may present with pain radiating to the ear in a dull and episodic manner.¹⁴ As well, severe nasal polyposis can result in otalgia and aural fullness because of eustachian tube obstruction.¹⁵ Patients with sinusitis as the source of otalgia will also present with nasal symptoms, including nasal congestion or obstruction, rhinorrhea (clear or purulent), pain or pressure over the face, and hyposmia.¹⁴ Workup and management of these patients should include appropriate imaging. Imaging is not recommended for patients suspected of having acute sinusitis. The recommended imaging modality for patients suspected of having chronic sinusitis is computed tomography of the sinuses, without contrast.¹⁶ Appropriate medication trials should be considered for patients with acute or chronic sinusitis, including intranasal corticosteroid sprays, over-the-counter analgesics, and nasal saline irrigation. In patients with severe or refractory cases of acute bacterial sinusitis, antibiotics may be considered.¹⁷ Referral to an otolaryngologist should also be considered in treating patients who are suspected to have chronic sinusitis with poor response to conservative management options.

Upper airway infection and laryngopharyngeal reflux. Chronic inflammation, infection, or irritation of the upper airway may result in referred pain to the ear through shared neural pathways with the glossopharyngeal and vagus nerves. Infectious causes (eg, recurrent tonsillitis or pharyngitis) may present with referred otalgia alongside other symptoms such as sore throat, odynophagia, dysphagia, and trismus. Treatment with appropriate antibiotics with consideration of the offending bacterial organisms should be addressed by the most responsible physician.


Irritation of upper airway mucosa can also occur secondary to laryngopharyngeal reflux (LPR). This clinical entity occurs secondary to retrograde flow of acidic material from the stomach into the upper airway, causing irritation of the surrounding tissue. Tissue

irritation may result in subsequent irritation of the glossopharyngeal and vagus nerves, which in turn presents as referred pain to the ear.¹⁵ While symptoms such as heartburn and acid regurgitation may point a clinician toward a diagnosis of reflux, isolated LPR may prove to be a more challenging diagnosis due to non-specific associated head and neck symptoms such as dysphonia, sore throat, chronic cough, globus, and otalgia. Appropriate therapies should be prescribed and referrals for management of acid reflux should be pursued for patients in whom LPR is the suspected cause of referred otalgia.

Case resolution

The patient underwent a comprehensive head and neck evaluation that was remarkable for tenderness to external palpation of the right TMJ and temporalis muscle. There was no evidence of malocclusion; however, substantial tenderness with medial pterygoid palpation was noted. She was counselled on conservative measures, including an occlusal dental splint, avoidance of hard foods, and self-guided massage therapy. After 3 months her otalgia had resolved.

Conclusion

Otalgia is a common initial complaint among patients presenting to family medicine clinics. The prevalence of referred otalgia makes this presentation an important one for family physicians to assess, manage, and triage based on patient presentation and examination. Enhancing family physicians' understanding of the common causes of referred otalgia may help reduce wait times for specialist assessment and allow ease and speed of access to management options for patients in community clinics. This paper outlines the most common causes of this presentation, which should guide family physicians in initial assessment and treatment options for this patient population. 

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Contributors

Drs Fatemeh Ramazani, Justin Chau, and Justin Lui contributed to study conception, content development, and manuscript completion. **Drs Charmaine Szalay-Anderson, Phillip Park, and Euna Hwang** contributed to content development and manuscript completion. **Arthur Volpato Batista** contributed to content development and to digital animation and figure creation.

Competing interests

None declared

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