

In this tutorial you will learn about the causes of pain in the ear (also called otalgia). Knowing about these is very important because some of the causes of otalgia lie outside the ear. For example cancer affecting the tongue or tonsil can cause ear pain.

Primary Ear Clinicians must be aware of other causes of otalgia and perform a physical examination that helps them to diagnose these and other diseases.

This tutorial begins by looking at the nerve supply of the ear and then discusses the concept of referred pain – pain that comes from a disease that is not in the ear but that is in another place. It then goes on to look at the causes of this and how you can diagnose these.

OVERVIEW OF THE NERVE SUPPLY TO THE EAR

When we think about the nerve supply to the ear we automatically think about the vestibulocochlear nerve. This is the nerve of hearing and balance. However, there are a number of other nerves that supply the ear. These other nerves are the ones that allow us to feel pain in the ear when disease such as otitis externa or acute otitis media is present. These nerves are known as somatic afferent nerves. What is a somatic afferent?

An afferent nerve is one that sends information **to** the brain. The cochlear nerve is partly afferent because it sends sound information to the brain. The vestibular nerve is also afferent and so are the nerves that send information about touch, pain and temperature to the brain. (Efferent nerves, on the other hand, are nerves that send information **from** the brain to the body. Nerves that move muscles in the arms and legs are examples of efferent nerves).

Somatic just means ‘of the body’. In other words it is a nerve that comes from the body and not from the intestines or heart (these are visceral nerves). So a somatic afferent nerve is a nerve that sends information to the brain about the surface of the body or about the world around the body.

Somatic Afferent nerves going from the ear to the brain.

The nerves that send information about heat, pain, pressure and touch to the brain from the ear are called general somatic afferents. Here is a list of them:

1. The Trigeminal nerve
2. The Facial nerve
3. The Glossopharyngeal nerve
4. The Vagus nerve
5. Some small nerve fibers coming from the neck (C2 and C3)

These are just some of the nerves called Cranial nerves. You saw a list of them all in the tutorial on the facial nerve.

The cochlear nerve and the vestibular nerves are examples of special somatic afferents because they send information about the special senses to the brain.

TYPES OF EAR PAIN (OTALGIA)

Otalgia is the word we use for ear pain. There are two types of otalgia: primary otalgia and secondary otalgia.

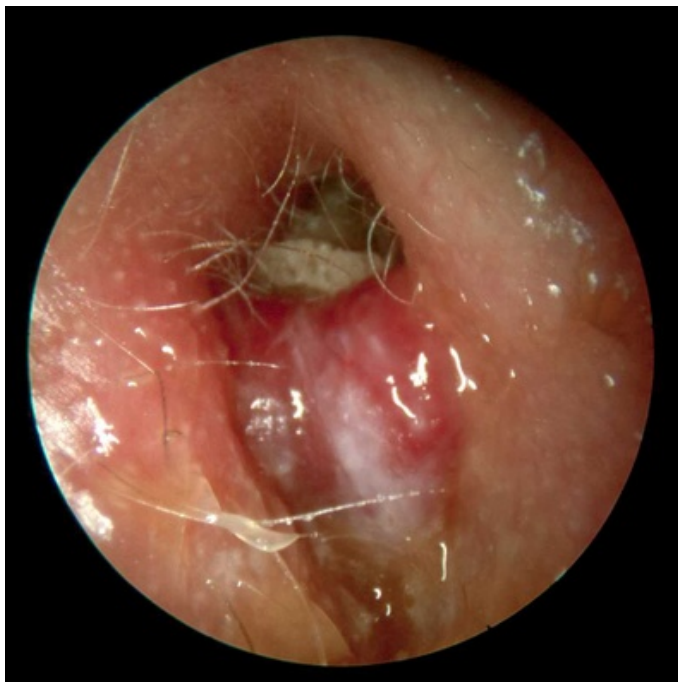
Primary otalgia.

Primary otalgia is caused by disease in the ear. This might be an acute otitis media, a malignant otitis externa or even a cancer. The important thing is that you can see the disease in the ear when you examine the patient. The pictures below are examples of diseases that cause primary otalgia.



Acute otitis media.

There is a build up of pus in the middle ear and this presses against the eardrum causing pain.



Malignant otitis externa.

This is an infection in the ear canal often caused by *pseudomonas aeruginosa*. The picture shows the typical appearance of a polyp arising from the floor of the ear canal

The important thing to remember here is that if a patient complains of ear pain and your examination finds an acute otitis or other ear disease then the pain is a primary otalgia.

But what if the patient complains of ear pain and the examination is normal?

Secondary otalgia

Secondary otalgia (also called referred otalgia) is diagnosed when the patient complains of ear pain but the examination of the ear is normal.



This patient complained of ear pain but the examination is normal. Therefore, they have secondary or referred otalgia.

But where has the pain come from?

Referred pain

Pains that appear to be in one place but come from a disease somewhere else are common. When someone has a heart attack they may complain of pain in their left arm or jaw – the disease is in the heart but the pain is in the arm or jaw. Similarly patients who have lower back problems often complain of pain in their upper leg or sometimes in their feet. Disease in the pancreas can cause back pain.

The exact reason for this is not known but what we do know is that the diseased area and the ear have the same somatic afferent nerve supply. For Primary Ear Clinicians this means that we must know the somatic afferents that supply the ear (see above) **and** the other places that those nerves go to.

Areas that Cranial nerves supply other than the ear

This table lists the somatic afferent nerves that supply the ear and the other areas that the nerve travels to.

Nerve	Part of the ear supplied	Other areas supplied
1 Trigeminal	Ear drum, outer ear skin, lateral surface of the pinna	Skin of the face, teeth, anterior tongue and mouth, temporomandibular joint.
2 Facial	Ear canal	Nowhere else has a sensory supply from the facial nerve
3 Glossopharyngeal	Middle ear mucosa	Tonsil, pharynx, posterior tongue

4	Vagus	Ear canal	Pharynx, larynx and thyroid
5	C2 and C3	Medial surface of the pinna	Bones of the upper neck

So, for example, a disease in the larynx may cause ear pain because the Vagus nerve goes both to the ear and the larynx. As another example disease in the tonsil may cause ear pain because of the Glossopharyngeal nerve supplies sensation to both places.

DISEASES THAT COMMONLY CAUSE REFERRED OTALGIA

Below is a list of diseases that commonly cause referred otalgia. There are many other diseases so I have listed the common or very serious ones.

	Nerve	Area supplied	Disease
1	Trigeminal	Teeth Anterior tongue and mouth Temporomandibular joint	Abscess and tooth decay Tongue and mouth cancers 'Arthritis' of joint
2	Facial	No other sensory supply	
3	Glossopharyngeal	Tonsil Posterior tongue Pharynx	Tonsil cancer, tonsillitis Posterior tongue cancer Pharyngeal cancer
4	Vagus	Pharynx Larynx Thyroid	Pharyngeal cancer Laryngeal cancer Thyroid cancer
5	C2 and C3	Bones of the upper neck	Arthritis in the neck

Some of these diseases like tonsillitis and tooth problems are unpleasant but easy to treat. Others, like the cancers, are much more important to remember.

What does this all mean to the Primary Ear Clinician?

The problem for the clinician is simple. If a patient complains of ear pain and the ear examination is normal (no causes of primary otalgia can be found) then the clinician must look for diseases elsewhere that may be causing the pain.

We look for disease elsewhere by taking a history and performing an examination and this means that you should start thinking about examining the mouth, throat and neck of patients with referred otalgia to see if you can see any cancers or infections. You should also start taking and recording a longer history in these patients.

The history will include questions about voice changes and difficulty in breathing (laryngeal cancers), difficulty with swallowing or clearing up blood from the throat (pharyngeal, tonsil and tongue cancers), reduced movement and stiffness or pain in the neck (arthritis), pain on chewing and clicking in the jaw joint

(temporomandibular joint problems). Some cancers produce an unpleasant smell on the breath.

When you examine the patient ask them to open their mouth wide so that you can look for cancers on the tonsil or tongue and see infections around the teeth. You should also examine the neck to look for lumps and thyroid diseases.



This is a cancer of the left tonsil. Not all cancers are this easy to spot. Some are much smaller.



This is a tongue cancer. It is on the right lateral border of the tongue



Here is another tongue cancer



This patient has a cancer that involves the lymph nodes in his neck.

Examining the neck is important when considering patient with referred otalgia because you may pick up a cancer that has spread like this.

Learning points

1. Secondary or referred otalgia is diagnosed when the ear is normal but the patient complains of ear pain.
2. If referred otalgia is diagnosed then you must examine for disease in the mouth, throat and neck.
3. Although referred otalgia is fairly common cancers are not. Usually the cause is infection in the teeth or tonsils or problems with muscles or joints in the neck.
4. If a cancer is suspected the patient must be referred to an ENT surgeon