

PUBLIC DOMAIN

Ear Problems in Diving *Part I: The Outer Ear*

Text by Michael Rothschild, MD

Many people suffer from ear problems during and after diving. Technical rebreather diver and underwater photographer Dr. Michael Rothschild is an ear, nose and throat specialist in New York City. In this series, he walks us through some of the common causes of dive-related ear problems, and how to treat and prevent them.

Introduction

I am an avid scuba diver and an ear, nose and throat specialist, which means that I end up answering a lot of questions about this topic! The majority of medical problems encountered by divers involve the ears. While they are rarely as serious as decompression sickness or other life-threatening conditions, they are incredibly common and can ruin a dive trip.

The ear is uniquely positioned to be vulnerable to both external and internal injury in this sport. Furthermore, there is a great deal of confusion about the nature of these problems—the relevant anatomy, the causes of

symptoms and the best treatment.

To make things worse, even people who have obtained medical care may have no better understanding of the source of their pain, dizziness or hearing loss. This is because even for many brilliant and experienced general physicians (GPs), the ear can be difficult to examine. And while pediatricians generally have a lot of ear experience, they rarely treat scuba divers. I realize that this might sound arrogant on my part—believe me, I am humble

about my own skills and deferential to GPs who must be able to manage a wide range of life-threatening conditions. However, the fact remains that many doctors who are not otolaryngologists (ENTs) do not have the specialized equipment or experience necessary to clean the ear thoroughly, to examine the eardrum under high magnification, and to test hearing in a comprehensive manner.

One of the greatest sources of confusion is the fact that the outer

ear, middle ear and inner ear—which are completely different systems that have very little to do with each other—often can give rise to similar symptoms such as ear pain, vertigo or hearing problems. In this series of articles, I will review each of these anatomical areas, and describe how diving can affect them. In this first part, I will discuss problems of the outer ear.

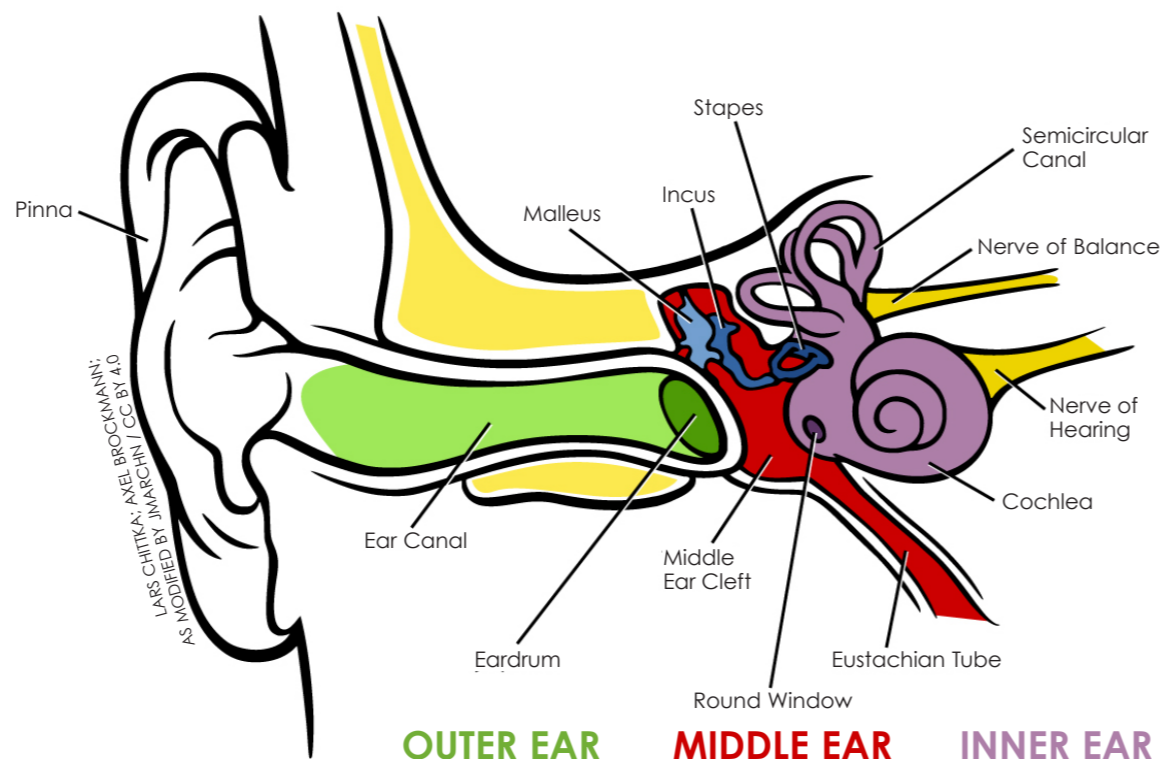
Problems of the outer ear

The outer ear refers to the part of the ear that sticks out of the head (the pinna) and the hole that leads to a tube (the ear canal) that ends at the eardrum. It is basically a pocket of skin, and it is where earwax (cerumen) is created and accumulates. Cerumen is a normal substance that protects the ear canal—it is generally just a thin layer coating the walls, but some people accumulate large amounts of it. It consists of dead skin, mixed with various oily secretions from glands in the outer ear.

When water gets into the ear from swimming or diving, it gets into the ear canal. Unless there is a hole in the eardrum, the water from swimming or diving does not enter the middle ear.

Swimmer's ear. Water from swimming or diving can get stuck in the external ear canal, especially if there is a lot of earwax. Furthermore, wet earwax takes a long time to dry out. Just like in cases of diaper rash or athlete's foot, when an area of the body stays damp and dirty, it can lead to chronic inflammation and swelling. This can cause skin breakdown and infection (usually with the *Pseudomonas* bacteria that normally lives in this area). This inflammatory condition of the outer ear is called "swimmer's ear" or otitis externa, and it can be extremely painful.

Surfer's ear. Some people develop bony growths, known as osteomas, in



OUTER EAR MIDDLE EAR INNER EAR

their ear canals. These are thought to be more common in cases of long-term exposure to cold water, hence the name “surfer’s ear.” They can trap earwax and water if they get big enough. The growths occasionally require surgical removal. Below is a photograph of my own ear canal, showing this condition. Just like you do not need to play tennis to get tennis elbow, you can see from this picture that you do not need to surf to get surfer’s ear!



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Surfer's ear

Treatment of swimmer's ear

Treatment of swimmer's ear often requires carefully cleaning the wet debris from the ear canal to allow the ear to dry. This is best done by an ENT doctor using a microscope and small ear tools, under direct vision. This will also allow for a high magnification inspection of the eardrum, to rule out a perforation or other middle ear problems. Once the ear is clean,

medicated ear drops are used, generally those containing an antibiotic to kill the bacteria, and a steroid to help with the swelling and pain.

It is important to keep the ear dry during healing, although this may be difficult on a long-anticipated dive trip! Earplugs can help keep water out with swimming or showering, but they can cause problems if used while diving. Even the ventilated type can lead to pressure-related injury (barotrauma) of the outer ear. Spending a day out of the water is a better approach to this problem.

Prevention of swimmer's ear

Disimpaction. Thorough disimpaction of large accumulations of cerumen (under direct vision, ideally with a microscope) will help avoid water trapping and prevent swimmer's ear. But overly aggressive and frequent ear cleaning, especially with wax-dissolving drops, can actually make the situation worse by removing the protective layer of cerumen.

Hydrogen peroxide can help remove debris from the ear canal if medical care is unavailable and if there is no significant outer ear infection or suspicion of perforation. Lie on your side, with your ear canal facing up, and fill it with this solution. Use a fresh bottle; it tends to go “flat” if it has been sitting around open for any length of time. You should hear the roar of bubbles as it reacts with the contents of the ear canal. Let it sit for two to three minutes, opening and closing your mouth occasionally, or



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tugging on your ear to help it get all the way into the ear canal. Again, do not overdo this; one treatment should be enough in simple cases of cerumen impaction.

Drying the ear. Drying the ear after swimming can help prevent swimmer's ear as well. A good way to do this is with a dedicated device (such as the Mack's Ear Dryer), which blows a gentle stream of warm air into the ear canal. While a hair dryer can be used, an ear dryer is safer and directs the correct temperature air directly into the canal. Interchangeable tips can let family members share the device without sharing infections.

Ear sprays. There are some commercial sprays that will help prevent the swelling and breakdown of the ear canal skin by coating it lightly. There are several brands available, such as “EarShield” or “EarPro.” These are helpful on a dive trip with prolonged water exposure, but they should not be overused, or used if there is already an outer ear infection.

Alcohol and vinegar solutions. Another approach to prevention of swimmer's ear is the use of five to ten drops of a solution of rubbing alcohol and white vinegar after diving. Add three tablespoons of vinegar to a pint of alcohol to make this mixture. Some people recommend a 50-50 combination, but ideally there should be very little water in the solution, and vinegar is mostly water. The alcohol dries the ear, while the vinegar makes the ear canal more acidic, which makes it harder for the pseudomonas bacteria to grow. You need very little vinegar for this purpose. And a few drops of glycerine in the mix can help prevent over-drying.

One easy way to make this is to add a small amount of white vinegar to commercially available solutions like “Swim-Ear.” This is 95% isopropyl alcohol and 5% glycerine. A half of a teaspoon of vinegar added to the one-ounce bottle is enough.

Avoid overuse of this solution, as it can overdry the ear, breaking down the protective layer of earwax and causing irritation—no more than once

or twice a day. If medical care is not available and there is no concern about an eardrum perforation, this solution may be used to treat swimmer's ear, but antibiotic and steroid drops are a better option. Cotton tipped applicators should never be used—they tend to pack the wax into the ear canal and can cause permanent injury if they touch the eardrum.

Conclusion

Most ear pain after diving goes away by itself in a short time. However, without an examination, a diver may not be able to tell whether the problem is in the outer or middle ear, and treatment depends on accurate diagnosis. Thorough evaluation of persistent ear problems should be done by a doctor with the tools and experience necessary to distinguish outer, middle and inner ear disease. ■

Check this space again to learn more. Next time, Dr. Rothschild discusses problems of the middle ear and how to treat them. For more information, please visit: dive.rothschilddesign.com.