



## IDC Physiology Tips – Understanding Ears

### Ears

Problem with the ears is one of the most common injuries you will face as a dive instructor. General soreness may occur in a lot of new divers as they get used to equalizing. Students or unexperienced divers equalizing to forcefully will be one of the most common injury and instructor will face.

They say the problem with ears can occur as shallow as one metre. This means that a student could possibly have issues whilst doing to confined water session. Caution needs to be taken in the shallowest of water.

What can further enhance this issue is that there is no physical way of teaching a student to equalize nor any way of knowing when I student should be equalizing or has equalized properly.

Quite a large number of open water students will get some sort of discomfort after initial dives as they learn to equalize properly. Any discomfort should be noted and taken seriously.

Instructors should take particular care in descending with not only new students but all divers. Instructors are a lot better at knowing when and how to equalize, are more relaxed in the water and can use several different techniques to equalize. With instructors diving each day they can descend faster than the average divers. Students and recreational divers who try to keep up the same descent rate as an instructor can fail to equalize and do serious damage to their ears.

Having a good understanding of ear problems, the cause and effect of ear issues will make you a lot safer dive instructor.

For the purpose of scuba diving the ear has been broken down into three sections.

### Inner Ear

The inner ear includes semicircular canals, cochlea and the round window.

**Inner Ear Barotrauma:** This injury generally occurs when divers delay equalization during descent and then attempts to forcefully equalize their ears. This "hard" blowing over-pressurizes the middle ear and can result in implosive or explosive damage to the round and oval windows. **\*\*EXAM TOPIC\*\***

**Signs & Symptoms:** Vertigo, vomiting, hearing loss, loud tinnitus (a ringing or roaring sound in the ear).

## **Middle Ear**

The middle ear includes ear drum, oval window and eustachian tube.

The middle ear is most effected by pressure changes **\*\*EXAM TOPIC\*\***

**Middle Ear Barotrauma:** This is by far the most frequently reported injury among divers. People with middle ear barotrauma generally develop symptoms immediately following the dive. However, delays of up to one day or longer have been reported. When the diver descends, the pressure can cause injury to the middle ear. This overpressure of the middle ear can cause serious fluid and blood to leak into the middle ear, partially or completely filling it. This fluid can often be mistaken for water and a diver may just think they have water in their ears.

**Signs & Symptoms:** A feeling of fullness in the ear may develop, like the feeling of fluid inside the ear. Muffled hearing or hearing loss are other indications of middle ear barotrauma.

## **Outer Ear**

The outer take in the ear canal and the actual ear itself (Pinna)

For the purpose of your exams PADI would like you to know the difference between inner, middle and outer ears as well as the following parts of the ear:

### **Parts of the Ear**

#### **Ear Canal**

Is the part of the ear that is exposed to the water and stops at the air drum. Some infections (swimmer's ear) can occur in the outer ear due to failing to since the ear of fresh water after scuba diving. Always have you students rinse the ear with fresh water after a scuba dive. Not likely to feature in PADI Exams.

#### **Ear Drum**

The ear drum separates the outer ear from the middle ear. The biggest concern and the most common injury is rupturing or perforation to the ear drum.

Barotraumatic injuries to the ear may result in perforation or rupture of the ear drum. This may occur in as little as 2.1 meters of water.

The two most common reasons for this is equalizing too forcefully or **failing to equalize at all**.

Symptoms

PADI

When the eardrum ruptures the diver experiences sharp pain followed by immediate relief as the break admits water instantly equalizing the ear space. Since the water is colder than normal body temperature it can cause vertigo. **\*\*EXAM TOPIC\*\***

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Generally there is pain and bleeding from the ear. This may not always be the case, as a number of dive-related ear drum ruptures have reported no pain at all. Hearing loss and tinnitus may also be present, but not always. A discharge from the ear of commingled fluid and blood may be a sign of ear drum rupture.

### **Oval window**

The most common ear barotrauma is the middle ear. This includes the eardrum and the space behind it.

**Inner Ear Barotrauma:** This injury generally occurs when divers attempt to forcefully equalize their ears. This "hard" blowing over-pressurizes the middle ear and can result in implosive or explosive damage to the round and oval windows.

### **Round Window**

A part of the inner ear. As mentioned earlier, can be the subject of round window rupture also known as inner ear barotrauma. Caused by delaying equalization and then forcefully equalizing. **\*\*EXAM TOPIC\*\***

### **Eustachian Tube**

The **eustachian tube** is a canal that connects the middle ear to the upper throat and the back of the nasal cavity. It controls the pressure within the middle ear, making it equal with the air pressure outside the body. This tube is what we use to equalize. **\*\*EXAM TOPIC\*\***

### **Cochlea**

The cochlea is a hollow, spiral-shaped bone found in the inner ear that plays a key role in the sense of hearing.

### **Typical PADI questions would be.**

The \_\_\_\_\_ ear is the most effected by pressure or changes in pressure.

A(n) \_\_\_\_\_ may occur if a diver who is having difficulty equalizing blows to forcefully against a pinched nose.

A diver who ruptures an ear drum while in cold water may experience \_\_\_\_\_ as the water comes into contact with the vestibular canals.

If why descending a diver is having difficulty equalizing his ears and he forcefully blows against a pinched nose, he may risk.

A ruptured ear drum may immediately cause \_\_\_\_\_ underwater and may also lead to infection due to water entering the \_\_\_\_\_

[https://www.diversalertnetwork.org/medical/articles/Common\\_Ear\\_Injuries\\_While\\_Diving](https://www.diversalertnetwork.org/medical/articles/Common_Ear_Injuries_While_Diving)