

EARS & DIVING



Release the Pressure

AVOIDING EAR AND SINUS INJURIES



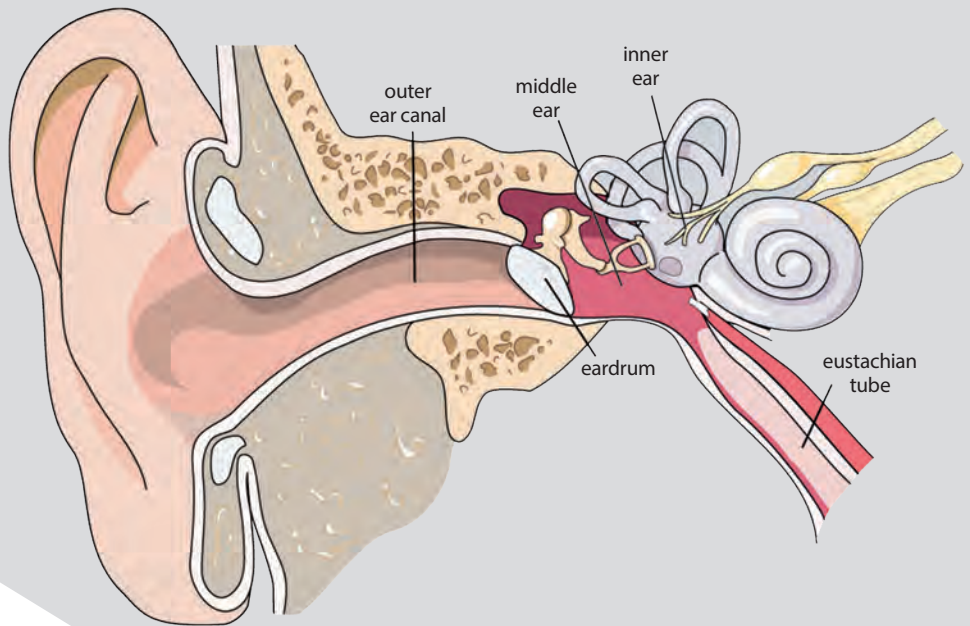
INTRODUCTION

Ear and sinus barotrauma

Ear and sinus barotrauma can be caused by changes in ambient pressure. During descent, when pressure increases, divers must equalise air spaces in the sinuses (through the sinus ostium connecting the nose and the sinuses) and middle ears (through the Eustachian tubes) to the surrounding water pressure. Swollen, damaged tissues could restrict the passage of air through the opening that allows equalisation. When pressure in air spaces cannot equalise, the diver may experience pain and discomfort.

During ascent, if the expanding air space cannot be vented (reverse block), the volume of gas in the cavity increases, resulting in more pain and discomfort.

If the stress on the middle ear becomes too great (from not equalising or trying too hard using the Valsalva technique) it can cause damage to the inner ear (hearing and balance structure), which can then lead to permanent damage. Outer ear barotraumata occur when the ear canal becomes blocked, trapping air between the blockage and the ear drum. This can create excess pressure or a vacuum in the air space as the diver changes depths. Blockages can be caused by excess wax, non-vented ear plugs or an extremely tight fitting hood.



When diving frequently, divers can also experience an outer ear infection (otitis externa). This is caused by bacteria in the external ear canal causing inflammation. A special diving mask (Pro Ear) or special ear drops (also available from the online DAN-SA store) can be used as prevention tools to reduce the risk of otitis externa.

PREVENTION

How to prevent ear and sinus barotrauma

- Equalise before you enter the water or descend and make sure you hear the “pop” or “click” in both ears. This means the Eustachian tubes are open.
- Descend slowly and equalise in a feet-first position and if needed extend your neck (looking up) as this tends to open the Eustachian tubes.
- Equalise early and often (every 0.3-0.5 m, especially in the beginning of the dive) until you reach the deepest point. If you feel discomfort, you may have waited too long to equalise.
- If you cannot equalise or experience pain and discomfort during descent, then ascend slightly until the discomfort is relieved and attempt to clear again; do not forcefully clear or attempt to descend unless your ears and sinuses have equalised.
- Do not dive with a cold or whilst congested.
- Do not use not-vented earplugs or a hood that is too tight as it does not allow water/air to enter the external ear.
- If you experience pain and discomfort during ascent, you should stop or descend slightly (or point the affected ear towards the bottom) and use of one the equalising techniques to open the Eustachian tubes; ascend as slowly as possible. If you still cannot equalise you will have to endure the pain in order to reach the surface.

If you could not equalise during a previous dive then you should not be diving until the problem is resolved. It may indicate a pre-existing problem, most commonly from infection or allergies. The mucus membrane will retain fluid and swell, narrowing the pathways to the sinuses and the Eustachian tubes. This not only makes clearing difficult, but it may prevent it altogether.

Some divers use nasal sprays or oral medications to temporarily shrink swollen mucus membranes and aid sinus and middle ear equalisation. These medications however can wear off at depth, possibly leading to complications on ascent.

Pierre-Yves Cousteau
President of Cousteau Divers



Equalising techniques

Although ear problems might be caused by a cold, it is also possible that the diver is not using the correct equalising technique. Divers should know, practice and use the “clearing” or equalising manoeuvre that works best for them:

- **Valsalva:** Hold nose and breathe against a closed throat
- **Toynbee:** Swallow with mouth and nose closed (good for ascent)
- **Frenzel:** Valsalva while contracting throat muscles with a closed throat
- **Lowry:** Valsalva plus Toynbee – holding nose, gently trying to blow air out of the nose while swallowing
- **Edmonds:** Jutting jaw forward plus Valsalva/Frenzel
- **Miscellaneous:** Swallowing, wiggling jaws (good for ascent)

Equalisation becomes more difficult as the pressure gradient between middle ear and the environment increases. Frequent gentle equalisations are more effective and less likely to cause injury than forceful equalisation, especially after significant pain has occurred.

For many divers a combination of techniques works best. Since the pathway to the sinuses is normally open, sinus equalisation typically does not require any special manoeuvres.

CAUSES

Possible reasons for difficulties in equalising

- Recent cold or congestion
- History of ear infections or even one severe infection
- History of a deviated septum or a broken nose, preventing one ear or set of sinuses from clearing as fast as the opposite side
- Allergies, which may produce swelling of the mucus membranes or cause nasal polyps that can partially or completely close a sinus airway

A diver with a medical history may require referral to an ear, nose and throat (ENT) physician or allergy specialist.

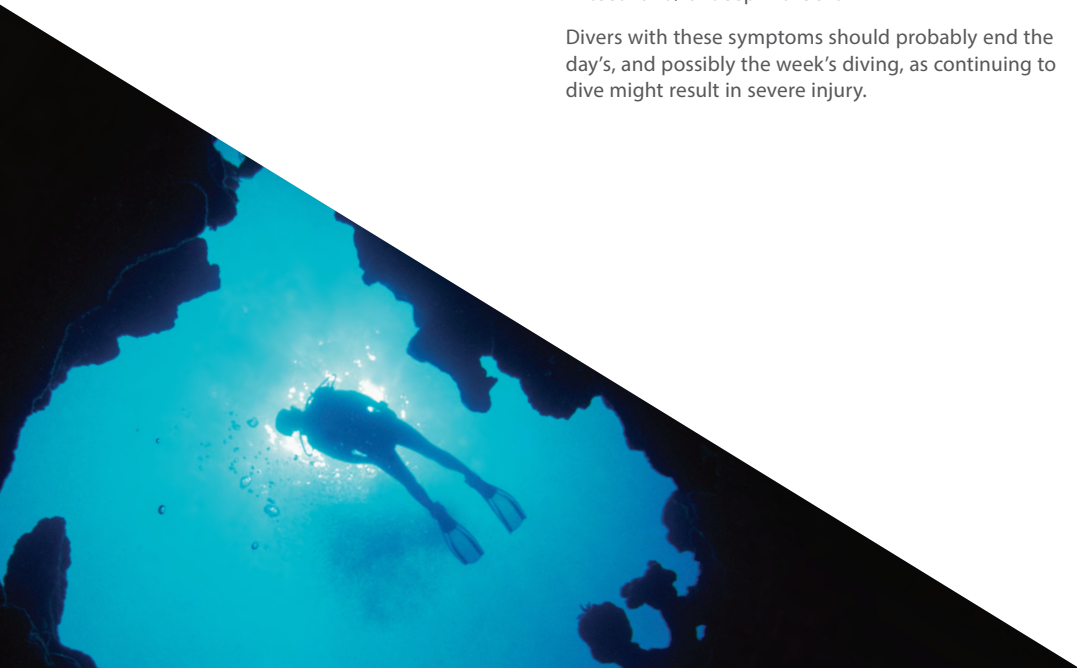


SYMPTOMS

Symptoms of barotraumas of the ears and sinuses

- Presence of mild discomfort to severe pain in the sinuses or ear
- Ringing or roaring in the ear
- Muffled hearing, partial or complete hearing loss
- Nausea, vomiting, dizziness (especially after experiencing ear pain)
- Blood coming from the nose or present in sputum (even if not associated with other symptoms)
- Pain felt above the eye, at the cheek bone or at the upper teeth and/ or deep in the skull

Divers with these symptoms should probably end the day's, and possibly the week's diving, as continuing to dive might result in severe injury.





Treatment and medication

TREATMENT

If you experience any symptoms during or after a dive, consult a physician (preferably an ENT specialist) to determine the extent of any injury. There may be some treatable condition causing the problem.

The physician can determine the correct treatment and medication. If medication is prescribed, then check with your physician if it will interfere with safe diving.

Proper care and treatment under the supervision of a physician can reduce the recovery time from symptoms of barotraumas, allowing you to return to diving sooner.



RELEASE THE PRESSURE

A DAN-SA safety campaign

The most common injuries reported to DAN-SA are pressure-related injuries (barotraumas) to ears and sinuses. Luckily, they are easy to avoid and a little education and common sense will go a long way to avoid these problems.

The ears and diving safety campaign is mainly focused on correct education and an online "Ears and Diving" Seminar is made available free of charge to DAN-SA members (also accessible for non-members with a small fee).

Discover more about this and other DAN-SA safety campaigns on www.dansa.org



Follow our campaign on Facebook and Twitter:
[#earbarotrauma](#) [#DiveSafety](#)

Safety campaigns are financed by DAN-SA membership dues. Thanks to all members for their precious support!

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