

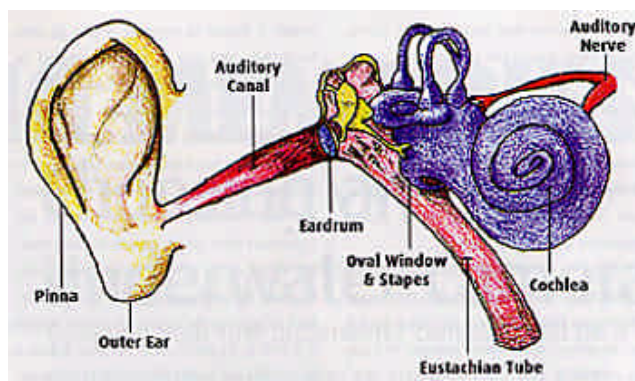
## Equalising for Idiots

**Improper equalisation can ruin a dive trip quicker than a broken mask. Consider these tips the next time your ears make diving difficult for you**

Forget that new winged BCD, the \$500 wetsuit or even the shiny titanium regulator. All the fancy equipment would mean nothing if you cannot equalise, a simple exercise that depends on a body part only a few centimetres long: the Eustachian tube. Improper equalisation is one of the most frequent problems consulted by diving doctors. And it is always a similar scenario: A novice diver has "taken to the sport", buys the neatest gear, and ends up in my surgery a week after doing the four open water certification dives.

### *Ear Anatomy 101*

The human ear is not a labyrinth, but there are enough bits and pieces to confuse anyone. The bit seen flapping in the wind is, of course, the outer ear, which is connected to the middle ear by a long tube. This is the external auditory meatus in medical speak, ear canal to the layperson.



The ear canal will fill with water during a dive and does not need to be equalised. It ends at the eardrum, the dividing line between the outer and middle ear. It is in this middle ear (which is air filled) that problems can occur for a diver. The air in the middle ear helps the three bones - malleus, incus and stapes - transmit sound across to the window of the inner ear. So here is an air filled cavity that exists in a species not designed to live underwater. As a diver descends every 10m the volume of the air will halve; but fortunately humans have the Eustachian tube, which allows air to be blown in to counteract the volume (which is halving). By pinching the tip of the nose and blowing we can push more air up into the tube and into the middle ear. In theory it is simple; but as we well know equalisation does not always work.

### *Early Warning System*

If we were to look closer at what occurs when the diver is unable to equalise, then we can see the dangers ignoring its consequences when diving. There will be no noticeable pain or discomfort for the first few metres. By the fourth metre the volume decrease is managed by the eardrum moving in to fill the space.

On further decent, pain would ensue resulting in the drums concaving and the lining of the middle ear becoming swollen by the vacuum. If the diver proceeds to 10m, the windows between the middle and inner ear may cause dizziness as the balance centres are given confusing signals.

At 20m (if the diver is foolish enough to continue), the pain would be overwhelming; unless the diver ascends, water would rush into one ear, or both, as the drums implode and perforate. Ironically this would bring about equalisation, but at the cost of deafness, dizziness and possible infection.

### *Anxious Moments*

What classically happens with new divers is that the joy of submersion becomes tinged with anxiety. They look around at the other divers, mentally double-checking the buddy check, and then eagerly descending at the slightest "OK" from the instructor.

In the first few metres the diver stares at a couple of fish, looks out for his buddy, and sees the instructor go straight down. "Oh, better look at my gauges again," he thinks to himself. "Damn, my mask is fogging." And with the possibility that he is a tad overweight, throwing 'caution to the water' he descends even further. If by seven metres he has not managed to push any air up the Eustachian tube, then all is lost: The pressure has forced it shut, and so he must ascend and start all over again.

The reality that a first-time diver is going to hold up his buddy, bob on his own with perfect buoyancy at four metres to clear the ears before rejoining the group in a few minutes to do all the skills is remote. In fact, he would most likely



plummet down frantically, contorting in pain as he failed to put any air in the ear; before kneeling down to perform the regulator retrieval, wishing he had taken up paragliding instead.

#### *Tips for Triumph*

The lesson here is to learn equalisation correctly the first time. It is a simple technique, and vital if the diver is to safely, and comfortably enjoy diving.

Before going near the water, it is recommended for the new diver to practise equalising. Exercise it a little: A good practice is to "pop" those ears gently, up to 10 times a day for a week before diving.

On that first plunge, remember this mantra: **Equalise a little at a time, and often.** And if you remember these few key points, equalisation should not be problem.

- ? Do not wait until you are at three metres before trying to equalise.
- ? Gently squeeze air into the tube in small amounts every few seconds.
- ? Always descend feet first. The raised pressure in your thorax and lungs makes equalising a whole lot easier.
- ? If the ears are not equalising, stop, fin up a little and try again, gently. (Do not hyperinflate your BCD and rocket up.) After the ear has equalised, then slowly descend and join the others.

#### *Can...Not...Equalise*

If it is one of those days when you cannot equalise, then you do not have too many options. Rather than force the issue, and possibly cause permanent damage, signal to your buddy and your instructor and ascend. The dive may be over, but your ear lives to dive another day.

There are several reasons why a diver might not be able to equalise. The worst-case scenario is that he may have a completely dysfunctional Eustachian tube. This means that equalising on an aeroplane would be difficult and painful unless an ENT (ear, nose and throat) surgeon does corrective surgery to bore the tubes wider. But the difficulty may never be settled. More commonly a failure to equalise is due to poor technique; and this is easily corrected by observing the aforementioned procedures.

For some divers medication is sufficient, which could open up the tube. Xylometazoline and Beconase nasal sprays have been tried to good effect; Sudafed tablets too. Medications like these basically shrink the lining of the Eustachian tube, which widens its bore, making it easier to get air inside. Some dive manuals do not advocate the use of medications to open up the Eustachian tube; I believe it is fine to try them about an hour before a dive if you are having difficulties. It is certainly better than trying to descend without them - if you are going to dive anyway. The chance of a medication suddenly losing all effect during the ascent is remote.

If you finally manage to descend for the first time using medication, does that mean you have to use one for each dive? Not necessarily. The problem could be undiagnosed and could be fixed by a good dive doctor. It could be nasal polyps, nasal septum displacement, or even an allergic reaction to the ship's cat, which caused too much mucous production. Again, all these problems are correctable.

The most common reason for experiencing equalisation problems is diving with a cold. The manuals all suggest you do not dive with this annoying viral infection, but I am a realist. If you have paid a month's wage for a seven-day live-aboard trip to the Burma Banks, and a cold sets in, most divers would still dive. If you insist on diving (though this in itself is dangerous) at least take some medication to 'pop open' the Eustachian tube; if you do not, you will suffer from what I call "cotton-wool" hearing for the next six weeks.

#### *Going Up*

What advice do I have for a diver who fails to equalise on ascent? As rare as it may seem it does happen.

If a diver had equalised ever so carefully on descent, but finds the expanding air would not come out on ascent, then he is suffering from an ear perforation. Divers would know this is the case if they felt a 'pop and gush': Cold water trickles into the middle ear and then to the back of the throat.

If this happens see the doctor immediately. He would probably recommend that you cover the ear with antibiotic drops and discontinue diving for about a month. Remember to get a check-up before the next dive to determine whether it has healed properly. If not, stay dry and even consider skin grafting the drum if it has not healed after six months. If the hole is closed - and the doctor would be able to establish this - you are fine to dive.

#### *Hood Removal*

In diving medicine, a tight hood (where the drum is pulled the other way) causes an un-equalisable pain, even after the ears have popped. The diving doctor recommends pulling the hood off the ears on descent.

#### *Earwax Havoc*

If there is a big, thick wedge of wax, the air space between this and the drum can make the ears feel weird on descent. If you are a tad deaf due to wax build-up, have your doctor look inside the canal and clean as necessary.

Excerpts of an article by Dr Jules Eden