



**DAN** AVOIDING EAR & SINUS INJURIES IN SCUBA DIVING

STUDENTS

# GUIDE



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As scuba divers, we must adapt to an environment that exerts pressure on our bodies. The most common injuries reported to Divers Alert Network (DAN) each year involve pressure-related injuries to divers' ears and sinuses. A little education and common sense will go a long way to avoid these problems.

Take a minute to read this brochure. DAN, your dive store and your instructor want your scuba adventures to be enjoyable and safe.

#### SINUS AND MIDDLE EAR INJURIES

Barotrauma is a pressure-related injury. Middle ear barotrauma, known as "ear squeeze," is the most common diving injury. Sinus barotrauma also occurs, but it is less common.

How does it happen? Barotrauma is caused by pressure changes when diving. During descent, air spaces in the sinuses and middle ear must be able to equalize to the surrounding water pressure, which increases with depth. When pressure in air spaces can't equalize, because swollen or damaged tissue restricts air passage through the openings that allow equalization, the diver may sense pressure or pain from one of these areas. During ascent, if the expanding air can't be vented, the cavity pressure increases, resulting in discomfort.

This type of injury can range in severity, from mild to extreme. A sinus- or middle ear injury may occur suddenly and lead to significant damage. For this reason, divers should know and use the "clearing," or equalizing, maneuver that works best for them.

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## GUIDE

**HOW TO EQUALIZE**

The main thing to remember is to begin to equalize early; start on the surface with a gentle Valsalva maneuver. At the first hint of a problem the descent should be stopped until you have equalized. If equalization is not possible, it may be helpful to ascend to a shallower depth and reattempt the process using a slower approach or a different technique. Equalization becomes more difficult as the pressure gradient between the middle ear and the environment increases. Gentle, frequent equalizations are more effective and less likely to cause damage than forceful equalization, especially after significant pain has occurred.

**THE VALSALVA MANEUVER**

In probably the most commonly taught method, the diver closes the mouth, pinches the nose and blows gently.

Avoid blowing too hard and overinflating the middle ear space. This can occur if the diver is overly excited or having a difficult time equalizing during descent, and especially if he has waited too long before attempting to equalize. The result could be injury to the middle- or inner ear.

**THE FRENZEL MANEUVER**

This method is similar to the Valsalva maneuver, except that instead of blowing air into the sinuses, the diver closes the nose and mouth, and drives the tongue backwards on the roof of the mouth. The muscle contraction opens the nasal cavities and Eustachian tube, which allows air into the middle ear.

**THE YAWN & SWALLOW MANEUVER**

Some divers can simply swallow, yawn or thrust the lower jaw forward and open the mouth while using the lips to maintain a seal with the regulator mouthpiece. This opens the Eustachian tube to the middle ear, which equalizes pressure. As long as the sinuses also equalize easily, this maneuver is acceptable.

For many divers, a combination of these methods — even switching back and forth during a single descent — works best. Since the ostia, or openings, to the sinuses are normally open continuously, sinus equalization normally does not require any special maneuvers. Pain in the forehead or cheek during descent usually indicates that there is some obstruction in the sinus ostium, and the dive should be aborted.

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## GUIDE

**PREVENTION IS THE KEY**

The most common reason for divers to suffer barotrauma is a failure to inflate the ears and sinuses with additional air during descent. Often divers mistakenly wait to equalize their ears or sinuses when they feel discomfort.

Begin the equalizing process by inflating your ears and sinuses with air before entering the water or beginning your descent — this ensures that the air passages are open and clearing is possible. A slow, steady descent with frequent inflation (every 1 to 2 feet) is then possible without barotrauma.

If you feel discomfort, stop your descent and ascend a few feet until the discomfort is relieved. Attempt to clear, but do not continue your descent unless your sinuses and middle ear spaces have equalized.

Some divers may use topical nasal vaso-constrictors such as Afrin® (oxymetazoline).

The effectiveness of Afrin taken just before diving has been questioned, but many divers feel it may help with the process of equalizing. However, overuse of Afrin or other vasoconstrictors can lead to a dependence and a “rebound” phenomenon: that is, if the medication is suddenly discontinued, the congestion returns and is much worse than before the drug was used. Use the medications sparingly, and use no more than absolutely necessary. Also, if you have never used a vasoconstrictor such as Afrin, try it topside, well ahead of time, to ensure it works for you and that you have no adverse reactions to its use. Regardless of the technique used to equalize the ears and sinuses, remember to descend slowly until you can easily clear these air spaces.

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## GUIDE

## TO AVOID BAROTRAUMA, REMEMBER:

- Test the ears and sinuses by equalizing prior to entering the water or prior to your descent;
- Descend at a slow, steady pace and keep up with your clearing maneuvers;
- Do not continue to descend and forcefully clear if you're having difficulty — stop your descent before you experience ear or sinus pain (waiting until you feel discomfort to begin clearing means that you've waited too long);
- Descend and equalize in a feet-first position; it is easier than head-first;
- If you do experience pain or discomfort, ascend until it is relieved;
- Equalize early and often to stay "ahead" of barotrauma.

## DIFFICULTY EQUALIZING

What if you can't equalize? First, don't dive until the problem is resolved. If a diver has trouble equalizing the sinuses and middle ear, there may be some pre-existing problem — the most common is diving with a cold or flu. Frequently the mucous membrane will retain fluid and swell, partially occluding the air passages to your sinuses and the Eustachian tube going from the back of your throat to the middle ear. This not only makes clearing difficult, but it may prevent it altogether. Other recognizable factors in equalizing problems are:

- A history of childhood ear infections or even one severe infection that may leave the Eustachian tube scarred and partially occluded;
- A history of a broken nose or a deviated septum that prevents one ear or set of sinuses from clearing as fast as the opposite side;
- Allergies, which may produce swelling of the mucous membranes or cause nasal polyps that can partially or completely occlude a sinus cavity or airway.

If you have a history that includes these conditions and want to dive successfully, it may require referral to an ear, nose and throat physician or allergy specialist who is familiar with these conditions. Nose sprays or oral medications can be used to shrink swollen mucous membranes and facilitate sinus and middle ear equalization.

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## GUIDE

**SYMPTOMS OF BAROTRAMA**

The most common barotrauma symptom a diver experiences may be mild discomfort to intense pain in the sinus or middle ear — almost always the first indication of a problem in equalizing.

Middle ear barotrauma may also include symptoms of ringing or hearing loss. As blood or fluid accumulates in the middle ear, a diver may experience a partial, complete or muffled hearing loss as well as damage to the inner ear. Roaring in the ear, nausea, vomiting, dizziness, a sensation of spinning and decreased hearing may also indicate inner ear barotrauma.

Blood from the nose or in the sputum is also an indication of barotrauma and does not have to be associated with other symptoms. These are symptoms that should probably end the day's — and possibly the week's — diving. Continuing to dive with barotrauma may result in serious injury.

**TREATMENT AND MEDICATION**

If you experience any symptoms during or after a dive, then you should consult a physician to determine whether there has been any permanent damage, or if there is some treatable condition causing the problem.

Your physician can determine the correct treatment and medication for sinus or middle ear barotrauma and refer you to an ear, nose and throat specialist, if necessary. If medication is prescribed, carefully review any potential side effects (such as drowsiness) with your physician to make sure taking it will not interfere with safe diving.

Proper care and medication under the supervision of a physician can reduce the time divers experience barotrauma symptoms — and the sooner they can get back into the water to enjoy diving.

Join DAN Today!  
Call 1-800-446-2671 or apply online at  
**[www.danismybuddy.com](http://www.danismybuddy.com)**

**Divers Alert Network:**

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