

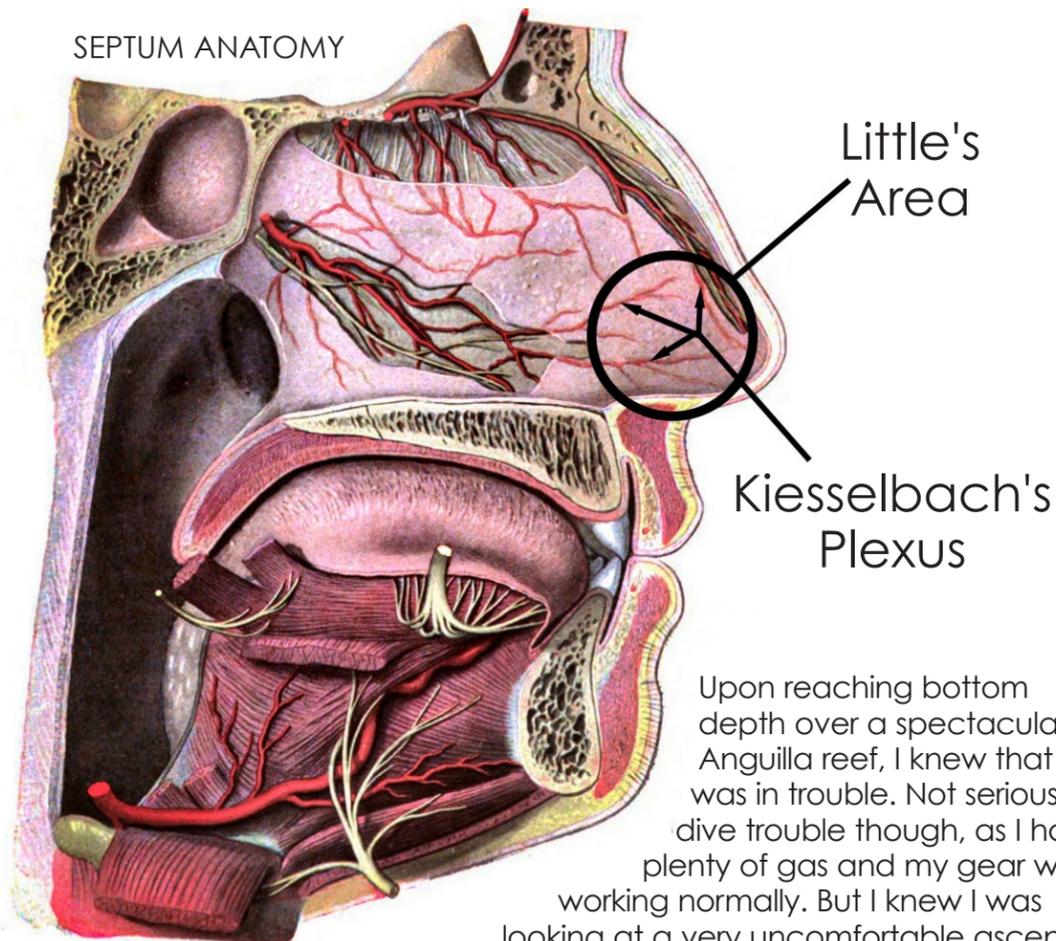
Nosebleeds in Scuba Diving

Text and photos by Michael Rothschild, MD

Well-trained divers all know that they need to equalize their ears and sinuses as they descend. Usually, this is an easy process. However, there are some medical conditions that can make this more difficult. Technical rebreather diver and underwater photographer Dr. Michael Rothschild is a pediatric ear, nose and throat specialist in New York. In this article, he walks us through the common causes of nosebleeds during diving, and how to avoid sinus blocks associated with changing ambient pressure that can cause nasal barotrauma and bleeding.



SEPTUM ANATOMY



Upon reaching bottom depth over a spectacular Anguilla reef, I knew that I was in trouble. Not serious dive trouble though, as I had plenty of gas and my gear was working normally. But I knew I was looking at a very uncomfortable ascent. And as they say, descents are optional, but ascents are mandatory.

I had started the dive with some mild nasal congestion that had given me a bit of trouble on the way down. It had

taken longer than normal to equalize my sinuses—specifically, my maxillary sinuses, the big air-filled spaces in my cheeks just below my eyes. When I ascended a bit, it was obvious that the compressed gas at ambient pressure—about four atmospheres at 100ft—was not going to come out of those sinuses easily, as it normally does.

Every well-trained diver understands that we need to equalize the pressure in the body's air-filled spaces to ambient pressure as we descend. For most

of us, this is not much trouble.

The spaces that we are most commonly aware of are the middle ear clefts (behind the eardrum); divers typically need to push gas into this space on descent with a Valsalva or other maneuver. The ears are connected to the airway by a long pathway (the Eustachian tube, or ET) that is normally closed by the springy cartilage in the wall, and which opens with muscular activity or a pressure gradient.

The paranasal sinuses are also air-

filled spaces, but the passageways connecting them to the airway are short and do not dynamically open and close like the ET. So, most of the time, there is no problem equalizing the sinuses. However, things like chronic sinus inflammation, acute infections, allergies or anatomic variants can make this more difficult.

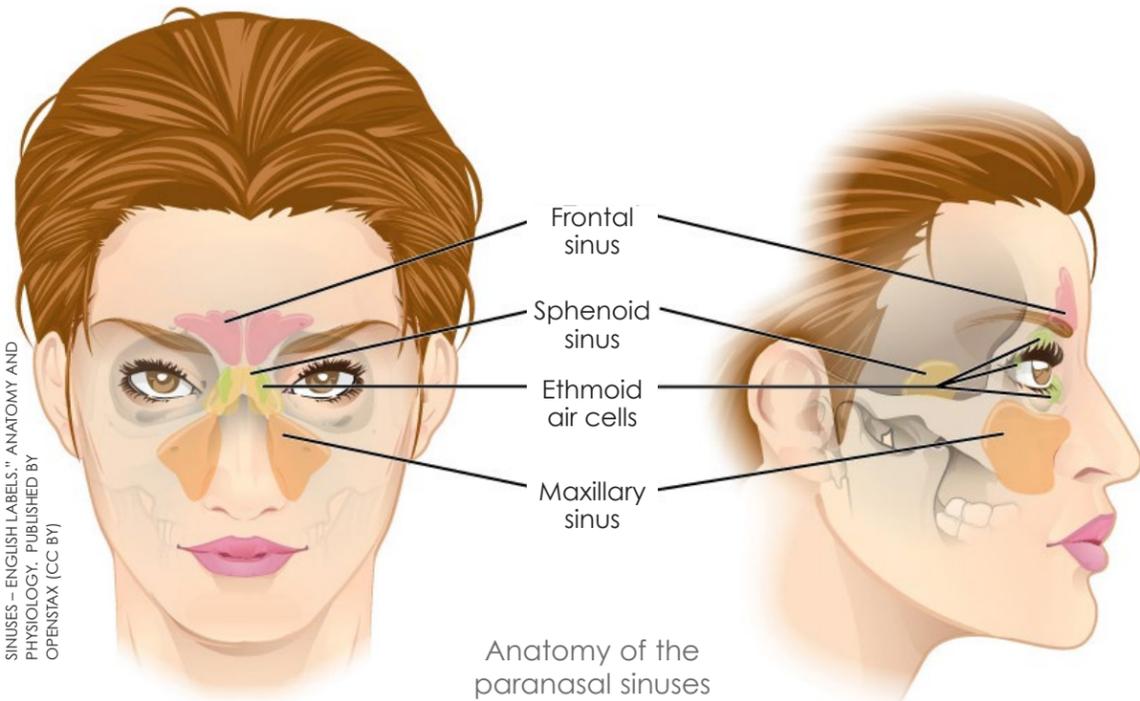
Block

A “block” refers to a problem with this equalization process on the way down,

The common anatomical source of nosebleeds *not* related to diving—dried surface blood vessels (Kiesselbach's plexus) in the front of the nasal septum (Little's area).

SOURCE: "SOBOTTA 1909 FIG. 544: NERVES AND ARTERIES OF THE NASAL SEPTUM AND TONGUE - NO LABELS" BY JOHANNES SOBOTTA AND THEO PHOTOGRAPHYX (CC BY-SA)

"OPENSTAX ANATOMY FIG. 7.18—PARANASAL SINUSES—ENGLISH LABELS," ANATOMY AND PHYSIOLOGY. PUBLISHED BY OPENSTAX (CC BY)



Anatomy of the paranasal sinuses

making it difficult to get gas into one of these spaces. And we all know what to do with an ear block, right? Slow your descent and then stop if you cannot equalize. Then ascend a bit if that does not work. *Never* push through it. True anatomical or physiological problems with the ET preventing equalization are very rare, it is almost always a technique issue.

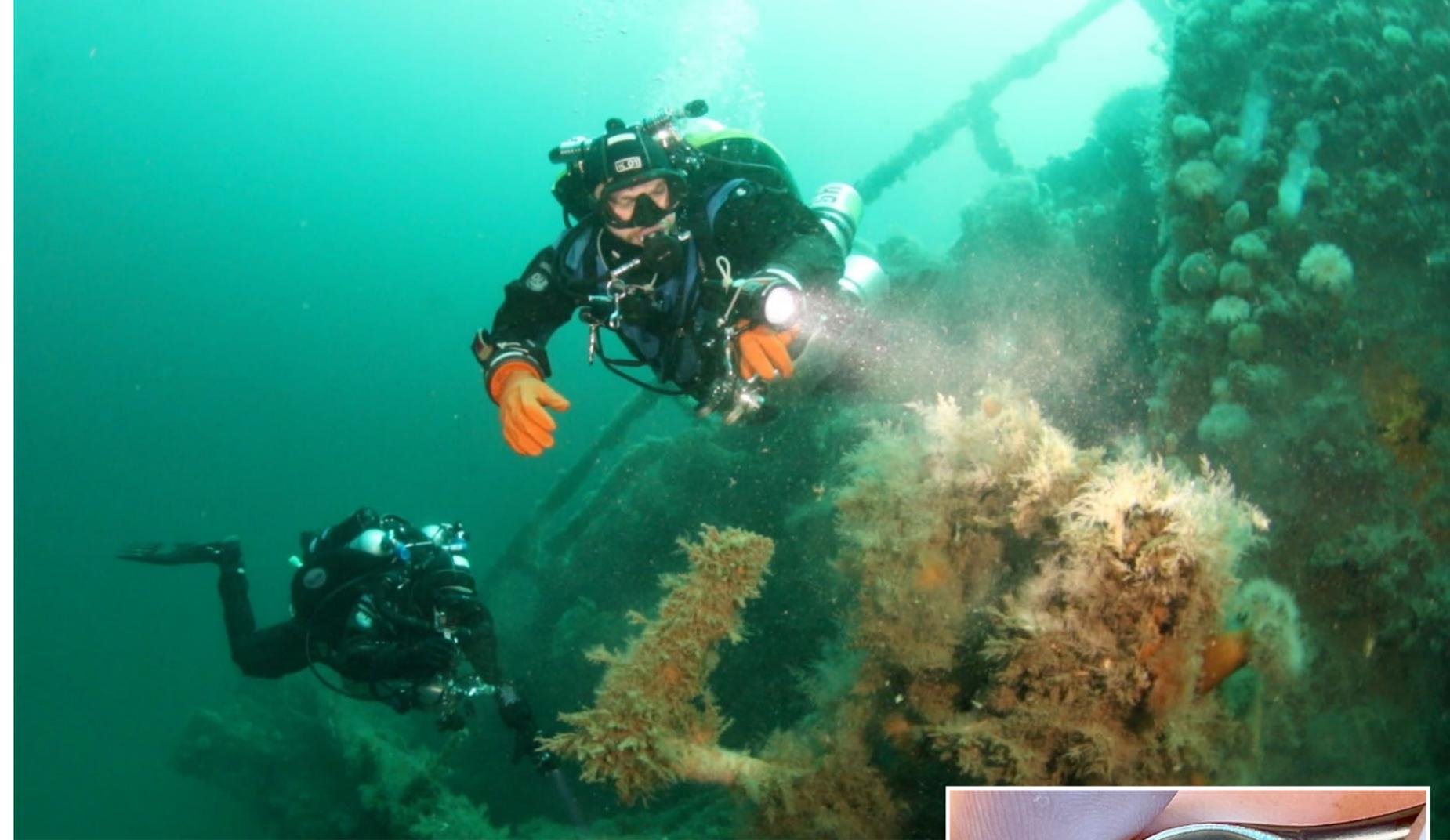
Reverse block

A "reverse block" is much less common. This refers to the situation where there is a problem getting gas out of the ears or sinuses on ascent, as ambient pressure drops. Just like how it is easier to get toothpaste out of a tube than back into it, there generally is not any problem equalizing on the way up. The expanding gas usually just pushes its way out. Usually, but

not always. And, sooner or later, you need to either evolve gills or get back to the surface, equalized or not.

In this worst-case scenario (surfacing without equalizing), the ear and the sinuses are very different. In the ear, the eardrum acts like the burst disk in a scuba tank. It is just a thin membrane, and if the gradient (the difference between middle ear and ambient pressure) gets big enough, the eardrum will rupture.

The sinuses, on the other hand, are bony cavities. In very rare cases, the wall of the sinuses can burst into the area around the eyes or even the brain, causing serious injury, but that is beyond the scope of this article. More commonly, they just act like little scuba tanks in your face. They hold gas under pressure against a significant gradient, until they eventually



decompress through their natural orifices into the nasal airway. But until that happens, that gradient hurts.

So that was what happened to me—a reverse sinus block. I tried my best to equalize on ascent, doing a reverse Valsalva maneuver where I tried to suck air out of the sinuses into my nose. But it did not work. I climbed back on the dive boat in agony, still wearing my mask, with my sinuses holding gas at 4atm of pressure.

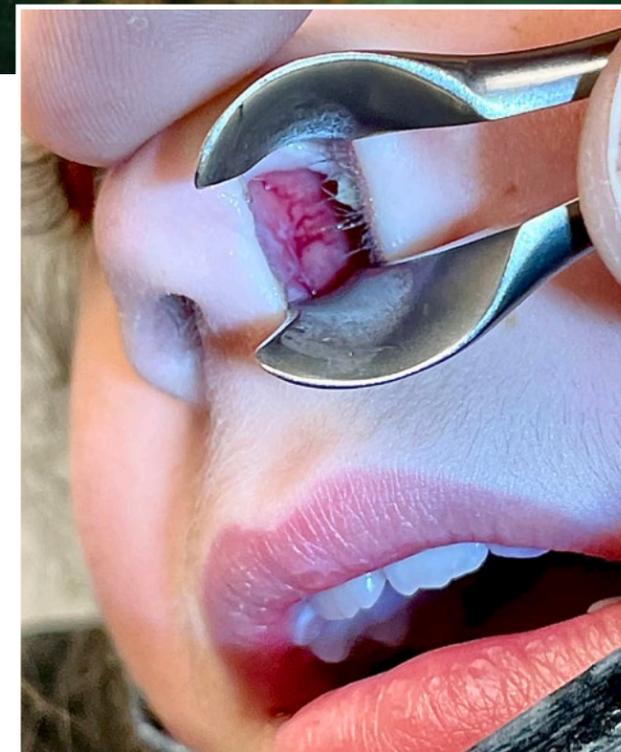
I could not pay attention to anything the crew was saying, I just kept trying to equalize. It was miserable. And then it happened. A sudden explosion of blood and snot into my mask. That was the single best sensation that I have ever had diving. It is hard to describe what an incredible relief I felt at that time, when I finally was able to equalize.

So why all the blood? Well, the lin-

ing of the nose and sinuses is a tissue called mucosa, and it has an excellent blood supply. It does not take much trauma to make that tissue tear and bleed—ask anyone who has had a nasal fracture. The trauma in scuba is barotrauma from that pressure gradient. And this is the most common cause of nosebleeds (also known as epistaxis) in diving. Even if there is not a severe reverse block, divers often will have slow or intermittent equalization of the sinuses on ascent and descent with transient barotrauma, resulting in some bleeding from the sinuses into the nasal airway.

Nosebleeds on land

Although what I described above is the most common reason for epistaxis in scuba, the mechanism for nosebleeds not associated with diving is completely different. Let me take a



"Little's area" is the part of the nasal septum (the wall in the middle of the nose) that is just inside the nostril. "Kiesselbach's plexus" is the group of blood vessels on the septum that dry out and bleed.

dive medicine

If you are very congested, you should not dive. If you do dive, do not push through any ear or sinus equalization problems. Go slowly, and make sure that you can descend without a lot of trouble. And, as always, remember that any diver can call off any dive at any time for any reason—do not hesitate to thumb a dive if you cannot equalize, and communicate any anticipated problems with your buddy ahead of time.

slight detour here and explain that.

The nasal septum is the cartilage wall in the center of the nose that divides the airway in half, and it is also lined with mucosa. There is an area in the very front of the septum, just inside the nostrils, called “Little’s area,” and this is where the vast majority of nosebleeds come from. There are two reasons for this.

Firstly, the area has a very good blood supply, sometimes with large blood vessels visible on the surface (“Kiesselbach’s plexus”). Secondly, this area is the one place in the body where mucosa with a rich blood supply frequently dries out. It is constantly “in the wind” as normal breathing moves a dozen lungfuls of gas over it every minute.

Unlike the rest of the airway, which

is internally protected and remains humid, Little’s area is continually bathed in dry external air. There is not even a protective mechanism to keep it moist. The mouth is also lined with mucosa, but very few people get “mouthbleeds” because the mouth is usually wet with saliva.

This is why your number one ally in the fight against nosebleeds is nasal moisture. Room humidifiers are good, especially in dry winter air, but they must be kept clean. Saline sprays (with or without the natural sugar xylitol) and aqueous ointments (like Bactroban) also help.

Sometimes, recurrent or severe nosebleeds require medical attention. In rare cases, they are due to medical problems with clotting, high blood pressure, or even growths in

the nose or sinus. If none of those are an issue, cautery can help. In the office, this usually involves touching Kiesselbach’s plexus with an irritating chemical like silver nitrate, which causes the vessels to clot off and scar over. While no doctor can completely prevent nosebleeds, between lubrication, humidification and cautery, they can be made a lot less common.

How to deal with nosebleeds

The first thing to remember if you ever get a nosebleed is this: Because of where Little’s area is, you can stop epistaxis by *pinching the nostrils together*. This compresses the blood vessels, and pinching will stop the majority of nosebleeds if you hold pressure for a while. For some reason, many people think that you should

pinch the bony bridge of the nose, between the eyes. I do not know where that idea came from but doing that does not help.

Preventing nosebleeds in diving

So, getting back to the original topic of this article, what should you do to prevent and treat epistaxis associated with diving? Well, if you are very congested, you should not dive. If you decide to dive anyway, do not push through any equalization problems. Go slowly, and make sure that you can descend without a lot of trouble. And, as always, remember that any diver can call off any dive at any time for any reason—do not hesitate to thumb a dive if you are in this situation, and communicate any anticipated problems with your

buddy ahead of time.

Some divers get nosebleeds not associated with sinus barotrauma, just from irritation of the area. Frequent Valsalva maneuvers for ear equalization can traumatize the nasal septum by pinching the nose tightly, so lubricating sprays or ointment can help here as well. A decongestant spray like Afrin will cause the nasal blood vessels to constrict, which can stop or prevent minor bleeding. However, it must *not* be used for more than three days in a row, or if you have certain heart problems (ask your doctor). Nasal steroids (like Flonase), which are commonly used by divers for congestion or to help with ear equalization, can cause epistaxis. Also, they do not actually help with ear equalization.



To stop most nosebleeds, just pinch the nostrils together (not the bridge of the nose). This compresses any vessels in Little’s area, the most common site of bleeding (above); Diver at dive boat on the wreck site of the *Algol*, New Jersey, USA (left)





If you have a nosebleed during or after a dive, do not panic. Pinch your nostrils together, hold for several minutes, and use some Afrin (three days only!). Prevent nosebleeds by keeping your nose moist, and by frequent and adequate equalization of the sinuses when diving.



Diver with hermit crab, Cozumel, Mexico (above); Diver on the PLM27 shipwreck, Newfoundland, Canada (top right)

Packing

Packing the nose is rarely a good idea. Unless you are trained to do this and have the equipment to retrieve any packing pieces that get stuck in the nose, this can cause trouble. Also, they can cause more bleeding when they are removed. If the nosebleed is from Little's area, pinching the nose will usually work just as well as packing. If the bleeding is from sinus barotrauma, it is unlikely that packing will actually stop it (although you may see it less!). In some cases of severe bleeding, packs are used, but they are generally not the best option for typical nosebleeds.

Summary

So, if you have a nosebleed during or after a dive, do not panic. Pinch your nostrils together, use some Afrin (three days only!), and keep your nose moist. Prevent nosebleeds while diving by frequent and adequate equalization. Do not dive if you anticipate any major difficulty doing this. Abort the dive if you have significant problems equalizing on descent.

Oh, and if it's a shark dive, maybe it's best to keep your mask on until you are back on the boat! ■

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in New York City. He is a Clinical Professor of Otolaryngology and Pediatrics at the Icahn School of Medicine at Mount Sinai. He has served as president of the American Broncho-Esophagological Association and of the New York Pediatric Society. He is also a technical rebreather diver, who dives frequently in the New York City area. Dr. Rothschild has been president and dive chair of the New York City Sea Gypsies, and he is currently the co-director of the New York Underwater Photographic Society as well as a medical moderator on Scubaboard.com. For more information, see: dive.rothschilddesign.com.



Shark on the wreck of the USCGC Spar, North Carolina, USA