

Chapter 12

OTHER BAROTRAUMAS

Barotrauma can develop wherever there is an enclosed gas space adjoining tissues. With descent, the space contracts, pulling tissue and blood into the space (implosions). With ascent, the space expands and disrupts tissue (explosions). Because gas changes are greater near the surface, barotrauma is more likely in the shallower depths.

The spaces may be within the body or between the body and the equipment. They include :

- **Facial (mask) squeeze**
- **Skin (suit) squeeze**
- **Body squeeze and "blow up"**
- **Gastro-intestinal barotrauma**
- **Dental barotrauma.**

Barotraumas dealt with earlier include lung, ear and sinus barotraumas.

FACIAL BAROTRAUMA OF DESCENT

(MASK SQUEEZE)

During descent the airspace inside a face mask is compressed and the contraction in volume of the gas space is accommodated by flattening of the mask against the face, and later by congestion of the facial skin and eyes.

It can lead to bleeding into the soft tissues under the skin and produce a characteristic **bruised** facial appearance under the mask area. The whites of the eyes may be grossly haemorrhagic ("**red eye**"). It may take 1–3 weeks to clear up.

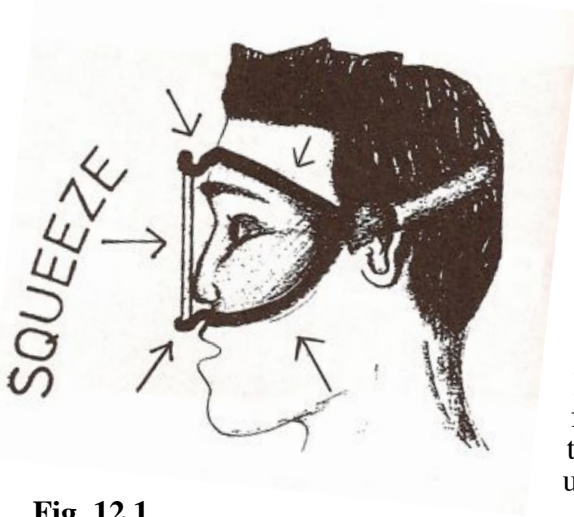


Fig. 12.1

This condition is easily prevented by exhaling into the face mask during descent, to equalise the mask with the water pressure. More cases have developed since rigid plastic face masks replaced the soft rubber ones. Expanding gas automatically vents around the edge of the face mask during ascent.

Divers using swim goggles run the risk of a similar form of barotrauma on a smaller scale involving the tissues around the eye. In the past, if goggles were used to dive, a method of equalising the space around

the eye, such as that shown in diagram 12.2, was employed.



Fig. 12.2

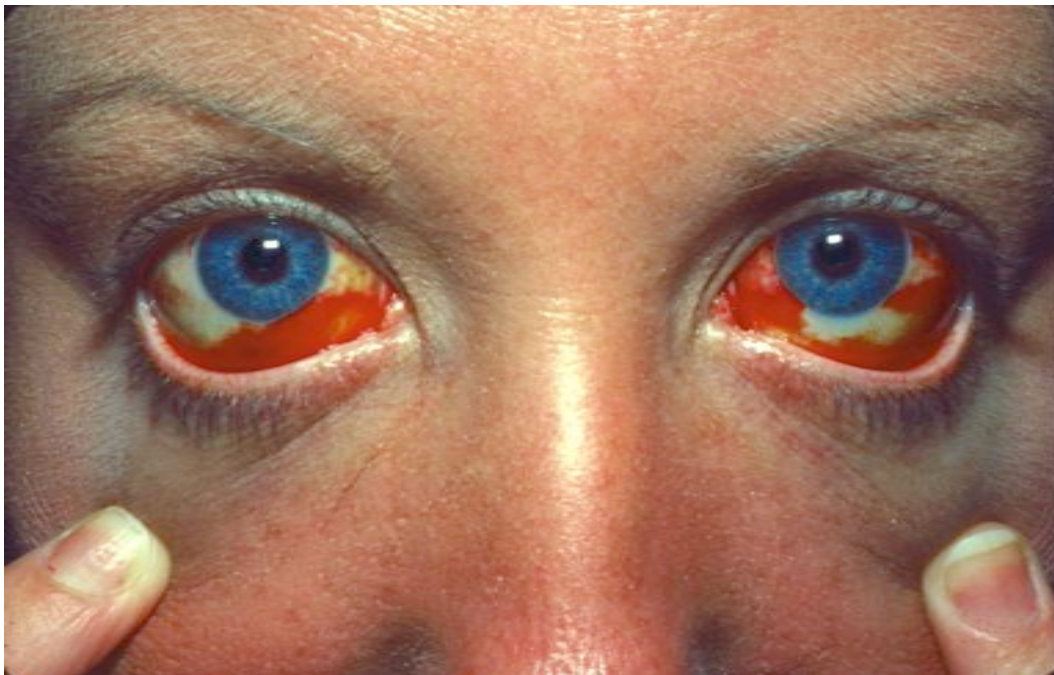


Fig. 12.3 Facial barotrauma from diving with goggles – note the bleeding into the sclera (white parts) of both eyes. Face masks can cause similar eye bleeds, but then the surrounding facial tissues are also bruised.

SKIN BAROTRAUMA OF DESCENT

(SUIT SQUEEZE)

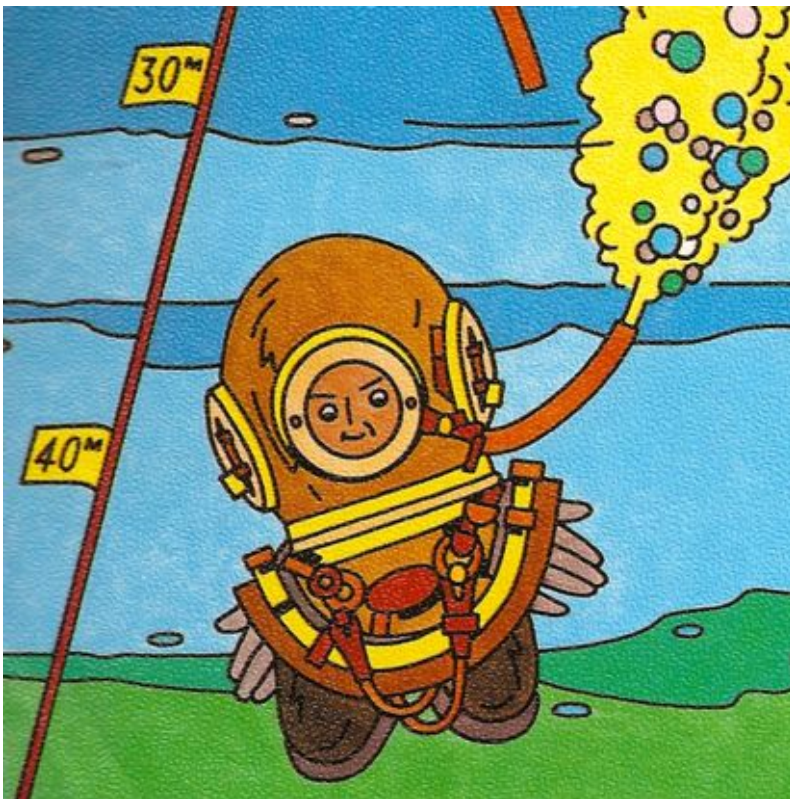
Divers using a **dry suit** or a **loose wet suit** may experience this problem. During descent, pockets of gas can be trapped in folds under the suit. Where the suit has folds, the contraction of the gas space is accommodated by the skin being sucked into the space leading to strips or welts of bruising.

It may cause discomfort at the time. After surfacing the diver may notice bruising over the skin, corresponding to the folds.

BODY BAROTRAUMA OF DESCENT

(BODY SQUEEZE)

With the solid metal helmet used in standard diving there is a possibility of the diver descending and the pressure in the air hose not keeping up with the environmental pressure. If this occurs, the diver's body may be forced up into the helmet, and crushed.



This can also happen at a constant depth, when a non-return valve is not used (or is not functional) and the air supply fails. The only treatment for this bizarre injury is to wash out the helmet with a good antiseptic.

Even the modern plastic helmets, used in deep and helium diving, can cause minor variants of this condition.

Fig. 12.4

SUIT BAROTRAUMA OF ASCENT

("BLOW UP")



Fig 12.5

With either dry suit or standard dress, the gas in the suit can expand with ascent, causing increasing buoyancy, more rapid ascent, etc. and a vicious circle develops where the diver may hurtle to the surface and be imprisoned in a balloon-like inflated suit. Special training and emergency procedures are needed for recreational divers who wear this equipment. As well as the physical injury that may result, other barotraumas and decompression sickness are likely.

GASTROINTESTINAL BAROTRAUMA

Gas is normally present in the gastro-intestinal tract. This finds its way into the atmosphere from time to time, as those who consume prunes, baked beans or cabbages will attest.

During a dive, gas may be swallowed when the diver equalises his ears, especially if in the inverted (head-down) position. It may accumulate in the stomach and gastrointestinal tract without initially causing any discomfort to the diver. During ascent however, this accumulated gas increases in volume, and can result in cramping colicky abdominal pain, belching and vomiting. Rare cases of stomach rupture have even occurred.

Divers are advised not to equalise their ears in the "head down" position.

Several cases of severe gastric discomfort have been reported during chamber dives when the divers drank carbonated beverages while under pressure. One amusing account relates the opening of a new hyperbaric facility which was toasted by champagne at 20 metres depth. The occupants were disappointed that the champagne appeared to be flat, but they drank with relish anyway because it tasted good. Their discomfort was exceeded only by their embarrassment during ascent as the gas in the champagne came out of solution and expanded in their stomachs.

DENTAL BAROTRAUMA

This uncommon form of barotrauma has on occasions been given sensational publicity, causing some divers to believe that they carry potential bombs set into their jaws.

Decayed teeth can occasionally contain a small air space which may lead to the tooth crushing inwards (imploding) during descent or fragmenting painfully (exploding) during ascent. The latter happens when there is an opening sufficient to allow air to enter during descent, but insufficient to allow it to escape during a fast ascent. As divers age, they develop small air spaces around their teeth, resulting in dental pain on descent. Because the air space is constant, the depth at which the barotrauma occurs also tends to be constant.

The explosive potential of this occurrence during descent or ascent has been overrated.

Diving within several days of a tooth extraction may occasionally allow air to enter the tissues through the tooth socket from the positive air pressure generated by breathing through a regulator. This results in air tracking into tissues around the face (**tissue emphysema**). This is rarely serious and is treated by the diver breathing 100% oxygen for several hours to eliminate the air.

Diving after any tooth extractions should be avoided until the tooth socket has healed — usually this takes about a week to ten days.