



SUHMS

SWISS UNDERWATER
AND HYPERBARIC
MEDICAL SOCIETY



DIVING- ACCIDENT

Evaluation and Management for
Emergency Physicians and Emergency Units

RECOMMENDATIONS
OF THE SWISS UNDERWATER AND
HYPERBARIC MEDICAL SOCIETY
"SUHMS"

Swiss underwater and hyperbaric medical
society
Société suisse de médecine subaquatique
et hyperbare
Società svizzera di medicina subacquea e
iperbarica



DIVING ACCIDENT

Diving accident usually occurs after a fast surfacing. In the reality symptoms of a diving accident may appear even if all diving rules have been followed.

The use of an underwater computer does not protect reliably from accidents.

Repetitive immersions, dehydration and a transfer to a higher altitude (flying, mountain pass crossing) can increase the risk of an accident.

Affected divers realise its signs often too late, never or they tend to deny the symptoms.

MANIFESTATIONS

Barotraumas

Barotraumas are damages to air filled cavities and organs caused by variation of pressure. The therapy of these damages will be carried out according to the standard trauma recommendations of each specialty.

Lesions due to bubble formation DCI

(Decompression Illness)

Bubbles of any origin cause tissue damage, ischemia, endothelial, coagulatory and inflammatory reactions.

Right-to-left shunts in the lungs or in the heart can facilitate bubble arterialisation, increasing the **risk of embolisms**.

- ▶ An etiological differentiation between the both in the following section described forms of DCI is not relevant for an emergency treatment!

PRESENTATIONS OF DCI

(Decompression Illness)



Arterial Gas Embolism, AGE

The entry of air bubbles into the systemic circulation can lead to gas embolism.

These gas emboli are mostly caused by a lung barotraumas, in the medical field is the embolism mostly caused by iatrogenic measures.

The symptoms appear during or immediately after the surfacing, rarely later. In addition to typical DCI symptoms, thoracic girdle pain, cough, hemoptysis and dyspnea may appear as well.



Decompression Sickness, DCS

During breathing under elevated pressure the inert gases, mostly nitrogen diffuse according to their partial pressure gradients via lungs and blood with variable speed into all body tissues. These additional gasloads have to be eliminated as the external pressure is decreased.

If the decompression rate exceeds the supersaturation tolerance of the tissue, formation of bubbles in the circulatory system and in the organs may occur.

Symptoms appear within a few hours, but up to 48 hours after the exposure to hyperbaric environment.

SYMPTOMS OF A DCI

(Decompression Illness)

■ **Unspecific**

- marked fatigue, headache

■ **Cutaneous**

- marbled skin (exanthemas, especially on the trunk, on the shoulders and on the outer sides of the thighs)
- sometimes lymphedemas

■ **Musculoskeletal** (bends)

- mostly periarticular pain in the proximity of large joints

■ **Neurological (peripheral, spinal or central)**

- disorders or loss of consciousness
- visual disturbances
- auditory disorders
- dizziness
- hypoesthesia's or paresthesia's
- palsies
- urinary retention
- ataxia
- girdle pain, often transitory, incomplete or complete para- or hemiplegia

► **Neurological symptoms** are signs of a serious diving accident requiring a fast and competent treatment.

A decompression illness misjudgment could lead to a permanent impairment. Repetitive neurological exams and a correct therapy are mandatory. Diving accidents are often underestimated due to their dynamic course and delayed onset of symptoms.

IMMEDIATE MEASURES ONSITE

- **Assessment of vital functions, BLS/ACLS** if necessary
- **Airway and lung assessment**, drainage of pneumothorax if needed.
- **Administration or ventilation with oxygen at 1.0 FiO₂**.
Suitable: Rebreathing systems with carbon dioxide absorber; reservoir oxygen mask with an O₂ Flow ≥ 15 L/min, or demand valve, with tight fitting mask. Endotracheal intubation only when indicated.
Unsuitable: nasal canulas/prongs, oxygen mask without reservoir.
- **Hydration:** If the patient is totally conscious, oral liquid administration; Ringer or NaCl (Sodium chloride) infusion. Divers are mostly dehydrated.
- **Protect from further cooling**, but no active rewarming (may increase bubble production).
- **Neurological exam and rapid general state evaluation** by the emergency physician. Follow up repeatedly.
- **Record of specific diving history** including dive computer data if possible.
- **Consultation with a diving medicine specialist** for diagnosis, therapy and possibilities of transport via:
DAN Hotline: Rega, Phone 1414,
from abroad +41 333 333 333

MEASURES IN THE EMERGENCY WARD

- Continuation of oxygen therapy in spite of good saturation with an appropriate system (as above) or with an anaesthetic circle system. Never N₂O or Entonox!
- Stabilisation of the vital functions according to Emergency Medicine Standards.
- Exclusion of pneumothorax.
- General cursory examination, eventually supplemented by a specialist exam (in consultation with a diving medicine physician).

- Repetitive neurological evaluation, including bladder and sphincter check.
- Stabilisation of the vital functions has higher priority than an albeit necessary decompression chamber treatment (HBO).
- Recording of the dive (dive partner, computer).
- Recording of all performed medical measures.

FURTHER THERAPEUTIC MEASURES

- See also the „Guidelines for Diving Emergencies“ on: www.suhms.org
- Diving medicine consultation for the diagnosis, therapy and the possibilities of transport via:
DAN Hotline: Rega, Phone 1414, from abroad +41 333 333 333
- Continuation of normobaric oxygen therapy (100% O₂) according to diving physician's recommendations, or until follow up therapeutic measures.
- Indication for HBO Therapy can be influenced by various logistic criteria (location of the accident, transport possibilities, availability of chamber treatment).

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