

Orthopaedic issues whilst diving

The human body contains a number of structures that may be affected by an orthopaedic condition.

- 206–212 bones
- 650 muscles and double the amount of tendons
- 300 joints with cartilage
- Soft connective tissue
- Spine with 24 vertebral bodies
- Spinal cord with 31 pairs of spinal nerves
- 780,000 km of nerves (almost 20 times around the world!)



The following issues should be considered at the “orthopaedic diver appointment”

Physical disabilities: Deformities, amputations, paralyses, ankyloses

Chronic illnesses: Muscular dystrophies, rheumatic conditions, prosthetic joints, bone diseases (osteoporosis, brittle bones), degenerative illnesses

Acute illnesses: Fractures, muscle, tendon and ligament injuries, luxations (dislocations), stress syndrome, bone tumours, acute rheumatoid episode, osteonecroses (bone infarctions), post-operative condition (e.g. metal implants following breaks, corrections of deformities, meniscus surgery etc.), bone diseases (osteomyelitis) and other types of tumours

Older divers: Degenerative illnesses, joint deterioration, ankyloses, prosthetic joints

Child divers: Risks to the growth plate on growing skeletons

Fitness to dive criteria

In order to carry out the sport of diving as a recreational or professional diver, it is important that all structures of the musculoskeletal system are able to perform properly with regard to strength, sensitivity and mobility. Fitness to dive may be granted without restrictions if the diver has the ability to rescue themselves and third parties. If this isn't guaranteed due to a functional limitation, there is a possibility to dive with limited fitness (sport for disabled people) using adapted frameworks in accordance with diving regulations. With acute or recent conditions such as broken bones, torn ligaments etc., the injury must be healed enough to be weight-bearing. This means that e.g. a diver must not only be able to move a previously broken bone, but also weight bear and walk around on it. With chronic conditions, orthopaedists and diving doctors must jointly consider whether diving would have an adverse effect or cause a deterioration of the condition (e.g. stress syndrome) or whether the risk of suffering decompression sickness may be increased as a result (with inflammatory diseases, extensive scarring, large metal implants).



Tips for divers

1. With orthopaedic issues or illnesses, the treating orthopaedist must have authorised recreational activities.
2. A diving break is required in the event of any acute inflammatory illnesses (rheumatism, stress syndrome, osteitis etc.).
3. Following operations, the wound must be fully healed and the skin must have closed without any inflammation.

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4. Conservative profiles may be dived with metal implants (screws, plates, nails, wires, prosthetic joints) provided that they are weight bearing, completely healed and do not show any signs of loosening (pain, instability, radiological).
5. Muscles are always weak following immobilisation. Make sure you build up your muscles. Beware of cramp whilst under water!
6. Children usually reach their puberty growth spurt between the ages of 11 and 13. Caution: stress damage! Make sure child-appropriate equipment is used. Help children when putting on and taking off the equipment and avoid long routes in full equipment.
7. The older diver should usually know their exact "orthopaedic limits" and behave appropriately in accordance with this.
8. Muscles and bones are "middle tissues" with a half-life period of 300–600 minutes. This is the time it takes for the absorbed nitrogen to become half desaturated. Blood flow increases during physical activity, for example in the muscles.

This means that the half-life period is not a precise time value, but instead - depending on the degree of the activity - a period of time. Decompression sicknesses of muscles and bones can be expected with extended, deep or repeated dives.

9. With orthopaedic conditions for which fitness to dive is granted, it is recommended that decompression stops are strictly observed and that surface intervals are of an adequate length.
10. Avoid decompression sickness by strictly observing decompression stops and ensuring that surface intervals are of an adequate length to give more time for desaturation.
11. "Dysbaric osteonecrosis" (bone infarction) is a recognised occupational disease for people who work under a high amount of pressure.

Further reading

<http://www.gtuem.org/wcms/ftp//g/gtuem.org/uploads/gtmrckenprogramm52s.pdf>