

# Face Up or Face Down?

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In some ways we are fortunate to have so little experience with transporting severely injured patients through sumps. This shows how rare a need it is. On the other hand, it also means we have few data points to answer some of the open questions. One of the areas with the widest variety of reasoning is whether to swim litter-bound patients face up or face down.

In this setting we are interested in injuries that occur to cavers in dry cave after swimming through a sump. You can also imagine an injury occurring amongst a party of purely-dry cavers who have their day really ruined by their exit additionally being halted due to rain flooding a tunnel. The most common dry-caving injuries are sprains and breaks to the lower and upper extremities. Cave rescuers train to respond to requests for assistance by local emergency management personnel, in situations outside the domain of an average fire fighter.

The most difficult scenario that most sump-rescue teams train for is the movement of a patient with a severe head, neck, or back injury and an altered state of consciousness through a sump. This necessitates the use of a litter. Leg injuries may require a litter while moving through dry cave, but then a patient with a properly splinted extremity can be swum without it. Even with a suspected head or spinal injury, limited immobilization with a backboard such as an Oregon Spine Split (OSS) or Kendrick Extrication Device (KED) is still preferable to a full litter. The water will provide good spine support (1), and litters

are difficult to maneuver. If a patient has a broken neck with an injured spinal cord, the odds of them surviving extraction from a cave are extremely low. Still, situations requiring a litter may arise.

In this situation rescuers will have to decide whether to swim the litter with the patient facing up or facing down. Right now, there is no consensus on which option is better. Good arguments exist for both options, and in training exercises around the world you will see both used. In this article I would like to discuss some of the factors that you will need to assess should you find yourself recruited onto a rescue team.

## Factors

All divers naturally swim in the face down orientation. This feels normal and helps several physiological processes. The natural buoyancy of the lungs, coupled with the pressure differential between the depth of the second stage and the lungs, enlarges the alveoli, making it more efficient to exchange gas than it does when laying on your back (2). The position of the regulator below the ears also makes it easier for the patient to equalize. Note that in the case of a patient in an altered-conscious state, you will not be able to equalize their ears and should expect to tear their eardrums.

Transporting the patient above the litter, and thus face up, is easier for the rescue team. The team will move with the litter in this orientation while traveling through dry cave and stream passages. When moving in to and out of the sump, if the litter or patient has heavy sidemounted scuba tanks and the team decides to go face down, then rotating the litter may prove challenging. While swimming with the litter, the rescue team will most likely swim slightly above it. Face up will make it easier for them

to monitor the patient and breathing apparatus.

You will almost certainly have your patient wearing a full facemask (FFM). If the FFM leaks and the patient is facing down, then the water will pool at the bottom of the mask. If the patient is facing up, then it will be easier to purge the mask but some of the leaking water may also get into their mouth. Note that an FFM may increase the buoyancy of the patient's head and thus impart increased forces to their neck. This is a slight argument in favor of face down, as their head position will be protected by the litter above them. If the patient is using a standard regulator instead of an FFM, keep in mind that some regulators perform poorly when upside down.

Overall patient comfort is another consideration. The patient will need to be strapped to the litter. An informal survey by the author suggests a slight preference for face up. Comfort is a much lower priority than the other factors discussed so far though. Whether or not to give the patient a cutting tool to free themselves from the litter straps is another open issue. During training exercises the mock patient should absolutely have cutting tools.

All cave rescues negatively impact the cave. It is not clear though that either orientation will have a lesser impact on the cave. The degree to which the rescue team is spread out around the litter will likely have a greater effect. If the guideline is run along the floor of the passage, which is likely, then traveling face up may be better. This will keep the smooth side of the litter near the line and the patient's snag-inducing kit away from it.

## Conclusion

In closing, the decision whether to swim disabled patients face up or face

down involves many factors. Almost every physiological factor suggests that face down is better. In training though, the vast majority of teams swim their mock patients face up, and this historical consensus should not be ignored. One rule of thumb may be that if the balance of effort is getting the patient in and out of the water, then the patient should stay face up. If the majority of the effort involves challenges under the water, then face down should be strongly considered. In all situations remember that your mission is to get the patient out of the cave as quickly as possible while causing as little additional harm as possible.

## Notes

- 1) Conversation with Richard "Harry" Harris
- 2) Conversation with Peter Buzzacott