ASCENTS

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Ascents following the breathing of a compressed gas have been a major subject in every Basic, Advanced and Instructors course since the inception of diving instruction. As a result of whatever information was given, literally millions of safe ascents have been made by the diver involved in the programs. All concerned have accepted the fact that overpressure of the lung on ascent can result in damage which might become life threatening. As the sport has become more sophisticated we have seen a greater attention to the details and possible consequences of inappropriate behaviour under nearly all conditions of participation with the gear. It is not at all uncommon to recognize that the more one knows about something the more that person recognizes the enormity of the remaining unknowns. The more we learn about ascents the more complicated are the answers to questions about ascents. Today I believe we are somewhat victimized by knowing a great deal and trying to provide ultimate protection in an area where the mechanically perfect solution will always be subject to the variables of human behaviour.

In my understanding of the problem I must say that I cannot foresee any solution to the problem of ascending after breathing a compressed gas which will be completely satisfactory if our goal is ultimate protection. In any systematic attempt to reach “the” solution we will be faced with the knowledge that it will not provide for all eventualities. We will be forced to consider “trade offs” which will hopefully put the risk-benefit ratio into an acceptable framework. At this point I am forced to point out that, to my knowledge, there have been no evaluations statistical or logical which have developed an accident rate for any of the emergency procedures in our sport. We are told of “increases” in incidence without any information pertaining to the level of incidence for activity. Our recent exercise in legislation has shown us the dangers of using only “failure” data in assessing risk.

I would submit that our practice of accepting or rejecting a course of action in emergency procedures in general should be based upon an objective assessment of risk vs benefit based upon actuarial data; or lacking such data, at least look at the number of known problems against the background of estimates of participation based upon data such as certifications, Skin Diver projections or other reasonable data base.

The following positions regarding this problem should be recognized as comparative and not definitive. I do not believe sufficient data has been accumulated to take a complete position.

Ascents can be identified as normal, in which case the diver is required to exhale and ascent at a rate which will not cause a pressure differential great enough to cause damage or abnormal in which the basic constraints are the same. It would appear that our concern should be directed at maintaining a safe pressure gradient regardless of any procedural choices. How we maintain this “safe” gradient under our selected procedural variations becomes an important issue.

These procedural variations each have some rather apparent strengths and weaknesses.

“Normal” ascent - This practice pre-supposes that no gas trapping circumstances are present and that the rate of ascent is compatible with the exhalation phase so that a minimal pressure differential is present.

1. We have no requirement to assure that even beginners are checked for the absence of gas trapping defects in their airways.

2. There is little training in the matter of safe ascent rate. Admonitions such as “don’t ascent faster than the small bubbles” are given with little reinforcement.

3. The checks to insure that divers “always exhale while ascending” is apparently effective. The overwhelming majority of divers look up, exhale and ascend slowly in a safe manner.

“Abnormal” ascent - This practice is undertaken in circumstances where an intervening variable resulting in stress enters the picture. Low tank pressure, equipment malfunction, loss of buddy contact, concern for personal safety, etc. are a few examples.

1. The risk appears to stem from a loss of self control resulting in a too rapid ascent rate. The crux of the problem appears to be the development of enough self control and relaxation to insure that the diver will not permit a significant pressure gradient to develop during the resolution of the problem.

2. Any technique which is used will ultimately depend upon self-control and an effective level of training.

3. What we should first address ourselves to is the question of teaching safe ascents, whether normal or abnormal. If venting is the problem we must teach them to vent effectively, if ascent rate is the problem we must train for slower ascent rates.

4. All alternative emergency procedures must be standardized, overlearned and reinforced. I suspect that much of the stress involved in using any of the emergency procedures is a result of a lack of confidence in the divers ability to perform adequately.

Questions

1. Do we have a data base to deal with the problem objectively?

2. Are there standardized procedures for
   a. low tank pressure and related problems?
   b. buddy breathing?
   c. use of the auxilliary 2nd stage?

3. Will either the single or dual second stage system operate effectively under all conditions?
   a. deep water
   b. low tank pressure
   c. two heavy breathers
   d. cold water

4. Does the suggested procedure create more problems than it solves?

My investigations strongly suggest that the answer to all of the above questions is NO! Thus it appears that the evaluation of any procedure should be responsive to the question “Would the procedure be safe and effective if it were overlearned and reinforced to the point where stress was minimized?