

**THE EFFECTIVENESS OF GROUND LEVEL
POST-FLIGHT 100% OXYGEN BREATHING AS THERAPY FOR
PAIN-ONLY ALTITUDE DECOMPRESSION SICKNESS (DCS)**

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ABSTRACT

In both the aviation and space environments, DCS is an operational limitation. Hyperbaric recompression is the most efficacious treatment for altitude DCS. However, the inherent recompression of descent to ground level while breathing oxygen is in itself therapy for altitude DCS. If pain-only DCS occurs during a hypobaric exposure, and the symptoms resolve during descent, ground level post-flight breathing of 100% O₂ for 2 hours (GLO₂) is considered sufficient treatment by USAF Regulation 161-21. The purpose of this study was to define the effectiveness of the GLO₂ treatment protocol.

Between 1983 and 1993, 1163 experimental hypobaric exposures were conducted at the Armstrong Laboratory altitude simulators at Brooks AFB, Texas. Constant pain or development of more severe signs or symptoms of DCS were designated as the endpoints of exposures and occurred in 309 (26.6%) of the chamber flights. Pain-only symptoms were present in 265 (85.8%) of these exposures. Of those, 261 (98.5%) met the criteria for GLO₂ of onset of pain-only DCS at altitude with resolution during descent. Treatment was successful in 259 (98.5%) cases. Post treatment sequelae were not present after any of these treatments, and recurrence of symptoms was noted 2 times. No permanent injury is believed to have resulted from any of these exposures.

These data supports utilization of the GLO₂ protocol for treating pain-only altitude DCS which resolves during descent in space operations. Although extravehicular activity (EVA) from the shuttle to date has yielded no reported cases of DCS, the DCS risk will rise with increased EVA associated with space station construction and operations. The availability of such a simple but effective protocol may provide an alternative to aborting a mission or depleting precious oxygen stores for a hyperbaric recompression. It is emphasized that the most effective treatment for DCS cases with signs and symptoms more severe than pain-only is hyperbaric recompression.



**HIGH ALTITUDE
PROTECTION FUNCTION**

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**The Effectiveness of Ground Level
Post-flight 100% Oxygen Breathing
as Therapy for Pain-only
Altitude Decompression Sickness**

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Purpose

Using data from the Armstrong Laboratory Hypobaric Decompression Sickness Research Database, assess the effectiveness of ground level post-flight 100% oxygen breathing (GLO2) in treating pain-only altitude DCS which resolved during descent.

PAIN-ONLY ALTITUDE DCS

- **Results from exposure to reduced atmospheric pressure**
 - Tissue gases reach supersaturation**
 - Bubbles form exerting pressure on pain receptors**
 - Characterized by constant pain, usually in the joints**
- **May induce mission abort or manifest in more severe symptoms unless treated**
- **Treatment: recompression and bubble resolution**

Air Force Pamphlet 161-27

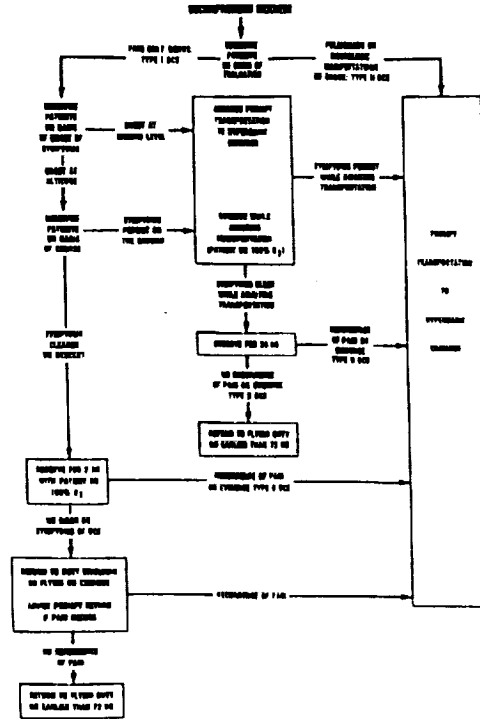
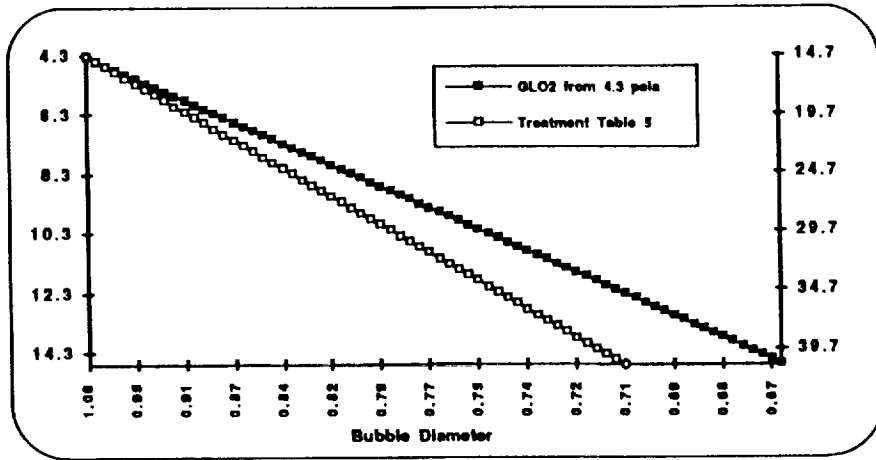


Figure 4-1. Diagram of Decision Points in Evaluating Decompression Sickness for Hyperbaric Treatment

BUBBLE RESOLUTION

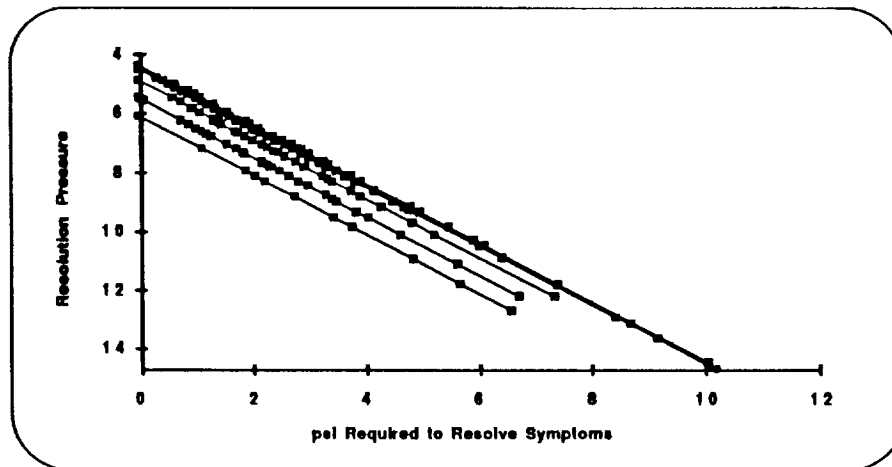


Exposure Pressure (psia)	4.4	4.5	4.9	5.5	6.1	7.8	TT5
Compression Ratio	3.4	3.3	3.0	2.7	2.4	1.9	2.8

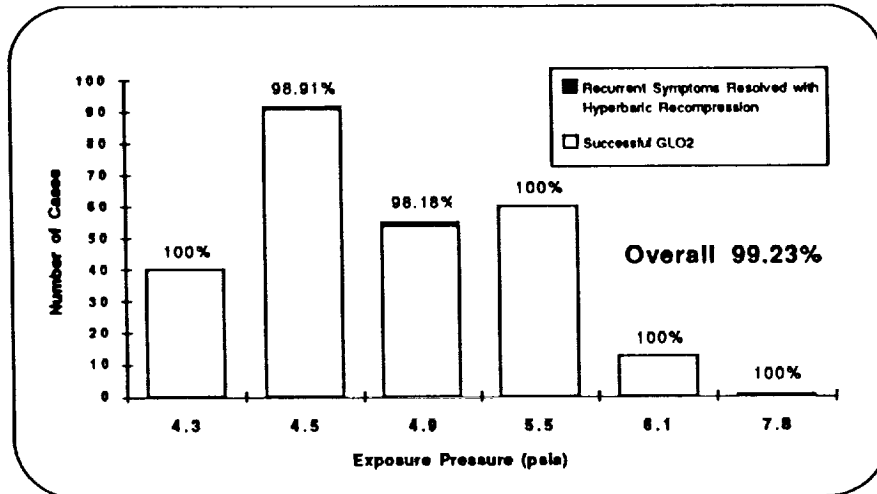
Distribution of DCS Cases

	Raw Data	Percent
Total Exposures	1163	
All DCS Cases	309	26.6%
Pain-only DCS	265	85.8%
Met GLO2 Criteria	261	98.5%

RESOLUTION OF CASES STUDIED



TREATMENT EFFECTIVENESS OF GLO2



CONCLUSION

GLO2 has proven 99.2% effective in treating pain-only altitude DCS which resolved during descent.

These data support the utilization of GLO2 therapy in space operations.