

Development of Underwater and Hyperbaric Medicine in Malaysia

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Summary

Underwater and Hyperbaric Medicine is a treatment modality gaining recognition in Malaysia. It uses the hyperbaric oxygen therapy (HBOT) approach where patients are placed in recompression chambers and subjected to oxygen therapy under pressure. In Malaysia it was introduced as early as the 1960's by the Royal Malaysian Navy to treat their divers for decompression illness (DCI), arterial gas embolism (AGE) and barotraumas. Other sectors in the armed forces, universities and private health centres began developing this approach too in the late 1990's, for similar purposes. In 1996, Underwater and Hyperbaric Medicine began gaining its popularity when the Institute of Underwater and Hyperbaric Medicine at the Armed Forces Hospital in Lumut started treating specific clinical diseases such as diabetic foot ulcers, osteomyelitis, and carbon monoxide poisoning and other diseases using HBOT. This paper discusses the development of this interesting treatment modality, giving a brief historical overview to its current development, as well as provides some thought for its future development in Malaysia.

Key Words: Underwater and Hyperbaric Medicine, Hyperbaric oxygen therapy (HBOT), Recompression chamber, Institute of Underwater and Hyperbaric Medicine, Decompression illness (DCI)

Historical Overview

The history of Underwater Medicine in Malaysia began in early 1960's after the establishment of the Royal Malaysian Navy (RMN) in Woodlands, Singapore. There was a multiplace recompression chamber available at KD "Kapal Di Raja" Malaya in the RMN Headquarters. This chamber was initially used by the British Royal Navy before they left this country as part of diving training among RMN divers at that time. The RMN base in Woodlands was the only location of treatment using this modality until 1970's¹.

In 1978, the Institute of Underwater Medicine was established in Sg Udang Camp, Melaka. This centre

was awarded a multiplace recompression chamber by the Australian government as part of bilateral military cooperation between the two countries. The institute is, up to the present time, a referral centre for the treatment of diving accidents among army divers¹.

In 1979, RMN installed its first multiplace recompression chamber on board of a hydrographic naval vessel. This was followed by an installation of another multiplace recompression chamber on board of one of the class support ships in 1981. In 1982, RMN installed several recompression chambers (multiplace and monoplace) at the naval base in Lumut, Kuantan and Labuan. Later in 1985, RMN also installed four

This article was accepted: 3 November 2006

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monoplace recompression chambers on board its "four-mine hunter's vessels" for operational support during military diving exercises. These facilities were extended to treat injured divers due to underwater mishaps².

All the above facilities were managed by military divers and assisted by diving medical officers of the Medical and Dental Corps. Recompression therapy then was limited to the treatment of underwater diseases such as decompression illness (DCI), arterial gas embolism (AGE) and barotraumas. The Malaysian Armed Forces also started to send their diving officers and medical officers to countries such as Australia, New Zealand and United States for training in underwater medicine¹.

Current Developments

In the early 1990's, the promotion of Malaysia as the world's tourist destination began. One of the targeted activities of promotion was recreational SCUBA (self-contained underwater breathing apparatus) diving. With a wealth of great diving facilities, Malaysia has become a destination of choice for international divers from all over the world. Wreck diving has also become another attractive diving activity since there are a number of wrecks scattered in Malaysian waters. There is also an increase in commercial diving activities due to the growth of marine-based industries like off-shore petroleum drilling and underwater logging³. Underwater logging is a unique commercial activity whereby divers (underwater loggers) go underwater to cut trees for timber. These activities were carried out in several dams in Tasik Temenggor (Perak), Tasik Pedu (Kedah), Tasik Pergau (Kelantan) and Tasik Kenyir (Terengganu)^{3,4,5}. The increases in the different types of diving activities have resulted in more diving accidents reported and treated in recent years in Malaysia.

Institute of Underwater and Hyperbaric Medicine (IUHM)

The Armed Forces Hospital in Lumut began operating in 1996. Built on a budget of RM 63.35 million, this 164-bed hospital has several departments including the Department of Diving Medicine (DDM). Its set-up was accelerated with the acquisition of RM 4.6 million of a multi-place three-compartment recompression chamber which is able to accommodate 14 persons at any one time⁶.

This hospital-based hyperbaric chamber, the first of its kind in Malaysia is managed by two underwater and hyperbaric medicine specialists. They are supported by

29 paramedics trained in underwater and hyperbaric medicine who either operate the chamber during compression sessions or attend to patients inside it. The DDM provides; (1) diving medical examination for military divers and divers from other agencies (Royal Malaysian Police, BOMBA, SMART team), (2) treatment for diving emergencies, (3) diving health education, (4) medical support during military diving operations and (5) research and development⁶.

With the shift from treating diving-related illnesses to the scope of work towards clinical cases, the DDM was officially upgraded to become the Institute of Underwater and Hyperbaric Medicine (IUHM) in 2002⁶. Although its main aim is to support the military diving operations, the IUHM has also treated many civilians (commercial and recreational divers) involved in diving accidents. Most diving-related illness cases such as DCI, AGE and barotraumas, which were earlier treated at RMN recompression chambers before 1996, are now handled at the IUHM³. Clinical diseases such as diabetic foot ulcers, osteomyelitis, necrotizing soft tissue infections, carbon monoxide poisoning, radiation-induced necrosis, compartment syndromes and skin graft/flap are also treated using HBOT. Most patients were referred by government hospitals and private health centres³.

Realizing the medical needs of the non-military diving community, in May 2000, collaboration was established with Divers Alert Network, an international non-profit diving organisation for a 24-hour emergency hotline at IUHM for injured divers. Calls are transferred to an underwater and hyperbaric medicine specialist on call, who gives emergency advice and assistance in evacuation and subsequent recompression treatment³. The IUHM has successfully organised several local and international courses related to underwater and hyperbaric medicine. They are: (1) Diving Paramedics Course, (2) Diving Medical Officers Course, (3) First Aid for Divers, (4) Basic Life Support Course for Divers and (5) International Diving Medical Officers Course. IUHM also plans to develop Submarine Medicine as part of its future plan⁶.

Royal Malaysian Navy (RMN)

The RMN has commissioned a new diving training centre "KD Duyong" in the Lumut Naval Base in early 2005. It is part of the modernization of diving training for the RMN diving courses, which accept military personnel from other countries and has a multiplace recompression chamber for training and emergency treatment of any diving accident².

In addition, the RMN has built a new submarine base in Teluk Sepanggar, Sabah. The first Scorpene submarine will be delivered at the beginning of 2008 and is expected to have initial operational capability in 2009⁷. This base will have a hospital equipped with modern medical facilities that include a multiplace recompression chamber².

Government Health Facilities, Universities and Private Health Centres

At the present time, there is no recompression hyperbaric facility in any Ministry of Health hospitals. Hospital Universiti Sains Malaysia (HUSM) is the first university hospital in Malaysia practising HBOT. This hospital has installed a monoplace chamber in 2004 and treat clinical cases such as diabetic foot ulcers, radiotherapy tissue injury and radiation myelitis⁸. A few private medical centres have set up recompression chambers in their premises. Currently registered are four private clinics and one private hospital. The first was set up in 2001 in Ipoh and followed by others in the Klang Valley⁹.

Future Direction

In the 1960s, 1970s and 1980s, there were limited recompression chamber facilities available in Malaysia. All of these facilities were managed by military divers and diving medical officers for treatment of diving accidents during diving training and exercises. With the establishment of the DDM (1996) which was upgraded to the IUHM (2002), the scope of treatment expanded to treat clinical cases using HBOT. With the arrival of the first submarine in 2008, this is expected to expand further to the next level in the form of Submarine Medicine.

Underwater and Hyperbaric Medicine has a good potential in Malaysia. There is an increasing trend of diving accidents contributed by recreational and commercial diving activities since tourism and underwater industries have become one of the major economic sectors. There is also an increasing trend of diabetic foot ulcers contributed by significant prevalence of diabetes mellitus in Malaysia resulting in amputation and non healing ulcers. There is also a need for alternative or adjunctive treatment in some cases (e.g. carbon monoxide poisoning). However, it depends on the availability and accessibility of recompression chamber facilities as well as expertise of man in handling the chambers. Exposure and hands on experience in HBOT among medical specialists will Create awareness that will contribute towards using HBOT as part of their treatment modalities.

Cost is an important issue that can determine the direction of Underwater and Hyperbaric Medicine in Malaysia. A huge amount of money is needed to develop hyperbaric medical centres and to maintain their operations. Treatment fees incurred by patients for HBOT treatment is another crucial issue since receiving HBOT from private health sectors can be rather expensive. Health planners should consider insurance coverage for this type of treatment in the future.

Acknowledgements

The authors wish to thank Brigadier General (Dr) Ya'akob Komeng and Mejar (Dr) Faizal Zuli of the Malaysian Armed Forces Health Services Division, Captain Abd Ghani Othman and Lt Cdr Mohamad Zainal of the Royal Malaysian Navy and Dr Nik Hisamuddin Nik Abd Rahman from Hospital Universiti Sains Malaysia for their assistance.

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