

E-NEWS

EDITOR'S NOTE – May 2024

The E-News is the monthly newsletter of CUHMA, the primary outlet to share news/announcements, upcoming events, abstracts of recent publications, job postings, professional perspectives, and images of relevant professional scenes. Submission of applicable content is welcome. New issues are released on the last business day of each month. Past issues are available at <https://cuhma.ca>. Direct correspondence to info@cuhma.ca.

Neal W. Pollock, PhD
Université Laval

NEWS/ANNOUNCEMENTS

CUHMA Annual Scientific Meeting Review

The one-day online conference was held Saturday, April 27. Topics included perspectives from Tobermory, physiological limitations of technology, the Titan sub disaster, polar diving, expedition medicine, and diving medical clearance case studies. Continuing education credits were made available from the College of Family Physicians of Canada, the Royal College of Physicians and Surgeons of Canada, and the National Board of Diving & Hyperbaric Medical Technology. The presentations were recorded and will be made available through the CUHMA website in the near future and confirmed in this newsletter.

UPCOMING EVENTS

Ponza Rebreather Conference

The eighth iteration of the Ponza Rebreather Conference will be held May 8-12, 2024 on the island of Ponza, Italy (south of Rome and west of Naples in the Tyrrhenian Sea). Each day will include lectures and boat dives organized by the Ponza Diving Center. Visit: www.ponzadiving.com or info@ponzadiving.com.

UMC Level 2 Advanced Diving Medicine Course

Undersea Medicine Canada is offering a CSA Z275 Level 2 'Advanced Course in Diving Medicine: Diagnosis and Treatment.' This 6-day course will be held May 20-25, 2024 at the Atlantic Commercial Diving Centre in Summerside, PEI. Augmenting classroom instruction and case-based

learning, site visits will allow observation of commercial diver training, diving, and hyperbaric chamber operations. A CSA Z275.2-15 Level 1 course or equivalent training is a prerequisite for this 45-h program. Find more information at <https://underseamedicine.ca> or contact Dr. Debbie Pestell at drdeb1@ns.sympatico.ca or 902-225-8214.

UHMS Annual Scientific Meeting 2024

The annual scientific meeting of the Undersea and Hyperbaric Medical Association will be held June 12-15, 2024 in French Quarter of New Orleans. Visit: <https://www.uhms.org/education/annual-scientific-meeting/asm-registration.html#read-bio>.

EUBS Annual Scientific Meeting 2024

The 48th annual scientific meeting of the European Underwater and Baromedical Society will be held September 16-20 in the port city of Brest, France. Visit: <https://eubs2024.sciencesconf.org>

RECENT PUBLICATIONS

Lampropoulou DI, Papageorgiou D, Pliakou E. Diving medicine: an exciting journey through time and future prospects. *Cureus*. 2024 Mar 26;16(3):e56947. doi: 10.7759/cureus.56947. eCollection 2024 Mar.

Humans, led by their eternal wish to explore the unknown, have always wanted to perfect their diving skills and conquer the sea world. The adverse conditions experienced by divers brought about medical problems and a new field of medicine. Diving medicine serves the identification, treatment, and precautions against illnesses that are related to diving activities. While the development of diving equipment is advancing, divers have had the chance to reach greater depths for a longer time. Along with this success, a novel medical condition under the term 'decompression illness' (DCI) was introduced. Although the history of hyperbaric medicine is very long, progress in the field of mechanics has offered great contributions to the management of the disease. The first attempt at DCI guidelines was made by the US Navy in 1944-1945 and resulted in the creation of hyperbaric treatment tables. These tools received international recognition, offering a major advance. Hyperbaric-Diving Medicine holds an important place in modern medical science nowadays with indications for various diseases. At the same time, there is

great scientific interest and a lot of research in the use of hyperbaric oxygen for several medical disorders, demonstrating great potential.

Lentz PC, Lim SY, Betzler BK, Miller DD, Dorairaj SK, Ang BCH. A deep dive into hyperbaric environments and intraocular pressure-a systematic review. Front Med (Lausanne). 2024 Apr 3;11:1365259. doi: 10.3389/fmed.2024.1365259. eCollection 2024.

Purpose: Scuba diving exposes participants to a unique hyperbaric environment, but few studies have examined the effects of such an environment on intraocular pressure (IOP) and glaucoma. This systematic review aims to consolidate recent literature findings regarding the impact of increased atmospheric pressure on IOP and glaucoma. Methods: Three online databases were searched to identify publications encompassing the subjects of diving or increased atmospheric pressure in conjunction with IOP or glaucoma. Three reviewers independently screened the publications and identified eligible articles. Relevant data was extracted from each article. The heterogeneity of the data precluded the conduct of a meta-analysis. Results: Nine studies met the inclusion criteria. Six experimental studies employed hyperbaric chambers to measure IOP under simulated diving conditions. Among these, IOP exhibited a reduction with increased atmospheric pressures in four studies, while the findings of two studies were inconclusive. One study measured IOP pre- and post-dive and another measured IOP with and without a diving mask. Post-dive, a decrease in IOP was observed, and a statistically significant reduction was noted when subjects wore a diving mask. A retrospective study examining the incidence of acute angle closure glaucoma attack found no association with weather or atmospheric pressure. Conclusion: The majority of studies found IOP to decrease with increased atmospheric pressure and after diving. The mechanisms underlying this reduction remain incompletely understood, with potential contributors including changes in ocular blood flow, sympathetic responses, and increased oxygenation. Hyperbaric chambers may have potential in future glaucoma treatments, but more studies are required to draw reliable conclusions regarding the safety of diving for glaucoma patients.

Marra C, Pentangelo P, Losco L, Ceccaroni A, Barbato A, Alfano C. Lower extremity trauma: a multidimensional reconstructive approach with hyperbaric oxygen therapy. J Clin Med. 2024 Feb 29; 13(5):1407. doi: 10.3390/jcm13051407.

Background: Distal lower extremity reconstruction is challenging. This study aims to propose a protocol for the treatment of traumatic soft tissue defects. The key concept is to combine the surgical armamentarium of the reconstructive surgeon with the advantages provided by hyperbaric oxygen therapy. Methods: This retrospective study analyzed data of 57 patients affected with unilateral

or bilateral lower extremity trauma distal to the knee and involving soft tissues with no indication of immediate reconstruction between 2010 and 2021. Before the reconstructive procedure, all the patients underwent a stick swab procedure for the collection of microbiological samples and debridement. Patients were divided into two treatment groups and only one group underwent a combined therapeutic procedure with hyperbaric oxygen therapy. Negative pressure wound therapy (NPWT) was employed only if deemed necessary according to the defect's depth and wound exudate. Surgical techniques, outcomes, and complications were discussed. Results: All patients achieved a complete recovery with no major complications and only minor complications observed. The study group treated with HBOT had a lower complication rate and lower percentages of minimal and partial graft loss compared with the same complications observed in the control group. No patients experienced HBOT-related complications. Significant reductions in the time to complete healing and the time from reconstruction to healing were found ($p=0.002$ and $p<0.00001$, respectively). Conclusions: A lower complication rate was observed in the group treated with HBOT. The administration of HBOT prior to soft tissue reconstruction significantly reduced the time to complete healing and the time interval from skin grafting to healing. However, prospective studies and randomized trials with larger cohorts should be designed to investigate the efficacy of HBOT for the treatment of lower extremity injuries with extensive soft tissue defects.

Moses RA, Hunter AE, Brandes ER, Zhang Z, Rees JR, Peacock JL, Bihrlle W 3rd, Sethuraman K, Weaver LK, Buckey JC Jr. Patient reported outcome measures following hyperbaric oxygen therapy for radiation cystitis: early results from the multicenter registry for hyperbaric oxygen therapy. J Urol. 2024 Apr 4;101097JU0000000000003929. Online ahead of print.

Purpose: To determine changes in patient reported hematuria and urinary symptoms after hyperbaric oxygen (HBO₂) treatment for radiation cystitis (RC). Methods: We analyzed prospectively data from the Multicenter Registry for Hyperbaric Oxygen Therapy Consortium collected within a week of beginning and ending HBO₂. Measures included the modified radiation therapy oncology group (RTOG) hematuria scale, urinary distress inventory short form (UDI-6), and EuroQOL EQ-5D-5L. RTOG hematuria and UDI scores were compared using the sign test. Logistic regression was used to evaluate characteristics associated with hematuria improvement. Results: 470 registry patients had RC. The median age, number of HBO₂ sessions, and years after radiation were 73 (IQR 12) years, 39 (IQR 10) sessions, and 5 (IQR 8) years respectively. 84% (393/470) had prostate-cancer-related radiation. EQ-5D-5L scores improved from 0.83 (IQR 0.14) to 0.85 (IQR 0.22), $P<0.001$. 370 had complete RTOG hematuria scores which

improved from 2 (IQR 2) to 0 (IQR 2), $P < 0.001$. 246 had complete UDI-6 ratings which decreased from 33.3 (IQR 44) to 22.2 (IQR 33) $P < 0.001$. Regression analysis of those with visible hematuria pre HBO₂, showed lower improvement odds associated with higher HBO₂ hematuria scores (OR: 0.44; 95% confidence interval (CI) 0.26-0.73, $P < 0.01$), a smoking history (OR: 0.44, 95% CI: 0.21-0.92, $P = 0.03$), or a non-prostate cancer history (0.32 (95%CI:0.10-0.99, $P = 0.05$). Conclusions: HBO₂ for RC improved reported hematuria, urinary function, and quality of life. Higher baseline hematuria scores, smoking, and non-prostate cancer history were associated with a lower odds of hematuria improvement.

Rozbicki P, Usowski J, Krzywdzińska S, Jurkiewicz D, Siewiera J. Assessing the effectiveness of different hyperbaric oxygen treatment methods in patients with sudden sensorineural hearing loss. *Audiol Res.* 2024 Mar 29;14(2):333-341. doi: 10.3390/audiolres14020029.

Introduction: Hyperbaric oxygen therapy (HBOT) is one of the treatment methods in patients with sudden sensorineural hearing loss (SSNHL). It is recommended as an elective treatment in patients undergoing steroid therapy. According to current scientific reports, HBOT should be implemented within two weeks after the first symptoms. However, as far as the profile of HBOT is concerned, there are no straightforward recommendations. Methods: The data obtained from the medical records of 218 patients undergoing HBOT for SSNHL at the Military Institute of Medicine-National Research Institute were analyzed statistically for the impact of the duration and the delay in implementing HBOT on the end results of pure-tone audiometry (PTA). Results: A statistically significant hearing improvement in patients undergoing more than 15 cycles of HBOT was detected at all frequencies except for 1500 Hz; in the group reporting for treatment with a delay of more than 10 days, hearing improvement was statistically insignificant at frequencies of 1500, 3000, and 4000 Hz. Conclusions: The statistical analysis showed that the urgent onset of HBOT could be a significant factor in the therapy of SSNHL.

Vulić M, Milovanovic B, Obad A, Glavaš D, Glavicic I, Zubac D, Valic M, Valic Z. Depth of scuba diving affects cardiac autonomic nervous system. *Pathophysiology.* 2024 Mar 29;31(2):183-189. doi: 10.3390/pathophysiology31020014.

The present study investigated the influence of SCUBA dives with compressed air at depths of 10 and 20 m on ECG-derived HRV parameters in apparently healthy individuals. We hypothesized that cardiac sympathetic activity (measured by HRV parameters) adapts proportionally to diving depth, and that both time- and frequency-domain parameters are sensitive enough to track changes in cardiac ANS function during diving activities and subsequently during the recovery period. Eleven

healthy middle-aged recreational divers (nine men and two women, age 43 ± 8 , all nonsmokers) volunteered to participate in the present study. The participants (all open-circuit divers) were equipped with drysuits and ECG Holter devices and were later randomly assigned to dive pairs and depths (10 m vs. 20 m), and each participant served as his or her own control. No interaction effects (diving depth x time epoch) were found for the most commonly used HRV markers. More precisely, in response to two different diving protocols, a significant post hoc effect of time was observed for HR and SDNN, as these parameters transiently decreased during the dives and returned to baseline after ascent ($p < 0.001$). The ULF, VLF ($p < 0.003$), TP, and LF parameters decreased significantly during the dives, while HF significantly increased ($p < 0.003$). Scuba diving apparently challenges the cardiac ANS, even in healthy individuals. The observed changes reveal possible underwater methods of influencing the parasympathetic activity of the heart depending on the depth of the dive. These results identify autonomic nervous system markers to track the cardiovascular risk related to diving and point to the possibility of tracking cardiovascular system benefits during underwater activities in selected patients.

CUHMA-ACMHS is the Canadian voice for the advancement of hyperbaric and diving medicine throughout our country and beyond. Our activities include continuous medical education for physicians, nurses, respiratory therapists and anyone involved in the fields of hyperbaric and diving medicine. We are also promoting dissemination of clinical research, publishing position statements, liaising with related professional associations and government agencies. Our main goal is advocating on behalf of our patients. Our vision is to be the reference for the development and delivery of hyperbaric and diving medicine in Canada and beyond. Our mission is to promote excellence in hyperbaric and diving medicine through leadership in education, promotion of best practices and advocacy for our patients. Our values are excellence, leadership, collaboration, communication, and integrity.

Canadian Undersea and Hyperbaric Medical Association

10 Plumtree Place, Portugal Cove-St. Philips,
Newfoundland and Labrador, A1M 3T1

info@cuhma.ca

<https://cuhma.ca>

Editor: Neal W. Pollock, PhD - neal.pollock@kin.ulaval.ca

CUHMA BOARD OF DIRECTORS

Jay MacDonald	Past-President
Geoff Zbitnew	President
Kaighley Brett	President-Elect
Caroline Bain	Vice-President
Neal Pollock	Secretary
Julie Malone	Treasurer
George Harpur	Director-at-Large
Hafeez Jamal	Director-at-Large