

Staff and patient fitness to hyperbaric exposure

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Purpose of medical evaluation of tenders

- * To identify medical conditions that are contraindications to working in a hyperbaric environment
- * To provide a baseline reference in the event of a change in medical status

Purposes of medical evaluation of tenders

- * To identify medical conditions* arising as a consequence of exposure to the hyperbaric environment
- * To initiate any necessary remedial action if problems are encountered

*: DON, hearing loss

What are we doing now in our country ?



What are we doing now in our country ?

- * Rapid survey by phone and e-mail of different hyperbaric facilities

Initial screening tests for tenders in different Canadian hyperbaric facilities

Exam	Facility A	Facility B	Facility C	Facility D
CBC	√			√
BUN,Creat, Electrolytes	√			
Coagulogram	√			
Urinalysis	√			√
Audiogram	√	√		√
ECG	√			√
Spirometry	√		√	√

Initial radiological tests

X-ray	Facility A	Facility B	Facility C	Facility D
Chest	√	√	√	√
Long bones	√			
Dorsal and lumbar spine	√			
Sinus	√			

Should we do long bones X-rays?

- * Radiologists have to earn their living...
- * Maybe we could find something ?



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Long bones X-rays for hyperbaric tenders ?

J Int Med Res. 2008 Mar-Apr;36(2):222-6.

MRI screening of dysbaric osteonecrosis in hyperbaric-chamber inside attendants.

Ozkan H, Uzun G, Yildiz S, Sonmez G, Mutlu H, Aktas S.

- * Aim of the study: to evaluate asymptomatic inside attendants for dysbaric osteonecrosis (DON) using MRI
- * Medical exam, detailed laboratory tests
- * MRI exam of the shoulders, humerus, hips, proximal femurs, knees
- * 12 inside attendants (4 men, 8 women)

Cohort characteristics

Variable	Mean	Range
Age (years)	28,9	22-36
duration of working(years)	3,8	1-9
Number of treatments per attendant	198	30-950
Pressure		2,4-3,0 ATA

Results of the study

No bone lesions consistent with
dysbaric osteonecrosis (DON)

Long bones X-Rays

- * Should be done based on clinical symptoms and signs suggestive of DON
 - * (MRI is probably a better exam)
- * Some authors suggest that they should be done immediately after an episode of DCS and 3 years after (?)

Initial spirometry for hyperbaric attendants

- * Disqualifying on the basis of the results of a spirometry is controversial
- * Pressure changes in the hyperbaric chamber are not as rapid as in SCUBA diving

Initial spirometry

- * Use of a Beta-agonist inhaler is possible inside the chamber
- * Asthmatics with good control and no severe episode of bronchospasm are probably not at greater risk for PBT

Periodical spirometry for hyperbaric attendants

* Is it necessary ?



Lung function in divers

- * Long-term effects seen in divers are :
 - * Divers tend to develop some degree of airflow obstruction, due to small airway narrowing
 - * Increase in hyperreactivity demonstrated by histamine provocation testing
 - * May be related to a cumulative pulmonary oxygen toxicity or to repetitive pulmonary gaseous microembolisation

Lung function in HBOT tenders

- * Thorsen and al. 2004
 - * Effects of HBOT exposure on the lung function of 14 inside attendants
 - * Yearly evaluation for 4-6 years
 - * Lung function tests are significantly changed in a similar manner to professional divers

Patient's fitness to hyperbaric exposure

Purpose of evaluating patients

- * Evaluate if the patient's medical condition is likely to benefit from the treatment
- * Identify patients at risk for complications from HBOT:
 - * Barotrauma, Cardiac heart failure, Hypoglycemia, Pulmonary O₂ toxicity, Neurological O₂ toxicity

Patient's fitness

- * 2 questions to explore today:
 - * What about pulmonary blebs ?
 - * Is heart failure a concern for HBOT ?

Pulmonary bleb or bullae

Respir Med. 2008 Aug;102(8):1145-7. Epub 2008 Jun 20.

Are pulmonary bleb and bullae a contraindication for hyperbaric oxygen treatment?

Toklu AS, Korpınar S, Erelel M, Uzun G, Yıldız S.

Pulmonary barotrauma(PBT)

- * Air cysts or blebs in the lungs may predispose to PBT
- * Many cases of PBT in divers
- * Few PBT cases reported as a complication of HBOT

Study methods

- * Internet survey
- * HBOT centers all around the world
- * Questionnaire sent to 266 e-mail addresses

Questionnaire

- * Q1: Do you apply HBOT to the patients having radiological evidence of pulmonary blebs or bullae?
- * Q2: What type of chamber (multi/mono) do you use?
- * Q3: What is the total number of HBOT sessions done in your center approximately?

Questionnaire

- * Q4: Did you have any pulmonary barotrauma case during HBOT session?
- * Q5: Do you radiologically screen the patients who have a history of lung disease?

Study results

* Answering rate: 36,8 % (98/266)

Pulmonary blebs and HBOT

	Results
HBOT to patients even they had cysts or blebs	65/98 (66,3%)

Pulmonary blebs and HBOT

	Results
Only for emergent cases	20/65 (30,7%)
HBOT after careful consideration of benefits and risks	15/65 (23%)
Multiplace chamber	45/65 (69,2%)

Pulmonary blebs and HBOT

	Results
Total number of HBOT sessions	2 000 000
Number of pulmonary barotrauma (PBT) cases	9
Incidence of PBT	0,00045%

PBT cases

- * 1 case was a complication of subclavian catheterization
- * There were preexisting lung pathologies such as tumor in 2 cases
- * Mechanical ventilation failure and endotracheal obstruction were present in 2 cases

PBT risk in HBOT vs Diving

- * Physical conditions in HBOT are different than the conditions encountered in diving:
 - * In diving, decompression rate is around 1 atm/min
 - * In HBOT, decompression rate is markedly slower slower, around 0,2 atm/min
 - * In HBOT, the breathing gas is 100% oxygen
 - * Immersion increases air trapping in the lungs as the hydrostatic pressure itself and hydrostatic pressure induced blood shift into thorax compress the lungs

PBT preventive measures

	Results
HBOT facilities taking preventive measures for patients with blebs	20/65 (30,7 %)

PBT preventive measures

- * Slower compression and decompression rates
- * Limiting the treatment pressure at 2 ATA (?)
- * Using bronchodilators prior to the treatment
- * Following up the patient closely
- * Keeping required equipment for thoracentesis near the chamber in case of a pneumothorax

Heart failure ?

Heart failure

- * HBOT may contribute to pulmonary edema by:
 - * Increasing LV afterload
 - * Increasing LV filling pressures
 - * Producing oxygen radicals that can damage the myocardium or interfere with myocyte calcium homeostasis. Oxygen radicals can also consume endothelial-derived nitric oxide, which would decrease diastolic LV distensibility

Heart failure and HBOT

- * It is also possible that cardiac sympathetic tone could be affected by HBOT causing an imbalance in cardiac output between the right and left heart
- * The right-sided cardiac output exceeding that of the left

Heart failure and HBOT

- * Supine position in a monoplace chamber might also increase the risk of pulmonary edema
- * Most patients treated with HBOT for hypoxic wounds also have ischemic cardiovascular disease

Heart failure and HBOT

- * Unfortunately, it is difficult to identify in whom or when acute pulmonary edema may develop
- * Caution is recommended in treating heart failure patients with HBOT

Conclusion

- * Maybe still more questions than answers...
- * We should look at the patient's risk evaluation done in our facilities
- * We should try to establish Canadian guidelines:
 - * Staff fitness
 - * Patient fitness

Tests for our staff ?

- * ~~Long bones X-Rays:~~
- * Chest X-Rays: probably initially
- * Spirometry: probably
- * ECG, Stress test: ?
- * CBC : ?
- * Urinalysis : ?
- * Audiogram : probably
- * Visual acuity : ?

What will be the patient tests?

- * Chest X-rays : probably
- * ECG : probably
- * Echocardiography : ?
- * Blood glucose level before and after each HBOT session for diabetics: ?
- * Monitoring of the patient during treatment : ?
- * Visual acuity: ?

The final word

- * We, as a group (CC-UHMS), have a great opportunity to work together establishing the best standards of practice



* There is the CSA.Z275.2-11

* Why not the CC-UHMS.123.go !!

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search ID: lahn376

"Claiming the North Pole for Mother Russia isn't as much fun as I thought."

Long life to
the
CC-UHMS!

Time for a coffee break...

