

Hyperbaric Patient Selection

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Continuing Education Activity

In hyperbaric medicine, healthcare professionals must recognize that approved indications are not common knowledge amongst those that do not practice it. Some healthcare professionals may be aware of hyperbaric medicine if the facility they work in has a chamber, but they still may not know the indications or when it is appropriate to refer patients. Part of being a hyperbaric clinician is to educate colleagues in the community to collaborate and provide the best care to patients. When evaluating patients, healthcare professionals must first determine if they have an indicated diagnosis. Healthcare professionals must also educate patients during the consultation and make sure they are willing to comply with safety regulations and rules of the chamber environment, the number of treatments recommended, and the frequency of treatments indicated by their plan of care. This activity reviews the considerations for the use of hyperbaric oxygen and discusses the role of the interprofessional team in appropriately selecting patients for hyperbaric oxygen treatment.

Objectives:

- Review the indicated diagnosis of hyperbaric therapy.
- Describe the educational needs of patients that are necessary for hyperbaric therapy.
- Explain the contraindications of hyperbaric therapy.
- This activity discusses the use of hyperbaric oxygen and the role of the interprofessional team in appropriately selecting patients for hyperbaric oxygen treatment.

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Introduction

In hyperbaric medicine, healthcare professionals must understand that the approved indications are not common knowledge amongst those that do not practice it. Some healthcare professionals may be aware of hyperbaric medicine if the facility they work in has a chamber, but they still may not know the indications or when it is appropriate to refer patients. Part of being a hyperbaric physician is to educate colleagues in the community to collaborate and provide the best care to patients. When evaluating patients, healthcare professionals must first determine if they have an indicated diagnosis. Healthcare professionals must also educate patients during the consultation and make sure they are willing to comply with safety regulations and rules of the chamber environment, the number of treatments recommended, and the frequency of treatments indicated by their plan of care.

Issues of Concern

Indications

There are currently 15 approved indications accepted by the Undersea and Hyperbaric Medical Society. There are both urgent and non-urgent indications[1][2], and they are as follows:

Urgent

- Air or gas embolism (can be the iatrogenic or diving related type of injury)[3]
- Central retinal artery occlusion
- Carbon monoxide poisoning [4]
- Clostridial myonecrosis (gas gangrene)
- Compromised surgical grafts and flaps[5]
- Crush injuries/skeletal muscle compartment syndrome/acute arterial insufficiency[6]
- Decompression sickness[7]
- Intracranial abscess
- Necrotizing soft tissue infections
- Exceptional blood loss anemia
- Specific acute thermal burns[8]
- Idiopathic sudden sensorineural hearing loss (urgent)

Non-Urgent Indications

- Delayed radiation injuries for soft tissue or bony necrosis/osteoradionecrosis[9][10]
- Chronic refractory osteomyelitis
- Enhancement of healing in a problematic wound (diabetic foot ulcers Wagner grade 3, 4, or 5)[11][12][13]

After confirming that a patient has an indicated diagnosis, the next step is to perform a thorough history and physical to determine if the patient is an appropriate candidate for hyperbaric chamber treatment. The first ethical obligation to a patient is nonmaleficence ("do no harm"). Healthcare professionals need to review any contraindications or relative contraindications for hyperbaric oxygen treatment.

Contraindications

The one absolute contraindication to hyperbaric oxygen treatment is a patient with an untreated pneumothorax. All patients should have lung imaging before treatment. If a patient receives pneumothorax treatment, the risk-benefit ratio would need evaluation before placing the patient in the chamber based on their indication. During pneumothorax management, a chest tube with the Heimlich valve open before initiation of treatment would be an acceptable approach for pre-chamber management in an emergency clinical situation.

Relative contraindications to evaluate before treatment include, but are not limited to, the

following:

- Uncontrolled hypertension (blood pressure can increase during treatment)
- Diabetes mellitus with glucose levels greater than 300 or less than 100
- Congestive heart failure with ejection fraction less than 35% (hyperbaric can exacerbate congestive heart failure and/or flash pulmonary edema)
- Claustrophobia/confinement anxiety (more common in monoplace chambers, may require multiplace chamber or pharmacotherapy to tolerate treatments)
- Congenital spherocytosis (hyperbaric oxygen can cause severe hemolysis)
- Current upper respiratory infection (concern for ability to equalize on the descent, or risk of reverse sinus block on the ascent, both of these situations can lead to barotrauma)
- Fever (can lower the seizure threshold during treatment)
- Chronic sinus condition (concern for ability to equalize on the descent, or risk of reverse sinus block on the ascent, both of these situations can lead to barotrauma)
- Pacemaker/implantable device (possibility of malfunction under pressure, if the device delivers a shock in 100% oxygen environment could ignite a fire, need to coordinate with the safety officer and call manufacturer to make sure device has been pressure tested to the treatment depth you are going to recommend)
- Recent eye/retinal/cataract surgery or optic neuritis (buckle procedure can have air trapped, other procedures can leave bubbles inside and usually require a few months waiting period before initiation of treatment)
- Recent thoracic surgery (recommend imaging to rule out pneumothorax)
- Obstructive lung disease/chronic obstructive pulmonary disease(COPD)/asthma (lose the hypoxic drive to breathe, can screen with pulmonary function tests and xenon washout study to evaluate for risk of air trapping)
- History of seizures (recommend that the seizures need to be controlled before initiation of treatment, monitor therapeutic levels, may require lower treatment pressures)
- Untreated cancer (controversial topic, but there are no studies to date showing that hyperbarics promote malignant cell proliferation)
- Contact lenses (need to be gas permeable, no hard contact lenses)

Clinical Significance

In assessing a patient's medications, clinicians need to remember the following pharmacotherapy interactions with hyperbaric oxygen treatments. Bleomycin can lead to interstitial pneumonitis (recent exposure, usually within a 12-month period), pulmonary fibrosis. Sulfamylon and cisplatin impair wound healing. Disulfiram blocks superoxide dismutase, which is protective against oxygen toxicity, and doxorubicin can cause cardiotoxicity (must wait a minimum of 72 hours from the last dose). Thus these medications are recommended to be discontinued before treatment.[14]

After a healthcare professional takes a history and performs a physical evaluation of a patient, they need to keep in mind the type of treatment plan recommended for the patient. For urgent indications, the sooner hyperbaric treatment sessions usually start, the better the benefit from treatments. Other considerations include the type of chamber available, and limitations of the chamber based on clinical requirements of the patient, the amount of staff available, mixed gas capabilities, and time needed for treatment. If a multiplace chamber is accessible, there are usually no limitations as a practitioner or tender will be available to the patient during treatment. For monoplace chambers, there can be limitations based on clinical requirements. For example, some monoplace chambers do not have air hoses to allow for air breaks during treatment. Others do not have ports to allow for monitoring heart rate or other vitals. There needs to be a special ventilator available with a respiratory therapist to control settings during treatment for intubated patients.

Enhancing Healthcare Team Outcomes

Appropriate hyperbaric patient selection will include patients that will follow all safety protocols, patients with approved indications, confirmation of diagnosis, no contraindications and minimal to no relative contraindications to hyperbaric oxygen treatment, a chamber and crew that is suitable to the patient's clinical needs, and consent to treatment from the patient or a legal representative. The healthcare team, including clinicians and nurses, must educate the patients on the risks and benefits of hyperbaric therapy, maintain safety during treatment, and provide coordinated care.

Review Questions

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