Contraindications, side effects and complications of HBOT

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Learning outcomes

Participants should be

Able to

- 3 relative contraindications for HBO2
- List 3 side effects of HBO2
- Manage typical HBO2 complications

Absolute contraindications

- Untreated pneumothorax
- Untested pacemaker

Absolute contraindications cont'

- Selected medications in administration also
  - Doxorubicin(Adriamycin™) anticancer agent : myocardial toxicity and risk of CHF
  - Bleomycin(blenoxane™) anticancer agent : pulmonary toxicity
  - Cisplatin anticancer agent interferes with DNA synthesis to delay fibroblast and collagen production
  - Disulfiram(antabuse™) blocks superoxide dismutase production risks **convulsions** 2ndary to elevated NO with recurrent treatment
  - Mafenide acetate(sulfamylon™) antibacterial burn cream carbonic anhydrase inhibitor promotes CO2 increase with vasodilation may cause **hypotension** in large quantity

Doxorubicin(Adriamycin™, Caelyx™, Rubex™)

- HBOT: myocardial toxicity and risk of CHF
- as a component of **multi-agent adjuvant** chemotherapy for treatment of women with axillary lymph node involvement following resection of primary breast cancer.
- cancers of the ovary, prostate, stomach, thyroid; small cell cancer of lung, liver; squamous cell cancer of head and neck; multiple myeloma, Hodgkin's disease, lymphomas, acute lymphocytic leukemia (ALL), and acute myeloid leukemia (AML)
- Elimination half life: 30 hours.→ (X4) 120 hours
- IV use

Bleomycin(Blenoxane™)

- HBOT: pulmonary toxicity
- Hodgkin's lymphoma, non-Hodgkin's lymphoma, testicular cancer, ovarian cancer, and cervical cancer
- IV use
- For malignant pleural effusion d/t lung cancer
- Elimination half life: 2 hours.→(X4) 8 hours

Cisplatin(Platinol™)

- HBOT: delay wound healing
- testicular cancer, ovarian cancer, cervical cancer, breast cancer, bladder cancer, head and neck cancer, esophageal cancer, lung cancer, mesothelioma, brain tumors and neuroblastoma.
- IV use
- Elimination half life: 10 days →(X4) 40 days

disulfiram

- alcohol use disorder by producing an acute sensitivity to ethanol (drinking alcohol)
- Cause “Hang over” feeling
- Elimination half life: 120 hr →(X4) 480 hr, 20 days

Mafenide acetate(sulfamylon™)

- Large area, large use
- hypotension

환자를 의뢰 받았습니다

- Delayed radiation cystitis
- RT 6개월 전
- 5일전 입원하여 재발 및 전이가 발견되어 chemotherapy 를 다시 시작: **Gemcitabine 1000 mg/m^2** on days 1, 8, and 15 **plus cisplatin 70 mg/m^2** IV on day 1 or 2; repeat cycle every 28 d for a total of 4 cycles

- 이 환자에게 HBOT를 어떻게 할까요?

환자를 의뢰 받았습니다

- Bladder cancer로 RT 후 Radiation proctitis가 발생하여 혈변을 자주 보는 76세 남자 환자
- 알코올 중독으로 이를 치료할 의지가 있어 disulfiram(Antabuse)를 7일전 처방 후에 매일 1정씩 먹고 있다고 한다.
- 이 환자에게 HBOT를 어떻게 할까요?

컨설트 의뢰 컨설트 답변

- 절대적 금기증의 전체 세세히 확인
- 상대적 금기증의 확인
- 위험도관련 의견 전달
- 시행 시기, 기간, 치료 중 관찰 답변

Relative contraindications

- URI
- Seizure disorder
- Emphysematous lung with CO2 retention
- High fever
- History of spontaneous pneumothorax
- History of thoracic surgery, otosclerosis
- Congenital spherocytosis
- History of optic neuritis

Fundamental check up

Airway
Breathing
Circulation

Medical Information: Tailored Interrogation

- Chief complaint
- Past medical history
- Review of system
- Physical examination
- …

✓ ***Indication***

✓ ***Contraindication***

: absolute/relative

✓ ***Preparation for the urgency***

Past Medical History

Medical devices
- **pacemaker, ICD**, insulin pump, …

Cardiovascular disease
- heart failure, coronary artery disease, …

Pulmonary disease
- COPD, asthma, **pneumothorax**, …

Psychiatric disease
- **anxiety disorder**, psychotic disorder, …

Ophthalmologic disease
- glaucoma, …

Infectious disease
- contagious, multidrug resistant

HBOT or Not

Medical
Information
Vital signs
Chest radiography

SAFETY

- ✓ ***Protocol*** ***(Pressure, Time)***
- ✓ ***Mono vs. multi***
- ✓ ***Inside attendant***
- ✓ ***Preparation***

Side effects

Side effect of HBO2

A. Barotrauma
B. CNS – seizure
C. Pulmonary system
D. Ocular
E. Cardiovascular
F. Hypoglycemia
G. Confinement anxiety

Barotrauma

- Most common side effects
- Ear, sinuses, pulmonary, GI, Teeth

Middle ear barotrauma

- Military(stone) 1446/31,599, 2%
- Civilian(Sheffield) 8,000/166,000, 0.4%

Normal vs. barotraumatic T.M

Prevention of Middle ear barotrauma

- Avoid exposing patients with URIs
- Teach auto-inflation
- Using decongestants/anti-histamines
- HBO break

Pulmonary Barotrauma

- Prevention
- Chest evaluation
  - Chest x-ray(may not see small pneumothorax)
  - CT scan
- Treatment of pulmonary barotrauma
  - Needle thoracostomy
    - 18~16 g needle
    - Midclavicular line-2nd intercostal space
    - Spinal thoracentensis

Needle thoracostomy

Laan D V., Vu TDN, Thiels CA, et al. Chest wall thickness and decompression failure: A systematic review and meta-analysis comparing anatomic locations in needle thoracostomy. Injury. 2015:14–16.

Seizure

- Risk factors
  - Fever
  - Hypoglycemia
  - Steroids
  - At risk medication
- Incidence of O2 convulsions at 2.0~2.4 ATA, 1/10,000, 0.01%
- Treatment: remove patient from the source

Very old video

Pulmonary toxicity

- COPD like effect – rare
- Symptoms
  - Chest pain
  - Cough
  - Resembles COPD presentation
- Remove from O2 source "air break"

Ocular disorders

- Visual acuity changes
  - Progressive myopia(near-sightedness)
  - Night vision blurring
  - Onset with after several weeks
  - Resolves in weeks- do not buy new glasses
- Cataract worsening opacity
  - Does not create new cataracts
  - Cataract resection as indicated
- Retinopathy
  - Diabetic retinopathy not worsened
  - Neonatal exposures may cause retinal lenticular fibrosis

Cardiovascular disorders

- Angina
- AMI
- Cardiac dysrhythmias
  - Bradycardia
  - Tachycardia
- CHF with pulmonary edema
- CHF
  - Ejection fraction < 30% increase risk
  - Normal EF – 64 +/- 12%
- Remove from chamber
- Treat like ACS
- Upright posture

Hypoglycemia

- Worse in type I DM, unpredictable occurrence
- Symptoms like usual hypoglycemia
- Contributing factors
  - Dietary intake
  - Anti-diabetic regimen
  - Physiologic response to HBO environment
- Prevention
  - Test patients prior to HBO : must have glucose > 100 mg/dl
- Remove patient HBO(monoplace)
- Inside observer intervention(multiplace)
  - Oral glucose etc.

Confinement anxiety

- Variable incidence – 0.01~0.6%
  - Type of chamber
  - Cultural norms for community being served
  - Prior experience
  - Patient education level
- Education
- Familiarization with repetitive treatments
- Ativan 1 mg or Xanax 0.25~0.5 mg PO prior to 30 min

Critical care patients risk

- Unconscious patients
  - Unrecognized seizure
  - Middle ear barotrauma(prophylaxis)
- Intravenous accidents
  - Arterial gas embolism
  - Exanguination with IV pump failure
- Pneumothorax secondary to
  - Positive pressure ventilation
  - Air trapping with stacked breadths
  - bronchospasms

Critical care patients risk(conti')

- CNS herniations
  - Open cranium with unsecured skull plate risk herniation through wound site
- Patient appliance failure
  - Pacemaker
  - Defibrillator
  - Glucose pumps

Thank you