Hyperbaric Oxygen and Wound Care Standards

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Standards of Care

- Chronic wounds - defined as any wound that has not healed with conventional treatment within 4 weeks.
- At four weeks wound should be ready for:
  - Hyperbaric Oxygen Therapy and
  - Application of Bioengineer Skin Substitute Grafting
The Goal

Easy recognition of the 5 categories of patients to consider for Hyperbaric Oxygen Therapy (HBO)
Multiplace Hyperbaric Chamber
Hyperbaric Oxygen Therapy

- Corrects tissue hypoxia directly
- Supports angiogenesis
- Enhances host response to local infection
- Stimulates tissue growth
- Increases the oxygenation of tissues greater than 240%
Diabetic Foot Ulcers
The Diabetic Foot Ulcer (DFU)

- This is the most common of the 5 categories of patients that benefit from HBO Therapy.
- Recent studies show that HBO will reduce loss of limb.
Amputation Secondary to Diabetic Foot Ulcer
15-20% of Diabetics will develop a significant DFU
15% of these patients will go on and have an amputation
Statistically they will lose their 2nd limb in 2 years
The Diabetic Foot Ulcer (DFU) Patient

- Use of HBO determined by:
  - Prior treatment is at least 4 weeks
  - Severity of wound..Wagner Grade 3 or higher
  - HBO retains quality of life and is more economic than amputation
Wagner Grade III - DFU
The Diabetic Foot Ulcer (DFU) Patient

- **Summary**
  - Probe wounds for depth and severity
  - Prepare patient for advanced healing techniques in 4 weeks
  - Have patient evaluated *before* the 4th week for HBO when wound is Wagner Grade 3 or greater
“Any wound that remains unhealed after 4 weeks is a cause for concern, as it is associated with worse outcomes, including amputations.”

1999 Consensus Development Conference on Diabetic Foot Wound Care
Healing of a Complicated Graft
Complicated Graft/Flap
Delayed Radiation Injury aka Soft Tissue Radionecrosis
Osteoradionecrosis
Before/After HBO
The Delayed Radiation Injury Patient

- 1.2 Million new cases of cancer per year
- Of patients treated with radiation 600,000 will survive
- Of the 600,000 cases per year 5% will develop delayed radiation injuries
- Radiation causes
  - hypovascular,
  - hypoxic,
  - hypocellular tissue
The Delayed Radiation Injury Patient

- Men post radiation treatment for Prostate CA have:
  - Hematuria
  - Incontinence
  - Frequency
  - Dysuria
The Delayed Radiation Injury Patient

- Radiation Proctitis causes:
  - Rectal bleeding
  - Rectal ulcers
  - Rectal incontinence
  - Significant Pain
The Delayed Radiation Injury Patient

Hyperbaric Oxygen Therapy helps **80%** of these patients get better as a result of angiogenesis.
The Delayed Radiation Injury Patient

- **In Summary:**
  - If you have an irradiated patient who has wounds that will not heal or has abnormal symptoms involving the bladder or GI tract
  - Consider HBO Therapy for Delayed Radiation Injury
Acute Trauma Ischemic Foot
Traumatic Crush Injury
Acute Traumatic Peripheral Ischemic Patient

- Acute Crush Injury
- Postsurgical procedures: especially hand or breast reconstruction
- Direct Compression
- Arterial Embolism
- Compartment Syndrome
The Acute Traumatic Peripheral Ischemic Patient

- There are 2 components of injury:
  - Direct from the ischemic interval of hypoxia
  - Indirect from the Ischemic-Reperfusion injury
- The Ischemic-Reperfusion Injury induces microvascular permeability, tissue damage, and edema.
Acute Traumatic Peripheral Ischemic Patient

In Summary

- Patients need to be treated with HBO ASAP - Less than 24 hrs - after the injury or after the procedure. The sooner the better.
- They will need 2 treatments a day for the first 7 treatments!
Necrotizing Fasciitis
The Patient with Severe Wound Infections

- Necrotizing Fasciitis
- Gas Gangrene/Clostridial Myonecrosis
- Intracranial Abscesses
- Chronic Refractory Osteomyelitis
The Patient with Severe Wound Infections

- HBO has a direct bactericidal effect on Anaerobic bacteria.
- HBO suppresses production of alpha toxins which cause the most damage in Clostridial bacterial infections.
The Patient with Severe Wound Infections

- HBO treatment stops the production of Alpha toxin at 3 ATA (66 ft of pressure)
- HBO is bacteriostatic to Clostridia
- HBO allows the host defenses to clear the circulating toxins

HBO enhances the effect of antibiotic therapy; especially the effectiveness of cephalosporins.

Aminoglycosides have improved transport across the bacterial cell wall with increased O2 under pressure.

The Patient with Severe Wound Infections

- HBO has been shown to reduce mortality by 83% in the patient with Necrotizing Fasciitis.

Necrotizing Fasciitis Before/After HBO
Patients with intercranial abscesses have been shown to have reduced mortality from 18% to 2% when patient was treated with HBO.
Chronic Refractory Osteomyelitis
The Patient with a Severe Wound Infection - Chronic Osteomyelitis

- Cure Rate of up to 89% when HBO is used in conjunction with antibiotics and surgical debridement.

- Cure Rate of ONLY 10% when HBO is excluded.
Central Retinal Artery Occulsion
The 5th Category is Central Retinal Artery Occlusion

- This patient will complain of loss of vision in one eye.
- Fundoscopic exam the retina will appear pale yellow/white.
- Retina will present with the typical boxcarring of the arterioles.
Central Retinal Artery Occlusion

- Patient should be immediately placed on 100% oxygen
- Patient should be transported to a facility with HBO as soon as possible
- Do not allow Anterior Chamber Paracentesis
IN SUMMARY

- HBO has **evidence based** success in numerous medical disease process.
- HBO is **Safe** with few side effects.
- HBO is **most effective when started early** in the disease/injury process.
- Most **IMPORTANTEDLY**, HBO **improves the quality of life** for our patients.
For Any Questions - Contact:
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