

Information on Hyperbaric Oxygen Therapy (HBOT) for Osteoradionecrosis

This Patient Information Sheet is to be used in discussion with your Doctor.

Osteoradionecrosis (ORN) is a condition where dead bone develops at the site of high dose irradiation, with poor healing of the flesh too. It occurs mainly in the lower jaw. It follows high dose irradiation to the head and neck for cancer, and occurs in a small proportion of patients. It may be precipitated after months or years by denture problems, ulcers, dental procedures, biopsies (tissue sampling), which can overwhelm the ability of the mouth to repair. It may occur without these provocations too. The irradiated bone and overlying tissue undergo inflammation, and blood vessels are damaged. These conditions ultimately lead to clotting, cell death, vessel damage and fibrosis.

ORN was described by Dr Marx (an American maxillofacial surgeon in 1983. It is poor oxygenation of poor quality tissues, which lack a good blood supply. HBOT improves this by growing new blood vessels. Treatment of ORN was controversial until Dr Marx demonstrated successful resolution of Jaw ORN in 58 patients using a staged approach with HBOT and surgery.

Symptoms include:

- Xerostomia (dry mouth from lack of saliva)
- Pain in the jaw and face
- Swelling over the side of the face
- Trismus (spasm and tight jaw)
- Exposed bone
- Fracture of the irradiated bone
- Malocclusion (teeth don't fit together properly)

3 grades of the disease are recognised:

- Grade I ORN - This is the most common presentation. Exposed jaw is poking through. HBOT is effective in promoting healing, surgery usually not needed.
- Grade II ORN - This is more severe, unlikely to respond to hyperbaric oxygen alone, and requires surgery.
- Grade III ORN - This is extensive, bare jawbone and often a fracture. A combined approach should be planned.

CT scanning and MRI help with early diagnosis, and staging of ORN and guide is the best treatment. HBOT elevates tissue oxygen levels enormously and stimulates fibroblasts (repair cells) and collagen synthesis helping bone to heal. It also grows new blood vessels in the irradiated bed. Results are variable, HBOT (+/-) surgery does not totally cure the radiation injury, because some degree of tissue injury persists, but it makes the symptoms much more bearable. 30 - 40 Treatments are needed, depending on the stage of the disease, and surgery may take place during the treatment, at the discretion of the surgeon.



*An example of radiation caries.
Photo supplied with thanks to Dr. C. Acton & her patient.*

Treatment

The course of treatment involves between 30 - 40 sessions in the hyperbaric chamber. This involves attending our facility Monday to Friday for 2 hours each day receiving 100% oxygen at 2.4 atmospheres.

If your patient is apprehensive or has claustrophobic tendencies please ensure that you mention this to our staff so we can prepare them, and initial treatments will be done with a personalised nurse to ease the apprehensiveness or claustrophobia.

Complications of Radiotherapy

Robert E Marx, DDS, Professor of Surgery, Director of Research, University of Miami, Miller School of Medicine, pointed out in a presentation at the Undersea Hyperbaric Medical Society conference in 2010:

Radiated tissue becomes less vascular, less cellular, more hypoxic and therefore less able to heal with time.

Marx's Comparison

Treating a blocked coronary artery with a stent prevents a myocardial infarct.

Treating radiation injured tissue with HBOT prevents Osteoradionecrosis

HBOT for Osteoradionecrosis (cont.)

History - The nature of Radiation Injury

Delayed radiation complications are typically seen after a latent period of six months or more, and may occasionally develop many years after the radiation exposure. Sometimes acute injuries are so severe that they never resolve, and evolve to become chronic injuries indistinguishable from other delayed radiation injuries. These are termed "consequential effects", and are not characterized by a symptom-free latent period. Often, delayed injuries are precipitated by an additional tissue insult such as surgery within the radiation field. The concerns of HBOT enhancing growth, of or precipitating recurrence of malignancy, have been discussed and largely refuted.

The Undersea Hyperbaric Medical Society (UHMS), which is a watchdog committee for hyperbaric treatments in the USA, has been treating radiation-damaged tissues for over several decades with minimal adverse effects.

Funds

Osteoradionecrosis is covered by all Health Funds and had has a MBS item number

Appointment Details

To send a referral or make an inquiry visit our website at www.wesleyhyperbaric.com.au, Referrals sidebar, or contact our specialist staff at the Wesley Centre for Hyperbaric Medicine on Tel: 07 3371 6033, Email: reception@wesleyhyperbaric.com.au

Additional information

Professor John Feldmeier, D.O., FACRO, FUHM, Professor Emeritus and Past Chairman of the Radiation Oncology Department, University of Toledo Medical Centre, presented a paper on Cancer and Hyperbaric Medicine Update at the Undersea & Hyperbaric Medical Society scientific conference in Montreal 2015.

In the largest published anecdotal experience from Marx: of the 405 patients with head and neck cancer followed by him, 245 received HBO. The recurrence in the HBO group was 19.6% vs 28% recurrence in the non-HBO group.

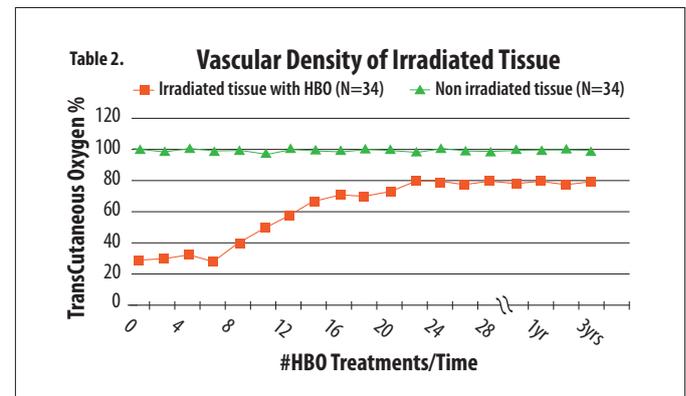
If we quantify reports by numbers of patients only, reports suggesting enhanced growth include 72 patients while negative or neutral effect seen in over 10,000 + patients. Studies are consistent in demonstrating that tumor cells that survive severely hypoxic (NOT NORMOXIC or HYPEROXIC) environments are:

- more aggressive
- more prone to metastasize
- less likely to undergo programmed death (APOPTOSIS)
- more resistant to treatment-either chemotherapy or radiation
- Hypoxia upregulates production and release of VEGF, Interleukin-8 and PDECGF

- Hypoxia down-regulates the production of PEDF (Pigment Epithelium Derived Factor) an angiogenic inhibitory factor
- DNA over-replication and mutation (oncogene amplification) is up to 5 X in Hypoxic vs normoxic cell cultures (Reynolds 1996) drug resistance
- A wound involves negative space and growth is outward; tumors are characteristically invasive and growth is inward
- Normal cells are subject to contact inhibition; tumor cells are not
- A healed wound contains well organized vasculature; tumor vasculature is disorganized with giant capillaries, retrograde flow and arteriovenous malformations; tumor vasculature does not follow the ordered pattern of artery-arteriole capillary venule-vein

In this study, Osteoradionecrosis was defined as the presence of exposed bone in the study socket after 6 months. As you can see, significantly fewer patients developed ORN when receiving Hyperbaric Oxygen.

For patients suffering established Osteoradionecrosis, a protocol of 30 preoperative and 10 post-op Hyperbaric treatments is recommended. Transcutaneous Oxygen measurements have demonstrated oxygen induced angiogenesis (blood vessel growth) becomes measurable after 8 HBO treatments and rapidly progresses to up to 85% of non irradiated vascularity by 20 sessions.



Follow-up of these patients at 1, 2 and 3 years indicated there was no reduction in these improved levels. Table 2 demonstrates the prolonged effect HBOT has on the vascular density of irradiated tissue⁽¹⁾.

Reference

⁽¹⁾ Marx RE, Johnson RP, Kline SN. Prevention of Osteoradionecrosis: A randomised prospective clinical trial of hyperbaric oxygen versus penicillin. J AM Dent Assoc. 1985