A Physician’s Guide to Problem Wound Management:

Radiation Proctitis/Enteritis

Chronic Radiation Proctitis (CRP) is a debilitating complication of radiation treatment of the pelvic region for many urologic, gastrointestinal, and gynecologic cancers. It occurs in up to 10% of post-radiation patients despite advances in administration technique and delivery. It can continue from an acute phase or begin after a variable latent period of at least 90 days, although years may pass before symptoms become apparent. The underlying pathology consists of submucosal injury and endarteritis with associated fibrosis, ischemia and ulceration.

Symptoms include tenesmus, urgency, diarrhea or constipation, sphincter dysfunction, mucoid bloody discharge per rectum, and frank bleeding with ulcerations, which may perforate. Severe complications also include persistent bleeding strictures and fistulae. Endoscopy may reveal a spectrum of mucosal changes including pallor, erythema, telangiectasia, friability, and ulceration.

Medical treatment is often unsatisfactory and there is no “best” treatment at present. Current treatments include anti-inflammatory medications and steroids, sucralfate, formalin, and thermal coagulation including Argon Laser. Surgical intervention carries considerable risk as the tissue may fail to heal because of the radiation related changes.

Hyperbaric Oxygen Therapy (HBOT) improves tissue oxygenation and vascular density (angiogenesis) in radiation damaged tissues and has been shown in numerous studies to result in recovery from delayed radiation effects. Several studies have demonstrated the cost effectiveness of HBOT when used in the treatment of the late effects of radiation. Medicare and most private insurers cover this effective treatment modality.

What is Hyperbaric Oxygen Therapy?

Hyperbaric oxygen (HBO) is a daily treatment, in which a patient breathes 100% oxygen at pressure greater than normal atmospheric pressure in a hyperbaric chamber.

HBO therapy systemically delivers 100% oxygen at 2-3 times greater than atmospheric pressure. This elevated pressure within the hyperbaric chamber results in a 10-15 fold increase in plasma oxygen concentration, which translates to arterial oxygen values of between 1,500 and 2,000 mmHg. The steep oxygen gradient provided by HBO produces a four-fold increase in the diffusing distance of oxygen from functioning capillaries.

On average most treatment regimens for radiation proctitis will be 90 - 120 minutes long with the number of treatment being highly individualized.

Hyperbaric oxygen has been proven to have no enhancing effects on cancer or metastatic growth.
Several beneficial mechanisms of action are associated with intermittent exposures to hyperbaric oxygen (daily treatments). HBO is the only intervention that has been demonstrated to increase the number of blood vessels in irradiated tissue.

Solid evidence demonstrates that hyperbaric oxygen can produce neovascularization in irradiated (ischemic) tissue while reducing fibrosis. The following is a brief description of this process.

In normal wound healing, both hypoxia and normoxia are necessary for the different phases of healing. Hypoxia stimulates macrophages to release angiogenesis factors and mitogens which in turn stimulate fibroblast replication. For fibroblasts to synthesize collagen normal levels of oxygen are required.

Intermittent hyperbaric oxygenation allows for periods of hypoxia between daily treatments. During these hypoxic periods, angiogenesis factor is released which causes capillary budding. New capillaries, however, cannot advance unless they are surrounded by a collagen matrix. Hyperbaric oxygen raises the oxygen tension in tissue sufficient for collagen formation to take place at greater distances from damaged/functioning capillaries. In addition, this elevated oxygen level will improve white cell function, further enhancing the healing process.

A minimum of 20 mmHg partial pressure of oxygen is required for fibroblast proliferation and collagen production to start (irradiated tissue is often far below this level). In normal tissue at atmospheric pressure this tension of oxygen exists up to 30 microns away from the capillary wall. Under hyperbaric conditions this tension can be maintained up to 280 microns away.

This rich collagen matrix allows capillary buds to invade rapidly and form a new advancing vascular system that returns perfusion to within normal limits, thus allowing the irradiated tissue to heal.

References


