# A Monograph for Health Care Providers

Innovative Wound Care Specialists

## Delayed Radiation Injuries (Bony Necrosis) and Hyperbaric Oxygen

Osteoradionecrosis (ORN) is a progressive deterioration of bone secondary to radiation-induced vascular changes. In ORN, the oxygen demands for normal reparative process exceed the surrounding tissues ability to supply oxygen. ORN is not osteomyelitis but more closely resembles an aseptic necrosis. Bacteria cultured from these wounds appear to be surface contaminants rather than causative agents.

Approximately 98% of cases of ORN involve the mandible; ORN can also occur in the skull or facial bones. Although rare, cases have been reported involving the pelvis, sternum, clavicle or femoral heads. ORN typically follows minor trauma or surgical procedures completed more than 6 weeks following radiotherapy. ORN may also result when radiotherapy is initiated prior to adequate soft tissue repair or if surgery is performed within the treatment fields during the course of radiation.

Once established, ORN is extremely difficult to treat. Because of impaired regional circulation, normal wound healing does not occur. In addition, antibiotics can not reach infected tissue. Surgical resection has been attempted but met with only limited success; surgery often compounds the problem. Dr. Robert Marx has shown that by using combined pre and postoperative HBO treatments, cure rates can be greatly improved. However, HBO by itself is not effective; it must be combined with antibiotics, meticulous local wound care and timely surgical debridement of involved bone. ORN that is not associated with any preexisting trauma, so called “spontaneous ORN” tends to be severe and requires aggressive care.

Hyperbaric oxygen increases tissue angiogenesis resulting in an increased circulation to the injured area. This increased oxygenation results in better wound repair by stimulating collagen deposition. Marx has shown that tissue oxygen levels in irradiated areas approached 80 to 85% of normal tissue level. The benefits of HBO are long lasting. In one study, three year follow-up revealed that tissue $pO_2$ levels were still 90% of those seen during active treatment cycles.

**Benefits of HBO include:**

- Increased collagen and extracellular matrix protein deposition
- Increased oxygen diffusion distance from the capillaries
- Improved leukocyte-bacterial-killing
- Improved local tissue oxygenation
- Decreased local tissue edema
- Increased angiogenesis
- Reduced inflammation


**References**

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