

## Radiation-Induced Injuries

### Problem:

Approximately 1.5 million people will be diagnosed with some form of cancer in 2010.<sup>1</sup> In their 2009 annual report to the nation, The National Cancer Institute reported that “rates of new diagnoses and rates of death from all cancers combined declined significantly in the most recent time period for men and women overall”. Early detection and a significant increase in the use of chemotherapy has played a major role in these declines; however, radiation therapy remains one of the most common treatments and is used in more than half of all cancer cases.<sup>2</sup>

New ways to deliver radiation to tumors are also making radiation therapy safer and more effective. However, about 5% of these patients develop complications at some point within 5 years of their radiation dosage. Radiation creates injury to soft tissue and bone which can then lead to hypoxic tissue and/or avascular necrosis (also known as osteonecrosis). The patients who suffer from soft tissue damage or bone necrosis present with disabling, progressive, painful tissue breakdown. This breakdown may present as wound dehiscence, infection, tissue loss and graft or flap loss.

Typically, radiation injuries are not visible and don't require the same type of wound management as other chronic wounds. These wounds can require intense management and many times present with multiple complications. The most common sites of radiation injuries are the head, neck, genitourinary area, and bowel. Delayed radiation injuries may be life threatening under certain circumstances and decrease quality of life in most instances.<sup>3</sup>

Approximately 50,000 cases of head and neck cancer will be diagnosed each year, with ~2,500 of these cases

being defined as osteoradionecrosis (ORN). ORN mostly occurs in the jaw/mandible and may present as exposed bone that has failed to heal either spontaneously or with treatment for at least 6 months.

Radiation cystitis and/or proctitis are not very common complications, but can be very difficult to manage when they do occur.<sup>4</sup>

### Reason:

The exact causes and biochemical processes leading to delayed radiation injury are complex and only partially understood at this time. Although several theories have been advanced to explain the etiology of radiation injury, virtually all delayed radiation injuries are characterized by endarteritis with resultant ischemia and tissue hypoxia. These wounds include disrupted epithelial barriers, increased fibrosis, and tissue/organ failure. In addition, there is a degeneration of blood vessels which continues throughout the patient's life resulting in a diminished blood supply to area tissues.<sup>4</sup>

Radiation scientists now appreciate that the process of radiation injury



Photo courtesy of Sechrist Industries, Inc.

**Hyperbaric Oxygen Therapy has been one of the most studied and most frequently reported applications in the treatment of delayed radiation injuries**

begins at the time of radiation treatment and involves the elaboration and release of many bioactive substances including very prominently fibrogenetic cytokines.<sup>4</sup> However, time plays a critical role in the manifestation of an injury. In addition, the injury may be precipitated by a traumatic or surgical insult.

### Solution:

The Center for Advanced Wound Healing at Community Hospital Anderson offers a multidisciplinary approach

to the management of these complicated wounds. Oftentimes the amount of care required for desirable outcomes surpasses the resources which any single physician can provide. Wound healing at the AWC is achieved in cooperation with referring physicians, surgeons, podiatrists, and other specialists as required.

Hyperbaric oxygen therapy (HBOT) has been one of the most studied and most frequently reported applications in the treatment of delayed radiation injuries. The impact of hyperbaric oxygen in terms of its beneficial effects is likely to involve three mechanisms in irradiated tissues:

1. Stimulate angiogenesis and improve tissue oxygenation
2. Reduce fibrosis
3. Mobilize and stimulate an increase of stem cells.<sup>4</sup>

The goal of adjunctive HBOT is to provide adequate granulation to support spontaneous or surgically supported wound healing. It is important to understand that HBOT for radiation tissue injury should be part of a vigorous and coordinated team approach to total patient and wound management. **(continued on back)**

The most widely applied and most extensively documented indication for hyperbaric oxygen in chronic radiation injury is its application in the treatment and prevention of radiation necrosis of the mandible. Multiple publications describing the use of HBOT in the treatment of mandibular necrosis have appeared in the medical literature since the 1970's. ORN was once considered and approached as a subset of osteomyelitis and patients were subjected to prolonged HBO exposure with rare success. The importance of integrating and timing of surgical intervention was not appreciated nor considered in the patient's treatment plan.<sup>4</sup>

HBO's use in the treatment of *osteoradionecrosis* and *soft tissue radionecrosis* is one part of an overall plan of care. Also included in this plan of care are debridement or resection of nonviable tissue in conjunction with antibiotic therapy. Soft tissue flap reconstruction and bone grafting may also be indicated. The goal of HBO treatment is to increase the oxygen tension in both hypoxic bone and tissue to stimulate growth in functioning capillaries, fibroblastic proliferation and collagen synthesis. The recommended daily treatments last 90-120 minutes at 2.0 to 2.5 ATA. The duration of HBO therapy is highly individualized.<sup>4</sup>

CMS (Medicare) approves coverage of radiation injuries with the following provisions:

- Documented history of radiation history, including date and anatomical site
- Evidence (open wound, bleeding, pain, etc.) of soft tissue injury or necrosis in the field of radiation
- Evidence of necrotic bone tissue breakdown and radiographic studies, if available, to confirm the diagnosis of ORN \*

Further, many commercial payors also cover the use of HBOT for prevention of radiation necrosis; a practice that is well documented in the literature and utilizes the Marx Protocol.

\*Always check the HBOT policy (LCD) of your local Medicare and/or Commercial payor to ensure compliance with both clinical and documentation requirements.

We are happy to answer any questions you might have regarding procedures, scheduling an appointment or general information, and can be contacted through the following ways:

**Center for Advanced Wound Healing  
Community Hospital Anderson  
1515 N. Madison Avenue  
Anderson, IN 46011**

**Phone:** 765-298-2121 • **Fax:** 765-298-5877

**E-mail:** [WoundHealing@eCommunity.com](mailto:WoundHealing@eCommunity.com)

**Website:** [CommunityAnderson.com/WoundHealing](http://CommunityAnderson.com/WoundHealing)

## Referrals:

Patients can be referred to the **Center for Advanced Wound Healing** for aggressive, outcome-based wound management. The physicians at the AWC provide specialized care in close coordination with the patient's primary physician. Care includes the application of advanced wound care technology and hyperbaric oxygen treatment, as indicated, based on evidence-based clinical pathways. The referring physician will continue to provide overall medical care for the patient and will receive frequent updates on the patient's response to care at the AWC.

*Patients can be referred to the Wound Center for aggressive, outcome-based wound management.*

While treatment of established wounds in patients with diabetes is a major emphasis of the AWC program, the treatment of radiation injuries and other types of chronic wounds is equally important. Consider referring patients when they:

- Have a history of radiation exposure
- Complain of exposed bone and pain in the mouth
- Have bleeding from the rectum or bladder
- Have radiation cystitis with resulting symptoms
- Have radiation proctitis with resulting symptoms

Discharge education focuses on patient follow-up with their primary physician, and other specialists as appropriate. In this manner, prevention and/or a rapid response to injury will become a more significant aspect of care for these patients.

## References:

1. National Cancer Institute SEER (Surveillance, Epidemiology and End Results) data for 2010
2. Edwards BK, Ward E, Kohler BA, Ehemann C, Zauber AG, Anderson RN, Jemal A, Schymura MJ, Lansdorp-Vogelaar I, Seeff LC, van Ballegooijen M, Goede SL, Anderson R, Ries LAG. *Annual Report to the Nation on the Status of Cancer, 1975-2006*, Published online Dec. 7, 2009. DOI: 10.1002/cncr.24760.009
3. Feldmeier JJ, Hampson NB. *A systematic review of the literature reporting the application of hyperbaric oxygen prevention and treatment of delayed radiation injuries: An evidence based approach*; 2002: 4-5
4. Undersea and Hyperbaric Medical Society: *Hyperbaric Oxygen Therapy Indications*; 12th Edition;: 145-163

## The Curespot

**A Publication of Acelecare Wound Centers**

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