

# Rapid Recovery Hyperbarics

9439 Archibald Ave. Suite 104 Rancho Cucamonga CA, 91730

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## ***Radiation Necrosis***

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Radiation therapy is effective for the treatment of solid tumors and allows for previously untreatable tumors to be cured or growth arrested. However, as any treatment RADIATION has some penalties and that is the injuries sustained to tissues adjacent to tumor.

In spite of all precautions and advances in the radiation therapy the healthy tissues do get damaged. Either the cell gets killed outright or inflicts lethal damage so it will die later. Others will not reproduce daughter cells or collagen.

**In general we can divide injuries to 2 basic categories:**

A - Soft tissues (fibroblast, endothelium, muscle, nerve etc.)

B - Radiation Osteonecrosis (bone injury- RON)

**Radiation pathology: Classification 1988 by Hemibach**

Acute period – First 6 month (accumulation of acute organ damage, which can be clinically silent)

Sub acute period – Second 6 month. The end of recovery of acute period. Persistence and progression of permanent damage evident.

Chronic period - from 2-5 years. Further progression of chronic residual damage. Deterioration of microvascular ending with hypoperfusion, parenchymal damage and increased susceptibility to infection.

Late clinical period – after 5 years post radiation/further progression of changes in chronic stage with addition of aging effects (premature), carcinogenesis may manifest in this stage.

Radiation damage progresses slowly and continues long after radiation therapy.

There is loss of collagen, increase in fibrotic tissue and low Oxygen gradient as a result of poor circulation.

The Oxygen tension at the center of uncomplicated radiated area is between 5 – 10 mmHg (Marx&Johnson 1988)

Oxygen tension 3 mmHg – wound brakes down spontaneously.

There is No Satisfactory conventional treatment of radiation tissue injury available.

Effect of Hyperbaric Oxygen on radiated tissue of more than 5000 cGy (SI unit of absorbed dose 1 Rad = 0.01 Gy) is the one of capillary angioneogenesis, fibroplasias and increase of Oxygen tension.

Soft tissues injury:

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**Radiation produce swelling, degeneration and necrosis of vascular endothelium.**

**This results in edema, fibrosis thickening of the vessel wall with degeneration of the muscular elements of the wall and eventual obliteration.**

## Brain

Injury to the tissue is of insidious, progressive course. Effect could be localized or diffuse depending on type of radiation given. Impairment of mental function is the most common problem, and may include personality change, memory deficiencies, confusion, and in times severe dementia. Several months following radiation demyelination are seen histologically, associated with proliferation of the glial element and monocellular cells. This can progress to irreversible damage to capillary endothelium perivascular. Inflammation, diffuse vasogenic edema of cerebral white matter (disruption of the blood – brain barrier), necrotic foci and petichial hemorrhage. The location and amount of brain injury is closely related to the radiation dose and methods used. The most common – Gliomas (graded 1- 4) malignancy rate of progression.

Soft tissue Neck post radiation complications

Damage to the tissue cells and vessels as described before. Surgery in such a tissues has high incidence of complication.

(Hart & Straus 1986/48) postoperative inclusion of HBOT all patient had less complication and improved

(Neovious et al 1907/15) 64Gy – confirmed as the previous study the benefit of HBOT in treatment of post radiation complications.

Radiation is a treatment of choice for early stages of laryngeal cancer. Post-radiation edema of the larynx usually resolves it self spontaneously with in 6 month. Necrosis develops after radiation between 3-12 month. MRI or CT scan is able to establish the line between the necrotic tissue and recurrence of the tumor. Tissue ischemia and hypoxia play important role in the pathogenesis. This is debilitating disease with pain dysphagia and respiratory obstruction.

**Chandler's grading system:**

Grade I – Laryngeal edema, telangectesia, Slight hoarseness

Grade II – Slight impairment of vocal cords mobility, moderate edema, and moderate hoarseness

Grade III – Severe impairment of vocal cords mobility, dyspnea, dysphagia

Grade IV - Respiratory distress, fistula, and fixation of the skin to larynx, laryngeal obstruction.

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Ferguson et al (1987/8 – 4-grade IV) definite improvement after using HBOT. Pt. with tracheotomies could be decanulated and the fistulae were closed. Author recommends HBOT as therapeutic option when ever necrosis of the larynx occur and there is a chance to save the larynx.

Neovius EB, Lind MG, Lind FG (Head&Neck-1997; 19:315-322) concluded that HBOT has clinically significant effect on initiation and acceleration of healing process.

Radiation injuries of the Abdomen and Pelvic region – Less commonly applied in this region as organs in this location poorly tolerate radiation doses. Whole abdomen radiation for Ovarian cancer has 20% risk of developing complications after period of 6 months. Some of those complications require surgical intervention.

Feldmeier et al (1996/44) reported overall success 81%. Minimizing surgical procedures or completely avoiding them.

Gynecological squeal of radiation treatment – Hamour & Dening (1996) patient developed severe diarrhea with blood and pain in the anal region following postoperative radiation for uterine cancer. Advised surgery.Pt.declined and after 98 hours of HBOT over 4 weeks she improved and healed completely. No reoccurrence of symptoms.

**Radiation Cystitis** – sequel of radiation administered for variety of malignancies in the pelvic region.

- A- Hematuria (recurrent)
- B- Urinary urgency
- C- Pain

Rijkmans et al (1989/10); Hart&Strauss (1986/15); Weiss&Neville (1989/8); Shroenrock & Cianci (1992); Velu&Myers (1992); Kindwall (1993); Nakada et al (1992); Shameem et al (1992); Morita et al (1994); Nakrool et al (1993/14)

- **The conclusion of the authors was that HBOT have favorable effect on the course of radiation – induced cystitis and recommended to be used as a primary treatment.**

**Radiation Proctitis** – well known complication of radiotherapy for prostate cancer. Difficult problem to deal with and will became more significant as the rate of prostate cancer increases. The inclusion of HBOT in to a treatment plan for radiation proctitis brought not only improvement in symptoms, but in some cases complete resolution and healing.

**Osteoradionecrosis** - Bone density is approximately 1.8-x more than normal tissue and hence will absorb larger amount of radiation. Radiation does damage vascular structure in the periosteum and also affects balance between the osteoclast and ostoblasts. This leads to osteoporosis and eventually to bone death.

Osteonecrosis sites:

- A- Mandible - most frequent site (lower jaw)
- B- Ribs, clavicle and sternum
- C- Skull

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D- Vertebral column  
E- Pelvis

Whenever radiation necrosis develops it will require surgical debriement with the inclusion of hyperbaric oxygen.

Use of HBOT before treatment may prevent for radiation necrosis to develop.

Several protocols are being used (20/20; 30/10) and studies clearly demonstrate efficacy of HBOT in treatment of radiation injuries by speeding healing time, decreasing morbidity and improving quality of life.

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