Stay current with new treatment and management options related to medical and radiation oncology. In this comprehensive and coordinated overview, you’ll use case-based reviews incorporating the latest research and perspectives from multiple disciplines to facilitate discussion among your peers.

**Target Audience:** Registered Nurses, Advanced Practice Nurses, Advanced Nurse Researchers

**Level of Content:** Intermediate/Advanced

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**Full Disclosure:**  
Nothing to Disclose

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Nothing to Disclose

**Objectives:**
At the end of this session, participants will be able to:
1. Describe the use of low-level laser therapy to manage oral mucositis related to radiation and chemotherapy treatment of head and neck cancers.
2. Describe the benefits of image-guided radiation therapy and gated therapy in the treatment of advanced lung cancer.

**Bibliography:**


Tumor Board: Medical and Radiation Oncology Treatment Modalities

Annette Quinn, RN, MSN
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The Use of Low Level Laser Therapy for Oral Mucositis (OM) from Head and Neck Cancer Treatment

Annette Quinn, RN, MSN
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Objective

• Describe the use of low level laser therapy to manage oral mucositis related to radiation and chemotherapy treatment of head and neck cancers

Apoptosis

• Much of the tissue damage is a result of apoptosis
• Endothelial cells produce keratinocyte growth factor (KGF) which triggers epithelial cells to grow
• Apoptosis of endothelial cells from RT or chemotherapy would remove the growth signaling normally provided to epithelium
• Endothelial injury > epithelial injury

Cytokines

• Increases in pro-inflammatory cytokines directly related to mucositis development
• TNF, IL-6, platelet activating factor and IL-1β increase before tissue damage is apparent
• Intensity of cytokine production correlates directly with severity of mucositis

Radiation- vs. Chemo-Induced OM

• Chemotherapy induced OM more acute, developing within 1 week of drug administration and reaching a peak within 2 weeks
• Radiation induced OM has a more chronic course, typically beginning at cumulative doses of around 15 Gy and becoming full blown at 30 Gy

Sonis S. J Support Oncol. 2007;5:3-11.

Barriers to Mucositis Management

- Knowledge gaps
- Absent and sporadic oral evaluations
- Failure to use consistent tool
- Inadequate documentation
- Inconsistent use of assessment data to guide practice

Survivorship Issues regarding OM

- Pain from oral mucositis can result in a patient being unable to meet their nutrition needs orally. As a result, inadequate nutrition may impede the healing process and result in weight loss.
- Patients experiencing weight loss greater than 20% of their total body weight are at an increased risk of toxicity and mortality.

Survivorship (cont.)

- Unplanned interruptions or modifications of radiation from ulcerative OM occur in 8%–27% of patients and may reduce the tumor control rate at least 1% for every day that radiation is interrupted.
- Maintaining adequate nutrition by preventing OM is key to decreasing treatment breaks in head and neck cancer patients.

General Measures

- Provide comfort measures
- Provide good oral care
- Ensure the patient is adequately hydrated
- Stress the importance of good nutrition
- Reassure the patient that OM is self-limiting
- Continue to reassess
## Nutritional Recommendations
- Encourage selection of soft foods
- Suggest drinking through a straw to make swallowing easier
- Recommend that patients avoid acidic, spicy, and dry foods
- Team approach
- PEG Tubes: To place or not to place that is the question!

## Treatment for OM
- Currently there are NO universal treatment recommendations for managing OM
- Recommended strategies:
  - Oral care
  - Interdisciplinary care
  - Dental prophylaxis
  - Oral hygiene
  - Routine oral rinse
  - Hydration
  - Treatment of pain

## MASCC/ISOO Guidelines—In favor of an intervention
- Low level laser therapy
- Recommend patient-controlled analgesia with morphine
- Recommendations for practice
  - Oral care protocols that include education for patients (i.e., using a soft toothbrush) and staff, regular assessments, inclusion of dental professionals

## MASCC/ISOO Guidelines—In favor of an intervention (cont.)
- 2% morphine mouthwash may be effective to treat pain due to OM in patients receiving chemoradiation for head and neck cancer
- 0.5% doxepin mouthwash
- Zinc supplements administered orally may be of benefit to prevent OM in oral cancer patients receiving radiation therapy for chemoradiation.

## ONS Guidelines for Mucositis
- Recommend oral care protocol that includes:
  - Educational components for patient and staff
  - Oral assessment with validated tool used regularly to assess function, pain and oral cavity
  - Include dental professionals throughout treatment and follow-up
- Likely to be effective:
  - Cryotherapy for bolus/rapid infusion chemotherapy with short half-life (e.g., 5-FU and melphalan)
  - Palifermin for autologous HSCT
  - Low Level Laser Therapy

## MASCC/ISOO/ONS Guidelines for LLLT
- Panel encouraged by accumulating evidence in support of LLLT
- For centers able to support the necessary technology and training, LLLT should be used to attempt to reduce the incidence of oral mucositis and its associated pain in patients receiving high-dose chemotherapy and chemoradiotherapy before hematopoietic stem cell transplant (HSCT) or head and neck radiotherapy

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Low Level Laser Therapy (LLLT) for OM

- Radiation at certain wavelengths can be beneficial to cells
- LLLT is absorbed by intracellular photoreceptors in the membrane of the mitochondria
  - Reduction of pain due to increased endorphins
  - Reduction of inflammation via reduction in interleukin-1 and C-reactive protein
  - Tissue healing as a result of increased neovascularization and macrophage activity

Low Level Laser Therapy for OM

- Cochrane review, analyzed the prospective data assessing the management of oral mucositis.
- Thirty-two prospective trials including 1505 patients were analyzed. Three comparisons for mucositis treatment including two or more trials were assessed: benzydamine HCl versus placebo, sucralfate versus placebo and LLLT versus sham procedure.
- Interestingly, only LLLT showed a reduction in severe mucositis when compared with the sham procedure, RR 5.28 (95% confidence interval (CI) 2.30 to 12.13).

Current Uses for Low Level Laser

- Strong evidence
  - Musculoskeletal pain, injury & dysfunction
  - Oral Mucositis
  - Muscle fatigue
- Moderate
  - Lymphedema
  - Wound healing
  - Neuropathic pain
- Experimental
  - Stroke
  - Depression
  - Post traumatic stress disorder
  - Traumatic Brain Injury
  - Age Related Macular Degeneration
  - Tuberculosis
  - Nerve regeneration

Image Guided Radiation Therapy and Gated Therapy

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Objective

- Describe the benefits of Image Guided Radiation Therapy (IGRT) and Gated Therapy in the treatment of advanced lung cancer

Pulmonary Toxicity: Risk Factors

- Lung volume irradiated
- Total dose of RT delivered
  - Fraction size
- Use of chemotherapeutic/hormonal agents
- Stem cell/bone marrow transplantation
- Advancing age
- Pre-existing pulmonary conditions
Physiologic Effect of Lung Tissue

- Disrupts normal pulmonary physiology
- Inefficient gas exchange
- Imbalance of perfusion and ventilation
- Inadequate airflow

Manifestations of Radiation Pneumonitis

- Occurs in 5-15% of patients
- Usually occurs within 6-12 weeks after completion of RT
- Symptoms include:
  - Low grade fever
  - Dyspnea
  - Cough
- Differential diagnosis:
  - Recurrent tumor
  - Infection
  - Lymphangitic spread

Azria, Benni, Bourgeois, Bussière, & Cloutier, 2012; Gravena et al., 2015

Manifestations of Pulmonary Fibrosis

- Occurs 6-24 months after completion of RT
- Symptoms include:
  - Dyspnea
  - Nonproductive cough
  - Malaise
  - Fatigue
  - Anorexia

Carver, Yaposi, Ng, Ascola, Schwartz, Yengo, Hagerty, Kerner, & Vaughn, 2007

Risk Reduction

- RT Techniques:
  - 3D treatment planning
  - Intensity Modulated Radiation Therapy (IMRT)
  - Image Guided Radiation Therapy (IGRT)
  - 4D Adaptive IGRT

Guerra et al., 2013

Management of Pneumonitis/Fibrosis

- Pharmacological Interventions:
  - Cough suppressants
  - Antipyretics
  - Glucocorticoid therapy
  - Pain management
- Non-pharmacological Interventions:
  - Pulmonary function tests
  - Conserve exercise/rest
  - Oxygen therapy
  - Pulmonary rehabilitation

Gravena et al., 2015

Risk Factors Associated with Cardiotoxicity

- Total dose of RT
  - Fraction size
- Type of RT/technique
- Volume of heart irradiated
- Age
- Time since exposure
- Chemotherapy history
- Other medical conditions

Adams, Lipshultz, Schwartz, Ayala, Ems, & Gershon, 2003; Haddad & Prat, 2013; Fanghella, Mayer, et al., 2010
Cardiotoxicity Manifestations

• Chronic pericardial effusion/Pericarditis
• Cardiomyopathy
• Coronary heart disease (CHD)
• Valvular heart disease
• Cardiac conduction fibrosis

Monsuez, 2012; Stan, Loprinzi, & Ruddy, 2013

Pericardial Effusion/Pericarditis

• Most common
• Effusive or Restrictive
• Symptoms include:
  – Retrosternal chest pain
  – Dyspnea
  – Cough
  – Muffled heart sounds
  – Pulsus paradoxus
  – Cardiac tamponade

Monsuez, 2012; Stan, Loprinzi, & Ruddy, 2013

Valvular Heart Disease

• Primarily aortic & mitral valves
• Causes stenosis or regurgitant lesions
• Follow-up/Management:
  – Prophylaxis
  – Surgery

Monsuez, 2012; Stan, Loprinzi, & Ruddy, 2013

Cardiac Conduction Fibrosis

• Fibrosis of sinus node
  – EKG abnormalities/arrhythmias
  – Right bundle branch block (RBBB)
  – Sinus node dysfunction or complete heart block

Monsuez, 2012; Stan, Loprinzi, & Ruddy, 2013

Cardiotoxicity Risk Reduction

• RT Techniques:
  – Cardiac blocking
  – Maximum heart distance (MHD)
  – IMRT
  – Electrons
  – Respiratory gating

Doyle et al., 2007; Monson & Haffty, 2009; Martinoe & Staa, 2013; Wang et al., 2012

Cardiac Toxicity Assessment

• Subjective findings:
  – Edema
  – Dyspnea/Exercise intolerance
  – Chest pain/Heart palpitations
• Objective findings:
  – Vital signs/Weight
  – Heart sounds
  – Lung sounds
  – Assessment of jugular veins
  – Presence of edema
  – Temperature of extremities

Monsuez, 2012; Stan, Loprinzi, & Ruddy, 2013; Doyle et al., 2007; Monson & Haffty, 2009; Martinoe & Staa, 2013; Wang et al., 2012
Management of Cardiotoxicity

- Control of symptoms to improve quality of life
  - Cardiac rehabilitation
  - Referral to Cardiac Oncology
- Pharmacological Interventions:
  - Diuretics
  - Afterload reducers
- Surgical Approaches:
  - Cardiac stents
  - Pacemaker
  - Coronary artery bypass
  - Heart transplantation

Carver, Shapiro, et al., 2007; Carver, Szolda, & By, 2013; Chen & Parameswaran, 2011; Davis & Witteles, 2013; Steingart et al., 2013

Monitoring of Cardiac Function (EMSO Guidelines)

- Patients at risk
- Clinical exam/medical history
- Tests dependent upon toxicity:
  - CHD: Lipid profile, Stress test, ECHO EKG
  - Pericarditis: EKG, Echo, CXR
  - Cardiomyopathy: EKG, Echo, Angiogram
  - Arrhythmias: EKG, Holter monitor
  - Valvular disease: Echo, cardiac catherization

Curigliano, Cardinale, Suter, et al., 2012