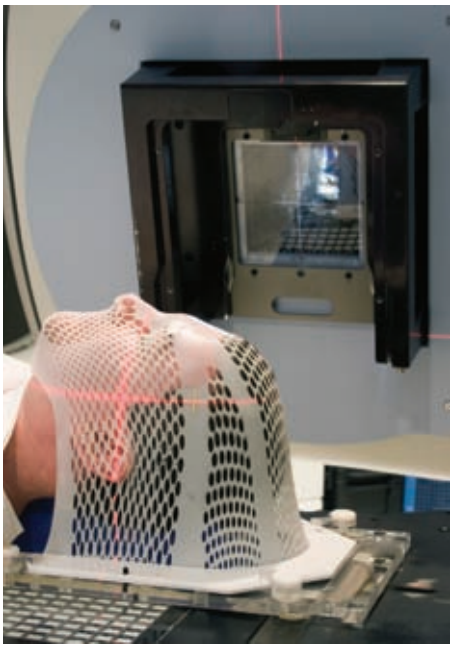

# Dental Management of Patients Receiving Radiation Therapy to the Head and Neck

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## Educational objectives

Upon completion of this course, participants should be able to achieve the following:

- Appreciate the ramifications to the orodental system of radiation therapy to the head and neck.
- Understand how to evaluate and prepare patients to withstand the rigors of radiation therapy to the head and neck.
- Understand and know how to prevent/minimize the deleterious side effects of radiation therapy to the head and neck.
- Be prepared to deal with patients who have previously received radiation therapy to the head and neck prior to coming under your care and know when and where to refer these people for care.

Patients with cancer of the head and neck region, be they primary or metastatic lesions, are commonly treated by surgery, radiation therapy, chemotherapy, or a combination of these modalities. Radiation therapy (RT) may be utilized either prior to, or subsequent to, surgical resection of the malignancy. It may also be used for palliation if the cancer is considered incurable. The goals for dental management of these patients are to minimize the deleterious side effects from radiation therapy, minimize/prevent post irradiation caries and necrosis (primarily osteoradionecrosis), and permit the maximum oral health and function during and post RT.

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*continued on page 60*

continued from page 58

**Fig. 1: Major Side Effects of RT to Head & Neck**

- Xerostomia
- Post irradiation caries
- Necrosis of soft tissues and/or hard tissues (osteoradionecrosis- ORN)
- Mucositis
- Trismus
- Prosthetic Complications
- Perio considerations
- Hypogeusia

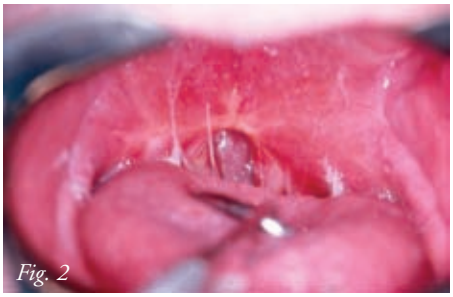

*Fig. 2*

*Fig. 3a*

*Fig. 3b*

*Fig. 3c*

When evaluating a patient, it is important to ask leading questions, since patients might not grasp the importance of a history of RT to the head and neck; sometimes lymphoma patients are also treated with RT, which extends up to the inferior border of the mandible.

Most commonly, RT uses external beam ionizing radiation produced by linear accelerators. The beams are directed at the tumor while attempting to spare healthy tissues. The ionizing radiation works by damaging the DNA of the rapidly dividing cancer cells, resulting in cellular death.

The field of application for the RT is referred to as the "portal" or "port." These are carefully determined after consultation between the radiation oncologist and the medical physicist. You need to know what these ports are; be sure to consult with the radiation oncologist to find out what areas are in the field. Hair follicles are fairly sensitive to irradiation. A clue to port locations is the lack of facial hair. Patients are usually tattooed with small dots to delineate the ports and permit very accurate serial repositioning for each treatment session. This brings up the concept of fractionation, where a total cancercidal dose of perhaps 6,000 rads (R) or 6,000 centigrays (cGy) is broken up, or fractionated, to levels safely tolerated by the healthy tissues. This is usually about 200R per day. The healthy tissue can then recover between each RT application. The treatments need to be provided serially until the total desired dose is received. The session where the radiation portals are precisely determined and marked out is called simulation. Just as the name suggests, this is a rehearsal of the actual treatment sessions. This is when the patient is tattooed and sometimes molds and stents are provided to enable healthy tissues to be held out of the field and permit very accurate repositioning each time.

Ideally, the patient should be seen prior to the start of RT. A complete orodental assessment is made, including the maximum intraoral opening level. See "Fig. 1" to the left for the major side effects of RT to the head and neck. Details of each side effect are presented below. At some level, each of these side effects is interrelated.

## Xerostomia

Xerostomia is caused by irradiation to salivary glands resulting in irreversible degenerative changes and diminished quality and quantity of the remaining saliva (Fig. 2). The parotid glands, which produce approximately two quarts of serous saliva daily, are almost always in the field. Without this serous saliva, the remaining saliva is mucinous. Sometimes all the glands, serous and mucinous, are in the field. This partial or complete loss of salivary flow has serious repercussions, since saliva is involved with all oral functions. The "washing" of teeth and caries protective function, food digestion, comfort with speech and swallowing, and prosthetic functions of saliva, are all lost. Patients with xerostomia are subject to extraordinary caries levels for the rest of their lives. Dry mucosa is also more subject to irritations and breaks, which can become portals for sepsis. Saliva, which would function as a lubricant and seal for removable prostheses, is absent; as are those abilities. Many different artificial saliva substitutes are available for use ad lib. The most important point to convey to patients is that they should never use sugared sucking candies to stimulate any remaining salivary flow. Constant bathing of the teeth in sugar, as we all know, would be disastrous. Pilocarpine medication (Salagen) may be used to stimulate maximum flow of remaining salivary function. Use of this approach must be weighed against side effects caused by the drug.

continued on page 62

continued from page 60

### Fig. 4: Use of Fluoride Applicators

- Use each night after brushing and flossing on a permanent basis
- Place one drop of gel for each tooth inside the applicator
- Place loaded applicator over the teeth and press into position
- Leave undisturbed for five minutes
- Remove after five minutes and spit out excess
- Do not eat/rinse/drink for 30 minutes!
- Clean applicator under cool running water and set aside to dry

*Fig. 5*

*Fig. 6a*

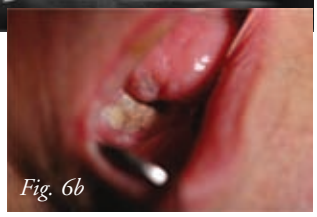

*Fig. 6b*

*Fig. 7*

## Post Irradiation Caries

Post RT caries are very dramatic and devastating (Figs. 3a, 3b & 3c see p. 66). The lack of salivary buffering ability in the oral cavity results in a drop in pH. The caries can literally encircle the teeth and render them flexible. Post RT caries are usually seen a few months after RT induced xerostomia. It can and should be prevented by good oral hygiene and daily use of custom fluoride applicators to apply neutral pH fluoride gel on a permanent basis for life (Fig. 4). These applicators, made from 4mm thick vinyl mouthguard material, hold the fluoride gel in close apposition to the teeth. They are made using models obtained from good alginate impressions using a thermoplastic vacuum machine. After trimming the vinyl material about 3-4mm past the gingival margins, the edges are smoothed very well. The patient loads the applicator by placing one drop of gel for each tooth inside the applicator. The loaded applicators are then placed over the teeth, pressed down, and left undisturbed for five minutes (Fig. 5). After removal, the patient cannot eat, drink or rinse for 30 minutes. Making this part of a daily routine, perhaps before retiring for the night, ensures compliance. After use, the applicators are cleaned in cool water and left to dry. It is important to use neutral pH gel, since acidulated fluoride gel will not only irritate soft tissues, but will etch any porcelain restorations.

## Necrosis of Hard or Soft Tissues (ORN)

Osteoradionecrosis (ORN) can be minimized/prevented by performing any invasive procedures before RT commences (Figs. 6a & 6b). Remember, after RT, the blood supply to irradiated areas is permanently diminished. After exodontia, the bony edges should be smoothed very well and primary closure attempted. This wound must epithelialize prior to RT, a process that usually takes 10 days. If you blow air down into the wound and the edges do not dehisce, the surgical site has epithelialized. If the wound dehisces, you should wait another five-to-seven days and repeat the test before clearing the patient to begin RT. ORN management is a difficult issue involving hyperbaric oxygen applications, debridement of sequestrum, and antibiotics.

## Mucositis

Mucositis usually occurs during the course of RT. It is painful and the denuded areas may provide portals for sepsis. Oral hygiene is difficult and treatment is symptomatic. A suspension of benadryl, kaopectate and lidocaine viscous may be compounded for the patient to swish and spit out. The kaopectate coats the mucosa and holds the local anesthetics against the tissue to provide relief for a period of time. Ultra soft toothbrushes and toothettes (sponge on a stick) are also helpful for oral hygiene. Sometimes the balance of the normal oral flora is upset and candida infestations may occur. This can be treated with nystatin suspensions or troches.

## Trismus

Trismus is a very difficult problem to resolve and is best prevented through exercise (Fig. 8a, see p. 70). It is caused by irradiation and subsequent fibrosis of some/all of the muscles of mastication. Remember that you measured the maximum oral opening prior to RT. Normally this is about 40mm. Provide the patient with a tongue blade marked by the distance of maximum opening. The patient is to exercise daily to open the mouth four-to-six times to this maximum level. They can hold the blade up to the mouth and check that they open to this extent. Use

continued on page 64

continued from page 62


Fig. 8a


Fig. 8b


Fig. 9a


Fig. 9b


Fig. 10a

of the fingers to stretch the mouth open is helpful. For patients unable to do this, a Therabite device can be used to stretch open the mouth (Fig. 8b).

## Prosthetic Complications

The prosthetic considerations of RT deal primarily with lack of saliva, which functions as both lubricant and sealing medium for removable prostheses. Soft silicone liners, which do not wet as well as hard acrylic, are contraindicated since the increased drag on irradiated mucosa promotes abrasions, breaks, and creates potential portals for sepsis.

## Periodontal Considerations

Periodontal considerations mainly address conservative management approaches. Surgical intervention is contraindicated in irradiated areas since the blood supply is diminished, healing compromised and the potential for ORN is markedly increased.

## Hypogeusia

Hypogeusia, which is diminution of the taste sensation, is caused by radiation to the microvillae on the posterior dorsum of the tongue. Recovery can occur some time after RT, but usually patients complain that all foods taste like cardboard.

Intellectually, you should divide the patient timeline into pre and during/post RT, since once an area is irradiated, it is changed forever. The pre-RT orodental evaluation should include dentition status, hygiene, maximum interincisal opening (IIO), what cancer treatment patient will receive (RT, chemo, surgery, etc.), the occlusion, and tongue/lip function. The patient is placed into one of four groupings: good dentition, fair dentition, poor dentition, and edentulous.

The good dentition patient (Figs. 9a & 9b) is in a good state of repair (not necessarily "perfect") and has good oral hygiene. For this patient, deal with any acute restorative needs, perform a prophylaxis, and educate the patient regarding RT, fabricate custom fluoride applicators (and prescribe neutral pH gel), and send a letter to the referring doctor.

The patient with a fair dentition (Figs. 10a bottom left; 10b & 10c on p. 72) will have a dentition in a fair state of repair, frequently with suboptimal periodontal health. Here you need to provide any acute restorative needs and remove compromised teeth in the field of RT. You need to be mindful of the patient's cancer prognosis and just how problematic these compromised teeth may be in the future. It is not advisable to try and salvage any and all teeth, since once the area is irradiated, removal will be very problematic. You should provide these patients with custom fluoride applicators, prophylaxis, educate them with regards to RT, and a letter to the referring doctor.

The patient with a poor dentition (Fig. 11, see p. 72) usually has poor hygiene as well as a dentition in a poor state of repair. Regardless of the patient's cancer prognosis, these people usually require removal of most/all of their teeth. Primary closure of the surgical sites and epithelialization prior to RT is needed. You should educate the patient with regards to RT and send a letter to the referring doctor.

Patients who are edentulous and are successfully using removable prostheses that do not cause any oral pathology can continue to use them until mucositis from the RT causes discomfort, at which time they should put the prostheses aside.

As for providing edentulous patients with a prosthesis after completion of RT,

continued on page 66

continued from page 64


Fig. 10b


Fig. 10c


Fig. 11

the experienced denture wearers seem to do better, although it is wise to wait six-to-eight months before fabrication of a prosthesis. Of course, you need to be mindful of your technique and avoid use of irritating materials, such as ZnOE impression pastes, and do not overextend any borders since, for these patients, irritations carry more import. Meticulous attention to technique and careful follow up is very important for all edentulous RT patients who receive a prosthesis. For those patients rendered edentulous prior to the start of RT, waiting a bit longer, perhaps one-and-a-half years after completion of RT, might be advisable. Remembering that use of complete dentures is a learned skill, these patients need to be carefully monitored to prevent self injury while using a new denture for the first time. There is no real answer for patients who need extractions after RT when the teeth are in the field. Use of hyperbaric oxygen, antibiotics, and careful surgical technique are sometimes not enough to prevent ORN. An alternative approach might be to consider endodontic therapy and overdenture fabrication.

Support for patients receiving RT to the head and neck is very important to quality of life. Support for People with Head and Neck Cancer (SPOHNC) was founded by an oral cancer survivor and has chapters in many areas of the U.S. Through its newsletter, meetings, and personal support network, SPOHNC can vastly improve the quality of life for many patients. SPOHNC's telephone number is: 800-377-0928, and its Web site is: www.spohnc.org.

In summary, the main side effects seen with RT to the head and neck are seen in Fig 1. It is our intention and goal as dentists to minimize and/or prevent these potentially devastating side effects from occurring and to help the patient maintain the highest possible level of oral health and function both during and after RT. ■

## Author's Bio

**Dr. Sheiner** graduated first in his class from NYU College of Dentistry in 1975. After a general practice residency at Albert Einstein College of Medicine, he completed a residency in general prosthodontics and a fellowship in maxillofacial prosthodontics at Memorial Sloan Kettering Cancer Center. Dr. Sheiner is a Diplomate of the American Board of Prosthodontics and a Fellow in the American College of Dentists and the American College of Prosthodontists. In addition to appointments at The Mt. Sinai School of Medicine and The Mt. Sinai Medical Center, Dr. Sheiner maintains a private practice in Manhattan.

*Disclosure: Dr. Sheiner declares that neither he nor any member of his family have a financial arrangement or affiliation with any corporate organization offering financial support or grant monies for this continuing dental education program, nor does he have a financial interest in any commercial product(s) or service(s) he will discuss in the presentation.*

continued on page 68

continued from page 66

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1. What are the goals of dental management for RT patients?
   a. Decrease incidence/severity of necrosis.
   b. Decrease incidence/severity of post RT caries.
   c. Minimize deleterious effects of RT.
   d. Rehab the patient as fully as possible.
   e. All of the above.

2. How long does it take after RT before the blood supply to irradiated tissues recovers?
   a. Six months
   b. Two years
   c. One year
   d. Never

3. How long should the irradiated patient use fluoride applicators?
   a. Only during treatment.
   b. Before RT commences.
   c. One year.
   d. On a daily basis permanently.

4. Ideally, when should the RT patient be seen by the dentist?
   a. Before RT commences.
   b. Only during RT.
   c. Once RT is completed.
   d. Only after patient has trismus.

5. What are some side effects of RT to the head and neck?
   a. Trismus
   b. Caries
   c. Xerostomia
   d. Hypogeusia
   e. All of the above
   f. a, b & c

6. Why are RT patients tattooed?
   a. To look cool.
   b. For record keeping.
   c. Initiation for RT patients into the group.
   d. To enable accurate serial repositioning for each treatment session.

7. What is simulation for RT?
   a. A session to introduce the patient to everyone.
   b. A session to make sure patient knows where to go for treatment.
   c. A session to precisely mark out areas to be treated.

8. What is the best way to deal with trismus associated with RT?
   a. Tongue blades.
   b. Therabite.
   c. Prosthetic screw.
   d. Prevention through exercise.

9. What type of fluoride should be used for RT patients?
   a. Acidulated stannous fluoride.
   b. Neutral pH sodium fluoride.
   c. Fluoride rinses.
   d. Fluoride cavity varnish.

10. How long after exodontias should RT commence?
    a. Five days.
    b. When epithelialization has occurred.
    c. When patient says "go."
    d. When radiation oncologist has time to treat the patient.

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