Clinical Note

Assessment of Pain During Head and Neck Irradiation

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Abstract

Radiation therapy for patients with head and neck malignancies frequently results in painful mucositis, which is usually poorly controlled with standard analgesics or topical anesthetics. To better understand the temporal development of radiation-induced pain and the effects of this pain on activities of daily living, 14 patients undergoing radiation therapy for a newly diagnosed head and neck malignancy completed daily pain diaries during the course of irradiation. All patients developed painful mucositis, usually beginning during the second or third week of radiation. Despite the use of analgesics/anesthetics, pain was rated as moderate or severe on 37% of treatment days and was noted to be constant or present throughout most of the day on 58% of treatment days. Eating and sleep disturbances related to pain occurred on 55% and 34% of treatment days, respectively. Eight patients had greater than a 2-kg weight loss. Radiation induces a predictable pattern of pain and comorbidity, which may be amenable to earlier and more aggressive analgesic treatment. J Pain Symptom Manage 1989;4:90–95.

Key Words
Cancer pain, head and neck malignancy, radiation therapy, mucositis

Introduction

Approximately 40,000 new head and neck malignancies are diagnosed each year in the United States. The term head and neck malignancy encompasses a heterogeneous group of epithelial neoplasms occurring in such diverse anatomic locations as the nasopharynx, mouth, pharynx, larynx, and hypopharynx. Standard treatment for these tumors includes surgery and radiation; the role of chemotherapy is increasing but not well defined to date. Radiation treatments encompassing the primary tumor and draining lymphatics include a large portion of the mucosal surface of the upper-aerodigestive tract. Moderate radiation mucositis is usually noted at the end of the second week of treatment. Mucosal reactions peak during the fourth week of therapy and persist for 2–4 wk beyond the completion of therapy. Associated symptoms include xerostomia, alterations in taste, and deterioration of oral hygiene because of changes in bacterial flora. Current therapeutic maneuvers designed to lessen radiation-induced mucosal pain include topical anesthetics and oral analgesics. However, these
measures often fail to provide significant analgesia.

New techniques for delivering head and neck radiation include accelerated fractionation and hyperfractionation, both of which may cause more severe mucosal reactions than standard fractionation schedules.6-11 Management of mucosal symptoms in these patients is critical since the radiobiologic advantage of accelerated fractionation or hyperfractionation would be negated by a delay in therapy due to intolerance of mucosal reactions. In order to understand how best to control the pain associated with radiation-induced mucositis, a more thorough understanding of radiation-induced pain is needed. Presented is a study detailing the temporal development and quality of pain associated with radiation-induced mucositis through the completion of daily patient diaries. Through a better understanding of the quality and intensity of pain experienced during head and neck irradiation, recommendations for more effective analgesic management can be made.

**Methods**

Daily pain assessment questionnaires were administered to all eligible patients with a diagnosis of head and neck malignancy undergoing primary radiation therapy between August 1987 and July 1988 at the Milwaukee County Medical Center in Milwaukee, Wisconsin. Eligibility criteria included a newly diagnosed primary head and neck malignancy in a competent patient willing to complete a daily written questionnaire. Prior radiation therapy to the head and neck excluded participation. On the first day of radiation treatment, each patient was given oral instructions regarding completion of the questionnaire. Prior radiation therapy to the head and neck excluded participation. On the first day of radiation treatment, each patient was given oral instructions regarding completion of the questionnaire. The same questionnaire was used in a daily diary, which was completed in the radiotherapy department on each treatment day (Table 1). Patient diaries were not available to the radiation oncology team responsible for care.

Radiation therapy following surgery was delivered by the sixth postoperative week, following adequate healing of incisions. Total doses ranged from 50.4 Gy to 70.2 Gy using conventional 180 cGy daily fractionation. Anatomic areas of primary involvement included: 5-oral cavity, 5-opharynx/supraglottic larynx, 2-hypopharynx, 2-larynx. At presentation, all patients had stage II or III disease.19 Standard treatment portals were applied to encompass the primary lesion and draining lymphatics. Only one patient received neoadjuvant chemotherapy, consisting of Cis-platinum and 5-fluorouracil delivered over three cycles prior to surgical resection.

**Results**

Twenty-one patients met entry criteria and were asked to complete questionnaires. Seven patients failed to complete greater than 75% of their daily questionnaires and were excluded from analysis. Fourteen patients were therefore evaluable. There were 12 men and 2 women, with a mean age of 57 yr (range 27-67 yr). Table 2 lists the tumor histology, location, and maximum radiotherapy dose for each patient. Radiation treatments were completed in an average of 35 treatment days (range 29-44 days), occurring over an elapsed time of 6 to 9 wk.

Ten patients had no pain prior to their first radiation treatment, while three patients noted mild pain and one moderate pain in the mouth, tongue, throat, or neck. Radiation-induced pain generally began during the second or third week of treatment. The number of treatment days in which no pain was reported quickly declined during the first 3 wk of treatment. Severe pain was first noted by patients during the fifth treatment week. Figure 1 demonstrates the changing description of pain intensity during each week of treatment. At its worst, pain was rated as severe on at least one treatment day by four patients and moderate by the remaining ten patients. Severe pain was reported on 3% (17/498) of treatment days, moderate pain on 33% (166/498) of days, mild pain on 39% (193/498) of days, and no pain on 25% (122/498) of treatment days.

When asked to describe the duration of pain throughout the preceding 24-hr period, ten patients (71%) noted their pain to be "always present" on at least one treatment day by four patients and moderate by the remaining ten patients. Severe pain was reported on 3% (17/498) of treatment days, moderate pain on 33% (166/498) of days, mild pain on 39% (193/498) of days, and no pain on 25% (122/498) of treatment days.

When asked to describe the duration of pain throughout the preceding 24-hr period, ten patients (71%) noted their pain to be "always present" on at least one treatment day. Pain that was "always present" occurred on 29% (142/498) of treatment days. Pain present "throughout most of the day" was noted on 29% (145/498) of treatment days, "only occa-
Table 1
Pain Assessment Questionnaire

Name ___________________________________________ Today’s Date ____________

1. Are you currently having pain in the mouth, tongue, throat, or neck?

2. Since the last time I completed this form, my pain is:
   — Completely relieved
   — Getting better, but still present
   — Staying the same
   — Getting worse

3. Check one of the following that best describes your pain within the last 24 hr:
   — No pain
   — Mild pain
   — Moderate pain
   — Severe pain

4. You would describe your pain as:
   Burning — Yes — No
   Sharp — Yes — No
   Aching — Yes — No
   Throbbing — Yes — No
   Shooting — Yes — No

5. In the last 24 hr, the pain has been:
   — Not present
   — Present only occasionally
   — Present throughout most of the day
   — Always present

6. In the last 24 hr, the pain has affected my (check as many as apply):
   — Sleep
   — Energy level
   — Ability to eat
   — Mood

7. What pain medicine have you used in the last 24 hr:

8. Do feel the medicine you take for pain:
   — Relieves all of my pain
   — Relieves most of my pain
   — Relieves little of my pain
   — Relieves none of my pain

9. Have you smoked since last completing this form?

10. Have you used alcoholic beverages since last completing this form?

sionally” on 18% (89/498) of days, and “not present” on 24% (122/498) of days.

Thirteen patients (93%) noted disturbance in eating due to pain. This occurred on 55% (273/498) of treatment days. Eleven patients (79%) noted disturbance in sleep due to pain, which occurred on 34% (170/498) of treatment days. Nine patients (64%) noted disturbance in energy level due to pain (occurring on 35% [173/498] of treatment days) and six patients (43%) noted disturbance in mood due to pain (occurring on 10% [92/498] of treatment days). Disturbances in eating, sleep, energy, and mood occurred in tandem with descriptions of increasing pain severity. All symptoms occurred almost exclusively after the first 2 wk of treatment.

At various times during treatment, ten patients chose the term burning to describe their pain, ten chose aching, six each chose sharp or
**Table 2**

**Patient Characteristics**

<table>
<thead>
<tr>
<th>Patient Number</th>
<th>Age (Sex)</th>
<th>Tumor Site</th>
<th>Radiation Dose (cGy)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>27 (M)</td>
<td>Tongue</td>
<td>5040</td>
</tr>
<tr>
<td>2</td>
<td>58 (M)</td>
<td>Larynx</td>
<td>7020</td>
</tr>
<tr>
<td>3</td>
<td>63 (M)</td>
<td>Soft palate</td>
<td>6400</td>
</tr>
<tr>
<td>4</td>
<td>55 (M)</td>
<td>Retromolar trigone</td>
<td>6120</td>
</tr>
<tr>
<td>5</td>
<td>62 (M)</td>
<td>Tongue</td>
<td>6300</td>
</tr>
<tr>
<td>6</td>
<td>64 (M)</td>
<td>Floor of mouth</td>
<td>5940</td>
</tr>
<tr>
<td>7</td>
<td>53 (M)</td>
<td>Soft palate</td>
<td>5940</td>
</tr>
<tr>
<td>8</td>
<td>57 (M)</td>
<td>Hypopharynx</td>
<td>7020</td>
</tr>
<tr>
<td>9</td>
<td>67 (M)</td>
<td>Larynx</td>
<td>7020</td>
</tr>
<tr>
<td>10</td>
<td>53 (M)</td>
<td>Tongue</td>
<td>6640</td>
</tr>
<tr>
<td>11</td>
<td>53 (M)</td>
<td>Epiglottis</td>
<td>7020</td>
</tr>
<tr>
<td>12</td>
<td>64 (M)</td>
<td>Epiglottis</td>
<td>6800</td>
</tr>
<tr>
<td>13</td>
<td>63 (F)</td>
<td>Tonsil</td>
<td>6120</td>
</tr>
<tr>
<td>14</td>
<td>58 (M)</td>
<td>Minor salivary gland</td>
<td>5950</td>
</tr>
</tbody>
</table>

throbbing, and five chose shooting. Twelve patients chose more than one descriptor on any given treatment day. There were no major changes in the pain descriptors used by individual patients during the treatment course.

Analgesics administered (or self-administered) during the course of radiation included non-opioids such as aspirin or acetaminophen, which were used by seven patients (50%) and oral opioid combination products, such as codeine or oxycodone with aspirin or acetaminophen, which were used by 13 patients (93%). Oral long-acting morphine sulfate preparations were used by two patients (14%). Single or combinations of oral topical anesthetics, such as viscous lidocaine, diphenhydramine elixir, or sucralfate, were used by all patients. The responses to analgesics during treatment weeks 4–6 included the following: "relieves all of my pain" on 3% (6/210) of treatment days, "relieves most of my pain" on 62% (130/210) of treatment days, "relieves little of my pain" on 8% (18/210) of days, and on 27% (56/210) of treatment days the question was not answered.

Eight patients experienced greater than a 2-kg weight loss during the course of radiation (range 0–15 kg, mean 4.6 kg). Five patients continued smoking (cigarette or pipe), and two patients noted alcohol consumption as least sporadically throughout their treatment course.

**Discussion**

Patients undergoing radiation therapy to the upper-aerodigestive tract for head and neck malignancies develop a predictable pattern of pain. Our results confirm the clinical observation that symptomatic radiation-induced mucositis begins during the second to third week of treatment, at a time when the total radiation dose is in the range of 2,000–3,000 cGy. All patients noted pain by the third treatment week, and all rated pain intensity as either moderate or severe sometime during treatment, despite the use of standard analgesics/anesthetics. Of special significance was the finding that on 58% of treatment days, the pain was either "always present" or "present throughout most of the day." This indicates that radiation-induced mucositis is often a continuous, rather
than episodic, pain experience during most treatment days.

The medications used by our patients included a representative sample of commonly prescribed oral analgesics and topical anesthetics. Despite the use of these agents, patients continued to report moderate to severe pain, along with disturbances in sleep, eating, and energy level. However, on most treatment days patients also responded that the analgesics relieved most of their pain. Thus, patients reported both significant pain and significant analgesia at the same time in response to differing questions. Of note, during the most painful period of radiation (wk 4–6) patients failed to respond to the question assessing response to analgesics on 27% of treatment days (by far the most frequently unanswered question).

One possible explanation for these ambiguous responses, and the frequent failure to respond at all, is that patients may have been reluctant to indicate a poor analgesic response due to a fear of being prescribed stronger medication, particularly opioids. The fear of taking opioids by cancer patients is well known and is largely due to exaggerated fears of narcotic tolerance, addiction, and central nervous system side effects. Other possible causes for this observation include the common concern on the part of the cancer patient that a label of complainer or “bad patient” will be given or the doctors’ attention diverted away from treating the cancer.

Despite the ambiguous response to the levels of pain and analgesia, it seems clear from the degree of pain severity and the influence on activities of daily living that pain control using current analgesic regimens is poor. There are probably several reasons for this, including the following: (1) The analgesics prescribed were of insufficient potency and/or were prescribed at an inadequate dosing schedule during periods of continuous pain, and (2) direct mucosal irritation from several of the drugs used may have negated their analgesic/anesthetic effects. Viscous lidocaine is not optimal for continuous pain due to its short activity and anesthesia of the pharynx it produces, which is associated with the risk of aspiration. Lidocaine or diphenhydramine tends to have a drying effect on the oral mucosa, and patients frequently complain of irritation. Oral tablets frequently need to be crushed, resulting in an unpleasant gritty sensation, which further irritates the mucosa. Although elixirs of acetaminophen and codeine are available without alcohol, most elixirs containing these products also contain alcohol, and this likely accounts for a burning effect noted by some patients.

Our results indicate that more effective analgesic regimens are needed to control pain and the accompanying problems of weight loss, and mood and energy level disturbances resulting from radiation-induced mucositis. Since radiation-induced pain is often continuous and of moderate to severe intensity, the more liberal use of moderate to strong opioids given “around the clock” would seem indicated. In addition, since pain in these patients has such a predictable time of onset, the early use of moderate to strong oral opioids, rather than weak analgesics/anesthetics that further irritate the mucosal surface may help to maintain nutrition and prevent weight loss. This approach has worked well in patients undergoing bone marrow transplantation, who often develop a similar pattern of time-limited, treatment-related mucositis. The development of transdermal opioid delivery systems may be the best option for these patients in the years to come.

References


