

## ORIGINAL RESEARCH

# Dysphagia after sequential chemoradiation therapy for advanced head and neck cancer

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**OBJECTIVES:** Assess impact of sequential chemoradiation therapy (SCRT) for advanced head and neck cancer (HNCA) on swallowing, nutrition, and quality of life.

**STUDY DESIGN:** Prospective cohort study of 59 patients undergoing SCRT for advanced head and neck cancer. Follow-up median was 47.5 months.

**SETTING:** Regional Cancer Center.

**RESULTS:** Median time to gastrostomy tube removal was 21 weeks. Eighteen of 23 patients who underwent modified barium swallow demonstrated aspiration; none developed pneumonia. Six of 7 with pharyngoesophageal stricture underwent successful dilatation. Functional Assessment of Cancer Therapy–Head and Neck Scale questionnaires at median 6 months after treatment revealed “somewhat” satisfaction with swallowing. At the time of analysis, 97% have the gastrostomy tube removed and take soft/regular diet.

**CONCLUSION:** Early after treatment dysphagia adversely affected weight, modified barium swallow results, and quality of life. Diligent swallow therapy, and dilation as needed, allowed nearly all patients to have their gastrostomy tubes removed and return to a soft/regular diet.

**SIGNIFICANCE:** Dysphagia is significant after SCRT but generally slowly recovers 6 to 12 months after SCRT.

**EBM rating:** C-4

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Increasingly head and neck cancer is being managed with intensive chemoradiation therapy (CRT). This treatment has proven successful at improving locoregional control, progression free survival, and overall survival.<sup>1</sup> A primary aim of organ preservation therapy is retention of vital tissue and thereby maintenance of normal breathing, swallowing, and communicating functions. When reviewing different treatment options, it is critical for clinicians and patients to compare treatment-related side effects and their impact on quality of life (QOL). As more patients receive CRT and survive, there must be increased attention focused on the long-term treatment side effects: xerostomia, dysphagia, and depression.<sup>2</sup>

Dysphagia occurs in up to 50% of patients after CRT.<sup>2</sup> Acute toxicities including mucositis, pain, nausea, and decreased appetite can temporarily lessen the ability to take nutrition by mouth. Late complications, such as xerostomia and fibrosis, can result in long-term swallowing problems. Patients are often further troubled by copious thick secretions, edema, and diminished pharyngeal sensation. The nutritional and dietary limitations caused by dysphagia can furthermore result in poor general health and poor overall QOL.

This study seeks to characterize swallow function before and after CRT for advanced head and neck cancer (HNCA) and to understand its impact on nutrition and QOL. Several measures were used including patient symptoms, weight, timing of gastrostomy tube (GT) removal, diet, modified barium swallow (MBS) results, and QOL assessments. Pa-

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tients were assessed before treatment, immediately after treatment, and at regular intervals up to a mature follow-up of median 47.5 + months.

## MATERIALS AND METHODS

Seventy-two patients with advanced stage III or IV HNCA without distant metastases began protocol-based sequential chemoradiation therapy (SCRT) between June 1999 and December 2002.<sup>3</sup> All patients had squamous cell carcinoma of the head and neck. Unknown primaries and primary cancer sites in the sinonasal cavity, nasopharynx, and salivary glands were excluded. Thirteen patients were not included in this analysis: 1 had unacceptable toxicity after the first cycle of induction chemotherapy and went off study; 3 patients quit treatment during induction chemotherapy; 2 patients developed progressive disease during treatment and went off protocol; 7 patients developed early recurrent disease between 2 and 12 weeks after completion of chemoradiation therapy and died between 2 weeks and 8 months after treatment. Six of 7 of these patients died with their GTs. This report analyzes the remaining 59 patients.

No patient had a history of neurologic disease, gastroenterologic dysfunction, previous head and neck cancer, or prior surgical or radiation treatment to the head and neck.

SCRT consisted of 3 cycles of platinum-based induction chemotherapy (IC), followed by concurrent CRT with once daily radiation therapy and weekly carboplatin at an AUC of 1.5.<sup>3</sup> The IC regimen was cisplatin, 5-Fluorouracil with or without docetaxel given for 3 cycles every 21 days. The total dose of radiation to the primary was 70 to 74 Gy. Involved nodal regions received at least 60 Gy, uninvolved nodal regions at least 50 Gy. Radiation was delivered at a dose of 2 Gy per day. Neck dissections were planned between 6 and 12 weeks after CRT. Neck dissection was advised for those patients without a neck complete clinical response to induction chemotherapy or initial N3 disease. Twenty-three patients underwent neck dissection.

Gastrostomy tube placement was performed after induction chemotherapy. Ongoing oral intake was encouraged as tolerated. Throughout treatment the patients were followed by the nutrition service. Patients with increased or protracted dysphagia after treatment underwent MBS and swallow therapy.

Swallow function was assessed both before and after treatment. Pretreatment assessments included: the patients' subjective sense of their swallowing ability, The Functional Assessment of Cancer Therapy–Head and Neck Scale (FACT–H&N),<sup>4</sup> and pretreatment weight loss. The highest grade of mucositis during treatment was determined using the RTOG/EORTC Acute Radiation Morbidity Criteria, grades 0 to 4.<sup>5</sup> Post-treatment assessments included: weight loss, diet, time to GT removal, MBS with Swallow Performance Status<sup>6</sup> applied, and FACT H&N QOL survey.

The FACT–H&N is a validated, self-reported QOL instrument.<sup>7</sup> We additionally focused on target questions re-

lated to swallowing (questions 1, 5, 7, 11). Use of this symptom specific index has not been validated. We hypothesized that diet and time to GT removal would correlate well with swallow related QOL. The questionnaire was administered before treatment, after induction chemotherapy cycle 2 and 3, and 6 to 9 months after treatment.

The MBS studies were conducted at Brigham and Women's Hospital in accordance with the routine radiographic protocols approved by the institution and were performed jointly by the radiologist and speech pathologist. Subjects swallowed liquid barium, barium paste, and a barium-coated cookie. All participants completed the study positioned upright and viewed in the lateral plane. The oral preparatory, oral, pharyngeal, and cervical esophageal phases were assessed. The incidence of laryngeal penetration, defined as entry of the bolus into the laryngeal vestibule above the vocal cords, and aspiration, defined as bolus passing below the vocal folds, were recorded. Patients were given advice with respect to a safe diet, appropriate helpful swallow maneuvers, and the need for further swallow therapy.

Follow-up period, overall survival (OS), and progression-free survival (PFS) were calculated from the date of treatment initiation. Patients were examined weekly during treatment. Patients were evaluated with physical examination and appropriate imaging monthly during the first year, every other month in the second year, and every 3 to 6 months thereafter.

## RESULTS

### Patient Characteristics

As shown in [Table 1](#), the median patient age was 54 years, (range, 38 to 75). Sixteen patients were female and 43 were male. Primary tumor locations were oral cavity 3, oropharynx 42, larynx 11, and hypopharynx 3. The primary and nodal stages are outlined in [Table 1](#). Overall stages were stage III 8, stage IV 51. At the time of analysis, the follow-up range is 21.5 to 74.5 months; median was 47.5 months.

Airway compromise required 2 patients to undergo a tracheotomy before treatment and 3 after treatment. Three patients had recurrent disease at the primary site and underwent salvage surgery. One patient underwent total laryngectomy due to chondroradionecrosis of the larynx.

At the time of analysis, 81% are disease-free and 90% are survivors. The median overall survival is 45.3+ months. The median progression free survival is 43.5+ months.

### Pretreatment Swallow Assessments

Before treatment, 41% of patients described dysphagia or odynophagia and 59% denied any swallowing difficulties. FACT H&N questionnaire findings are reported in [Table 2](#). The mean pretreatment score for the questions pertaining to swallowing function was 3.2 (scale, 0 to 4). This indicated "quite a bit" of satisfaction with swallowing and diet.

**Table 1**  
Patient characteristics, n = 59

|                            |                    |
|----------------------------|--------------------|
| Age                        |                    |
| Range                      | 38-75 Years        |
| Median                     | 54                 |
| Sex                        |                    |
| Female                     | 16                 |
| Male                       | 43                 |
| Primary site               |                    |
| Oral cavity                | 3                  |
| Oropharynx                 | 42                 |
| Larynx                     | 11                 |
| Hypopharynx                | 3                  |
| Primary stage              |                    |
| T1                         | 8                  |
| T2                         | 17                 |
| T3                         | 18                 |
| T4                         | 16                 |
| Neck stage                 |                    |
| N0                         | 10                 |
| N1                         | 6                  |
| N2                         | 35                 |
| N3                         | 8                  |
| Overall stage              |                    |
| III                        | 8                  |
| IV                         | 51                 |
| Follow-up duration*        |                    |
| Range                      | 21.5-74.5 + months |
| Median                     | 47.5 + months      |
| Progression free survival* |                    |
| Median                     | 43.5 + months      |
| Overall survival*          |                    |
| Median                     | 45.3 + months      |

\*Follow-up duration, progression free survival, and overall survival calculated from start of treatment.

Documentation of pretreatment weight loss was available for 35 of the 59 patients; 20 reported no weight loss. The range of reported weight loss was 0 to 27 kg; mean 4 kg, median 0 kg.

The highest grade of mucositis during treatment was determined. The mean highest grade was 2.6 (scale, 0 to 4). Grade 2 or 3 mucositis was identified in 55 (93%) of 59 patients.

### Post-treatment Swallow Assessments

The median weight loss after completion of CRT was 9.6 kg with a range of 3.6 kg gain to 29.7 kg loss. The median percent weight loss was 12.7% with a range of 7.5% gain to 28.6% loss.

GT dependence and diet after completion of chemoradiation therapy was assessed with findings as noted in Figure 1. At 3, 6, 9, and 12 months, 17%, 53%, 70%, and 80% of patients took a soft or regular diet, respectively. At the time of analysis, 97% of patients are taking a soft or regular diet.

The median time to GT removal after CRT was 21 weeks with a range of 1 week to 218 weeks. At 3, 6, 9, 12 months, and 2 years, the GT was removed in 27%, 63%, 80%, 81%,

and 90% of patients, respectively. As noted, 9% had their GTs removed between 1 and 2 years after treatment. Two (3%) of 59 patients still have their GTs at 140 and 112 weeks. One patient has recurrent disease at his primary site and has been receiving palliative chemotherapy. The other patient takes a nutritionally adequate soft diet by mouth but prefers to keep his GT.

Twenty-three patients underwent a MBS (Table 3.) after chemoradiation therapy. The decision to perform MBS was based on patient or clinician appreciated swallowing difficulties beyond that expected after treatment. The studies were performed between 1 week and 13.5 months after treatment, median, 3.5 months. At the time the patients underwent MBS, 7 had their GTs removed and were taking oral diets: 1 pureed, 2 soft, 4 regular. Pharyngeal phase problems were most commonly noted, including in order of frequency: decreased epiglottic movement, decreased base of tongue contact to posterior oropharyngeal wall, decreased laryngeal elevation, and decreased bolus propulsion.

Penetration without aspiration was identified in 4 patients and 18 patients had aspiration. Aspiration was silent in 8. The advised diets for these 8 patients were: 1 NPO, 1 thickened liquids, 1 pureed, 3 modified diet, and 2 regular. Swallow therapy was undertaken by all of these patients. No patient developed aspiration pneumonia.

GT removal required special management in several patients. MBS revealed that 14 patients had pharyngoesophageal narrowing, usually located between the hypopharyngeal and the cervical esophageal regions; 7 required pharyngoesophageal dilation. One patient had esophageal stenosis after salvage laryngectomy and regional flap reconstruction. Dilations were performed between 1 and 14 times per patient, median 2 times. After dilations, 6 of the 7 patients were able to have their GTs removed. Five patients take a regular diet. One patient takes a soft diet. The one remaining patient with a GT takes a nutritionally adequate soft diet but feels more secure with his GT in place. Continued utilization of swallow therapy and dilations as needed provided reduction of overall GT dependence in this population to 3% of patients.

The Swallow Performance Scale (SPS)<sup>6</sup> was applied to the MBS results. The mean score was grade 5 (scale, 1 to 7), indicating moderate swallow dysfunction. SPS results are further displayed in Table 3.

The FACT H&N QOL questionnaire was administered after treatment. Twenty-six of 59 patients answered the questionnaire within 5.5 to 9.5 months, median 6 months, with findings as noted in Table 2. At the time the patients responded to the questionnaire, 16 (62%) had their GTs removed and were taking oral diets: 13 regular, 2 soft, and 1 pureed. The overall mean score for the swallowing-related questions was 2.0, indicating “somewhat” satisfaction with swallowing and diet. The lowest score was for question 7 “I can swallow naturally and easily.” The mean response was 1.35, indicating “a little bit” of agreement with the statement.

**Table 2**  
Quality of life assessment, FACT-HN

| Variable                                    | Before CRT | After CRT (median 6 months) |
|---|------------|-----------------------------|
| Swallowing-related questions*               | n = 58     | n = 25                      |
| 1. I am able to eat the foods I like.       |            |                             |
| Mean  | 3.2        | 2.3                         |
| SD  | 1.2        | 1.4                         |
| 5. I am able to eat as much food as I want. |            |                             |
| Mean  | 3          | 2                           |
| SD  | 1.3        | 1.4                         |
| 7. I can swallow naturally and easily       |            |                             |
| Mean  | 2.8        | 1.5                         |
| SD  | 1.4        | 1                           |
| 11. I can eat solid foods                   |            |                             |
| Mean  | 3.7        | 2.4                         |
| SD  | 1.4        | 1.7                         |
| Mean response swallow questions             |            |                             |
| Mean  | 3.2        | 2                           |
| SD  | 1.1        | 1.2                         |
| Total swallow questions                     |            |                             |
| Mean  | 12.4       | 8.1                         |
| SD  | 3.9        | 4.7                         |
| FACT-H&N subscale score                     |            |                             |
| Mean  | 28.3       | 22                          |
| SD  | 6.1        | 7.5                         |
| Total FACT-H&N score (H&N + G)              |            |                             |
| Mean  | 113.9      | 107.3                       |
| SD  | 18.6       | 19.1                        |

\*Questionnaire asks subjects to indicate how true each statement is: 0, not at all; 1, a little bit; 2, somewhat; 3, quite a bit; 4, very much.

## DISCUSSION

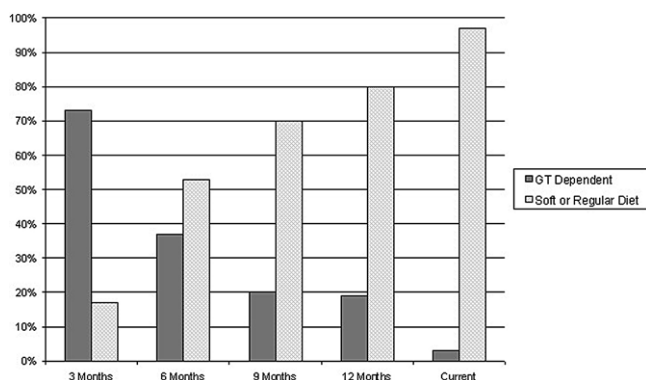
As chemoradiotherapy becomes more widely used for treatment of HNCA it is imperative to appreciate, prevent, and optimally manage treatment-related side effects. The aim of this study was to understand the frequency and severity of dysphagia in patients undergoing CRT for advanced HNCA and its impact on nutrition and QOL. During and after treatment, dysphagia adversely affected weight, need for GT, diet, MBS, and QOL survey results. Longer term follow-up demonstrated that nearly all patients had their GTs removed and returned to a soft or regular diet. Further

analysis revealed that perseverance with swallow rehabilitation is needed to provide this level of functional organ preservation. Notably 12% of patients required pharyngoesophageal dilations and 9% of patients had their GTs removed between 1 to 2 years after treatment.

Dysphagia assessment begins with an initial determination of the tumor's influence on swallowing. Though 41% of the patients reported swallowing difficulties before treatment, the median reported pretreatment weight loss was 0 kg, and FACT H&N QOL responses indicated patients were "quite a lot" satisfied with their swallowing.

Gastrostomy tubes were placed before chemoradiation therapy in anticipation of evolving treatment-related swallowing difficulties. This approach helps insure that patients finish treatment on time without delays related to admission for hydration or GT placement. An imperative part of "up-front" GT placement is ongoing encouragement of oral intake to avoid unnecessary and early GT dependence. During follow-up visits with the physician team, nutrition service, and swallow therapists, the patients were coached and strongly advised to continue oral intake as long as possible throughout treatment.

Treatment resulted in significant weight loss and swallowing difficulties. The median weight loss was 9.6 kg or 12.7%. However, within a year after treatment and at the time of this analysis, nearly all patients were able to return



**Figure 1** Diet after chemoradiation therapy.

**Table 3**  
**Modified barium swallow results, median 3.5 months after chemoradiation therapy, n = 23**

| Findings                    |   |
|-----------------------------|---|
| Swallow Performance Scale   | Grade 1, Normal = 0<br>Grade 2, Functional = 2<br>Grade 3, Mild impairment = 3<br>Grade 4, Mild-moderate impairment = 1<br>Grade 5, Moderate impairment = 11<br>Grade 6, Moderate-severe impairment = 4<br>Grade 7, Severe impairment = 2 |
| Aspiration, n = 18          | Silent = 8  |
| Esophageal Stenosis, n = 14 | Esophageal dilation = 7   |
|                             | Aspiration Pneumonia = 0<br>GT removed = 13   |

to a regular or soft diet and have their GTs removed. The median time to GT removal was 21 weeks, 10% were GT dependent at 2 years, and only 2 of 59 patients still have their GTs. A regular or soft diet was taken by 80% at 1 year and 97% at the time of this analysis. Others have reported longer rates of GT dependence. Nguyen et al<sup>8</sup> assessed dysphagia in 55 patients after concurrent CRT with median follow-up of 17 months. They reported a median weight loss of 8 kg and a median time to GT removal of 9 months. Staar<sup>9</sup> and Ang<sup>10</sup> reported considerably higher rates of GT dependence among survivors at 2 years after treatment, 30% and 29%, respectively. Differences in length of GT dependence between our report and others may reflect earlier recognition and aggressive management of dysphagia and implementation of swallow rehabilitation by a unified team, in a single institution.

Modified barium swallow is an accepted tool for objective assessment of swallowing. Our MBS findings were similar to those reported by others.<sup>2,11-13</sup> After chemoradiation therapy swallowing efficiency is decreased and airway protection is often compromised.

The Swallow Performance Scale (SPS),<sup>6</sup> with a score range of grade 1, normal swallow, to grade 7, severe dysphagia, was applied to the MBS results on our patients. The mean score was grade 5, which indicates moderate swallow dysfunction. Other investigators have found similar results. Nguyen et al<sup>8</sup> applied the SPS to 33 patients that underwent MBS for dysphagia after CRT and found 55% had grades 3 to 5, mild to moderate dysphagia. Carrara-de Angelis et al<sup>12</sup> applied the O'Neil Dysphagia Outcome and Severity Scale to 14 patients that prospectively underwent MBS, mean 4.7 months after CRT, and identified mild to moderate dysphagia in 64%.

Aspiration has commonly been identified in MBS performed after CRT with varying degrees of impact on health. The aspiration is often silent, without an induced cough. When analyzed prospectively with MBS, the reported incidence of aspiration has varied widely: Carrara-de Angelis et al 28%,<sup>12</sup> Kotz et al 33%,<sup>11</sup> Eisbruch et al 68%.<sup>13</sup> Carrara-de Angelis et al<sup>12</sup> found that no patients with aspiration on MBS developed aspiration pneumonia. Gillespie et al<sup>14</sup> assessed patients more than 12 months after CRT with MBS and applied the Penetra-

tion Aspiration Scale (PAS). Even among the patients with high PAS scores, none developed aspiration pneumonia. In contrast, Eisbruch et al<sup>13</sup> assessed patients at median 2.5 months after CRT and found 5 (29%) of 17 with aspiration on MBS developed aspiration pneumonia and 2 of 5 died from their pneumonia. Nguyen et al<sup>8</sup> assessed patients with protracted dysphagia during and after CRT and found that 12 (36%) of 33 patients had silent aspiration. Eight patients developed aspiration pneumonia and 5 died; 2 died during treatment and 3 after treatment. Twenty-three of our patients had protracted or severe dysphagia and underwent post-treatment MBS. Eighteen (78%) had aspiration on MBS and silent aspiration was seen in 8 (35%) of 23 cases. However, none developed aspiration pneumonia. All patients with aspiration underwent swallow therapy and had their diets adjusted accordingly, and only 1 patient was advised to remain NPO. The vast differences in rates of aspiration and pneumonia may in part be attributable to underlying medical comorbidities that result in exclusions from protocol-based reports and some MBS studies that were performed later after CRT.

Modified barium swallows are not always obtained after CRT and aspiration is likely under appreciated. Similarly, the incidence of aspiration pneumonia may be under estimated. Reports by Eisbruch et al<sup>13</sup> and Nguyen<sup>8</sup> demonstrate that aspiration pneumonia can be life threatening but our patient series and others<sup>12,14</sup> show that some patients with MBS documented aspiration can be managed effectively with swallow therapy and dietary modifications. There is a need to better differentiate those patients with aspiration that should remain on enteral feedings only to help prevent aspiration pneumonia from those patients able to be managed with maintenance of some oral intake and thereby facilitate swallow rehabilitation.

The importance of post-treatment MBS with inclusion of the esophageal phase is underscored by the frequent identification of pharyngoesophageal strictures in our series and the need for pharyngoesophageal dilation in 12% of patients. Pharyngoesophageal stenosis is a potentially treatable cause for dysphagia. Subsequent to pharyngoesophageal dilation 6 of 7 patients were able to undergo GT removal and all 6 take a regular or soft diet. Among patients

with dysphagia after CRT Nguyen et al<sup>7</sup> found 3 (9%) of 33 patients on MBS had pharyngeal or esophageal stenosis and required repeated dilations. Eisbruch et al<sup>13</sup> performed prospective MBS after CRT and reported 13 (52%) of 25 patients had esophageal stenosis with the majority identified 1 to 3 months after treatment. As more patients are long-term survivors from HNCA treated with CRT, prevention, identification, and management of pharyngoesophageal stenosis becomes more critical. Novel approaches to management of pharyngoesophageal stenosis have been developed and were used in this study. Operative exposure can be enhanced through combined antegrade and retrograde esophagoscopy through the GT site.<sup>15</sup> In addition, topical mitomycin-C can help prevent restenosis after dilation.<sup>16</sup>

Utilization of MBS should be considered before and after treatment to assess tumor and treatment impact on swallowing. This facilitates an early relationship with a speech swallow therapist and helps identify and manage swallow dysfunction including aspiration and pharyngoesophageal stenosis. A safe diet can be determined as well as an effective swallow therapy rehabilitation program.

Cancer status, function, and QOL are all important outcomes after HNCA treatment. Swallow dysfunction not only impairs an individual's physical well being but also his or her emotional and social well being. Informing patients about the anticipated time to GT removal and return to normal diet is helpful, but even patients that have had their GTs removed and can tolerate a soft or regular diet may still have significant swallowing limitations. Chronic phase xerostomia and fibrosis may make eating time-consuming and effortful and result in restriction in place, food, or companion during meals, and cause social and emotional turmoil and negatively impact on QOL.

We administered the FACT H&N QOL questionnaire before and after treatment. As expected the Total H&N subscore and the swallow specific question responses decreased after treatment. At the time of post-treatment administration, median 6 months, just over half of the responding patients had their GTs removed and were eating a regular or soft diet. As anticipated, responses to swallow specific questions indicated that patients were only "somewhat" satisfied with their swallowing ability. We predict that if the FACT H&N had been additionally administered at 12 months after treatment or at the time of the analysis, time periods during which most patients had achieved GT removal and returned to a regular diet, likely the QOL responses would have significantly recovered.

Abdel-Wahab et al<sup>17</sup> used FACT H&N to assess patients before, during, and at sequential intervals after concurrent CRT. They found that the H&N subscore decreased significantly during and at the completion of treatment compared with baseline but by 4 months after treatment the H&N subscore returned to baseline. They asserted that QOL reporting at 3 to 6 months may miss recovery that they saw at 6 to 12 months. Gillespie et al<sup>14</sup> compared swallow function at >12 months after either CRT or surgery followed by

radiation therapy, with the M.D. Anderson Dysphagia Inventory (MDADI).<sup>18</sup> They found that the CRT group had better swallow QOL. In addition, poor correlation was noted between diet consistency, MBS Penetration-Aspiration Scale, and MDADI scores.<sup>19</sup> In their development and validation of the MDADI scale, Chen et al<sup>18</sup> observed higher global scores with assessments at longer follow-up periods. This finding was attributed to the patient's progressive ability to rehabilitate from deficits caused by tumor or treatment as time elapsed. Survivor bias was also considered. These studies make clear the importance of assessing QOL not only during and early after treatment but also at long-term follow-up.

Dysphagia is a well-recognized complication from HNCA treatment and should be routinely assessed and reported with protocol findings. Mouth, throat, and salivary gland injury cause dysphagia and result from the lack of tumor specific injury with treatment and the resulting mucositis, xerostomia, and tissue fibrosis. Investigators are assessing methods to reduce CRT morbidity. Less toxic agents have been explored including epidermal growth factor inhibitors such as cetuximab<sup>20</sup> and radioprotectors such as amifostine and palifermin.<sup>21</sup> Intensity modulated radiation therapy provides highly conformal dose distribution around tumor targets and potentially spares mucosa and salivary glands.<sup>22</sup>

Future prospective studies could be improved by more standardized data collection. Routine usage of MBS before and after treatment would enhance the understanding of tumor and treatment impact on swallowing. Administration of QOL questionnaires during follow-up visits >12 months after treatment, would help appreciate continued rehabilitation of swallowing over time. The use of the MDADI<sup>18</sup> or the Performance Status Scale<sup>7</sup> would give more swallow-specific QOL information readily comparable with reference data. These swallow issues will be further addressed in 2 multi-institutional studies forthcoming from our institution.<sup>3,21</sup>

## CONCLUSIONS

In tandem with our pursuit of the most curative CRT regimen for advanced HNCA, there must be vigilant identification, prevention, and management of treatment-related side effects, particularly dysphagia. In our patients, weight loss, need for GT, and restrictions in oral intake were substantial until 6 months after treatment. During this period, MBS results showed moderate swallow dysfunction and QOL assessments revealed "somewhat" satisfaction with swallowing and diet. Longer term follow-up revealed that with intensive swallow rehabilitation nearly all patients had their GTs removed and returned to a regular or soft diet.

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