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Severity and Duration of Chronic Dysphagia Following Treatment for Head and Neck Cancer

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Abstract. *The purpose of this investigation was to evaluate chronic dysphagia (lasting 3 or more months) following treatment for head and neck cancer. Since dysphagia is a common sequela post therapy in cancer survivors, it may be helpful for the clinician to be aware of the persistence of dysphagia as well as its usual severity. Modified Barium Swallow (MBS) examinations were performed in cancer-free patients who complained of dysphagia following treatment for head and neck cancer. The severity of the dysphagia was graded on a scale of 1 to 7. Each patient had sequential MBS and underwent swallowing therapy in between. The severity of dysphagia was compared between the first and last MBS study to determine whether the swallowing function had returned to normal. Results: Between 1996 and 2004, 12 patients with dysphagia underwent repeated MBS following treatment . Swallowing function did not return to normal in all patients. At a median time of 29 months following treatment (range 8 to 94 months), the severity of dysphagia decreased in 8 patients (67%), remained unchanged in 3 patients (25%) and worsened in 1 patient (8%). Chronic dysphagia following treatment is unlikely to resolve with time despite rehabilitation therapy. Excessive scarring following treatment may be responsible for the persistence and severity of dysphagia. Physicians should be aware of the long-term effects of dysphagia on patient nutrition and psychological well-being.*

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Dysphagia is a common complication following treatment for head and neck cancer. Treatment modalities such as surgery, radiation and chemotherapy, either alone or combined, may produce tissue defects or excessive scarring leading to deglutition disorders (1-4). The impact of dysphagia may compromise patient nutrition, physical status and quality of life (5). Prospective studies have shown the evolution of dysphagia up to one year following treatment (6). However, it is also known that patients may experience lasting dysphagia for many years following treatment (7). Understanding the development of chronic dysphagia may be beneficial to assess patient clinical status for therapy, rehabilitation, possible psychological counseling, and to search for other causes of dysphagia.

Modified barium swallowing (MBS) has proved to be a reliable tool to assess swallowing abnormalities and aspiration risk (8-10). Sequential monitoring of patients with MBS may offer valuable input about the duration and severity of dysphagia and may be potentially life saving, as aspiration pneumonia may lead to patient demise (11).

The purpose of the present study was, therefore, to investigate the duration, severity and evolution of swallowing disorders in patients complaining of chronic dysphagia following treatment of head and neck cancer.

Materials and Methods

Patient selection. A retrospective review was undertaken to select patients who suffered from to chronic dysphagia following treatment for head and neck cancer at the Veterans Affairs North Texas Health Care System, USA, between 1996 and 2004. Patients

were referred by their primary care or ENT (Ear, Nose and Throat) physicians. All patients underwent sequential MBS fluoroscopic examinations to assess dysphagia. They were selected for the present study if they had sequential post-treatment MBS studies, underwent swallowing therapy for their dysphagia and were cancer-free at the last examination. The electronic charts of 153 head and neck patients who underwent MBS during that time-frame were reviewed. Twelve patients fitting the above criteria were selected.

Swallowing study. During the MBS procedure, the patient was either sitting or standing and viewed in frontal and lateral planes. The fluoroscopy tube was positioned to view the oral cavity anteriorly, the soft palate superiorly, the posterior pharyngeal wall posteriorly and the seventh cervical vertebra inferiorly. In this way, the oral preparatory, oral, pharyngeal and cervical esophageal phases of deglutition could be assessed and viewed simultaneously. The study was terminated if the patient had evidence of aspiration following the ingestion of a small amount of contrast material. If no aspiration was observed, seven consistencies of food and liquid were introduced by teaspoon to the patient. Water, liquid barium, apple sauce, mashed potatoes, green beans, ground meat and sliced meat mixed with barium paste were used in the assessment. The patient was instructed to hold the material in his mouth until told to swallow. The fluoroscope remained focused on the oral cavity and pharynx during and after each swallow. A number of observations were made during each swallow. Residue on the tongue or in the pharynx after the swallow, laryngeal penetration or aspiration during or after the swallow, backflow, esophageal-pharyngeal reflux, and disordered peristalsis in the pharynx or esophagus were noted. The patient was then repositioned in the anterior-posterior position and presented with at least two additional consistencies, usually liquid barium and mashed potatoes, introduced by teaspoon. Finally, at the completion of swallowing, the patient was instructed to vocalize on /a/ and count to five while being videotaped with fluoroscopy.

Each patient was scored using the Swallowing Performance Scale (8), as described below.

Grade 1: Normal

Grade 2: Within functional limits: abnormal oral or pharyngeal stage, but able to eat a regular diet without modifications or swallowing precautions.

Grade 3: Mild impairment: mild dysfunction in oral or pharyngeal stage; requires a modified diet without need for therapeutic swallowing precautions.

Grade 4: Mild-to-moderate impairment with need for therapeutic precautions: mild dysfunction in oral or pharyngeal stage; requires a modified diet and therapeutic precautions to minimize aspiration risk.

Grade 5: Moderate impairment: moderate dysfunction in oral or pharyngeal stage; aspiration noted on examination; requires a modified diet and swallowing precautions to minimize aspiration risk.

Grade 6: Moderate-severe dysfunction: moderate dysfunction of oral or pharyngeal stage; aspiration noted on examination; requires a modified diet and swallowing precautions to minimize aspiration risks; needs supplemental enteral feeding support.

Grade 7: Severe impairment: severe dysfunction with significant aspiration or inadequate oropharyngeal transit to esophagus; nothing by mouth; requires primary enteral feeding support.

Results

Patient characteristics. Twelve male patients were selected. Their ages ranged from 46 to 78 years (median 56). The sites of disease were: oropharynx (7), larynx (3), oral cavity (1) and hypopharynx (1). The stages of the disease were: IV (8), III (3) and II (1). All had diagnosis of squamous cell carcinoma. Their treatments were respectively: chemoradiation (7), postoperative radiation (3), surgery (1) and radiation (1).

Indications for postoperative radiation were positive lymph nodes, and/or close positive margin of resection. The postoperative radiation therapy dose ranged from 5940 to 6600 cGy.

In the group who received concurrent chemoradiation for locally advanced tumors, chemotherapy (5-fluorouracil, cisplatin) was delivered on weeks 1 and 4 of radiation. The radiation therapy dose ranged from 6600 to 7000 cGy.

Radiation therapy was delivered by a Cobalt or a 6 MV linear accelerator, using the standard technique (2 lateral and 1 anterior beam, off cord at 3960 cGy or 4000 cGy, at 180-200 cGy/fraction), covering the tumor and regional lymph nodes. One patient had definitive radiation therapy for laryngeal cancer. The tumor dose was 7000 cGy. One patient had wide local excision and bilateral neck dissection for his oral tongue cancer. Table I summarizes the patient characteristics.

Swallowing (MBS) results. Number of MBS performed. Nine patients received three MBS studies and three received four MBS studies. The first post-treatment MBS was performed at 1 to 66 months (median: 4 months). The first MBS interval ranged from 1 to 35 months (median: 6 months). The second MBS interval ranged from 4 to 17 months (median: 11 months). In patients who had a fourth MBS study, the time-interval following the third MBS study ranged from 9 to 26 months. The time from treatment completion to completion of final MBS study was 8 to 94 months for the whole group (median: 29 months). Table II summarizes the time-interval between treatment completion and consecutive MBS studies.

MBS grading. One patient had a rating of 3, one patient had a rating of 4, six patients had a rating of 6 and four patients had a rating of 7 at the first MBS post treatment. The dysphagia severity ranged from 3 to 7 at the first MBS interval: one patient had a rating of 3, three patients had a rating of 4, two patients had a rating of 5, one patient had a rating of 6 and five patients had a rating of 7. For the second MBS interval, two patients had a rating of 3, two patients had a rating of 4, five patients had a rating of 5, one patient had a rating of 6 and two patients had a rating of 7. Among the 3 patients who had the fourth MBS, the grades were 3, 4 and 7, respectively.

Table I. *Patient characteristics.*

Characteristic	No. of patients (%)
Total	12 (100)
Gender (male)	12 (100)
Race	
Caucasian	8 (67)
African American	3 (25)
Hispanic	1 (8)
Age	
Median	56
Range	46-78
Histology (squamous)	12 (100)
Stage	
II	1 (8)
III	3 (25)
IV	8 (67)
Site	
Oropharynx	8 (67)
Larynx	2 (17)
Oral cavity	1 (8)
Hypopharynx	1 (8)
Treatment	
Chemoradiation	7 (58)
Postoperative radiation	3 (25)
Radiation	1 (8)
Surgery	1 (8)
Follow-up (months)	
Median	29
Range	8-94

Table II. *Time-interval (months) between sequential modified barium swallow.*

Patient No.	1st MBS	2nd MBS	3rd MBS	4th MBS	Total
1	5	6	13		24
2	2	5	16		23
3	12	8	9		29
4	4	7	4	9	24
5	3	3	14	9	29
6	1	3	6	3	36
7	1	4	5		11
8	66	17	13		94
9	48	6	11		65
10	13	35	7		55
11	1	1	6		8
12	10	5	17		32

MBS, modified barium swallow; 1st MBS, time elapsed after treatment and first MBS; 2nd MBS, time-interval between first and second MBS; 3rd MBS, time-interval between second and third MBS; 4th MBS, time-interval between third and fourth MBS; Total, time between treatment completion and the last MBS.

When we compared the dysphagia grade between the first and last MBS study, the severity of dysphagia decreased in eight patients (67%), remained unchanged for three patients (25%) and increased in one patient (8%). No patient achieved normalization of his swallowing despite swallowing therapy. They required continued nutritional support and in the case of the three patients who still had grade 6-7 dysphagia, enteral tube feeding because of continued aspiration at the last follow-up.

Table III summarizes the individual patient results.

Discussion

Recent improvements in the management of locally advanced head and neck cancer have resulted in better loco-regional control and longer survival rate compared to historic controls (12, 13). In addition, chemoradiation has allowed anatomic organ preservation, which may translate into a better quality of life (14, 15). However, in cancer survivors, excessive scarring secondary to increased apoptosis of the combined modality or anatomic defect in patients who have had extensive surgery may result in dysphagia (16, 17). Malnutrition, the need for enteral tube feeding, social isolation and the feeling of helplessness may impair the patients' quality of life (18-20). Chronic dysphagia has been reported to occur in 12-69% of patients 6-12 months following treatment (1, 7, 21). Long-term dependence on tube feeding has also been observed up to 18 months after treatment (22-25). The aspiration rate has been reported to be 41 to 65% by endoscopic and MBS studies following treatment for locally advanced head and neck cancer and may be silent (7, 26-28). Movement impairment of structures essential for normal swallowing such as the base of the tongue, larynx and pharynx was observed following chemoradiation and explains aspiration despite normal anatomic preservation (29, 30).

The evolution of dysphagia post treatment has been described by prospective studies. Pauloski *et al.* (6) compared dysphagia severity for oral and oropharyngeal cancer patients at 1, 3, 6 and 12 months postoperatively. Over half of these patients also received radiation. There was little improvement in swallowing function at one year. However, 70% of the patients did not receive swallowing therapy between 1 and 12 months post surgery. Swallowing rehabilitation improved swallowing efficiency and significantly decreased the aspiration rate of patients who had had surgery or postoperative radiation for head and neck cancer (31, 32). In patients who had sequential swallowing studies following chemoradiation, only five out of 22 (23%) achieved a normal swallowing study 6 or 12 months post treatment (33). Eisbruch *et al.* (2) also corroborated these findings: 6/10 (60%) patients had no change or worsening of dysphagia severity at 6-12 months post concurrent chemoradiation. It was unclear whether the patients in these two studies received any swallowing therapy.

Table III. *Evolution of dysphagia grade following treatment for head and neck cancer.*

Patient No.	1st MBS	2nd MBS	3rd MBS	4th MBS	Treatment
1	6	3	3		ChemoRT
2	7	7	3		ChemoRT
3	6	7	4		ChemoRT
4	7	7	7	7	ChemoRT
5	4	4	5	4	ChemoRT
6	6	4	4	3	ChemoRT
7	7	7	6		ChemoRT
8	6	6	5		PostopRT
9	6	5	5		PostopRT
10	7	7	7		PostopRT
11	6	4	5		Surgery
12	3	5	5		Radiation

MBS, modified barium swallow; ChemoRT, chemoradiation; PostopRT, postoperative radiation.

Despite its known deleterious effect on patient well-being, data are scarce about the evolution of chronic dysphagia (more than 1 year post treatment). It is well established that cancer survivors may develop dysphagia and aspiration 1 to 5 years post surgery (34), radiation (7), or chemoradiation (1). Such information is essential for optimal patient management.

MBS has been shown to be the reference standard to monitor dysphagia severity following treatment (8-10). The examination has two objectives. The first is to define the anatomy and physiology of the patient's oropharyngeal swallow of solid food and liquid by introducing increasing amounts of barium-coated thin and thicker food. Once abnormality of the patient's swallowing mechanism has been identified, various strategies (postural techniques, increased sensory input, voluntary swallowing maneuvers) may be introduced by the speech therapist to decrease the risk of aspiration and improve the efficiency of swallowing. MBS can be used for a range of dysphagia conditions such as after a stroke, head and neck injury, or treatment for oropharyngeal malignancies in patients of all ages. The validity of its grading system has been tested (35, 36). We used the Swallowing Performance Scale because of its simplicity, ease of reporting and convenient data base storage in our electronic medical record (8).

Our data showed absence of swallowing normalization for all patients despite a relatively long-term follow-up (median 29 months) and swallowing therapy. All patients had diet modification, safe eating techniques and swallowing maneuvers designed to facilitate the safest swallow. MBS was repeated to assess treatment efficacy. Most of our patients lived far away from our tertiary referral center and had difficulty with transportation. The MBS schedule thus had to be flexible, which accounted for the variability of the MBS timing. There was improvement of dysphagia severity in eight patients following rehabilitation therapy. Nevertheless, four of these patients still had trace (grade 5) or severe aspiration (grade 6) at the last MBS. Dysphagia severity remained unchanged in three patients: two of them showed aspiration (grade 7), at 24 and 55 months, respectively, and required enteral tube feeding. One patient had worsening of dysphagia over time.

Because of the small number of patients, the heterogeneity of the patient population and treatment modality, it is difficult to explain why there is a lack of swallowing normalization over time even when the majority of the patients (8) displayed anatomic organ preservation. One hypothesis is the excessive scarring following surgery or radiation. At the molecular level, scar formation is secondary to stimulation of transforming growth factor beta 1 (TGF β1), a peptide, which is induced by radiation or surgery (37). Recent studies suggested an autocrine loop with hyperactivation of TGF β1 to be responsible for the continued deposit of collagen tissue despite the disappearance of the initial stimuli (38). Interstitial tissue formation may then impede movement of the scarred swallowing muscles. Our limited observations are in agreement with this mechanism as it is unlikely for scar tissue to disappear over time once a critical mass has been reached.

We acknowledge the limitations of our study since this is a retrospective review of a small number of patients with persistence of dysphagia despite swallowing therapy. Nevertheless, we hope our initial study will promote further prospective studies of sequential MBS as a investigative tool to assess the long-term evolution of dysphagia severity following treatment.

Conclusion

Chronic dysphagia is not likely to resolve over time despite swallowing therapy. Patients with persistent dysphagia following therapy for head and neck cancer should be monitored closely with sequential MBS to assess the need for rehabilitation, nutritional support and enteral tube feeding. Additionally, we advise assessment of chronic dysphagia with careful ENT evaluation, traditional barium swallow and CT, especially in the presence of new, late-onset, or worsening dysphagia. Long-term aspiration risk is a potential life-threatening complication of treatment of head and neck cancer and may not be apparent without radiography. Psychological counseling may be beneficial for people with chronic dysphagia to cope with their long-term disability.

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