

Dysphagia Severity and Aspiration Following Postoperative Radiation for Locally Advanced Oropharyngeal Cancer

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Abstract. The aim of the present study was to assess dysphagia severity following postoperative radiation for locally advanced oropharyngeal cancer. **Patients and Methods:** Eighteen patients with oropharyngeal carcinoma had undergone postoperative radiation. There were eight base of tongue, eight tonsils, and two soft palate carcinomas. All the patients had undergone modified barium swallow (MBS) to assess the persistence of dysphagia (more than one month) post-treatment. All the patients were cancer-free at the time of the swallowing study. Dysphagia severity was graded as 1-7. **Results:** At a median follow-up of 12 months, there were three grade 2, four grade 3, two grade 4, five grade 5, two grade 6, and two grade 7. Only three patients (17%) had normal swallow post-treatment. Six patients (33%) had mild to moderate dysphagia (grade 3-4). Nine patients (50%) developed aspiration (grade 5-7). Among the patients who developed aspiration, four (22%) required tube feeding for severe aspiration. **Conclusion:** Long-term (more than one year) dysphagia following postoperative radiation for oropharyngeal cancer may be symptomatic of permanent damage to the swallowing mechanism. Evaluation of patients who complain of persistence of dysphagia a year or more following treatment should include MBS, because of the increased risk of aspiration.

The oropharynx plays a key role in modulating speech and swallowing and the management of oropharyngeal carcinoma remains a challenge for clinicians (1). Tumors arising in this anatomical location often produce dysphagia with the frequency of occurrence proportional to the tumor volume and the percentage of the soft palate and tongue infiltrated by the tumor (2) and aspiration may be observed prior to treatment. Surgery has been the standard treatment for early stage oropharyngeal cancer, complete resection of the tumor requires removal of a rim of normal tissue surrounding the cancer. Surgery frequently produces severe dysphagia by disruption of the normal anatomical structures critical for deglutition, such as the base of the tongue and the soft palate (3, 4). Dependent on the volume of normal tissue resected, the oral and pharyngeal phase of swallowing are often affected by surgery, and in severe cases, aspiration may occur (5-8). Most instances of aspiration resolve with swallowing therapy (9). When the tumor is locally advanced, radiation is required following surgery to reduce the recurrence rate (10). The addition of radiation often increases dysphagia severity because of radiation-induced scarring (11, 12). Thus, long-term if not permanent damage to the swallowing mechanism may result. This is an important issue because dysphagia and aspiration significantly alter the patient's quality of life and induce anxiety and depression (13, 14).

In an attempt to clarify this issue, a retrospective survey of dysphagic patients who had oropharyngeal carcinoma treated with postoperative radiation was undertaken. All the patients had been evaluated with MBS.

Patients and Methods

Patient population. Between February 1999 and March 2005, eighteen patients with oropharyngeal cancer had undergone post-operative radiation at the Veterans Affairs North Texas Health Care

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System. Their ages ranged from 51 to 77 years (median age 60 years). The patients were all males. There were 14 Caucasians and four African-Americans. The tumors were located at the base of tongue (8), tonsils (8) and soft palate (2). The histology was squamous. Two patients had stage II, six patients had stage III and ten had stage IV (9 IVA, 1 IVB) and there were 9 T1, 5 T2, 3 T3, and 1 T4 tumors. The patient characteristics are summarized in Table I. The patients were referred to Speech Pathology by their primary care or ear, nose, and throat physicians because of dysphagia. They were cancer-free at the last follow-up. Modified barium swallow was performed to evaluate the severity of dysphagia.

Surgery. The types of surgery that had been performed were: wide excision, flap reconstruction with functional bilateral neck dissection (9); tonsillectomy with unilateral functional neck dissection (8) and hemiglossectomy, flap reconstruction with functional bilateral neck dissection (1).

Radiation. Radiation therapy had been delivered on a Cobalt Unit or a 6 mV linear accelerator using standard technique (2 lateral and 1 supraclavicular field, off cord at 3960-4000 cGy, 180-200 cGy/fraction). The dose to the tumor bed and regional lymph nodes was 5940 cGy to 6000 cGy. The tumor bed was boosted to a total dose of 6600 cGy if the margins of resection for the tumor were positive or close. Radiation therapy was initiated four to six weeks following surgery to allow wound healing. Indications for radiation were: T3-T4 tumor stage, three or more positive metastatic neck nodes, extracapsular extension and close or positive margins.

Modified barium swallow. During the MBS procedure, the patients were either sitting or standing and viewed in frontal and lateral planes. The fluoroscopy screen 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. 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 each assessment. With each swallow, 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. Residue on the tongue or in the pharynx after the swallow, laryngeal penetration or aspiration during or after the swallow, backflow, esopharyngeal-pharyngeal reflux, and disordered peristalsis in the pharynx or esophagus were noted. The patient was then positioned 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 (15), with the following categories: 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, requiring a modified diet without need for therapeutic swallowing precautions; grade 4, mild-to-moderate impairment with the need for therapeutic precautions, mild

Table I. Patient characteristics.

No. of patients	18
Gender	
Male	18
Age	
Median	60
Range	51-77
Race	
African-Americans	4
Caucasians	14
Sites of disease	
Base of tongue	8
Tonsils	8
Soft palate	2
T stage	
T1	9
T2	5
T3	3
T4	1
Stage	
II	2
III	6
IVA	9
IVB	1
Histology	All squamous
Median follow-up	12 months (2-77 months)

dysfunction in oral or pharyngeal stage, requiring 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, requiring 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, requiring a modified diet and swallowing precautions to minimize aspiration risk, needing supplemental enteral feeding support and grade 7, severe impairment, severe dysfunction with significant aspiration or inadequate oropharyngeal transit to esophagus, nothing by mouth, requiring primary enteral feeding support.

During the fluoroscopic examination, the patient was monitored by two to three speech pathologists. Any abnormality of the swallow was noted. Compensation techniques, such as the chin tuck maneuver, were performed to evaluate their efficacy at improving the patient swallow during the study. A grade of dysphagia was assigned after discussion among the speech pathologists. Because consensus was reached, there was no intra- or interreliability issue. The patients were instructed about the safe eating technique. Patients with severe aspiration (grade 6-7) required tube feeding.

Results

At a median follow-up of 12 months (range: 2-77 months), there were three grade 2, four grade 3, two grade 4, five grade 5, two grade 6, and two grade 7. Only three patients

Table II. *Dysphagia grade following postoperative radiation for locally advanced oropharyngeal cancer.*

Grade	Base of tongue	Tonsils	Soft palate	Total
1	0	0	0	0
2	2	1	0	3
3	1	3	0	4
4	1	1	0	2
5	3	2	0	5
6	0	0	2	2
7	1	1	0	2

(17%) had normal swallow. Six patients (33%) had mild to moderate dysphagia (grade 3-4). Aspiration (grade 5-7) was observed in nine patients (50%). Four patients (22%) required tube feeding because of severe aspiration (grade 6-7). Among the patients who developed aspiration, there were three T1, three T2, two T3, and one T4. The corresponding anatomic tumor sites of the patients who aspirated were: tonsils (4), base of tongue (4), and soft palate (1). The follow-up time for these nine patients ranged from 8 to 68 months (median: 24 months). The dysphagia grade observed following postoperative radiation for oropharyngeal carcinomas is summarized in Table II.

Discussion

It is very difficult for physicians to interpret dysphagia as a symptom. Cancer free patients may complain of swallowing difficulty because of a benign condition such as xerostomia or for a potentially life-threatening radiation complication such as aspiration. Because of patient's suppressed cough reflex, aspiration may escape detection, even by experienced clinicians (16, 17). Modified barium swallow is an ideal tool to assess dysphagia severity post-treatment (18). The validity of its grading system has been previously reported (19).

Only three patients (17%) in our study had normal swallow after postoperative radiation at a median follow-up of 12 months and six patients (33%) had developed mild to moderate dysphagia (grade 3-4). The most disturbing observation was the high aspiration rate of 50% (grade 5-7). These patients developed late aspiration ranging from 8 to 68 months (median 24 months). Aspiration was severe in four patients (22%), requiring tube feeding. Aspiration occurred with all tumor sites (four tonsils, four base of tongue, and one soft palate) and

sizes (three T1, three T2, two T3, and one T4). Even though all patients with dysphagia undergo swallowing therapy, the prognosis for their recovery is poor, as swallowing therapy is most effective when begun within three months after treatment (9).

Our observations are in agreement with Chang *et al.* (20). In a study of 184 patients with nasopharyngeal carcinoma who had radiation alone, patients who developed dysphagia more than one year following treatment had significantly more swallowing abnormalities on MBS compared to the ones with dysphagia onset less than one year after radiation. The dysphagia severity also worsened with a longer follow-up. Thus, patients with persistent dysphagia following postoperative radiation may be a selective group at risk of long-term aspiration because of permanent damage to the swallow mechanism.

The limitations of our study included the absence of a baseline swallowing study, its retrospective nature, the small number of patients, and the selection factor as only patients who complained of dysphagia underwent investigation with MBS.

Conclusion

Long-term dysphagia following postoperative radiation for oropharyngeal cancer may be associated with permanent damage to the swallowing mechanism. All patients with persistence of dysphagia one year or more post-treatment should be diagnosed using MBS, as this test is an ideal means of detecting the high prevalence of aspiration.

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