Role of surveillance radiologic imaging after treatment of oropharyngeal cancer

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Abstract

Current trends in the treatment of oropharyngeal cancer include the increasing use of organ-preservation chemoradiation protocols. Reports in the recent literature have shown high success with this approach, with advanced stage III/IV oropharyngeal cancers having >80% 2- and 3-year disease-free survival rates (1). Nonetheless, some oropharyngeal cancer patients do suffer recurrent disease, suggesting the need for post-treatment surveillance. The exact benefit of a surveillance program, the type of surveillance program, and the interval and duration of a surveillance program remain undefined. Because the oropharynx can be a difficult anatomic location to evaluate, and this evaluation may be further obscured by tissue changes wrought by cancer treatment, it has been generally assumed that physical examination alone is insufficient as a surveillance method for oropharyngeal cancer. Thus, radiologic imaging studies, in addition to the history and physical examination, have been commonly employed in cancer surveillance for this disease. The purpose of this manuscript is to review the evidence regarding the role of radiologic imaging for surveillance after chemoradiation treatment of oropharyngeal cancer.

LITERATURE REVIEW

While it might seem logical and self-evident, there is limited data with regard to the benefits for any head and neck cancer surveillance program. The presumed rationale of a head and neck cancer surveillance program is that frequent, routine interval clinical assessment results in earlier detection of recurrent cancer compared to patient self-identification, and this earlier detection increases the likelihood of successful salvage therapy. Whether routine surveillance actually leads to earlier detection of recurrences, and whether earlier detection actually translates into significantly improved disease outcome and survival, however, remain unproven.

The increased survival of patients with recurrent tumor diagnosed by routine surveillance reported in some studies have been criticized as being due, in part, to lead time bias (that is, early diagnosis falsely appears to prolong survival). Agrawal et al found that the large majority of patients diagnosed with recurrent head and neck cancer had self-identified clinical symptoms or findings prior to routine surveillance examination (2). In a follow-up study, survival in the recurrent disease setting appeared to be more dependent on variables such as prior early disease stage and recurrence location (local-only rather than regional or distant) than those associated with follow-up surveillance (3). There is no doubt that some head and neck cancer patients with recurrence achieve improved disease outcome through identification in an earlier subclinical point in time. But the current state of scientific evidence in the literature highlights the need for better, more critical assessments of head and neck cancer surveillance recommendations.

The critical assessment of any cancer surveillance program must consider 1) the recurrence rate, 2) whether earlier detection of recurrence leads to increased rates of successful salvage treatment and improved survival, and 3) which method of surveillance is best. Presently, in North America, patients with oropharynx cancers treated with chemoradiation have a low recurrence rate compared to historic data, with most recurrences occurring within the first 2 years following treatment. The rise in non-smokers with human papilloma virus-related oropharynx tumors may be a key factor in the recently reported improved treatment results. The low recurrence rate for these tumors means any surveillance program must have high sensitivity, or else the false positive rate is likely to be high.

The experience of most head and neck cancer physicians is that earlier detection of recurrence in oropharynx cancer does increase the opportunity for treatment cure. The likelihood of salvage treatment success depends heavily on the site of recurrence, with local and/or regional recurrences

more likely to be salvaged than distant recurrences.

The final consideration, and the one most controversial, relates to what method of surveillance is best. It is generally assumed that radiologic imaging adds to the sensitivity of physical exam alone. Our own head and neck cancer program outcomes suggest that the added benefit of post-treatment routine surveillance imaging is limited. We recently reported results of 43 patients treated for oropharynx cancer who underwent 252 imaging scans, resulting in the identification of 2 recurrences in otherwise asymptomatic patients (4).

There is presently no consensus regarding the optimal type of imaging surveillance and the recommended frequency of any study. The current National Comprehensive Cancer Network (NCCN) guidelines recommend a baseline cross-sectional imaging study at 4-6 months following treatment, but there are no recommendations for subsequent routine follow-up imaging. Nonetheless, frequent and expensive imaging studies are routinely obtained at many head and neck cancer treatment centers throughout the United States. In contrast, other centers take a more individualized approach, with post-treatment imaging limited to when a recurrent tumor is suspected, in order to confirm the presence of such a lesion and to determine its extent. The type of imaging study obtained also varies from center to center, and may include CT scan, MRI, PET, PET/CT, or ultrasound. Most recent studies have focused on PET and PET/CT. Below the literature on the utility of the various modalities of post-treatment imaging surveillance is examined.

A meta-analysis of 27 manuscripts on the utility of PET scans after chemoradiation treatment of head and neck cancer was recently reported (5). The meta-analysis showed an overall pooled sensitivity of 94% for the detection of residual or recurrent disease at the primary site, with a sensitivity of 74% for residual or recurrent neck disease. The negative predictive values were 95% for the primary site and 96% for neck disease, whereas the positive predictive values were 75% for the primary site and 49% for the neck. While this meta-analysis mostly included studies that examined the utility of PET as the initial evaluation of chemoradiation treatment response, another recent study considered the diagnostic utility of PET/CT as an on-going follow-up tool after radiation therapy for head and neck cancer. Kao and colleagues reviewed 80 head and neck cancer patients treated with radiation therapy who underwent a total of 240 PET/CT scans at 4 to 6 month intervals over an approximately three year period (6). Twenty-two percent of scans were considered positive with a positive predictive value of 64%. Seventy-eight percent of scans were considered negative with a false-negative rate of 0.9%. The sensitivity of PET/CT after radiation therapy was 94%. These authors concluded that PET/CT is a highly sensitive technique for the detection of recurrent head and neck cancer.

Relatively few studies have compared MRI with PET, however, MRI is generally thought to have inferior sensitivity and specificity to PET/CT for the detection of head and neck cancer recurrence. MRI does provide superior anatomic delineation, particularly with regard to lesions near the skull base. It may also be the more useful study if one desires to confirm and assess the extent of a suspected recurrence, so that surgical planning can be done. The use of diffusion weighted MRI may increase the sensitivity for persistent or recurrent head and neck cancer. In a recently reported series, Vandecaveye and colleagues found diffusion weighted MRI to have a sensitivity of 94.6%, specificity of 95.9%, and overall accuracy of 95.5% for the detection of clinically suspected persistent or recurrent head and neck cancer (7).

Ultrasound as a surveillance tool has the advantage of lower cost and the capability for use in conjunction with the routine clinical visit and exam. A recent report from our institution comparing ultrasound and PET/CT for staging and surveillance of head and neck and thyroid cancer found superior sensitivity (96.8% vs. 90.3%), specificity (93.3% vs. 20%), positive predictive value (96% vs. 70%), and negative predictive value (93% vs. 50%) for ultrasound compared to PET/CT (8). On the other hand, in North America, the use of ultrasound as a practical tool for head and neck cancer surveillance is still relatively constrained due to the limited number of practitioners who are skilled in head and neck ultrasonography.

CONCLUSION

In summary, there is no high-level scientific evidence to guide us to the optimal strategy of radiologic imaging surveillance for patients treated for oropharynx cancer. Additional studies are needed to quantify the benefits of any imaging surveillance program and to address the type of imaging study most appropriate in this patient population. Recent reports suggest that PET/CT is a sensitive and specific method for identifying recurrent head and neck cancers, although MRI and ultrasound offer unique benefits

that deserve further investigation.

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