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Compliance with Quality Assurance Measures in Patients Treated for Early Oral Tongue Cancer

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Abstract

BACKGROUND: The objective of this study was to identify measurable parameters that provide quality data for assessing how well cancer care adheres to accepted treatment guidelines and is delivered to any given patient with oral tongue cancer.

METHODS: Retrospective chart review of 116 patients treated for T1-T2/N0-N1 squamous cell carcinoma of the oral tongue (SCCOT) between 1998 and 2003. A set of quality measures considered critical for outcome included: 1) accurate tumor-nodal-metastasis (TNM) staging at presentation, 2) documentation of margin status, 3) appropriate referral for adjuvant radiation therapy, and 4) neck dissection for depth of invasion greater than 4mm. Additionally, 26 clinical endpoints involving pretreatment assessment and staging, treatment, and surveillance and symptom control were analyzed.

RESULTS: There were 73 male and 43 female patients (median age, 57 years). Forty-one patients (35.3%) presented with stage I disease, 61 (52.6%) with stage II, and 14 (12.1%) with stage III. The overall 5-year survival rate for all patients was 68.6%. There was a 90.5% compliance with TNM staging at presentation, 99.1% for documentation of margin status, 98.2% for adequate referral to radiation therapy, and 88.7% for appropriate neck dissection based on depth of invasion. Compliance with clinical endpoints was variable and ranged from 100% for endpoints related to radiation therapy to less than 40% for endpoints related to speech pathology and rehabilitation.

CONCLUSION: Overall compliance with documenting the 4 parameters designated as quality measures for treatment of SCCOT was acceptable thus demonstrating that it is possible to utilize this data for measuring effective cancer care.

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Summary

This study evaluates the compliance with a set of measures and clinical endpoints created to assess the quality of care that with oral tongue cancer receive at a tertiary cancer center. We found that overall compliance with these measures was above 90%, demonstrating that these measures can be used to assess the performance and identifying areas for improvement in centers treating this disease.

Keywords

oral tongue cancer; squamous cell carcinoma; neck dissection; radiation; quality; standard of care; guidelines; outcome

INTRODUCTION

Recently, quality of care has gained importance in clinical oncology practice. The Institute of Medicine defines “quality” as “the degree to which health services for individuals and populations increase the likelihood of desired health outcomes and are consistent with current professional knowledge.”¹ Similarly, the Agency for Healthcare Research and Quality definition of “quality care” is “doing the right thing, at the right time, in the right way, for the right person, and having the best possible results.”²

Defining and maintaining quality standards in head and neck oncology is becoming more relevant for clinical and economic reasons. It is widely accepted that the initial treatment provides the best opportunity for cure in head and neck cancers. In a recent meta-analysis, Goodwin et al³ found that patients with recurrent cancer of the aerodigestive tract have an average 5-year survival rate of 39%, highlighting the importance of adequate initial treatment. In cases of floor of mouth cancer, the risk of tumor-related death is increased 16-fold after recurrence⁴; similar findings have been reported for oral cancers at other primary locations.⁵ Defining quality standards is also important to decrease unnecessary resource utilization; it is estimated that one-third of health care expenditures in head and neck cancers are related to inappropriate initial therapy.⁶

The American Head and Neck Society has created a quality committee to develop quality guidelines for head and neck cancer care. This group has systematically reviewed the literature, and determined evidence-based measures that represent measurable parameters about quality care in oral cancer.⁷ However, systematic evidence-based data upon which to standardize these types of quality measures are lacking, and it is difficult to predict how these parameters are relevant to prognosis or survival. Obtaining these assessment tools is particularly challenging for head and neck cancer due to low incidence, disease heterogeneity, and limited level I evidence.⁶

The objective of this study was to identify measurable parameters that provide a basis for assessing how well cancer care is delivered to an individual oral tongue cancer patient. The quality measures are chosen to represent critical aspects of accepted standards of oral cancer care, and the presence or absence of these measures are most likely to affect the overall

outcome. The present study does not assess treatment guidelines; rather, it is designed to identify evidence-based quality measures which in turn demonstrate a cancer center's compliance with National Comprehensive Cancer Network guidelines and institutional treatment algorithms. These measures are chosen using evidence-based literature or best practices as defined by expert opinion for treating oral tongue cancer. It was our goal to determine whether these metrics are measurable data points within a medical record as well as to determine how well a single tertiary cancer institution adheres to them.

METHODS

We searched the database of the Department of Head and Neck Surgery to identify and retrospectively review the electronic medical records of patients primarily treated for clinical T1–2, N0–1 oral tongue squamous cell carcinoma between January of 1998 and December of 2003. Only patients who completed surgical treatment at our institution and had at least 1 year of follow-up at M.D. Anderson Cancer Center were included. This study was approved by The University of Texas M. D. Anderson Institutional Review Board and a waiver for consent was obtained.

The information retrieved from the charts included demographics, clinical staging, imaging data, dates of presentation, completion of therapy and follow-up, surgical treatment, adjuvant therapy, adjuvant therapy adverse effects, referrals, pathological and surveillance information.

Quality Measures

As with most head and neck cancer subsites, there are no validated quality measures for oral tongue cancer. We followed the lead of the American Head and Neck Society⁷ by using available literature, the National Comprehensive Cancer Network guidelines and the M. D. Anderson Cancer Center institutional guidelines to identify 4 quality indicators considered critical for overall outcome. These measures were considered to be important evidence-based metrics that affect the success of treatment in a tongue cancer patient. The medical literature was found with a Pubmed search using the terms: “quality, head and neck, tongue, surgery, indicators, prognostic, pathology”, and general consensus among clinical experts as well as previously published guidelines. Each patient medical record was reviewed to determine the presence or absence of documentation for each of these 4 quality measures being performed. The following are the measures evaluated:

1. Staging—The first criteria were whether the patient was appropriately staged according to the American Joint Committee on Cancer 6th edition tumor-node-metastasis (TNM) staging system on the first visit. The TNM staging system⁸ is a reliable and widely utilized risk-stratification tool that allows comparison of different treatment modalities. T-stage and N-stage have been consistently related to overall survival and disease-free survival in multiple published series.^{9–12}

2. Margin Status—The second measure was the histopathologic margin status as documented in the pathology report and acknowledged by the attending surgeon in the chart. There is sufficient evidence that accurate documentation of margin status is important to

overall outcome. Studies have shown the presence of microscopically positive or close surgical margins has been found to increase local recurrence by a factor of 2 or more in most series.^{9,10,13,14} While the impact of margin status on survival is more variable than other adverse features such as nodal status, multiple series have reported a negative impact on survival,^{10,15,16} as well as association with other negative prognostic factors.^{10–12} Perhaps the most important relevant feature of surgical margins is that margin status is the only prognostic indicator that is under the surgeon's direct control.

3. Postoperative Radiation Therapy—The third quality measure was the documentation of a referral to radiation oncology for consideration of post-operative external-beam radiation therapy if adverse features were identified in the pathology report. It is well-known that appropriate use of post-operative radiation therapy will affect the overall outcome in head and neck cancer.^{15,18} The indications for postoperative radiation therapy were defined in conformity with the recommendations of the National Comprehensive Cancer Network guidelines and include: the presence of perineural or lymphovascular invasion, close or positive surgical margins, multiple pathologically positive lymph nodes, and presence of extracapsular extension. In addition, there is now significant level I evidence in the literature demonstrating the advantages of postoperative chemoradiation therapy in patients with positive margins and extracapsular spread^{17–19}. Because the patients in this study were treated earlier than these timely studies, this evidence could not be included in the current analysis.

4. Selective Neck Dissection—The fourth measure identified was the documentation of selective neck dissection being performed if the depth of tumor invasion was 4 mm or greater. There is sufficient evidence in the literature linking tumor depth of invasion with the risk of subclinical nodal disease in the neck.^{20–24} And, the interval development of nodal metastasis has a large impact on prognosis and survival in all head and neck cancers. Most of the literature has recommended prophylactic treatment of the neck once the tumor reaches a specific depth of invasion, although there is no consensus regarding the cutoff value. Alkureishi et al found that a 4-mm cutoff appears to provide the best balance of sensitivity and specificity for tumors affecting/originating in the oral cavity, while up to 2-mm of invasion appears to be more appropriate for those affecting the oropharynx.²⁵ The 4-mm treatment recommendation used in the current study was based on available data and has been part of our institutional guidelines for more than a decade.

Clinical Endpoints

In addition to the preceding 4 quality measures, we analyzed 26 clinical endpoints that we feel are important to the treatment of oral cavity cancer. While not directly linked to evidence-based outcomes, these endpoints may indicate adherence to our own institutional practices throughout the continuum of care that is pretreatment assessment and staging, active treatment, and posttreatment cancer surveillance and symptom control. There was no specific quality of life questionnaire, but instead we analyzed the medical record for the presence or absence of documentation for each endpoint being performed during the patients' cancer treatment.

Endpoints Related to Pretreatment Assessment and Staging—Risk control measures included a detailed history of alcohol consumption and smoking, as well as documentation of tobacco cessation counseling. Available evidence supports that head and neck cancer patients who smoke are at higher risk for developing a synchronous tumor²⁶ or second primary tumor in the upper aerodigestive track²⁷ and are more prone to continue smoking after diagnosis than are patients with other types of cancer.²⁸ Among smokers, those who consume alcohol and have been diagnosed with depression may require treatment for depression and alcohol addiction before effective smoking cessation intervention can be implemented.^{29,30}

For diagnostic evaluation, endpoints included a detailed description of the primary tumor and documentation of a comprehensive head and neck examination (Table 1) which is necessary to rule out synchronic lesions²⁶ and assess nodal status.³¹ Radiographic imaging as an adjunct to physical examination was also an endpoint of interest as it increases the sensitivity for detecting cervical metastasis.³¹ Both computed tomography and magnetic resonance imaging were accepted imaging modalities since they have comparable sensitivity for detecting nodal disease. To date, there are no large prospective randomized studies comparing these techniques in patients with oral tongue cancer. Other endpoints, such as multidisciplinary evaluation and referrals to dental and speech pathologists, were defined in conformity with National Comprehensive Cancer Network and institutional guidelines.

Endpoints Related to Treatment—Table 1 presents treatment-related endpoints that were used to assess quality of care. The evidence supports the use of frozen section analysis to assess surgical margins intraoperatively³² and determine tumor depth of invasion, and so these 2 factors appear on the list, along with documentation that frozen sections were used.²⁵ A set of endpoints was created to evaluate the completeness of the histopathological information conveyed in the pathology report. The parameters assessed were chosen based on their prognostic relevance as supported in the literature, mirroring the requirements of our current standardized pathology report template. The surgical and pathological information assessed included 3-dimensional measurement of the tumor,⁸ margin status,¹² depth of tumor invasion²⁵ tumor differentiation,³³ and presence of lymphovascular or perineural invasion.²¹

Endpoints Related to Cancer Surveillance and Symptom Control—The endpoints related to cancer surveillance and symptom control (Table 1) were chosen to conform with institutional guidelines and included routine quarterly visits during the first postoperative year, multidisciplinary follow-up and posttreatment speech pathology evaluation. All patients were to be followed for 5 years with an annual chest radiograph in keeping with evidence³⁴ Finally, adequacy of thyroid function monitoring for patients receiving radiation therapy was assessed based on evidence demonstrating that up to 14% of head and neck cancer patients receiving post-operative radiation will develop hypothyroidism within 3 years of therapy.²⁰ Other studies justify thyroid function monitoring on a regular basis for this subset of patients.³⁵

Functional Outcomes

The quality of care related to functional outcomes was assessed for documentation of the patients' posttreatment speech functions, presence or absence of chronic pain, and ability to return to activities of daily living. The quality of speech was to have been assessed with a 5-point scale: 5) all speech was understood, 4) sometimes not understood, 3) could be understood when conversational content was already known by the listener, 2) sometimes understood, and 1) not understood.³⁶

Statistical Analysis

Each chart was assessed for compliance with these guidelines as well as for completeness of initial patient data in order to determine the impact on decision-making and outcome. The presence of local or regional recurrence was documented, as was the presence of synchronous and metachronous lesions during the observation period. Frequencies of study patients within the categories for each of the parameters of interest were enumerated and descriptive statistics on scaled data (ie, age at time of admission, follow-up time, etc.) were calculated. Correlations between parameters and endpoints were assessed by the Pearson chi-square test or, when there were fewer than 10 subjects in any cell of a 2 × 2 grid, by the two-tailed Fisher exact test. Statistical analyses were performed with the assistance of the Statistica Version 8.0 statistical software application (StatSoft Inc).

RESULTS

Demographics

The cohort comprised of 73 male and 43 female patients (total n=116), who ranged in age from 18 years to 90 years (median 57 years). Forty-three (37.1%) and 73 (62.9%) had T1 and T2 tumors, respectively, while 14 patients (12.1%) also had N1 disease. There were 41 (35.3%) patients with stage I disease, 61 (52.6%) with stage II and 14 (12.1%) with stage III. The follow-up period ranged from 13 to 116 months, with an average of 37.6 months. Compliance with the defined set of quality measures is presented in Table 2, and compliance with the defined clinical endpoints is presented in Table 1.

Surgery

The majority of patients ($n = 70$; 60.3%) were left to heal by secondary intention. A primary closure or skin graft was performed by the attending surgeon in 38 patients (32.8%), while a plastic surgeon performed reconstruction on the remaining 8 patients (6.9%). For all patients who required reconstruction, the plastic surgeon had been consulted preoperatively. No intraoperative consultations for reconstruction were required.

The neck was dissected in 92 patients in conformity with the estimated depth of invasion determined by frozen section analysis in 103 cases (87.7%). In the remaining 13 cases, the neck was not dissected and there was no documentation of the depth of invasion by frozen section analysis or in the operative report. The records of these patients were reviewed, and they provided some justification for not performing a regional lymphadenectomy in 10 cases. Prior to treatment at M. D. Anderson, 5 of these patients had undergone excisional biopsy that revealed microinvasion only, 2 patients had received neck dissection for previous

primary tumors, 2 patients were older than 90 years (so lymphadenectomy was deferred to decrease anesthetic time), and 1 patient presented with a synchronous T3 lesion of the tonsil requiring irradiation of the neck and oropharynx. In the remaining 3 cases, justification for not performing a regional dissection was not identified. None of these 3 patients developed regional recurrence during the observation period.

Radiation Therapy

Twenty-nine patients (25%) met at least 1 of the institutional criteria for radiation therapy. Of these, one patient declined treatment and 28 patients underwent radiation therapy. One of these patients received radiation based on poor tumor differentiation, which was not one of the defined criteria for therapy. Post treatment thyroid function tests were obtained in 96.6% of patients who received radiation therapy. The radiation oncologist reported acute toxicity, according to accepted guidelines, for all 22 patients who received radiation treatment at our institution. Among the 28 patients receiving radiation therapy, one patient had grade 4 toxicity who was treated at another institution and 4 patients with grade 3 toxicity who were treated in our institution.

Table 3 shows the functional outcomes for the patients in this series. A modified barium swallow was performed in 35 of the 42 patients who were monitored postoperatively by speech pathologists. Ninety-four of the 116 patients (81.0%) were able to return to their activities of daily living after treatment, and 19 patients (16.4%) presented with chronic pain, which was defined as pain that lasted 6 months or more. Postoperative speech quality was either excellent or good in 94.8% of the patients.

The overall 5-year survival rate for the series was 68.6%; 18 patients (15.5%) experienced disease recurrence and the majority (55%) had local failures in that time. Three patients with recurrent disease each presented with a synchronous lesion in the oropharynx, buccal mucosa, and lung; these patients were included in the series since the treatment algorithm for their index oral tongue primary cancer was not altered. During the surveillance period, 12 patients presented with a second primary tumor, which was located in the upper aerodigestive tract in 10 cases and the lung in 2 cases.

DISCUSSION

Our objective was to identify quality metrics that would be measurable in the medical record of early oral tongue cancer patients. We reviewed our own level of compliance with documenting these measures to determine whether we met the accepted clinical care standards within our multidisciplinary program. It is our goal to show that compliance with, or deviation from, these standards could be used as a measure of the quality of care delivered. We selected four parameters for quality measurement based on the evidence-based medical literature, our programmatic treatment approach, and consensus among clinical experts. Documentation for these quality measures within the medical records were recorded and demonstrated compliance in nearly 90% of the patients in this cohort (TNM 90.5%, margin status 99.1%, referral to radiation 98.2%, and neck dissection 88.7%). The findings showed the reliability of using these metrics as data points within the medical records. From the literature and experience, it is generally accepted that adherence to these parameters is

important to the overall care of tongue cancer patients, thus these measures can likely be used for ascertaining the quality of care.

Such high level of adherence to the standards for defined quality measures was clearly apparent in the assessment of immediate TNM staging that was achieved in more than 90% of the cases. Eight of the 11 cases lacking TNM staging in the records were seen in the first half of the study period; before the advent of the electronic medical record (EMR). With the improving EMR, medical documentation has become more immediate and more complete, thus explaining the improvement in achieving this measure. The chart review also demonstrated that in some of these cases, staging was delayed until imaging could be completed. Although we stand that imaging is can be critical to differentiate disease stages in oral cavity tumors, a thorough appraisal by an experienced head and neck surgeon and TNM staging based on the clinical findings are necessary on every patient.

As expected in a tertiary referral cancer center, surgical margins were documented in detail in the vast majority of patients. Margin status has been consistently reported in the literature as an independent outcome predictor.^{9,10,11,12,13} Of the described prognostic indicators for oral tongue cancer, surgical margins is the only modifiable parameter that depends entirely on the surgeon. The standards of care for patients with positive margins has changed recently, with level I evidence supporting the use of chemoradiation therapy versus radiation therapy alone. Although this change in the standard of care was not considered for the current series, it underscores the critical role of this histopathological variable in both surgical and medical management of patients with oral tongue cancer. In this review, the single patient with a deviation from the standard was initially diagnosed with a premalignant lesion and treated accordingly.

In this study there was a very high rate of compliance in adequate referral to adjuvant therapy. The most common indication for adjuvant treatment was the presence of perineural or lymphovascular invasion, which was documented in 21 of 28 patients. perineural and lymphovascular invasion were routinely looked for but usually were documented only if positive. This raises the possibility that adverse pathologic findings may be present but not adequately reported. This practice has already changed at our institution with the adoption of a standardized pathology template in recent years. The evidence suggests that implementing a standardized pathology template that requires documentation of all pertinent data ensures complete reporting of all vital pathologic information to the treatment team.³⁷ We underscore that the use of the standardized pathology report is an important step for improving the quality of care for patients with head and neck cancer. Every patient referred for radiation therapy had at least 1 accepted indication for adjuvant treatment, except for a patient who was treated based on poor tumor differentiation, a criterion not defined as an accepted indication. On the other hand, patients who underwent radiation therapy had very high compliance rates with institutional guidelines as demonstrated by the detailed descriptions of the treatment volume, dose, and fractionation scheme, and of toxicity and routine thyroid function monitoring. Quality assurance for radiation therapy has been in place at our institution for many years and is likely responsible for the observed high compliance rates in the clinical endpoints related to radiation.

The overall compliance for performing elective neck dissection was the least adhered to parameter of all the quality measures assessed. However, the quality measure was actually met when our review revealed documentation of why the neck dissection was not performed. The deviation from the standard of care was justified based on pathology reports that demonstrated microinvasion, previous treatment of the neck, or very advanced patient age. When documentation of a justified cause for deviation is considered as meeting the quality metric, then the compliance rate increases to 97.1%. Of the 3 patients who did not undergo neck dissection based on tumor depth of invasion, all were treated during the first half of the study period perhaps indicating that as this treatment paradigm has become more standard, that the overall compliance has improved.

In regards to the clinical endpoints seen in Table 1, these were chosen to evaluate our own multidisciplinary approach to oral tongue cancer care. Unlike the specific 4 quality measures above, these endpoints were selected as internal guides to our own institutional compliance, and are not necessarily supported by high level evidence to have any known impact in the overall outcome. As demonstrated in the table, there was significant variation within our practice. The variability of the results is likely due to the inability to actually document these as data points within the medical record. Since the medical record is a text document, it is hard to search for subjective points such as whether the surgeon estimated the depth of invasion prior to treatment or whether the surgeon assessed the dentition. In this retrospective study, it is not entirely possible to determine which data clearly shows a deficiency in multidisciplinary cancer treatment and which data demonstrates a lack of clinical documentation.

The information in Table 1, however, does show a trend towards better attention to the details of the specific cancer care such as surgical tumor descriptions, pathology documentation, and multidisciplinary referrals; and less attention to the therapies not directly related to the cure such as speech and dental rehabilitation. As the paradigm of cancer care shifts to include quality of life and function after treatment as one of the primary goals, it is likely that the compliance towards these types of referrals will be improving. At our institution, we now include functional and social rehabilitation as one of the key goals of survivorship after cancer care.

Also, while there is no good evidence to support cancer surveillance best practices, there is likely to be a nationwide push to clarify this issue soon. The cost of medicine is escalating, and with the threat of malpractice resulting in defensive medicine, it will likely be very high on the agenda of most cancer centers to define the appropriate follow-up. As this evolves, the variability in our own practice is likely to become more consistent. It is notable, however, that the one endpoint supported by evidence as having impact on outcome (thyroid function monitoring after radiation³⁴) is the most consistent surveillance endpoint in our study (96%).

This retrospective quality assessment has inherent potential shortcomings including selection or recall bias, suboptimal or incomplete documentation and most importantly, the absence of level I evidence on this specific subject. The nature of this study was not designed to compare a cohort of cancer patients adhering to treatment guidelines to one not

following standard of care. Nor will it be possible to assess whether the presence of the quality measures had any affect on the overall outcome in this patient population since the compliance was very high within this single institution. These questions will need to be answered prospectively in a multi-institutional review of compliance.

Despite these limitations, our results demonstrate that it is possible to identify quality metrics within a cancer subsite that are measurable data points within the medical documentation. This study does provide a useful benchmark to review the clinical practices within an institution and use the data to evaluate the quality of care delivered for patients with early stage oral tongue cancer. This is the first report of a quality of care project in a primarily surgical patient group, though it is likely there are going to be many quality projects to follow that will help define how medicine and cancer care should be measured. Through these results, we determined that even in a large tertiary care institution where all treating physicians have similar treatment philosophies, we observed variation in documentation and adherence to quality standards. This is the type of data that will help make changes in practice that will positively influence quality of care in the future, including a template-driven electronic medical record, standardized pathology templates for reporting pathologic findings, and greater emphasis on documenting treatment-related morbidity and functional outcomes.

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none

References

1. Hewitt ME , Simone JV . Ensuring quality cancer care Washington, DC: National Academy Press, 1999:ix, 246.
2. United States Department of Health and Human Services Agency for Healthcare Research and Quality. Available for URL: <http://www.ahrq.gov/consumer/qnt> [accessed 04/22/2009].
3. Goodwin WJ . Salvage surgery for patients with recurrent squamous cell carcinoma of the upper aerodigestive tract: when do the ends justify the means? Laryngoscope 2000;110(3 Pt 2 Suppl 93): 1–18.
4. Sessions DG , Spector GJ , Lenox J et al. Analysis of treatment results for floor-of-mouth cancer. Laryngoscope, 2000 110(10 Pt 1): p. 1764–1772.11037841
5. Sessions DG , Spector GJ , Lenox J , Haughey B , Chao C , Marks J Analysis of treatment results for oral tongue cancer. Laryngoscope, 2002 112(4): p. 616–25.12150512
6. Weber RS , Improving the quality of head and neck cancer care. Arch Otolaryngol Head Neck Surg, 2007 133(12): p. 1188–92.18086958
7. Chen AY ., The development of quality of care measures for oral cavity cancer. Arch Otolaryng Head Neck Surg, 2008 124(6): p 672.
8. Green FL , American Joint Committee on Cancer: Cancer Staging Manual 6th ed. New York: Springer-Verlag, 2002:421.
9. Ravasz LA , Slootweg PJ , Hordijk GJ , Smit F , van der Tweel I The status of the resection margin as a prognostic factor in the treatment of head and neck carcinoma. J Craniomaxillofac Surg, 1991 19(7): p. 314–8.1752972
10. Sutton DN ,Brown JS , Rogers SN , Vaughan ED , Woolgar JA The prognostic implications of the surgical margin in oral squamous cell carcinoma. Int J Oral Maxillofac Surg, 2003 32(1): p. 30–4.12653229

11. Woolgar JA , Triantafillou A A histopathological appraisal of surgical margins in oral and oropharyngeal cancer resection specimens. *Oral Oncol*, 2005 41(10): p. 1034–43.16129652
12. Binahmed A , Nason RW , Abdoh AA The clinical significance of the positive surgical margin in oral cancer. *Oral Oncol*, 2007 43(8): p. 780–4.17174145
13. Slootweg PJ , Hordijk GJ , Schade Y , van Es RJ , Koole R Treatment failure and margin status in head and neck cancer. A critical view on the potential value of molecular pathology. *Oral Oncol*, 2002 38(5): p. 500–3.12110346
14. Yuen AP , Lam KY , Wei WI A comparison of the prognostic significance of tumor diameter, length, width, thickness, area, volume, and clinicopathological features of oral tongue carcinoma. *Am J Surg*, 2000 180(2): p. 139–43.11044531
15. Chandu A , Adams G , Smith AC Factors affecting survival in patients with oral cancer: an Australian perspective. *Int J Oral Maxillofac Surg*, 2005 34(5): p. 514–20.16053871
16. Loree TR , Strong EW Significance of positive margins in oral cavity squamous carcinoma. *Am J Surg*, 1990 160(4): p. 410–4.2221245
17. Bernier J , Cooper JS , Pajak TF , et al. Defining risk levels in locally advanced head and neck cancers: a comparative analysis of concurrent postoperative radiation plus chemotherapy trials of the EORTC (#22931) and RTOG (# 9501). *Head Neck*, 2005 27(10): p. 843–50.16161069
18. Bernier J , Dumenige C , Ozsahin M , et al. Postoperative irradiation with or without concomitant chemotherapy for locally advanced head and neck cancer. *N Engl J Med*, 2004 350(19): p. 1945–52.15128894
19. Cooper JS , Pajak TF , Forastiere AA , et al. Postoperative concurrent radiotherapy and chemotherapy for high-risk squamous-cell carcinoma of the head and neck. *N Engl J Med*, 2004 350(19): p. 1937–44.15128893
20. August M , Wang J , Plante D , Wang CC Complications associated with therapeutic neck radiation. *J Oral Maxillofac Surg*, 1996 54(12): p. 1409–15; discussion 1415–6.8957119
21. Brown B , Barnes L , Mazariegos J , Taylor F , Johnson J , Wagner RL , Prognostic factors in mobile tongue and floor of mouth carcinoma. *Cancer*, 1989 64(6): p. 1195–202.2766218
22. Fukano H , Matsuura H , Hasegawa Y , Nakamura S Depth of invasion as a predictive factor for cervical lymph node metastasis in tongue carcinoma. *Head Neck*, 1997 19(3): p. 205–10.9142520
23. Jones KR , Lodge-Rigal RD , Reddick RL , Tudor GE , Shockley WW Prognostic factors in the recurrence of stage I and II squamous cell cancer of the oral cavity. *Arch Otolaryngol Head Neck Surg*, 1992 118(5): p. 483–5.1571116
24. Spiro RH , Huvos AG , Wong GY , Spiro JD , Gnecco CA , Strong EW Predictive value of tumor thickness in squamous carcinoma confined to the tongue and floor of the mouth. *Am J Surg*, 1986 152(4): p. 345–50.3766861
25. Alkureishi LW , Ross GL , Shoaib T , et al. Does tumor depth affect nodal upstaging in squamous cell carcinoma of the head and neck? *Laryngoscope*, 2008 118(4): p. 629–34.18094651
26. Cianfriglia F , Di Gregorio DA , Manieri A Multiple primary tumours in patients with oral squamous cell carcinoma. *Oral Oncol*, 1999 35(2): p. 157–63.10435150
27. Khuri FR , Kim ES , Lee JJ , et al. The impact of smoking status, disease stage, and index tumor site on second primary tumor incidence and tumor recurrence in the head and neck retinoid chemoprevention trial. *Cancer Epidemiol Biomarkers Prev*, 2001 10(8): p. 823–9.11489748
28. Schnoll RA , Rothman RL , Lerman C , et al. Comparing cancer patients who enroll in a smoking cessation program at a comprehensive cancer center with those who decline enrollment. *Head Neck*, 2004 26(3): p. 278–86.14999804
29. Chan Y , Irish JC , Wood SJ , et al. Smoking cessation in patients diagnosed with head and neck cancer. *J Otolaryngol*, 2004 33(2): p. 75–81.15518093
30. Duffy SA , Ronis DL , Valenstein M , et al. A tailored smoking, alcohol, and depression intervention for head and neck cancer patients. *Cancer Epidemiol Biomarkers Prev*, 2006 15(11): p. 2203–8.17119047
31. Merritt RM , Williams MF , James TH , Porubsky ES Detection of cervical metastasis. A meta-analysis comparing computed tomography with physical examination. *Arch Otolaryngol Head Neck Surg*, 1997 123(2): p. 149–52.9046281

32. Spiro RH , Guillaumondegui O , Paulino AF , Huvos AG Pattern of invasion and margin assessment in patients with oral tongue cancer. *Head Neck*, 1999 21(5): p. 408–13.10402520
33. Anneroth G , Hansen LS , Silverman S Malignancy grading in oral squamous cell carcinoma. I. Squamous cell carcinoma of the tongue and floor of mouth: histologic grading in the clinical evaluation. *J Oral Pathol*, 1986 15(3): p. 162–8.3084741
34. Loh KS , Brown DH , Baker JT , Gilbert RW , Gullane PJ , Irish JC A rational approach to pulmonary screening in newly diagnosed head and neck cancer. *Head Neck*, 2005 27(11): p. 990–4.16136584
35. Garcia-Serra A , Amdur RJ , Morris CG , Mazzaferri E , Mendenhall WM Thyroid function should be monitored following radiotherapy to the low neck. *Am J Clin Oncol*, 2005 28(3): p. 255–8.15923797
36. Matsui Y , Ohno K , Yamashita Y , Takahashi K Factors influencing postoperative speech function of tongue cancer patients following reconstruction with fasciocutaneous/myocutaneous flaps--a multicenter study. *Int J Oral Maxillofac Surg*, 2007 36(7): p. 601–9.17363217
37. Yunker WK , Matthews TW , Dort JC Making the most of your pathology: standardized histopathology reporting in head and neck cancer. *J Otolaryngol*, 2008 37(1): p. 48–55.

Table 1.**Compliance With Clinical Endpoints**

Clinical Endpoint	%	n
<i>Staging and risk stratification</i>		
Smoking history documented	101/116	87.1
Alcohol history documented	93/116	80.1
Tobacco cessation counseling documented	90/116	77.5
Tumor size described	106/116	91.4
Tumor depth estimation described	79/116	68.1
Tumor location described	111/116	95.6
Attending surgeon assessed tumor	116/116	100.0
Fiberoptic examination performed	47/116	40.5
Dentition status documented by the surgeon	70/116	60.3
Comprehensive head and neck examination	112/116	96.6
Preoperative head and neck CT scan or MRI	78/116	67.2
Case presented in multidisciplinary committee	116/116	100.0
Preoperative speech pathology evaluation	22/116	18.9
Preoperative dental evaluation	73/116	62.9
<i>Surgical treatment</i>		
Frozen section analysis performed	115/116	99.1
Frozen section margins documented	113/116	97.4
Pathology report described tumor size in 3dimensions	101/116	87.1
Pathology report described tumor differentiation	104/116	89.6
Pathology report described tumor depth of invasion	91/116	78.4
Pathology report documented presence or absence of lymphovascular invasion	33/116	28.5
Pathology report documented presence or absence of perineural invasion	46/116	39.7
<i>Surveillance and symptom control</i>		
Quarterly visits completed in the first year	63/116	54.3
Multidisciplinary follow-up	70/116	60.3
Annual chest x-ray	75/116	64.7
Speech pathology follow-up	42/116	36.2
Thyroid function assessed after radiation therapy	25/28*	96.6

CT indicates computed tomography; MRI, magnetic resonance imaging.

• n=28 patients completing radiation therapy.

Table 2.

Compliance With Quality of Care Measures

Quality of Care Measure	Patients n	(n=116) %
1. The patient was appropriately staged according to the American Joint Committee on Cancer TNM staging system on the first visit.	105	90.5
2. Oncologic margin status was documented in the pathology report and acknowledged by the attending surgeon in the chart.	115	99.1
3. If adverse features were identified in the pathology report, patient was referred for external-beam radiation therapy.	114	98.2
4. If the depth of tumor invasion was 4 mm or greater, a selective neck dissection was performed.	103	88.7

TNM indicates tumor-node-metastasis.

Table 3.

Documentation of Functional Outcomes and Postoperative Speech Quality

Functional Outcomes	n=116	%
Patient returned to activities of daily living	94	81.0
Presence of chronic pain	19	16.4
Postoperative speech quality		
5 (excellent)	73	62.9
4 (good)	37	31.9
3 (fair)	6	5.1