Evaluating differentiation grade as a guide for decision-making in elective neck dissection for early-stage oral squamous cell carcinoma: a population-based cohort study

Junxu Chen[1], Derong Zou[1], Hao Zan[1], Xiangyu Li[1], Hyung Jun Kim[1,2]^

[1]Department of Oral & Maxillofacial Surgery, Yonsei University College of Dentistry, Seoul, Republic of Korea; [2]Oral Cancer Research Institute, Yonsei University College of Dentistry, Seoul, Republic of Korea

Contributions: (I) Conception and design: J Chen, HJ Kim; (II) Administrative support: HJ Kim; (III) Provision of study materials or patients: D Zou, H Zan; (IV) Collection and assembly of data: D Zou, H Zan; (V) Data analysis and interpretation: J Chen, X Li; (VI) Manuscript writing: All authors; (VII) Final approval of manuscript: All authors.

Correspondence to: Hyung Jun Kim, DDS, PhD. Department of Oral & Maxillofacial Surgery, Yonsei University College of Dentistry, 50-1 Yonsei-ro, Seodaemun-gu, Seoul 03722, Republic of Korea; Oral Cancer Research Institute, Yonsei University College of Dentistry, 50-1 Yonsei-ro, Seodaemun-gu, Seoul 03722, Republic of Korea. Email: kimoms@yuhs.ac.

Background: Early-stage oral squamous cell carcinoma (OSCC) frequently poses a risk of occult lymph node metastasis, complicating neck management decisions. Elective neck dissection (END) is a critical strategy for mitigating this risk, though its criteria for selection continue to be debated. This study evaluated whether tumor differentiation can guide END decisions in early-stage OSCC.

Methods: Patients with stage I/II OSCC were identified from the Surveillance, Epidemiology, and End Results (SEER) database. Kaplan-Meier and Cox regression analyses assessed cancer-specific survival (CSS) and overall survival (OS), comparing END and no END groups across tumor differentiation grades. Stratified analyses further examined the influence of tumor site and size on survival.

Results: Among 10,396 early-stage OSCC patients, END did not improve survival in well-differentiated tumors but significantly improved CSS and OS in moderately and poorly differentiated/undifferentiated tumors. Interaction analyses revealed that tumor site and size significantly modified END's survival benefit. Stratified analyses highlighted that END benefits patients with moderately or poorly differentiated/undifferentiated tumors, but provides limited benefit for well-differentiated, small tumors, or those located in the floor of mouth.

Conclusions: Tumor differentiation is a critical determinant of END's survival benefit in early-stage OSCC. END should be considered for patients with moderately or poorly differentiated/undifferentiated tumors but may be unnecessary in well-differentiated cases.

Keywords: Differentiation grade; elective neck dissection (END); early-stage oral squamous cell carcinoma (early-stage OSCC); cancer-specific survival (CSS)

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^ ORCID: 0000-0001-8247-4004.

Introduction

Oral cavity cancer (OCC) is one of the most common and aggressive malignancies, marked by significant morbidity and mortality. This type of cancer primarily develops in anatomical regions such as the tongue, gums, floor of the mouth, buccal mucosa, and hard palate. The 2020 report by the Global Cancer Observatory indicated that OCC was responsible for over 350,000 new cases and 150,000 deaths globally, with the majority of cases associated with oral squamous cell carcinoma (OSCC) or its histopathological variants (1). OSCC results in significant functional impairments and disfigurements, profoundly affecting patients' quality of life. The challenges associated with OCC include unbearable pain, dysphagia, dysarthria, and severe facial disfigurement, which together create significant physical, psychological, and social burdens (2). The National Comprehensive Cancer Network (NCCN) clinical practice guideline for head and neck cancers generally recommends surgical excision as the primary treatment for OCC. The decision to employ adjuvant therapies, such as radiotherapy and chemotherapy, depends on the tumor's stage and pathological characteristics. For early-stage OSCC, classified as T1N0M0 or T2N0M0 under the American Joint Committee on Cancer (AJCC) staging system, the standard of care includes surgical removal of the primary tumor, optionally accompanied by neck dissection, as the preferred treatment approach (3). Although survival outcomes are generally better for patients with early-stage OSCC compared to those with advanced-stage disease, the risk of occult metastasis is considerable. This poses a challenge in cases of micro-metastasis that are undetectable through clinical examination and imaging modalities, necessitating meticulous neck management (4).

Elective neck dissection (END), frequently used for managing early-stage OSCC, aims to address potential occult metastasis in the cervical lymph nodes to improve regional control and survival outcomes. Nevertheless, the role of END in the treatment of early-stage OSCC is contentious, with ongoing debates about which patients should undergo END and the extent of its prognostic benefit. Previous studies have shown that END substantially reduces nodal regional recurrence and enhances disease-specific survival rates, thereby underscoring its importance for patients with early-stage OSCC (5,6). However, other studies have found that END does not significantly enhance survival in early-stage OSCC management and is linked to risks such as shoulder dysfunction and surgical complications (7,8). These outcome discrepancies may arise from factors like limited sample sizes and the lack of comprehensive stratified patient classifications.

Current NCCN guidelines cite depth of invasion (DOI) as the main predictor for occult metastasis and a key criterion for guiding END in patients with early-stage OSCC (9). Nonetheless, relying solely on this parameter might not sufficiently assess the patient's condition or establish the appropriate treatment plan. The tumor's differentiation grade, a critical characteristic reflecting its biological behavior, has been identified as a significant prognostic factor due to its strong association with nodal involvement, recurrence rates, vascular and perineural invasion (PNI), and overall survival (OS) (10). Additionally, other studies have highlighted the importance of tumor differentiation not only for prognosis but also for guiding chemotherapy decisions in patients with OSCC (11). Therefore, examining the role of differentiation grade in the decision-making process for END could provide new perspectives for a more precise approach to patient

Highlight box

Key findings

- This study demonstrated that elective neck dissection (END) did not improve survival in patients with well-differentiated early-stage oral squamous cell carcinoma (OSCC), but significantly improved cancer-specific survival (CSS) and overall survival (OS) in patients with moderately differentiated and poorly differentiated/undifferentiated tumors
- Stratified and interaction analyses revealed that END benefit was consistent across sex, age, and race groups, but was significantly modified by tumor site and size, showing clear benefit in tumors located on the tongue or larger than 10 mm, and minimal benefit in floor-of-mouth tumors or tumors smaller than 10 mm.

What is known and what is new?

- Early-stage OSCC carries a substantial risk of occult nodal metastasis, and END is widely used but remains controversial
- This study is the first to demonstrate, using a large population-based cohort, that tumor differentiation grade can stratify the survival benefit of END in early-stage OSCC, identifying specific subgroups that gain or do not gain from END.

What is the implication, and what should change now?

- END should be prioritized for early-stage OSCC patients with moderately or poorly differentiated/undifferentiated tumors, while observation may be more appropriate for well-differentiated tumors.
- Future multicenter datasets with detailed pathology are needed to validate preoperative differentiation as a reliable criterion for END.

management, potentially enhancing treatment outcomes and minimizing unnecessary interventions.

To validate the proposed hypothesis, a large-scale analysis employing real-world data is essential. In this study, patient cohort data was sourced from the Surveillance, Epidemiology, and End Results (SEER) database, an extensive cancer registry program in the United States. A retrospective analysis was conducted to evaluate whether tumor differentiation grade could serve as a guiding criterion in the decision-making process for END in patients with early-stage OSCC. The objective of this study is to provide evidence-based insights that could enable more precise and individualized treatment strategies, ultimately enhancing patient outcomes. We present this article in accordance with the STROBE reporting checklist (available at https://tcr.amegroups.com/article/view/10.21037/tcr-2025-1593/rc).

Methods

Study design and population

This retrospective, large-scale, population-based study utilized data retrieved from the National Cancer Institute's SEER database (https://seer.cancer.gov/) via SEER*Stat version 8.6.6 software. Patients diagnosed with OSCC from 2004 to 2021 were selected based on the following inclusion criteria: (I) identification through ICD-O-3 morphological and topographical codes (8050–8076, 8078, 8083, 8084, C01.9, C02.0, C02.1, C02.2, C02.3, C02.8, C02.9, C03.0, C03.1, C03.9, C04.0, C04.1, C04.8, C04.9, C05.0, C06.0, C06.1, and C06.2); (II) diagnosis of OSCC as the first primary malignancy; (III) staging of the cancer as stage I or II according to the AJCC tumor-node-metastasis (TNM) system, with stage I defined as T1N0M0 and stage II as T2N0M0; (IV) patients who underwent surgery as the sole treatment, with or without END. Exclusion criteria included: (I) absence of a confirmed positive pathological diagnosis; (II) survival data of less than one month or unknown; (III) incomplete or unknown records for END or AJCC staging; (IV) receipt of adjuvant therapy, including radiotherapy, chemotherapy, or systemic therapy; (V) presence of regional lymph node metastasis (N1–N3) or distant metastasis (M1). When both clinical (c) and pathological (p) staging information were available, the pathological stage was preferentially selected to enhance the accuracy of tumor classification and minimize potential bias from occult nodal metastasis.

Clinical characteristics collected from the database included sex (categorized as female and male), age at diagnosis (reclassified as <63 and ≥63 years), race (divided as White, Black, and other races), primary tumor site (including tongue, floor of mouth, gum, and other mouth), tumor size (≤10 mm, >10–20 mm, and >20 mm), pathological grade record (grade I well differentiated, grade II moderately differentiated, grade III/IV poorly differentiated/undifferentiated), execution of regional lymph node surgery (categorized as END and no END), as well as cancer-specific survival (CSS), OS, and survival times records. The primary outcomes measured in this study were CSS and OS. CSS was defined as the time from diagnosis to death specifically caused by OSCC, while OS was defined as the time from diagnosis to death from any cause. The study was conducted in accordance with the Declaration of Helsinki and its subsequent amendments. As this study did not involve direct interaction with human subjects and utilized publicly available data from the SEER database, institutional review board (IRB) approval was not required.

Statistical analysis

Differences in categorical variables were evaluated using the Chi-squared test or Fisher's exact test. The probability of CSS and OS across different groups of OSCC patients was assessed through Kaplan-Meier analysis and the log-rank test. The hazard ratios (HR) and 95% confidence intervals (CI) for each comparison were estimated using the Cox proportional hazards model within each subgroup. Interaction P values were calculated to assess statistically significant differences between variables within each subgroup. The subgroup forest plots and survival curves were generated using the 'forestploter' and 'survminer' packages in R. A two-sided P value of less than 0.05 was deemed statistically significant. All statistical calculations and visualizations were conducted in R-studio (version 4.3.3).

Results

Clinicopathological profile of the patient cohort

A total of 10,396 patients with early-stage OSCC who met the screening criteria were included in this study. The overall baseline characteristics of the cohort are summarized in *Table 1*. Patients were categorized based on two major variables. The first variable was pathological grade, which

Table 1 Clinicopathological characteristics of patients with early-stage OSCC

Characteristics	Total	Grade (n, %)				Surgery (n, %)		
		WD	MD	PD/UD	P value	END	No END	P value
Total	10,396	3,893 (37.45)	5,445 (52.38)	1,058 (10.18)		5,554 (53.42)	4,842 (46.58)	
Sex					0.001			<0.001
Female	4,609	1,815 (39.38)	2,351 (51.01)	443 (9.61)		2,042 (44.3)	2,567 (55.70)	
Male	5,787	2,078 (35.91)	3,094 (53.46)	615 (10.63)		2,800 (48.38)	2,987 (51.62)	
Age					0.003			<0.001
<63 years	5,193	1,862 (35.86)	2,792 (53.76)	539 (10.38)		2,706 (52.11)	2,487 (47.89)	
≥63 years	5,203	2,031 (39.04)	2,653 (50.99)	519 (9.98)		2,136 (41.05)	3,067 (58.95)	
Race					0.002			0.01
White	8,849	3,316 (37.47)	4,625 (52.27)	908 (10.26)		4,074 (46.04)	4,775 (53.96)	
Black	349	116 (33.24)	180 (51.58)	53 (15.19)		163 (46.70)	186 (53.30)	
Other races	1,198	461 (38.48)	640 (53.42)	97 (8.10)		605 (50.50)	593 (49.50)	
Site					<0.001			<0.001
Tongue	6,913	2,589 (37.45)	3,596 (52.02)	728 (10.53)		3,262 (47.19)	3,651 (52.81)	
Floor of mouth	1,293	320 (24.75)	817 (63.19)	156 (12.06)		674 (52.13)	619 (47.87)	
Gum/other mouth	2,190	984 (44.93)	1,032 (47.12)	174 (7.95)		906 (41.37)	1,284 (58.63)	
Size					<0.001			<0.001
≤10 mm	1,006	449 (44.63)	471 (46.82)	86 (8.55)		383 (38.07)	623 (61.93)	
>10–20 mm	4,159	1,500 (36.07)	2,243 (53.93)	416 (10.00)		2,038 (49.00)	2,121 (51.00)	
>20 mm	4,926	1,780 (36.13)	2,599 (52.76)	547 (11.10)		2,359 (47.89)	2,567 (52.11)	
Unknown	305	164 (53.77)	132 (43.28)	9 (2.95)		62 (20.33)	243 (79.67)	

END, elective neck dissection; MD, moderately differentiated; OSCC, oral squamous cell carcinoma; PD/UD, poorly differentiated/undifferentiated; WD, well differentiated.

included 3,893 cases of well differentiated (37.45%), 5,445 cases of moderately differentiated (52.38%), and 1,058 cases of poorly differentiated or undifferentiated OSCC (10.18%). The second variable was surgical intervention: 5,554 patients (53.42%) underwent tumor resection with concurrent END, whereas 4,842 patients (46.58%) received tumor excision without END. The average age at diagnosis was 63.31 years [standard deviation (SD), 13.71 years], and patients were divided into two age groups, one for those under 63 years (n=5,193, 49.95%) and the other for those 63 years or older (n=5,203, 50.05%). The follow-up period ranged from 1 to 120 months, with a mean duration of 71.12 months (SD, 53.48 months). The majority of the patients were male (n=5,787, 55.67%) and white (n=8,849, 85.12%). The most common tumor site was the tongue (n=6,913, 66.50%), and the predominant tumor size was over 20 mm (n=4,926, 47.38%).

Differentiation grade and neck dissection in OSCC survival

Kaplan-Meier survival analysis was utilized to assess CSS and OS among patients who underwent END and those who did not. The analysis showed significantly higher survival probabilities for both CSS and OS in patients who underwent tumor resection with END compared to those who underwent tumor surgery alone (P=0.001 for CSS and P<0.001 for OS, *Figure 1A,1B*). Furthermore, survival curves stratified by pathological grade—well differentiated, moderately differentiated, and poorly

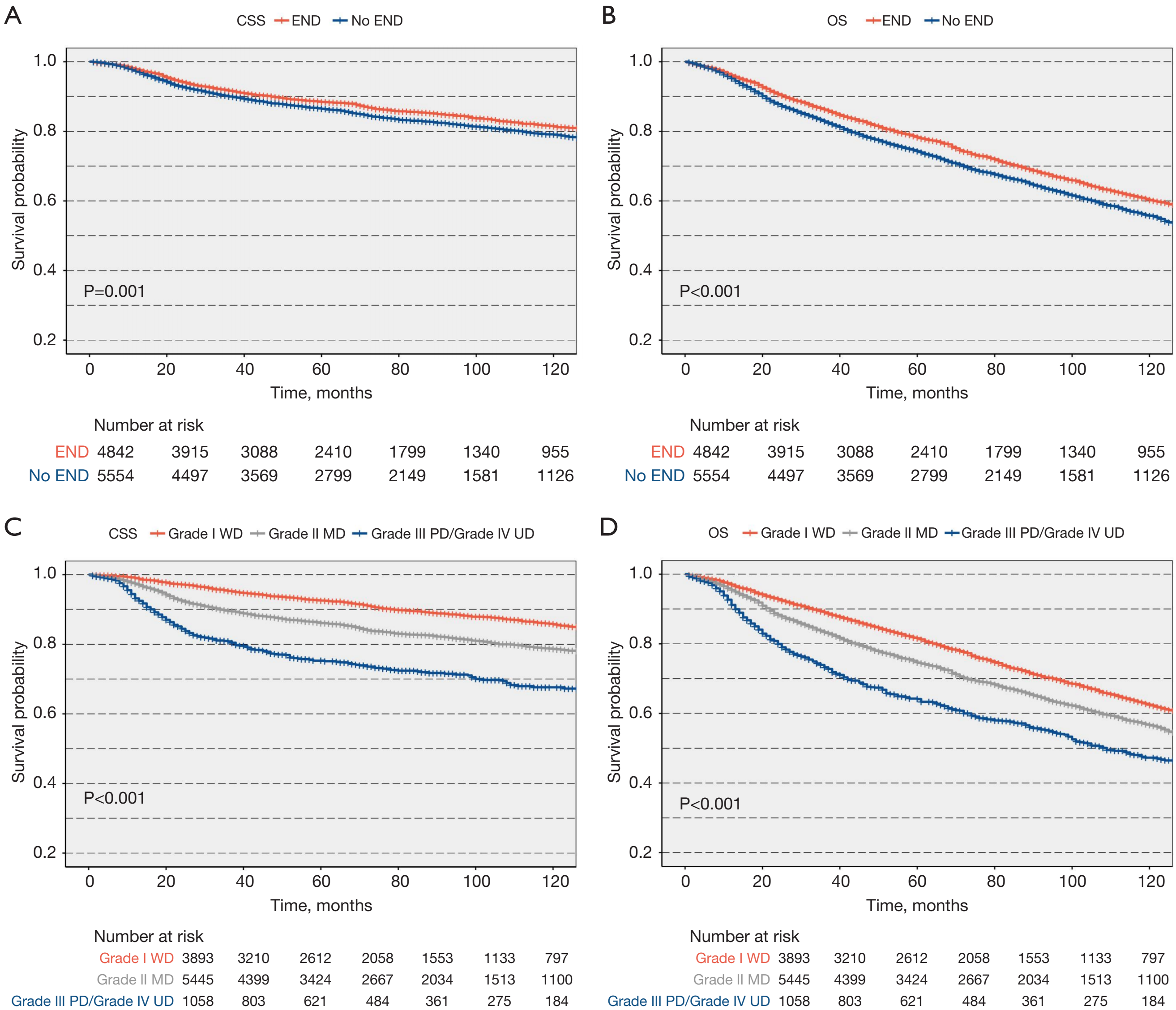

Figure 1 Kaplan-Meier survival curves for CSS and OS. (A,B) Comparison between CSS and OS in the END and no END groups; (C,D) CSS and OS stratified by tumor differentiation grades. Log-rank test P values are displayed. CSS, cancer-specific survival; END, elective neck dissection; MD, moderately differentiated; OS, overall survival; PD, poorly differentiated; UD, undifferentiated; WD, well differentiated.

differentiated/undifferentiated—revealed statistically significant differences in both CSS and OS across the three groups (P<0.001 for both CSS and OS, *Figure 1C,1D*). These results suggest that patients with higher-grade differentiation exhibited better survival probabilities, with well-differentiated tumors demonstrating the most favorable outcomes compared to moderately and poorly differentiated tumors.

To determine whether pathological grade could guide decision-making for END in clinical treatment, a stratified survival analysis was performed to evaluate END outcomes across different grades. In the well-differentiated group, the survival curves of the END and no END groups nearly overlapped, with no significant differences observed (P=0.78 for CSS and P=0.09 for OS, *Figure 2A,2B*). In contrast, among the moderately differentiated and poorly differentiated/undifferentiated groups, patients who underwent surgery with END exhibited significantly better

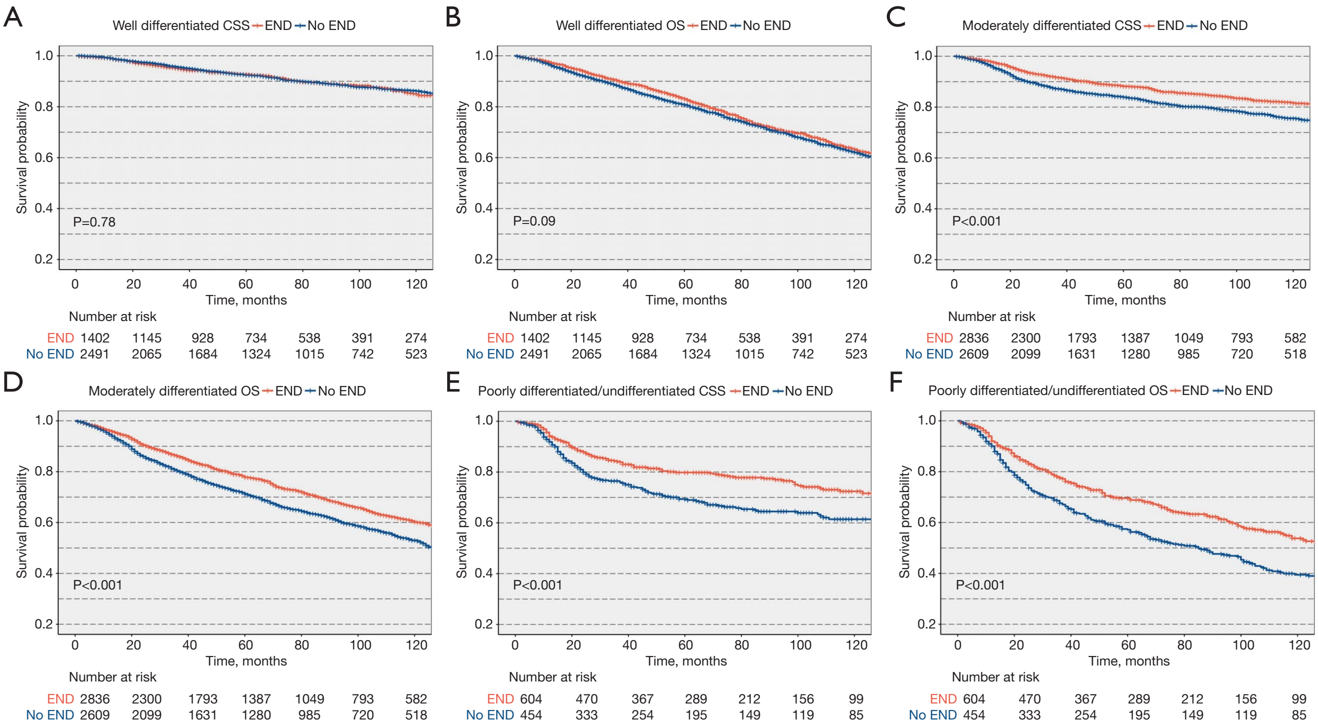

Figure 2 Kaplan-Meier survival curves for CSS and OS stratified by tumor differentiation grades (well, moderately, and poorly differentiated/undifferentiated) and END status. (A,B) CSS and OS in well-differentiated tumors; (C,D) CSS and OS in moderately differentiated tumors; (E,F) CSS and OS in poorly differentiated/undifferentiated tumors. P values from log-rank tests comparing the END and no END groups are provided. CSS, cancer-specific survival; END, elective neck dissection; OS, overall survival.

survival outcomes compared to those who did not undergo END, for both CSS and OS (P<0.001 for both CSS and OS in the MD group; P<0.001 for CSS and P<0.001 for OS in the poorly differentiated/undifferentiated group, as shown in *Figure 2C-2F*). Furthermore, interaction analysis between grade and END revealed statistically significant interaction effects on survival outcomes, with interaction P values of 0.004 for CSS and 0.02 for OS. These findings suggest that the benefit of END treatment may differ significantly depending on the pathological grade of the tumor. Specifically, END appeared to enhance prognostic survival in early-stage OSCC patients with relatively poorer pathological grades, whereas the outcomes for patients with well-differentiated pathological grades remained comparable irrespective of END treatment.

Stratified analysis across multiple subgroups in OSCC

Considering the potential confounding impacts of clinical variables on survival outcomes in OSCC, a stratified Cox regression analysis enhanced by interaction assessment was conducted to enable a comprehensive and nuanced exploration. The HR values obtained across various subgroup classifications demonstrated that END significantly improves survival in moderately and poorly differentiated patients, with particularly notable benefits in poorly differentiated patients irrespective of sex or age. Conversely, for well differentiated patients, survival benefits associated with END were not evident (Figure S1). These findings are consistent with earlier results from this study. The results from the interaction analysis revealed that interaction P values showed no significant effect of sex (P=0.76 for CSS and P=0.27 for OS), age (P=0.45 for CSS and P=0.17 for OS), or race (P=0.82 for CSS and P=0.12 for OS), corroborating that survival benefits of END are stable across sex, age, and race groups. However, significant interaction effects were noted for tumor site (P=0.03 for CSS and P=0.03 for OS) and tumor size (P=0.001 for CSS and P=0.01 for OS), indicating that these variables significantly influence the relationship between END and

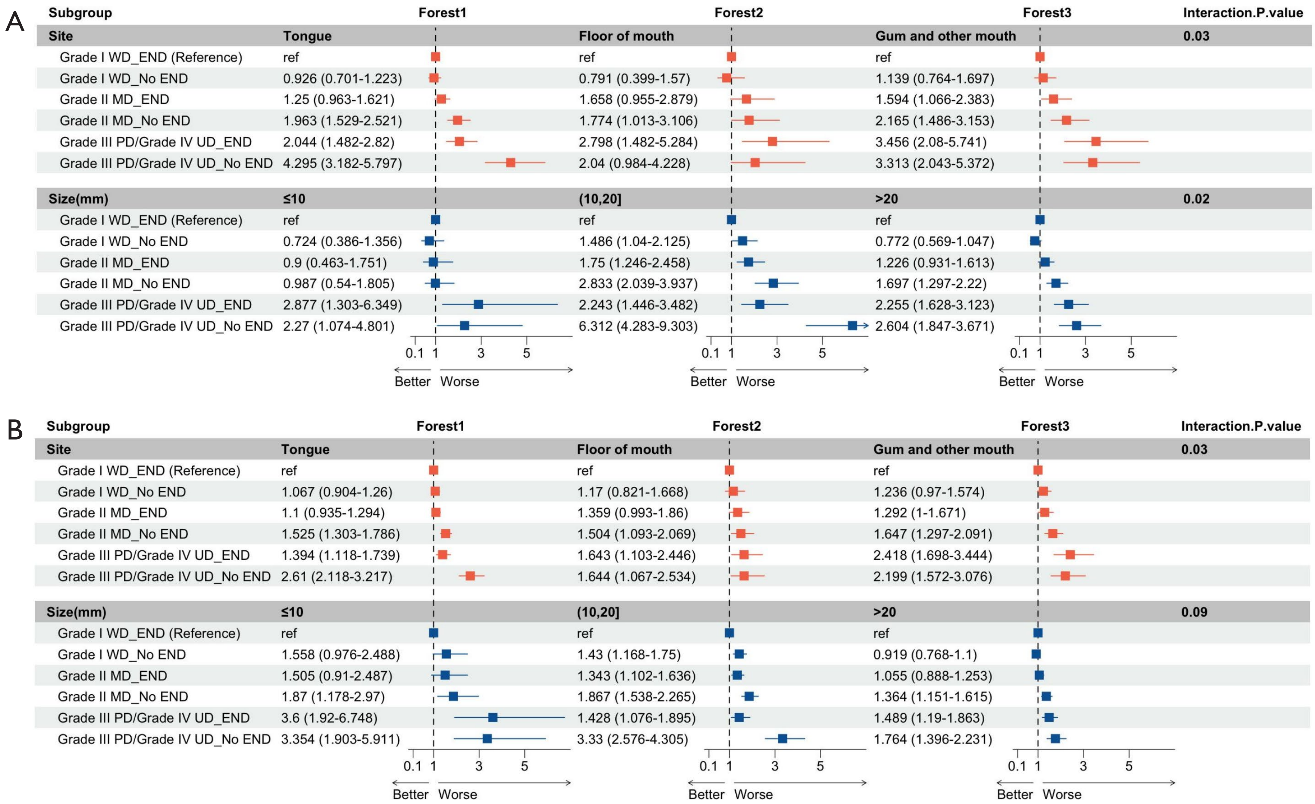

Figure 3 Forest plots summarizing HRs for CSS (A) and OS (B) across site and size subgroups. Interaction P values are included to evaluate the modifying effects of subgroup variables. CSS, cancer-specific survival; END, elective neck dissection; HR, hazard ratio; MD, moderately differentiated; OS, overall survival; PD, poorly differentiated; UD, undifferentiated; WD, well differentiated.

survival (*Figure 3*). Consequently, further survival analyses stratified by tumor site and size were conducted to more thoroughly explore these effects.

In the stratified survival analysis, subtle differences were observed across tumor sites and sizes when stratified by differentiation grade. For tumors located in the tongue (*Figure 4A,4B*), the results were consistent with the overall findings: patients with moderately or poorly differentiated tumors showed significant survival benefits from END (both CSS and OS, P<0.001), whereas well-differentiated cases demonstrated no clear postoperative survival advantage in either CSS or OS (P>0.05). Similarly, among patients with tumors larger than 10 mm (*Figure 4C,4D*, including >10–20 mm and >20 mm), those in the moderately and poorly differentiated groups exhibited markedly better survival outcomes after END than those who did not undergo END (all P<0.001). In contrast, survival benefits for well-differentiated tumors were less pronounced, although a degree of separation between the END and no END survival curves was still observed. In the gum and other oral subsites (Figure S2), survival differences among poorly differentiated or undifferentiated patients did not reach statistical significance (P>0.05), suggesting that larger sample sizes are needed for further validation. For tumors smaller than 10 mm or located in the floor of the mouth (Figure S2), no significant survival advantage from END was identified regardless of differentiation grade (P>0.05), implying that END may offer limited benefit for this specific subset of patients. These findings should, however, be interpreted with caution, as the statistical power in some subgroups may have been limited. Future multicenter studies with larger and more comprehensive cohorts are warranted to confirm and clarify these preliminary observations.

Discussion

Using data from the SEER database, we examined a large

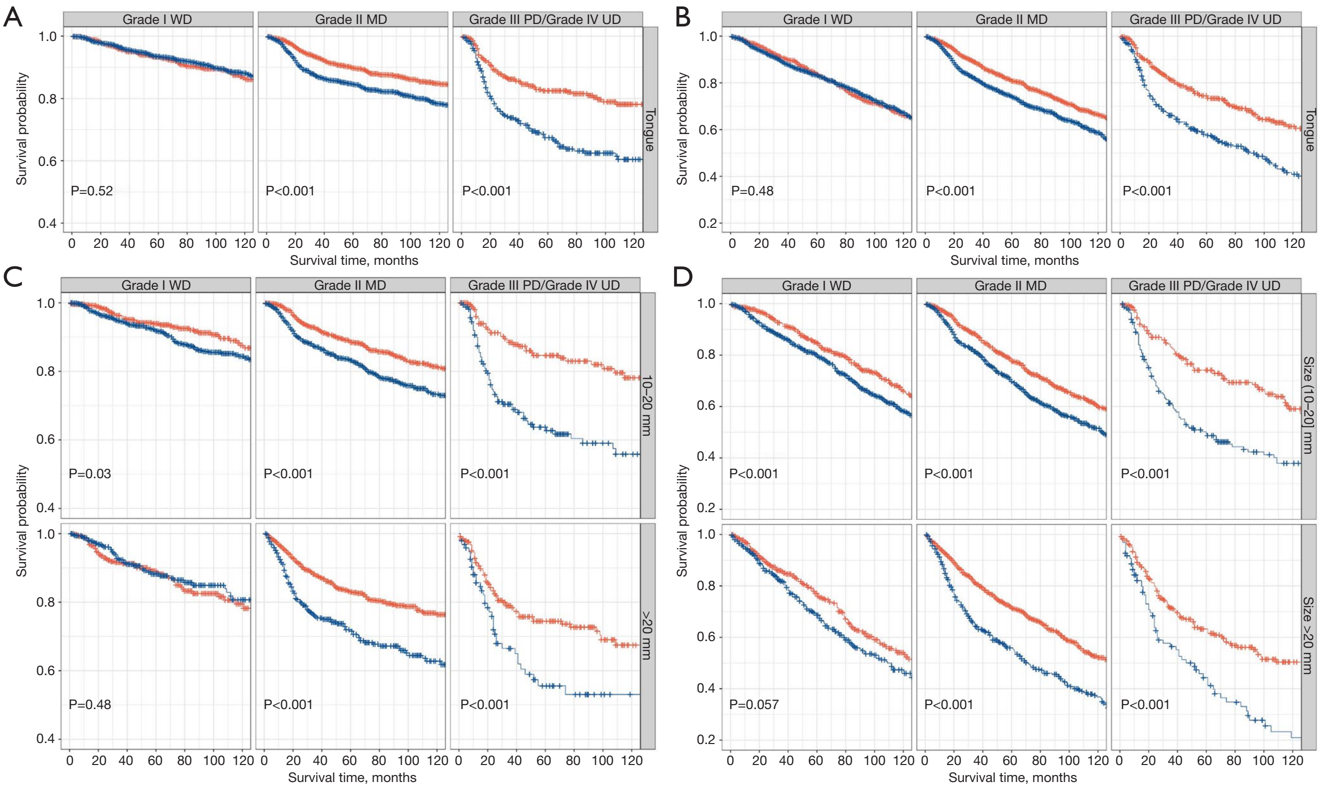

Figure 4 Kaplan-Meier survival curves for CSS (A,C) and OS (B,D), stratified by tumor site and tumor size across different tumor differentiation grades. (A,B) Patients with tumors located in the tongue; (C,D) Patients grouped by tumor size (>10–20 mm and >20 mm, respectively). Red curves indicate patients who underwent END, and blue curves indicate those who did not (no END). P values were calculated using the log-rank test. CSS, cancer-specific survival; END, elective neck dissection; MD, moderately differentiated; OS, overall survival; PD, poorly differentiated; UD, undifferentiated; WD, well differentiated.

cohort of early-stage OSCC patients to assess whether tumor differentiation grade could inform decisions regarding END. Our findings indicated a strong association between tumor grade and END outcomes, underlining their interrelationship. Notably, the benefits of END were not uniform across all early-stage OSCC patients. While END did not significantly improve survival for patients with well-differentiated tumors, those with moderate or poorly differentiated tumors exhibited pronounced survival benefits. Furthermore, tumor site and size proved to be significant factors; for patients with tumors in the floor of the mouth or those measuring less than 10 mm, END provided no survival advantage, regardless of tumor grade.

These findings contribute valuable insights to the ongoing discussion about the role of END in early-stage OSCC management. Previous studies often compared END with either therapeutic neck dissection (TND) or observation strategies for managing the neck in early-stage OSCC, while the selection of optimal treatment strategies remained controversial in clinical practice (12). A prospective randomized trial (PRT) conducted in 1994 involving 67 patients with early oral cavity squamous cell carcinoma (SCC) assessed the indications for END. The study demonstrated that neck dissection is crucial due to its association with improved survival rates and the limited efficacy of salvage treatments compared to those patients undergoing tumor resection alone (13). Another randomized controlled study indicated that early-stage oral cancer patients treated with END alongside local resection have a lower risk of death and recurrence, even with small tumors compared to those who have resection only. Although END patients experienced more facial or neck nerve damage, their quality of life was largely unaffected (14).

Comparisons between END and TND have been extensively investigated. Vandenbrouck *et al.* proposed postponing neck dissection until nodal metastasis becomes apparent in T1-3N0 patients, but recommended END for those who are unable to attend regular follow-ups (15). Retrospective studies have revealed that patients undergoing TND exhibited a higher mortality rate compared to those treated with END (16). In a larger randomized controlled trial (RCT) that included 596 stage I or II OSCC patients, performing END concurrently with tumor resection markedly enhanced OS (17). Moreover, systematic reviews and meta-analyses have consistently affirmed the efficacy of END in reducing nodal recurrence and enhancing disease-free survival (5,6,18,19).

Despite evidence to the contrary, not all findings are consistent. A study by Fakih *et al.* reported no survival advantage for early tongue carcinoma patients undergoing END compared to those who had only the tumor resected, particularly when the tumor depth was less than 4 mm (20). Yuen *et al.* also observed no significant difference in five-year disease-specific survival rates between patients receiving END and those under observation for N0 early tongue carcinoma (21). Additionally, a retrospective analysis of 222 T1/T2 OSCC cases showed equivalent survival rates between patients monitored through observation and those undergoing END (8).

The conflicting evidence poses challenges for clinicians seeking to balance comprehensive neck management against the risks of overtreatment and the potential for undetected metastases. Recently, sentinel lymph node biopsy (SLNB) has been recognized as a less invasive option for evaluating nodal involvement (9). A prospective equivalence RCT by Garrel *et al.* reported that 2-year neck node recurrence-free survival (RFS) rates were comparable between the END and SLNB arms (89.6% *vs.* 90.7%, P<0.01) among patients with T1/T2N0 oral and oropharyngeal cancers, supporting the equivalence of these approaches (22). Additionally, a noninferiority RCT conducted by Hasegawa *et al.* demonstrated that the 3-year OS rates were noninferior between the SLNB and END groups (87.9% *vs.* 86.6%, P for noninferiority <0.001) (23). Both studies imply that SLNB could potentially replace END and diminish postoperative neck functional disability (22,23). However, the limitations of SLNB must be acknowledged, such as its technically demanding and operator-dependent characteristics, and its role primarily as a diagnostic tool, which may not be advantageous for lymph node positive patients who would need two separate surgical interventions (24). A retrospective analysis by Battaglia *et al.* suggested that END combined with intraoperative frozen section could serve as an alternative to SLNB for detecting occult metastasis in T1/T2N0 OSCC patients (25). Therefore, further high-quality evidence is required to ascertain whether SLNB or END constitutes the superior clinical strategy in the management of early-stage OSCC.

Given that END remains the preferred treatment approach for most clinicians managing early-stage OSCC, we aimed to further refine the selection criteria for END to enhance its clinical applicability. Tumor differentiation, a crucial factor influencing prognosis in OSCC, is strongly associated with nodal involvement, recurrence rates, vascular and PNI, OS, and surgical margins (26). Research has demonstrated that patients with moderately and poorly differentiated tumors show higher rates of close (28.4% *vs.* 14.9%) and infiltrated surgical margins (30.5% *vs.* 22.4%) compared to those with well-differentiated tumors (10). Further, studies indicate that poorly differentiated carcinomas are more likely to have close or positive margins at the time of resection and are also more frequently associated with cervical metastasis at diagnosis (27). More significantly, Zhan *et al.* discovered that the incidence of occult nodal disease was substantially higher in moderately (17.5%) and poorly differentiated (28.5%) cT1N0 oral cavity SCC compared to well-differentiated tumors (5.9%), emphasizing tumor differentiation as a valuable tool in preoperative decision making (28).

This study categorized patients according to differentiation grade to enhance the clinical relevance of END. Our data indicate that END is suitable for moderately and poorly differentiated tumors, whereas it may be unnecessary for well differentiated ones. In contrast to previous retrospective analyses based on the SEER database that provided generalized recommendations for T1/T2N0 OSCC patients, our research acknowledges the heterogeneity among subgroups and underscores the importance of differentiation grade as a critical determinant (29-31). These findings refine treatment decision-making and establish differentiation grade as a key criterion for recommending END in early-stage OSCC.

Several limitations inherent to this study should also be noted. For instance, DOI and PNI are well-established prognostic factors for OSCC, closely associated with lymph node metastasis, recurrence, and survival outcomes. These pathological features may also correlate with tumor differentiation and could further refine the decision-making process regarding END. However, the SEER database lacks detailed information on DOI and PNI, which limits our ability to incorporate these important variables into the analysis. Secondly, with multiple subgroup stratifications, instances of insufficient sample size may occur, potentially introducing bias into the results. Consequently, external validation with larger sample sizes is essential for further confirmation. Thirdly, the recording of tumor differentiation is subject to interobserver variability, as it depends on the subjective evaluations of pathologists, which may introduce inconsistencies and bias. In addition, the differentiation grade determined from a preoperative biopsy may differ from that of the final surgical specimen, which could influence the accuracy of using preoperative differentiation to guide END decisions. Lastly, including data on postoperative complications of neck dissection and lymph node metastasis would provide more comprehensive and compelling evidence. Looking forward, establishing multicenter collaborations to build comprehensive clinical and pathological databases including more prognostic variables will be essential to further validate the association between tumor differentiation grade and the role of END.

Conclusions

In conclusion, tumor differentiation and END are critical factors influencing survival outcomes in early-stage OSCC patients. While END is not universally recommended for all cases, it is advised for those with moderately or poorly differentiated tumors through combined tumor resection with END. However, for early-stage patients with well differentiated tumors, simple tumor resection followed by observation may be more appropriate. If END is considered, a comprehensive evaluation of tumor location, size, and DOI is necessary.

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Footnote

Reporting Checklist: The authors have completed the STROBE reporting checklist. Available at https://tcr.amegroups.com/article/view/10.21037/tcr-2025-1593/rc

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Ethical Statement: The authors are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. The study was conducted in accordance with the Declaration of Helsinki and its subsequent amendments. As this study did not involve direct interaction with human subjects and utilized publicly available data from the SEER database, institutional review board (IRB) approval was not required.

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