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Meeting Quality Metrics in Oral Squamous Cell Carcinoma Surgery

A Single-Center Experience

KEYWORDS

Quality metrics
Oral squamous cell carcinoma
Lymph node yield
Lymph node ratio

SUMMARY

Patient-centered quality metrics have been proposed to evaluate and optimize hospital processes, aiming to improve patient outcomes. Furthermore, they can be used to objectively rate and compare the ability of health care providers to meet the needs of their patients. In patients with advanced resectable oral squamous cell carcinoma, optimal surgical treatment of the neck and timely initiation of both surgical and adjuvant therapy, when indicated, are crucial for recurrence-free and overall survival. This retrospective analysis included 160 patients who received primary resection of oral squamous cell carcinoma and concurrent neck dissection. It aimed to investigate how well quality metrics were met during a 6-year period in the department of oral and maxillofacial surgery at a university hospital.

93.1% of patients were seen in the specialist's office within 21 days after referral. Resection was classified as R0 in 94.4%. A lymph node yield ≥ 18 was achieved in 82.5%. The lymph node ratio was $\leq 6\%$ in 43.3% of nodal-positive necks. Readmission and unplanned revision surgery were rare (6.9%). Adjuvant radiotherapy was started ≤ 6 weeks after surgery in 45.3%, and the indication was in accordance with international guidelines in all cases.

Quality metrics are an effective tool for planning process optimization in a hospital. Moreover, nodal quality metrics such as lymph node yield and lymph node ratio could, after validation, complement existing and well-established prognostic parameters for patient-specific adaptation of adjuvant treatment plans.

Introduction

Oral squamous cell carcinoma (OSCC) is a common malignancy. Despite guideline-compliant therapy in specialized centers and by an experienced interdisciplinary team, the prognosis is often poor. Treatment quality can be objectively described by various indicators. Such quality metrics can relate, for example, to treatment outcomes or costs. Patient-centered quality metrics in OSCC surgery usually focus on patient survival and satisfaction.

Recurrence- and progression-free survival in OSCC can be improved by early, well-planned treatment with clear resection margins (R0) and optimal surgical treatment of the neck (neck dissection). Survival is known to be significantly affected by cervical lymph node involvement. The quality of the neck dissection can be measured by the number of cervical lymph nodes harvested (lymph node yield, LNY). A LNY of 18 or more and a maximum of 6% metastatic lymph nodes (lymph node ratio, LNR) is considered by many authors to be a quality standard of prognostic significance (EBRAHIMI ET AL. 2014; DIVI ET AL. 2016; MALLÉN-ST CLAIR 2017; JUDSON 2018). The overall quality of surgical treatment can be estimated by the frequency of unplanned repeat hospitalizations within 14 days and repeat surgeries within 30 days after primary surgery (APPACHI ET AL. 2019). Interdisciplinary collaboration and general patient management can be measured by whether the indication for adjuvant radiotherapy in patients with locally advanced disease was correctly made according to the National Comprehensive Cancer Network (NCCN) guidelines, and whether radiotherapy was initiated within 6 weeks of surgery. The efficiency of in-hospital processes can be assessed, for example, by the time between patient referral and surgery.

The purpose of this study was to evaluate how well our department met the above quality metrics to better understand the feasibility and overall value of analyzing quality metrics in head and neck cancer surgery.

Materials and methods

For this retrospective analysis, the clinical information system of the University Hospital Zurich, Department of Oral and Maxillofacial Surgery, was searched for patients aged 18 years or older who had undergone primary resection of an OSCC and concurrent neck dissection with or without free flap reconstruction between January 2013 and December 2018.

Patients with a synchronous malignancy, prior oral cavity cancer surgery, or an incomplete dataset were excluded from further analysis, as were patients treated with sentinel neck dissection only. Data through January 2021 were included.

All patients were operated on by experienced surgeons according to the standards of our department, which is certified by the German Cancer Society (Deutsche Krebsgesellschaft, DKG). Data on age, gender, malignancy, surgery, and follow-up were obtained from patient charts and surgical reports.

Statistical analyses were performed with SPSS (version 26; IBM Corp., Armonk, NY, USA) and included descriptive statistics.

All patients have signed an informed consent form for further use of their medical data. The relevant ethics committee approved the conduct of this study (KEK Zürich, approval no.: 2019-01852). This study fulfills the criteria of the Declaration of Helsinki.

Results

Patient data

160 patients (95 men, 65 women) met the inclusion criteria, as is shown in Figure 1. Their mean age at diagnosis was 64.6 years (range, 26 to 92 years; median, 65 years).

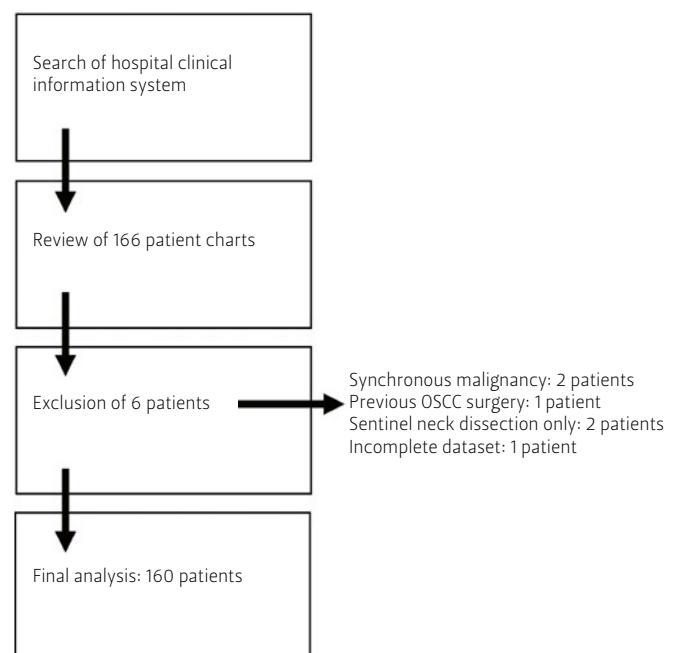


Fig.1 Flowchart showing patient inclusion/exclusion

Smoking and alcohol consumption were prevalent: 105 patients drank alcohol regularly (65.6%), and 118 patients were smokers (73.8%).

OSCC was most frequently found on the tongue with 65 cases (40.6%), followed by the floor of mouth (32 patients, 20%), mandibular gingiva (28 patients, 17.5%), maxillary gingiva (13 patients, 8.1%), and retromolar region (11 patients, 6.9%). Multifocal carcinoma was found in two cases.

107 patients had advanced disease at the time of diagnosis (66.9%). The distribution of pT, pN, and UICC cancer stages is shown in Tables I–III.

Surgery

124 patients (77.5%) were treated with a free flap reconstruction, most commonly with a radial forearm flap (76 patients), fibula flap

Tab.1 Distribution of pT classification

pT stage	pT1	pT2	pT3	pT4	Total
Number of patients	46	47	21	46	160

Tab. II Distribution of pN classification

pN stage	pN0	pN1	pN2a	pN2b	pN2c	pN3	Total
Number of patients	84	27	3	33	10	3	160

Tab. III Distribution of UICC-combined cancer stages

UICC stage	I	II	III	IVa	IVb	Total
Number of patients	30	23	33	72	2	160

Tab. IV Overview: Adherence to quality metrics

Quality metric	Number met	% met
LNY \geq 18	132	82.5
LNR \leq 6%	33	43.4
No re-hospitalization \leq 14 days	149	93.1
No re-surgery \leq 30 days	149	93.1
Correct indication for adjuvant therapy according to NCCN guidelines	160	100
Adjuvant therapy started \leq 6 weeks after surgery if indicated	34	45.3

(26 patients), or anterolateral thigh flap (17 patients). In 5 cases, other flaps (scapula, latissimus dorsi, and sural flap) were used. The remaining patients were eligible for direct defect closure.

69 patients underwent unilateral supraomohyoid neck dissection of levels I–III (43.1%). Unilateral neck dissection of levels I–IV was performed in 59 cases (36.9%), and that of levels I–V in 11 cases (6.9%). In the remaining 21 patients, various combinations of levels were dissected on one or both sides.

Quality metrics

Most patients were referred by dentists, followed by general practitioners and otorhinolaryngologists. All but 23 patients were seen within 14 days of referral (85.6%), and another 12 within 3 weeks. Of the remaining 11 patients, 5 initially refused treatment or presented to another physician beforehand, and 3 had difficulty being brought to our department because they lived in a nursing home. For the remaining 3 patients, the reasons for the delay are unknown. On average, surgery took place 20 days after the first consultation in our office (median, 20 days; range, 6–34 days). When comparing patients with and without free flap reconstruction, there was no statistically significant difference in the timing of surgery, although a tendency toward later surgery was noted when extensive planning for fibula flap reconstruction was required.

Clear resection margins (R0) were achieved in 151 patients (94.4%). 9 resections were classified as R1; there were no R2 resections. A LNY of 18 or more was achieved in 132 patients (82.5%), with a mean of 29 lymph nodes harvested (median, 27; range, 9–82). Lymph node metastases were found in 76 patients (47.5%) with a mean of 3.3 positive lymph nodes (median, 2). Occult metastases were found in 29 of the 100 patients with a clinically nodal-negative neck (cN0). On the other hand, 13 patients with a cN+ neck had no lymph node metastases on histopathologic examination and were downstaged to a pN0 neck.

Extra-nodal extension (ENE) was detected in 29 patients. Among the 76 patients with positive lymph nodes, the mean LNR was 11.5% (mean, 7.4%; range, 2.1–88.9%). A LNR of 6% or less was obtained in 33 patients (43.4%). For a tabular overview, see Table IV.

The length of hospital stay averaged 17.4 days (median, 15 days; range, 4–53 days).

Unplanned readmission within 14 days of discharge was required in 11 cases (6.9%). Unplanned repeat surgery within 30 days of primary surgery was performed in 17 patients. Of these, 11 required surgery under general anesthesia (6.9%): 9 patients required follow-up resection due to an R1 resection margin, and 2 cases required revision of the free flap. The remaining minor unplanned surgeries were due to wound dehiscence or fistula, surgical closure of a tracheostomy, or evacuation of a post-surgical hematoma.

The indication for adjuvant therapy was correctly made according to the NCCN guidelines in all cases. In 8 cases, adjuvant therapy was not started at the patient's request, although it was formally indicated. 75 patients received adjuvant radiotherapy. It was started at a mean of 7.25 weeks after surgery (median, 7.07 weeks; range, 2.18–11.85 weeks). In 34 patients (45.3%), radiotherapy was started within 6 weeks after surgery.

Discussion

In a competitive environment and when treating patients with potentially life-limiting diagnoses, all health care providers must strive for excellence. One means of assuring quality is an independent certification, for example by the DKG. To be certified, centers must meet strict criteria (DEUTSCHE KREBSGESELLSCHAFT 2010). This ensures compliance with expert guidelines such as the “S3-Leitlinie” (LEITLINIENPROGRAMM ONKOLOGIE 2021), which are developed after central multinational evaluation of cancer data (e.g., DÖSAK tumor registry).

Quality metrics have been defined to facilitate the evaluation, comparison, and improvement of a surgical center's treatment processes according to international guidelines. Adherence to quality metrics is associated with improved patient outcomes (GRABOYES ET AL. 2016; LIU ET AL. 2021). Overall, the nodal and process-related quality metrics were well met in our department. Patients were seen shortly after referral, and surgery was performed promptly. Surgical outcomes can be described as excellent, with high R0 resection rates and low complication rates, especially considering flap failures. Evaluation of the quality metrics was feasible as all necessary parameters are documented in the standard medical records. At this time, comparison with other centers is difficult, because to the authors' knowledge, no other center has openly published its current data on adherence to quality metrics.

The underlying high-quality database with comprehensive and complete data makes the results of our study meaningful. A limitation might be found in the inherent selection bias. In our university hospital, patients with advanced disease and therefore more complex treatment plans are disproportionately common. The exclusion of patients with sentinel neck dissection in this study may have further contributed to this problem. The high rate of patients with advanced lymph node involvement (stages pN2b and higher) may explain why the LNR of $\leq 6\%$ was achieved rather rarely. Since the LNY is limited to some degree, the more lymph nodes affected, the higher the LNR is bound to be.

Although the recommended interval between surgery and adjuvant radiotherapy is 6 weeks, radiotherapy was started later in most of our patients. Except for a few rare cases in which delays due to repeated interdisciplinary tumor board meetings or holidays may have played a role, radiotherapy was deliberately postponed. A careful patient-specific benefit-risk analysis is critical when planning any adjuvant therapy. Delayed general recovery after major surgery, wound dehiscence, infection, or the need for prolonged outpatient rehabilitation warrant postponement of radiotherapy. Ultimately, patient-specific treatment planning must be a key objective. Thorough and honest patient information and preparation, involvement of patients and their families in decision-making, and optimal interdisciplinary collaboration can help optimize treatment processes and shorten treatment time.

In addition to quality assessment, some quality metrics may also have prognostic value for patient outcomes (REINISCH ET AL. 2014; HINGSAMMER ET AL. 2019; SHEPPARD ET AL. 2021). The current literature is inconclusive regarding the suitability of LNY and LNR as prognostic factors (JABER ET AL. 2014; DE KORT ET AL. 2019; HUANG ET AL. 2019). Because both LNY and LNR are influenced by many variables, it is advisable to use these parameters in addition to the well-established predictive values for an even more specific risk assessment for each patient (MARRES ET AL. 2014; LIM ET AL. 2017). A follow-up analysis of this extensive dataset, analyzing LNY and LNR as a function of neck dissection type, cancer type, and patient and tumor characteristics, will shed light on this aspect. Evaluation of complication and recurrence rates, as well as survival analyses per subgroups, will provide further helpful insights and will reveal whether adherence to the quality metrics improves patient outcomes as measured by recurrence-free or overall survival. This may contribute to the future use of LNY and LNR as risk stratification tools for individualized treatment-plan adjustment in patients with OSCC.

We encourage other cancer centers to also assess their adherence to the above quality metrics in order to collect and evaluate comprehensive data, aiming to further improve quality of care in the best interest of their patients.

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Zusammenfassung

Einleitung

Trotz leitliniengerechter Therapie ist die Prognose des Mundhöhlenkarzinoms oft schlecht. Rasche, gut geplante Tumorresektion mit freien Schnitträndern (R0) und bestmögliche Behandlung der Halslymphknoten-Stationen (Neck Dissection) mit Entnahme einer ausreichenden Anzahl an Lymphknoten (Lymph Node Yield, LNY) mit geringem Anteil metastatisch befallener Lymphknoten (Lymph Node Ratio, LNR) sind entscheidend für das rezidivfreie Überleben und das Gesamtüberleben.

Qualitätskennzahlen (Quality Metrics) können einerseits zur objektiven Bewertung von Tumorzentren herangezogen werden. Andererseits haben sie nach Ansicht einiger Autorinnen und Autoren auch prognostische Relevanz. Die Einhaltung der Qualitätskennzahlen in der Kopf-Hals-Tumorchirurgie geht mit einem besseren Outcome für die Patientinnen und Patienten einher.

Ziel dieser Studie war es, die Einhaltung nodaler und prozessbezogener Qualitätskennzahlen in unserem Tumorzentrum zu untersuchen und die Eignung dieser Qualitätskennzahlen als Vergleichsmaßstab in der Kopf-Hals-Tumorchirurgie zu prüfen.

Material und Methoden

In die Auswertung wurden 160 Personen (95 Männer, 65 Frauen) eingeschlossen, die zwischen Januar 2013 und Dezember 2018 aufgrund eines Mundhöhlenkarzinoms eine Tumorresektion und gleichzeitige Neck Dissection mit oder ohne Lappenrekonstruktion erhalten haben. Ausschlusskriterien waren synchrone Malignome, frühere Tumoroperationen in der Mundhöhle, unvollständige Datensätze und Durchführung einer alleinigen Sentinel Neck Dissection.

Resultate

93,1% der Patientinnen und Patienten wurden innert 21 Tagen nach Zuweisung durch vorbehandelnden Zahnarzt, vorbehandelnde Hausärztin oder HNO in der Spezialsprechstunde gesehen. Im Durchschnitt konnte die Operation 20 Tage nach Erstkonsultation durchgeführt werden.

Zum Diagnosezeitpunkt hatten 107 Personen (66,9%) ein fortgeschrittenes Tumorstadium. In 124 Fällen wurde eine Defektdeckung mittels freier, mikrovaskulär anastomosierter Lappenplastik (meist Radialislappen oder Fibulalappen) vorgenommen. Die Neck Dissection umfasste mehrheitlich die Levels I–III (43,1%), I–IV (36,9%) und I–V (6,9%).

Die R0-Resektion gelang in 151 Fällen (94,4%). Der LNY betrug 18 oder mehr Lymphknoten in 132 Fällen (82,5%). 76 Betroffene hatten metastatisch befallene Halslymphknoten (47,5%), das mittlere LNR betrug 11,5%. Ein LNR $\leq 6\%$ wurde in 33 Fällen erzielt (43,4%). Ungeplante Reoperation innert 30 Tagen nach Primäreingriff und ungeplante Rehospitalisation waren selten (6,9%). Die Indikation für die adjuvante Radiotherapie war in allen Fällen leitliniengerecht nach den Guidelines des National Comprehensive Cancer Network (NCCN). 75 Patientin-

nen und Patienten wurden adjuvant bestrahlt, die Radiotherapie wurde in 45,3% der Fälle ≤ 6 Wochen nach Operation begonnen.

Diskussion

Die Qualitätskennzahlen wurden an unserer Klinik insgesamt gut erreicht. Betroffene Personen wurden nach der Zuweisung rasch in der Spezialsprechstunde gesehen und zügig und qualitativ hochstehend operiert (hoher Anteil R0-Resektionen, wenig Komplikationen). Die Erhebung der Qualitätskennzahlen gelang problemlos, da alle notwendigen Daten routinemässig in den Patientenakten dokumentiert sind. Dank der Vollständigkeit der Datenbank sind unsere Ergebnisse aussagekräftig. Eine Limitation ist der inhärente Selection Bias: An einer Universitätsklinik werden überproportional viele Patientinnen und Patienten mit fortgeschrittenen Tumorstadien und komplexen Therapien behandelt. Der hohe Anteil an Betroffenen mit ausgedehntem Lymphknotenbefall könnte erklären, warum das LNR in eher wenigen Fällen $\leq 6\%$ war. Die Radiotherapie wurde oftmals mehr als 6 Wochen nach Primäroperation begonnen. Dies ist nur in den wenigsten Fällen durch Prozessfehler zu begründen; meist wurde der Beginn der Radiatio nach individueller Nutzen-Risiko-Analyse bewusst verschoben. Eine patientenspezifische Anpassung der adjuvanten Therapie unter engem Einbezug der Patientinnen und Patienten und ihrer Angehörigen muss Ziel einer modernen Tumorthherapie sein. LNY und LNR könnten sich in Zukunft als Tool zur Risikostatifizierung etablieren. Der prognostische Wert der Qualitätskennzahlen wird noch kontrovers diskutiert. Eine Folgestudie soll zeigen, von welchen Faktoren LNY und LNR abhängen und inwiefern sie das Überleben beeinflussen. Es ist wünschenswert, dass auch andere Zentren ihre Qualitätskennzahlen offenlegen, um durch besseres Verständnis der Tumorthherapie die Behandlung im Sinne der Betroffenen zu optimieren.

Résumé

Introduction

Malgré un traitement conforme aux directives internationales, le pronostic du cancer de la cavité buccale est souvent mauvais. Une résection tumorale rapide et bien planifiée en marge saine (R0), ainsi que le traitement optimal des aires ganglionnaires cervicales (« neck-dissection ») comprenant un curage ganglionnaire suffisant (lymph node yield, LNY) avec un faible envahissement ganglionnaire (lymph node ratio, LNR) sont décisifs pour la survie sans récurrence et la survie globale.

Les indicateurs de qualité (« quality metrics ») peuvent d'une part être utilisés pour évaluer objectivement les centres d'oncologie. D'autre part, selon certains auteurs, ils ont également une pertinence pronostique. Le respect des indicateurs de qualité dans la chirurgie des tumeurs de la tête et du cou s'accompagne d'un meilleur résultat pour les patients.

L'objectif de cette étude était d'examiner le respect des « quality metrics » liés au traitement des sites ganglionnaires et liés à la prise en charge des tumeurs dans notre centre universitaire, puis d'évaluer la pertinence de ces indicateurs de qualité comme critère de comparaison dans la chirurgie tumorale de la tête et du cou.

Matériels et méthodes

L'évaluation a porté sur 160 patients (95 hommes, 65 femmes) qui, entre janvier 2013 et décembre 2018, ont été opérés d'une

résection tumorale et d'un curage ganglionnaire cervical simultané avec ou sans reconstruction par lambeau en raison d'un carcinome de la cavité buccale. Les critères d'exclusion étaient les malignités synchrones, les opérations antérieures de tumeurs dans la cavité buccale, les dossiers incomplets par données manquantes et la réalisation d'une technique du ganglion sentinelle seule.

Résultats

93,1% des patients ont été vus en consultation spécialisée dans les 21 jours suivant l'envoi par leur dentiste, médecin généraliste ou ORL. En moyenne, l'opération a pu être réalisée 20 jours après la première consultation.

Au moment du diagnostic, 107 patients (66,9%) étaient à un stade avancé de la tumeur. Dans 124 cas, la reconstruction a été réalisée par une plastie par lambeau (généralement un lambeau radial ou un lambeau de fibula). La dissection du cou comprenait majoritairement les niveaux I-III (43,1%), I-IV (36,9%) et I-V (6,9%).

La résection R0 a été réalisée dans 151 cas (94,4%). Le LNY était de 18 ganglions lymphatiques ou plus dans 132 cas (82,5%). 76 patients présentaient un envahissement ganglionnaire cervical (47,5%), le LNR moyen étant de 11,5%. Un LNR $\leq 6\%$ a été obtenu dans 33 cas (43,4%). Les réinterventions non planifiées dans les 30 jours suivant l'intervention primaire et les réhospitalisations non planifiées étaient rares (6,9%). L'indication de la radiothérapie adjuvante était dans tous les cas conforme aux directives internationales (NCCN). 75 patients ont reçu une radiothérapie adjuvante; la radiothérapie a débuté dans 45,3% des cas ≤ 6 semaines après l'opération.

Discussion

Dans l'ensemble, les indicateurs de qualité ont été bien atteints dans notre clinique. Les patients ont été vus rapidement à la consultation spécialisée et ont été opérés avec un haut niveau de qualité (résections R0, peu de complications). Le relevé des « quality metrics » s'est déroulé sans problème, car toutes les données nécessaires sont documentées de manière systématique dans les dossiers des patients. Grâce à l'exhaustivité de la base de données, nos résultats sont significatifs. Une des limites peut être le biais de sélection; en effet un nombre plus élevé de patients sont traités avec des tumeurs à un stade avancé et des thérapies complexes en établissement universitaire. La proportion élevée de patients avec une atteinte étendue des ganglions lymphatiques pourrait expliquer pourquoi le LNR était $\leq 6\%$ dans plutôt peu de cas. La radiothérapie a souvent été débutée plus de six semaines après l'opération primaire. Cela ne s'explique que très rarement par des erreurs de gestion; la plupart du temps, le début de la radiothérapie a été délibérément reporté après une analyse individuelle des bénéfices et des risques. L'objectif d'un traitement moderne des tumeurs doit être d'adapter le traitement adjuvant en fonction du patient, en association étroite avec les patients et leurs proches. Les indicateurs LNY et LNR pourraient s'établir à l'avenir comme outil de stratification des risques. Cependant leur valeur pronostique fait encore l'objet de controverses. Une étude de suivi doit montrer de quels facteurs dépendent le LNY et le LNR et dans quelle mesure ils influencent la survie. Il est souhaitable que d'autres centres publient également leurs indicateurs de qualité afin d'optimiser la prise en charge grâce à une meilleure compréhension du traitement des tumeurs, ceci dans l'intérêt des patients.

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