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Reconstruction of the maxilla and midface – Surgical management, outcome, and prognostic factors

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SUMMARY

Loss of the maxilla due to tumor ablation has both functional and aesthetic consequences. Even small defects become obvious because of missing bone and soft tissue. Reconstruction of the maxilla and midface in these patients presents a challenge to the surgeon although several possibilities are available for this purpose. The long term benefit to patients of the different modalities remains unclear due to wide individual variation.

One hundred and twenty-one patients with maxillary oral squamous cell carcinoma were treated with curative intent. One hundred and five patients were surgically reconstructed using local or free microsurgical flaps. All parameters were collected from case records. Kaplan–Meier plots and univariate log-rank test and multivariate Cox proportional hazards regression models were used to determine the association between possible predictor variables and survival time of patients suffering from oral squamous cell carcinomas.

After controlling for age, resection margins, nodal stage, and surgical management, which were independent and dependent predictors of survival, the type of reconstruction and involvement of surgical margins were associated with survival (HR = 0.50, $p = 0.044$, 95% CI, 0.25–0.98 and HR = 3.16, $p = 0.007$, 95% CI, 1.38–7.25).

Various types of maxillary defects can be reconstructed successfully using different reconstructive techniques. The size and complexity of defects does not correlate with prognosis in oral squamous cell carcinoma patients. The criteria for reconstruction with a free flap were based on extensive defects in which local flaps were insufficient, on medical co-morbidities, and previous treatment.

Introduction

The reconstruction of bony defects due to tumor resection in the head and neck area presents a challenge to the surgeon for both functional and aesthetic reasons. The mandible and the maxilla are important for occlusion, mastication and articulation and for shaping the contours of the midface. Unfortunately, even small defects of the maxilla are clearly visible and lead to an asymmetric appearance of the facial contours. The basic principles of reconstruction require the presence of a healed wound, separation of the oral and nasal cavities, restoration of the orbital contents and maxillary buttresses, restoration of functional dentition, mastication and deglutition, and restoration of the midfacial contours.[1,2]

Several options are available for the reconstruction of maxillary defects. Maxillary prostheses, local pedicled flaps, soft tissue free flaps and vascularized bone flaps are suitable for reconstruction.[1,3,4] The recipient sites vary widely depending on the defects size and complexity and the recipient bed, which can be surrounded by healthy tissue or contain large resections and irradiated tissue. Large defects in particular, call for microvascular anastomosed bone flaps with a skin or muscle paddle to achieve a good functional and aesthetic outcome.[5] These free composite flaps provide a sufficient bone length and reliable wound healing even at complicated recipient sites.

In the present report different defects and techniques of surgical reconstruction are evaluated over a 10-year period. The use of the obturator prosthesis, local flaps and a range of microvascular free flaps are presented. Functional and aesthetic recovery was evaluated. In addition, patients suffering from oral squamous cell carcinoma (OSCC) were reviewed for survival controlling for demographic, clinical, and tumor characteristics.

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Patients and methods

Subjects were recruited from the Department of Oral and Maxillofacial Plastic Surgery of the Ruhr-University Bochum treated during 2000–2006 and from the Technische University of Munich from 2006 to 2009. Between these time periods, a total of 121 patients were treated. Staging was complemented after incisional biopsy by computed tomography (CT) or magnetic resonance imaging (MRI), skeletal scintigraphic surveys, sonography, gastroscopy, bronchoscopy, and thoracic X-ray. Thoracic or abdominal CTs were performed if suspicious lesions were detected.

All patients were treated with curative intent and the aim of complete surgical resection. The histological assessment was conducted by two independent pathologists, one being a senior consultant or the chief of the institute of pathology. Supraomohyoid neck dissections (level I–III) were performed in clinically palpable or radiologically enlarged cervical lymph nodes (>1 cm). If the intraoperatively performed instantaneous sections of echelon lymph nodes showed positive involvement in level III, the neck dissection was extended to levels IV and V. When gross metastases with infiltration of adjacent structures were present in the neck, a comprehensive dissection (classic radical or modified radical neck dissections if possible) of all five levels of lymph nodes were performed.[6,7]

Postoperative radiotherapy was employed, directed at the primary site and draining lymphatic areas in the neck if positive lymph nodes were present on the basis of consensus reached by a Tumor Board conference. In both centres the dose schedules and treatment modalities were the same, depending on the typical regimen used a three-field method including bilateral parallel opposed fields to the primary site and upper neck. Chemoradiotherapy was performed in most palliative cases if possible, but not in the adjuvant therapy regimen, because this modality was preserved for patients with recurrences or OSCC arising at a different site in the head and neck region.[8] Representative doses to the primary site and neck were between 54 and 71 Gy maximum doses delivered for the patients.

Inclusion criteria were: defect at the maxilla or midface resulting in defects of the vertical dimension $\geqslant 2$ according to the classification of Brown.[9] Recorded parameters included: demographic features, extension of defects, histopathology, grade, stage, and presence of regional or distant disease, type of surgical procedure and reconstruction, margin status, outcome, and survival duration after completion of treatment.

Data analysis

Descriptive statistics for quantitative variables are given as the mean ± standard deviation. If appropriate, medians and ranges were also computed.

For outcome analysis the overall survival in months and 5-year overall survival were used as dependent variables. Only patients who underwent an operative treatment were analyzed. The overall survival was assessed after completion of treatment. Associations of possible predictor variables with the dependent variable, survival, were determined using the Kaplan–Meier estimator and univariate log-rank test. The Kaplan–Meier method was used to plot survival curves for defect dependent categories as prognostic factors. *p*-Values are two-sided and subject to a global significance level of 0.05. *p*-Values given are unadjusted for the issue of multiple testing.

The data were analyzed with the "Statistical Package for the Social Sciences" (SPSS for Windows, release 16.0.0. 2008, SPSS Inc.). Figures are generated with SPSS and Microsoft® Office Excel (Microsoft Excel for Windows, release 11.0, 2003, Microsoft Corporation).

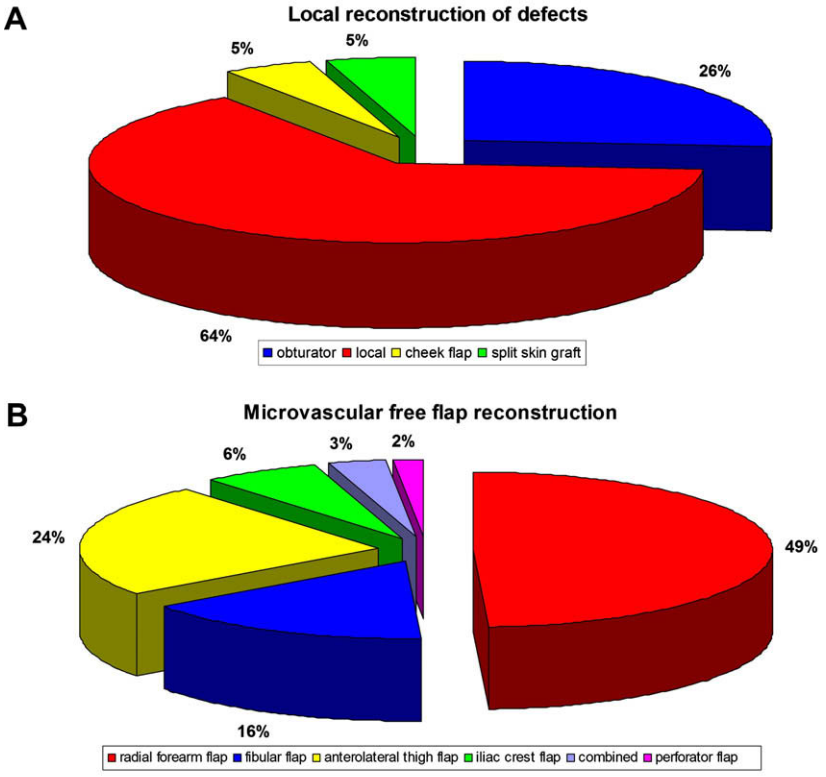

Figure 1 Distribution of patients treated with local and regional pedicled flaps (A) and defect reconstruction with microvascular free flap transfer (B).