Staged surgical therapy of basal cell carcinoma of the head and neck region: an evaluation of 500 procedures

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Summary

Questions under study/principles: The surgical therapy of basal cell carcinoma (BCC) is especially demanding in the facial area. This retrospective study was undertaken to evaluate the outcome of staged surgical therapy (SST) of BCC of the head and neck region performed on an interdisciplinary basis at our institution.

Methods: Patients treated for BCC in the head and neck area between 1/1/1997 and 31/12/2001 were included in the study. The lesions were histologically evaluated. Diameter of lesion, number of stages, defect coverage, operation time, recurrence and infection rates were analysed using descriptive and inferential statistical procedures.

Results: 281 patients were included in the study. SST was performed in two stages in 43.7%, in three stages in 12.9% and in four or more stages in 2.7%, depending on the type of tumour and the patient’s pretreatment status. The total operating time per lesion averaged one hour. Defect coverage was achieved by direct closure (37.7%), by full thickness skin graft (39.5%), by split skin graft (1.1%), by local flaps (20.3%) or by composite grafts (1.1%). Median follow-up time was 58.5 months. Low rates of recurrence (3.6%) and infection (2%) were observed with this technique.

Conclusions: The staged surgical therapy of basal cell carcinoma evaluated here offers a series of advantages in respect of patient comfort and economy, while allowing precise histological safety with low infection rates and reliable long-term results.

Key words: staged surgical therapy; basal cell carcinoma; head and neck region; skin cancer

Introduction

Malignant cutaneous lesions of the face, head and neck area are of particular importance in the fields of plastic and reconstructive surgery, dermatology, ear, nose and throat (ENT), maxillo-facial and general surgery. Patients fear the lifelong stigmata associated with visible postoperative scars and deformities. Surgeons face the problem of removing sufficient tissue to ensure oncologically sound treatment [1], while avoiding an unnecessarily large excision with its avoidable sequel [2, 3]. Mohs’ description of micrographic surgery was a milestone, especially in treating lesions of the face, in striking an optimal balance between sufficient resection and unnecessary trauma [2–4] via repetitive tangential excisions and immediate histological evaluation of the resection margins [5–7]. This approach requires, however, lengthy and unpredictable operating theatre time and the personnel resources of highly-trained specialists. Hence it becomes costly [8, 9] and remains limited to only a few specialised centres.

In theory, the staged surgical therapy (SST) approach offers similar advantages to Mohs’ micrographic surgery (MMS) in terms of histological safety of the resection margins while allowing optimal planning of surgical procedures with little manpower and predictable operating theatre time allocation. The risk of wound infections is believed to be low in the well-vascularised region of the face, head and neck, which is thus particularly suitable for the staged surgical approach involving a period of open wound treat-
Patients and methods

The study was conducted on all patients treated surgically for basal cell carcinoma (BCC) of the face, head or neck at Inselspital University Hospital between January 1997 and December 2001. This retrospective time frame allowed an appropriate follow-up period. Exclusion criteria were incomplete records, genetically predisposing disorders with more than 5 BCCs, BCCs exceeding 6 cm in diameter and basosquamous lesions and radiation therapy. Additionally, patients with more than five lesions in the same body area were excluded since the distinction between recurrences and new primary lesions in the same body area is unreliable.

Tumours were assessed under optimal operating-theatre lighting and 2.5x loupe magnification, and the clinical margin of the BCC was marked in ink. An appropriate excision margin of 3–5 mm was then drawn around the BCC area. The tumour was excised under local anaesthesia following the marked line. The specimens were oriented with a marker suture and fixed in formaldehyde for histological evaluation.

Histological examination was performed following ink marking by serial transverse blocking of the specimen, processing and embedding into wax blocks. Histology reports were issued with additional schematic line drawings for surgeon orientation. In cases with positive histological margins (incomplete BCC excision) surgery was performed again and the tissue specimen was analyzed as described above. Final defect closure or coverage was performed only following histological confirmation of tumour-free surgical margins. In the local health system, follow-up was performed both at the Inselspital University Hospital and by the referring dermatologist, who would re-refer the patient in the event of BCC recurrence, thus giving the patient the benefit of a close network of postoperative reassessment.

The data analysis included descriptive statistics of means (with standard deviation) or medians (with range), depending on the data distribution. Non-parametric tests (Wilcoxon or Kruskal-Wallis) were used to compare means. Differences in tumour diameters of different tumour types were assessed with linear models. The Bonferroni procedure was used to adjust for the problem of multiple comparisons. Homogeneity of variance for the groups was assessed by the Levene test.

Logistic procedures were used to analyse the following discrete data:

- Number of stages (Poisson distribution)
- Recurrences and infections (binary distribution)
- Pretreatment status (binary distribution).

In the Poisson model the numbers of stages were rescaled, starting with zero (equivalent to one stage, representing 40.9%). The models accounted for multiple lesions in a patient and were adjusted for age and gender. Statistical analysis was performed with SAS 9.1 (SAS Institute Inc., Cary, NC, USA) and the level of significance was set at 0.05 throughout the study.

Results

During the study period a total of 292 patients were treated surgically for BCC lesions in our unit. Of these, 228 patients’ records met the inclusion criteria outlined above.

The gender distribution was equal, with 111 male and 117 female patients. The median age was 74 years (range: 26–97) with only 8% of the treated patients under 45 years of age at the time of the first excision. The patients’ profession was recorded in 123 patients and was in most cases, surprisingly (86.2%), an indoor activity. In these patients, 281 basal cell carcinoma lesions were excised from the head and neck area. The majority of patients (83.3%) presented with only one basal cell carcinoma, while 11.4% presented with two lesions, 3.9% with three and only 1.3% with four or five (fig. 1).

The mean tumour diameter was 11.32 mm (±8.43 mm). Surgical records showed the tumour diameter to be larger than 20 mm in only 9.8% of cases. The localisation was in the non-hair bearing areas of the head and neck in 97.5%, with a strong prevalence in the nasal (27.0%) and frontal (21.4%) areas. Other frequent localisations were the cheek (15.3%), eyelids (12.1%), ears (7.5%) and neck (7.5%), while the lips (5.3%), scalp (2.5%) and chin (1.4%) were less frequent sites of occurrence (fig. 2).

The histological types of basal cell carcinoma were solid in two thirds of cases (66.2%) and infiltrative in 17.1%, while 7.1% of the lesions were combined. In 9.6% of cases the histology report did not clearly specify the subtype of the lesion.
The tumour diameter did not vary significantly between different histological types of basal cell carcinoma (table 1).

Single stage procedures were performed in 40.9% of cases in situations where a primary temporary closure was possible without undermining the wound edges. Multiple stage surgical therapies were performed in two stages in 43.1%, required three procedures in 13.2% and were completed after four or more procedures in 2.8% of lesions. The resulting total of 500 procedures represents a mean of 1.8 procedures for each tumour, irrespective of the initial tumour diameter (fig. 3).

In the logistic regression model, the combined subtype required significantly more (p = 0.021) and the solid type significantly fewer (p = 0.0330) surgical excision stages than other subtypes (table 2).

The resulting defect had a median diameter of 2.5 cm following histologically proven complete excision. This finding is in agreement with the prevalent lesion diameter of 2 cm or below in 90% of cases. The recorded safety margins following staged excision reached a median of 2.45 mm (range: 1.8 to 4.3 mm).

Soft tissue defect coverage was performed by various techniques, in accordance with the steps of the reconstructive ladder in plastic surgery (table 1). No free flap transfer was necessary in these patients, in line with the explicit inclusion criteria of lesions less than 6 cm in diameter. The additional median operating time for each lesion was just above one hour (65 minutes, range: 23–146 minutes) and included the first excision, all necessary secondary excisions and the final reconstruction regardless of the degree of complexity.

The observed infection rate was low (1.3 % of patients or 2% of lesions) in spite of the necessary intermittent open wound treatment between surgical stages.

The recurrence rate was 3.6% (10 out of 281 lesions) and its incidence was equally divided among the various aesthetic units of the face. The ear showed the highest recurrence rate of 9.5%. The recurrent lesions measured only a median 5 mm in diameter, which underlines the success of careful follow-up by specialists. Immunosuppressed patients (3.9%) did not have a higher incidence of lesions (p = 0.8235, corrected for age and gender) or a higher recurrence rate (p = 0.2792). The duration of the immunosuppression preceding surgery (median 26 months) did not correlate significantly with the incidence of BCC lesions in this small group.

A second patient subgroup of particular interest was the “pretreated” group. These 49 patients (21.5%) had undergone a surgical procedure on a facial BCC lesion at least once (i.e., by the attending physician) prior to referral to our centre. The histological subtypes of BCC and the recurrence rates of this subgroup did not differ statistically.

### Table 1

<table>
<thead>
<tr>
<th>Number of lesions (%)</th>
<th>Basal cell carcinoma subtype</th>
<th>Combined</th>
<th>Undefined</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Solid</td>
<td>Infiltrative</td>
<td>186 (66.2)</td>
<td>48 (17.1)</td>
</tr>
<tr>
<td>Diameter of tumour mm (mean, SD)*</td>
<td>10.66 (± 7.81)</td>
<td>13.76 (± 11.25)</td>
<td>12.41 (± 7.48)</td>
<td>10.86 (± 7.24)</td>
</tr>
<tr>
<td>Number of stages performed (mean, SD)</td>
<td>1.63 (± 0.73)</td>
<td>1.92 (± 0.77)</td>
<td>2.80 (± 1.15)</td>
<td>2.00 (± 0.92)</td>
</tr>
</tbody>
</table>

**Defect coverage techniques:**

- Direct closure: 86 (81%) 11 (10%) 4 (4%) 5 (5%) 106 (37.7%)
- Full thickness skin graft: 62 (56%) 24 (21.5%) 11 (10%) 14 (12.5%) 11 (39.5%)
- Local flap: 15 (63.5%) 10 (17.5%) 4 (7%) 8 (14%) 17 (20.3%)
- Composite graft: 1 (33.3%) 2 (66.6%) 0 0 3 (1.1%)
- Split thickness graft: 1 (33.3%) 1 (33.3%) 1 (33.3%) 0 3 (1.1%)
- Secondary healing: 0 0 0 0 0

*There were no statistically significant differences between the initially measured tumour diameters of the different histological BCC subtypes (p = 0.275; Levene Test)
from those in the overall patient group. This group represents two thirds of all patients undergoing three or more surgical stages. The Poisson model showed that these patients required significantly (p = 0.0013) more stages for complete surgical therapy than patients treated primarily at our institution (table 2).

<table>
<thead>
<tr>
<th>Estimate</th>
<th>Standard error</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept 0.3403</td>
<td>0.611</td>
<td>0.5776</td>
</tr>
<tr>
<td>Tumour diameter 0.0116</td>
<td>0.0073</td>
<td>0.1107</td>
</tr>
<tr>
<td>Age 0.0001</td>
<td>0.0045</td>
<td>0.9784</td>
</tr>
<tr>
<td>Gender (ref. = “female”) -0.0247</td>
<td>0.1308</td>
<td>0.8504</td>
</tr>
<tr>
<td>Immunosuppression (ref. = “no”) 0.1007</td>
<td>0.4513</td>
<td>0.8235</td>
</tr>
<tr>
<td>Pretreatment (ref. = “no”) 0.4474</td>
<td>0.139</td>
<td>0.0013</td>
</tr>
</tbody>
</table>

Table 2: Parameter estimates of variables for the number of staged surgery.

Note: The undefined group was set to value zero for statistical comparison between the various groups.

Discussion

The worldwide rise in the incidence of malignant cutaneous lesions [11, 12] calls for medically and oncologically appropriate treatment for these growing patient numbers at a time of downward pressure on health expenditures, when all treatment costs are subject to close cost accounting and specialised personnel are becoming scarce. Although Mohs’ micrographic surgery [7] is known to strike a perfect balance between sufficient tissue excision and limited collateral damage, especially in the visible areas of the face, head and neck, similar cost effective treatment modalities like the staged surgical therapy presented here should be evaluated with respect to their efficacy in tumour treatment [8, 13, 14].

The current study shows that staged surgical therapy is very similar to MMS in terms of oncological safety [15], while offering significant advantages in operative planning, cost and resource availability [8], elements essential for smaller centres and varied surgical disciplines.

The technique evaluated is not new and must be clearly differentiated from single surgical excision with immediate closure [2, 16–18]. The most frequently performed comparative studies have focused on MMS versus surgical excision with immediate wound closure [19], without a knowledge of histological safety margins. There are inherent issues surrounding surgical closure over an incompletely excised lesion with a subsequently higher rate of recurrence due to iatrogenic spread of malignant cells.

The oncologically important issue of tumour free excision margins prior to defect closure is addressed in the staged surgical technique, in which risks of iatrogenic spread are minimised by leaving the wound open with appropriate wound care until final histology reveals clear safety margins and defect coverage can be performed. Both the oncological and the cosmetic advantages of SST over single stage surgical excision with immediate closure become evident if one compares the resection safety margins [2] and the outcome in terms of recurrence [20], not to mention the need for revision of closed wounds in the case of incomplete excisions [3, 8].

A possible drawback of SST when compared to other therapies [3, 8] could lie in the open wound therapy required throughout the treatment from the first surgical step of lesion excision to the final step of defect coverage. Hence an important parameter for risk/benefit calculation in the assessment of SST is the rate of infection, which was observed in only 2% of lesions treated. None of the patients with infections needed to undergo larger excisions or additional surgery, since the wounds were open and could easily be treated topically or through systemic antibiotic coverage. The resultant delay in treatment has never exceeded one week in any of these four patients. This positive finding might well be explained by the particularly good perfusion pattern of the soft tissues of the head and neck area, which also allow excellent healing in older or even immunosuppressed patients.

An interesting sidelight from the data presented in this study is the high incidence of BCC in patients with an indoor occupation compared to patients with an outdoor occupation. Possible explanations for this are either the fall in the percentage of persons performing outdoor jobs in recent decades, optimised protection in outdoor jobs or – the most likely explanation – that the data refer to the UV-irradiation toll of outdoor hobbies in patients with indoor jobs.

The limitations of this study should be noted. It was conducted as a single Swiss centre retro-
Staged surgical therapy of BCC

Staged surgical therapy is a simple and reliable surgical approach able to achieve oncologically therapeutic results similar to the "state of the art" Mohs’ micrographic surgery for patients with BCC of the head and neck area. Staged surgical therapy can be adopted by varied surgical disciplines in small hospital centres thanks to its ready availability, low costs and predictability of operative duration and resource planning, warranting broad clinical use for the benefit of the patient in need.

Conclusions

Staged surgical therapy is a simple and reliable surgical approach able to achieve oncologically therapeutic results similar to the "state of the art" Mohs’ micrographic surgery for patients with BCC of the head and neck area. Staged surgical therapy can be adopted by varied surgical disciplines in small hospital centres thanks to its ready availability, low costs and predictability of operative duration and resource planning, warranting broad clinical use for the benefit of the patient in need.

References


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