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ORIGINAL RESEARCH ARTICLE

An evaluation of the scapular osseous free flap in maxillary reconstruction using the FACE-Q Head and Neck Cancer Module for patient-reported outcome measures

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ABSTRACT

Introduction: Health-related quality of life (HR-QoL) outcomes following maxillary reconstruction with the scapular osseous free flap (SOFF) are lacking.

Material and Methods: To determine these outcomes, a study of patients who completed maxillary reconstruction with flap survival of the SOFF between 2016 and 2023 was conducted, using Face-Q Head and Neck Cancer Module (FACE-Q).

Results: Eligible patients had at least six months of follow-up. Twenty questionnaires were completed (100% response rate). Median age was 59 years, 80% were male, and 90% were being treated for malignant disease. Overall, best scores were reported in the facial appearance and experience of care domain. Furthermore, the worst scores were reported in the facial function domain. Subgroup analysis focused on the following three specific surgical outcomes; dental rehabilitation, oronasal fistula and eye-related problems. A better score, though non-significant, in facial function was recorded in the dental rehabilitation group, (70±23 vs. 40±34, p = 0.089). A tendency towards worse facial function regarding eating and drinking was noted in the fistula group (49±14 vs. 56±23, p = 0.468). Patients suffering from eye-related problems reported marginally worse facial appearance scores, (79±21 vs. 68±19, p = 0.289).

Conclusion: In 20 patients who completed maxillary reconstruction with flap survival of the SOFF, the group reported the best scores in the facial appearance and experience of care domain.

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Introduction

Midface reconstruction of tumour- or trauma-related defects is one of the most challenging problems in reconstructive surgery. One of the fundamental problems with reconstructing the maxilla is the significant variability in defects resulting from tumour resection or trauma mechanism. Moreover, the rarity of maxillary cancers has constrained comprehensive studies to a limited number of centres [1–3].

Midface reconstruction attracts controversy, not only because of the many reconstructive options but also because dental prostheses can be very successful in selected cases [1]. Comparative studies between obturators and free flap reconstruction have demonstrated similar outcomes for smaller defects, while favouring microvascular free flap reconstructions for larger defects [4, 5]. Furthermore, patient-reported health-related quality of life (HR-QoL) outcomes are generally better for midface reconstruction with free flaps than obturator rehabilitation [5, 6].

Various free flaps, both osseous and soft tissue, have been delineated for maxillary reconstruction, with the optimal choice remaining a subject of debate. The SOFF has a long pedicle, good bone volume, several soft tissue options and low donor site morbidity and is therefore a good option [1, 7, 8]. However, to our knowledge, HR-QoL is not available for this free flap in midface reconstruction. The importance of explaining the options to patients so they can provide appropriate informed consent cannot be overemphasised. Patient-reported outcome measures (PROM) represent an important tool in this quest.

The FACE-Q Head and Neck Cancer Questionnaire (FACE-Q) developed by Cracchiolo et al. is a head and neck cancer-specific PROM which is used in various countries [9]. This is the first time FACE-Q has been used in its Swedish translation.

At Skåne University Hospital, a tertiary referral institution, the SOFF was introduced for maxillary reconstruction in 2016. A prior publication detailed outcomes from 42 patients: 29 with maxillary and 13 with mandibular reconstructions. The maxillary cohort experienced a high complication rate [10].

The present study uses the FACE-Q to evaluate PROM in a population-based cohort of patients who completed maxillary reconstruction with flap survival of the SOFF. Furthermore, we aim to conduct a subgroup analysis focusing on postoperative outcomes and complications and their correlation to PROM scores.

Materials and methods

Study design and cohort

This was a population-based study with obtained ethical approval. All living patients who had completed maxillary reconstruction, and flap survival, with the SOFF at the Dept. of Otorhinolaryngology-Head and Neck Surgery at Skåne University Hospital, Sweden from November 2016 to March 2023 were invited to fill out the FACE-Q when they had been followed for at least 6 months after the surgery. The patients were invited to participate either during routine

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follow-up appointments or by written invitation. The questionnaires were not anonymised. However, results were not available to health professionals involved in patient care.

Demographic and medical history

Demographics and clinical history were collected from medical charts. Sex, age, indication for reconstruction, time since surgery, history of malignancy, smoking history, tumour staging (if applicable), and additional therapy (radiotherapy [RT] or chemotherapy (c)RT) were collected. Survival data was obtained from the Swedish Population Register.

FACE-Q Head and Neck Cancer Module

The FACE-Q is a 102-item questionnaire measuring functional, psychosocial, and experiential outcomes across 14 scales: eating, oral competence, salivation, speaking, swallowing, smiling, appearance, drooling distress, eating distress, appearance distress, smiling distress, speaking distress, cancer worry, and satisfaction with information. Validation statistics of the FACE-Q demonstrate good psychometric properties. The answers from each scale must be converted using a conversion table to obtain the final score. Scores range from 0 to 100 points, with higher scores indicating better outcomes (except for the cancer worry scale, where higher scores indicate more worry) [9].

Definitions and assessments by the surgical team

All patients with malignant tumours were staged according to the International Union against Cancer (UICC) tumour-node-metastasis (TNM) classification, 8th edition [11]. A current smoker had smoked any number of cigarettes within the previous 6 months and a previous smoker had stopped smoking at least 6 months previously [12]. The maxillectomy defects were classified at the time of surgery using the classification system developed by Brown et al. [1]. The osseous SOFF flap is defined as scapular bone and part of the teres major muscle. Performance status was assessed according to WHO. The Charlson comorbidity index (CCI) was defined [13]. General complications were categorised using the Clavien-Dindo Classification for surgical complications [14]. Eye-related outcomes were collected retrospectively from the medical record i.e. ectropion and globe malposition and were evaluated as either present or absent. The assessment was conducted 6–12 months after surgery and involved a collaborative subjective judgement between a senior head and neck surgeon and a senior plastic surgeon during postoperative follow-up.

Statistical analysis

Categorical data were given as proportions and continuous variables expressed as mean ± standard deviation (SD). Normally distributed data was presented as mean ± SD, whereas median and range (min-max) were reported in skewed distributions. For continuous variables, a Student's *t*-test was used. A p-value < 0.05 was considered statistically significant unless otherwise stated. Statistical analysis was performed on standard software (IBM Corp. Released 2017. IBM SPSS Statistics for Mac, Version 29. Armonk, NY: IBM Corp).

Ethics

This study was approved by the Swedish Ethical Review Authority, Sweden (2019-03187 and 2021-00594). Informed consent was obtained from all participating patients.

Results

Study population and patient follow-up

Twenty individuals, 16 men and four women were eligible for analysis, which was performed in November 2023. The median follow-up time was 49 months (range 8–85 months). The questionnaires were completed between 12 months and 60 months after the surgery.

Preoperative and surgical characteristics

The median age for all patients was 59 years (range 22–75 years). All patients, except two, had the SOFF because of malignant tumours (Table 1). All patients had good WHO performance status (WHO 0), and rather few comorbidities (CCI scores of 0–3). Different types of SOFFs were harvested to suit individual defects: osseous flap in 14 (70%) and osseous flap with ± latissimus dorsi muscle (LD) ± skin island flap in six (30%) patients. Type II, based on the Brown classification, was the most frequent defect in patients who underwent maxillary resection (12/20 patients).

Oncological treatment

Two patients (10%) had previously received RT and the surgery in those cases was due to recurrence or a second primary tumour. Postoperatively, 13 (65%) patients received RT or (c)RT (Table 1).

Postoperative outcome and assessment by the surgical team

General surgical complications were classified according to the Clavien-Dindo system. Grade II adverse effects were most common and affected 70% of patients (n = 14) (Table 1).

As seen in Table 1, 10 patients (50%) received dental rehabilitation with dental implants. Eight patients (40%) developed an oronasal fistula due to wound dehiscence or partial flap failure. In one patient, the oronasal fistula was closed with a radial forearm free flap (RFFF) reconstruction. One patient healed spontaneously within 1 month postoperatively, leaving six patients with remaining fistulation (30%), who were helped with a palatal obturator.

Eye-related problems were noticed in six patients (30%) (Table 1).

FACE-Q Head and Neck Cancer scores

All patients responded to the FACE-Q (20/20). Overall, the group reported the highest scores in the *facial appearance* and *experience of care* domain (76 ± 21 vs. 75 ± 19). The worst scores were seen in the *facial function* and *HR-QoL* domain. In all domains, variability among reported scores was large.

Subgroup analysis focused on different outcomes: dental rehabilitation, oronasal fistula and eye-related problems.

Dental rehabilitation

PROM from patients receiving dental rehabilitation is summarised in Table 2. A better score, though non-significant, in *facial function* regarding *salivation* was recorded in the dental rehabilitation group (70 ± 23 vs. 47 ± 34, p = 0.089). Furthermore, a trend towards a better score in *HR-QoL, speaking distress,* was recorded in the dental rehabilitation group (82 ± 21 vs. 59 ± 35, p = 0.097).

Oronasal fistula

There were no significant differences between the groups suffering from postoperative oronasal fistula formation (Table 3). A tendency towards

worse *facial function* regarding *eating and drinking* was noted in the fistula group (49 ± 14 vs. 56 ± 23, $p = 0.468$). No speaking differences could be noticed in facial function and HR-QoL domains, (67±30 vs. 60±18, p = 0.562) and (73±32 vs. 65±31, p = 0.624) in the non-fistula and fistula group.

Eye-related problems

Patients suffering from eye-related problems reported marginally worse *facial appearance* scores (79 ± 21 vs. 68 ± 19, $p = 0.289$) (Table 4).

Table 1. Baseline demographics, therapeutic management and postoperative outcome.

	All patients ($n = 20$)
	n (%)
Gender	
Male	16 (80)
Female	4 (20)
WHO	
0	20 (100)
CCI	
0	5 (25)
1	4 (20)
2	6 (30)
3	4 (20)
Smoker	
Never	11 (55)
Previous	5 (25)
Active	4 (20)
Surgical indication	
Malignant disease	
Total	18 (90)
T1	1 (5)
T2	2 (10)
T3	3 (15)
T4	12 (60)
Benign disease	2 (10)
Surgical access	
Weber Fergusson	10 (50)
Oral	10 (50)
Brown classification	
I	1 (5)
II	12 (60)
III	6 (30)
IV	1 (5)
SOFF	
Osseous flap	14 (70)
Osseous ± LD ± skin island flap	6 (30)
(Chemo)Radiotherapy	
Previous RT	2 (10)
Postoperative (c)RT	13 (65)
N/A	5 (25)
Complications according to Clavien-Dindo	
None	1 (5)
Grade I	1 (5)
Grade II	14 (70)
Grade III	3 (15)
Grade IV	1 (5)
Palatinal oronasal fistula	8 (40)
Aesthetic compromise	6 (30)
Eye problems	6 (30)
Dental rehabilitation	
Dental implants	10 (50)
None	10 (50)

Values are expressed as number (%) or median [range]; WHO: World Health Organisation performance status; CCI: Charlson comorbidity index; SOFF: Scapular osteomyogenous free flap; LD: Latissimus dorsi muscle.

Discussion

This study presents PROM results from 20 maxillary reconstructions with SOFF, with regard to three specific surgical outcomes. To our knowledge, only two previous publications exist using the FACE-Q on maxillary reconstruction, none of which focus on SOFF reconstruction [15, 16]. The response rate to the survey is one of the major strengths of this study, with the 100% response rate being far higher than the standard 60% that is common in survey-dependent research [17]. The questionnaires were completed between 12 months and 60 months after the surgery which should be adequate for assessing long-term HR-QoL [18].

Many aspects might affect HR-QoL. Patfield et al. have demonstrated that older age (≥70 years) was associated with better HR-QoL outcomes in domains relating to speech and cancer worry in patients undergoing maxillomandibular reconstruction [15]. In their study, the younger group, corresponding to our cohort, reported the highest score in the *facial appearance* domain, similar to our results.

Venchiarutti et al. have shown that women, younger patients, and patients who undergo RT appear at greater risk of having negative functional and HR-QoL outcomes [16]. In our limited cohort, we chose to focus our subgroup analysis on the main objective problems encountered in the follow-up.

One of the main advantages of osseous reconstruction is the possibility of dental rehabilitation with osseous-integrated implants. Van Rooij et al. showed that osseous compared with soft tissue free flap reconstruction led to more favourable HR-QoL outcomes of bony defects in long-term PROM after reconstructive surgery [18]. To date, little data on the patient's perspective has been published regarding rehabilitation involving osseointegrated dental implants after a maxillectomy [19]. In our study, a trend towards better *facial function* scores and *HR-QoL* regarding speaking distress was recorded in the dental rehabilitation group. As an alternative, the use of an obturator prosthesis shortens the procedure and offers the possibility of immediate and adequate dental rehabilitation [20].

One of the most troublesome complications in maxillary reconstruction is the formation of an oronasal fistula, which is reported in 4–21% of cases [5, 21–23]. In our series, eight patients (40%) developed an oronasal fistula. It should be noted that the group was heterogeneous with both large and small fistulas. One patient with a large communication between the oral cavity and the sinonasal cavities was closed with an RFFF, and one patient healed spontaneously, leaving six patients (30%) with a remaining oronasal fistula. Previous studies have shown that the presence of a fistula predicted poorer HR-QoL [6]. In our population, a trend towards worse *facial function* in *eating and drinking* and *oral competence* was noticed in the fistula group. Surprisingly, no speaking differences could be noticed in *facial function* and *HR-QoL* between the non-fistula and fistula groups. This might be explained by small fistulas with very limited speech consequences or successful rehabilitation with a palatal obturator.

Eye-related problems are correlated with large defects. Diplopia is related to Brown III defects. Ectropion and epiphora are possibly associated with the Weber Fergusson incision [6]. Cordeiro and Chen assessed 21 patients who underwent resection of the orbital floor with preservation of the orbital contents and subsequently reported diplopia, enophthalmos and ectropion in 24%, 5% and almost 50% of cases respectively [2]. In our series, 30% suffered from eye-related problems. However, small differences in PROM scores were only observed in the *facial appearance* domain.

Table 2. PROM, grouped by dental rehabilitation.

FACE-Q scale	All patients (n = 20)	Dental implants (n = 10)	No dental implants (n = 10)	Mean difference (CI)	P
Facial appearance					
Appearance	76 ± 21 (44–100)	68 ± 23 (44–100)	84 ± 16 (62–100)	15.9 (–2.7–34.5)	0.089
Facial function					
Eating & Drinking	54 ± 20 (14–87)	60 ± 22 (14–87)	48 ± 18 (22–72)	–11.8 (–30.6–7.0)	0.204
Oral competence	57 ± 30 (16–100)	65 ± 28 (16–100)	48 ± 30 (16–100)	–17.1 (–44.8–10.6)	0.210
Salivation	58 ± 31 (0–100)	70 ± 23 (28–100)	47 ± 34 (0–100)	–23.7 (–51.4–4.0)	0.089
Smiling	63 ± 32 (0–100)	61 ± 31 (0–100)	65 ± 34 (16–100)	3.9 (–26.6–34.4)	0.791
Speaking	65 ± 26 (0–100)	61 ± 31 (0–100)	57 ± 29 (0–100)	–15.6 (–39.8–8.6)	0.193
Swallowing	65 ± 35 (0–100)	74 ± 33 (0–100)	55 ± 36 (13–100)	–18.5 (-50.9–13.9)	0.245
Health-related QoL					
Appearance distress	61 ± 22 (10–100)*	61 ± 25 (10–100)	62 ± 19 (22–77)*	0.3 (–21.9–22.4)	0.981
Cancer worry	38 ± 17 (6–81)	41 ± 10 (29–59)	36 ± 22 (6–81)	–5.8 (–21.9–10.3)	0.458
Drooling distress	60 ± 42 (0–100)	71 ± 40 (0–100)	48 ± 42.4 (0–100)	–22.8 (–61.4–15.8)	0.231
Eating distress	65 ± 22 (26–100)	71 ± 23 (26–100)	59 ± 20 (26–100)	–11.4 (–31.7–8.9)	0.253
Smiling distress	63 ± 23 (24–100)*	68 ± 16 (48–100)	57 ± 29 (24–100)*	–11.2 (–33.4–10.9)	0.300
Speaking distress	70 ± 31 (0–100)	82 ± 21 (38–100)	59 ± 35 (0–100)	–22.9 (–50.4–4.6)	0.097
Experience of care					
Information	75 ± 19 (33–100)	73 ± 17 (52–100)	77 ± 22 (33–100)	4.6 (–13.8–23.0)	0.606

Values are expressed as mean ± Standard deviation (minimum-maximum), PROM: Patient-reported outcome measurement; FACE-Q: FACE-Q Head and Neck Cancer Questionnaire; CI; 95% Confidence Interval of the Difference; QoL: Quality of Life.

*One patient missing.

In summary, several predictive factors for HR-QoL have been identified in prior studies. Reported positive predictive factors include a high level of social support and the type of reconstruction [18]. Negative predictive factors include old age (above 60–70 years old), depressive symptoms at baseline, (naso)gastric feeding tube dependency, and active smoking [18, 24–27]. In addition, osteocutaneous reconstruction and adjuvant c(RT) or RT seem to affect patient-reported function and aesthetic satisfaction [16, 18, 28, 29]. Knowledge of such predictive factors is critical to estimating the course of HR-QoL for any individual patient. Evaluating these risk factors prior to treatment provides an opportunity to implement personalised interventions.

PROMs rely on patients' self-assessments, which can be influenced by various subjective factors such as mood, personal expectations and the interpretation of the survey questions. Moreover, while PROMs are a powerful tool for capturing patient perspectives at the group level, their usefulness at the individual level for future patients is limited.

Limitations

Limitations of the present study included the relatively small number of patients, making causal interpretations difficult. In addition to a larger sample size including different types of reconstruction and outcomes, further studies would benefit from a preoperative HR-QoL assessment as well as a standardised time after the treatment for PROM evaluation. Furthermore, an evaluation of depression and anxiety at different time points would add valuable information to the interpretation of the PROM results.

Conclusions

This study presents PROM in 20 patients who completed maxillary reconstruction with flap survival of the SOFF. The best scores were reported in the *facial appearance* and *experience of care* domain.

Table 3. PROM, grouped by oronasal fistula.

FACE-Q scale	All patients (n = 20)	No fistula (n = 14)	Fistula (n = 6)	Mean difference (CI)	P
Facial appearance					
Appearance	76 ± 21 (44–100)	73 ± 21 (44–100)	82 ± 22 (44–100)	–8.9 (–30.5–12.6)	0.395
Facial function					
Eating & drinking	54 ± 20 (14–87)	56 ± 23 (14–87)	49 ± 14 (22–62)	7.5 (–13.7–28.7)	0.468
Oral competence	57 ± 30 (16–100)	58 ± 33 (16–100)	53 ± 25 (16–87)	5.7 (–25.7–37.1)	0.708
Salivation	58 ± 31 (0–100)	55 ± 30 (14–100)	66 ± 35 (0–100)	–11.2 (–43.5–21.2)	0.478
Smiling	63 ± 32 (0–100)	62 ± 35 (0–100)	67 ± 25 (29–100)	–5.7 (–38.9–27.5)	0.723
Speaking	65 ± 26 (0–100)	67 ± 30 (0–100)	60 ± 18 (43–82)	7.7 (–19.7–35.2)	0.562
Swallowing	65 ± 35 (0–100)	62 ± 38 (0–100)	71 ± 30 (21–100)	–8.8 (–45.3–27.6)	0.617
Health-related QoL					
Appearance distress	61 ± 22 (10–100)*	61 ± 21 (22–100)*	63 ± 27 (10–77)	–1.6 (–25.4–22.2)	0.891
Cancer worry	38 ± 17 (6–81)	37 ± 20 (6–81)	41 ± 8 (29–49)	–4.2 (–21.9–13.5)	0.625
Drooling distress	60 ± 42 (0–100)	60 ± 43 (0–100)	60 ± 41 (0–100)	0 (–43.9–43.9)	1.000
Eating distress	65 ± 22 (26–100)	65 ± 21 (26–100)	66 ± 26 (26–100)	–0.9 (–23.8–22.1)	0.938
Smiling distress	63 ± 23 (24–100)*	61 ± 22 (24–100)*	66 ± 27 (24–100)	–4.8 (–29.3–19.6)	0.681
Speaking distress	70 ± 31 (0–100)	73 ± 32 (0–100)	65 ± 31 (15–100)	7.6 (–24.6–39.9)	0.624
Experience of care					
Information	75 ± 19 (33–100)	75 ± 20 (33–100)	75 ± 20 (52–100)	0.6 (–19.7–20.8)	0.953

Values are expressed as mean ± Standard deviation (minimum-maximum), PROM: Patient-reported outcome measurement; FACE-Q: FACE-Q Head and Neck Cancer Questionnaire; CI; 95% Confidence Interval of the Difference; QoL: Quality of Life.

*One patient missing.

Table 4. PROM, grouped by eye problems.

FACE-Q scale	All patients (n = 20)	Normal (n = 14)	Eye problems (n = 6)	Mean difference (CI)	P
Facial appearance					
Appearance	76 ± 21 (44–100)	79 ± 21 (44–100)	68 ± 19 (44–100)	11.1 (–10.2–32.4)	0.289
Facial function					
Eating & drinking	54 ± 20 (14–87)	55 ± 20 (14–87)	50 ± 22 (22–87)	5.1 (–16.3–26.4)	0.622
Oral competence	57 ± 30 (16–100)	60 ± 31 (16–100)	48 ± 27 (16–87)	11.9 (–19.1–42.9)	0.431
Salivation	58 ± 31 (0–100)	59 ± 29 (14–100)	57 ± 39 (0–100)	1.5 (–31.4–34.3)	0.927
Smiling	63 ± 32 (0–100)	63 ± 35 (0–100)	64 ± 26 (29–100)	–0.5 (–33.8–32.9)	0.978
Speaking	65 ± 26 (0–100)	65 ± 27 (0–100)	66 ± 27 (43–100)	–0.9 (–28.6–26.9)	0.949
Swallowing	65 ± 35 (0–100)	66 ± 35 (0–100)	62 ± 38 (13–100)	4.5 (–32.1–41.1)	0.799
Health-related QoL					
Appearance distress	61 ± 22 (10–100)*	62 ± 19 (22–77)	60 ± 33 (10–100)*	1.9 (–23.2–27.1)	0.873
Cancer worry	38 ± 17 (6–81)	40 ± 19 (6–81)	33 ± 11 (16–49)	8.0 (–9.4–25.3)	0.349
Drooling distress	60 ± 42 (0–100)	61 ± 44 (0–100)	55 ± 38 (0–100)	6.0 (–37.8–49.7)	0.778
Eating distress	65 ± 22 (26–100)	68 ± 21 (26–100)	58 ± 25 (26–100)	9.4 (–13.1–31.9)	0.392
Smiling distress	63 ± 23 (24–100)*	63 ± 22 (24–100)	61 ± 29 (24–100)*	1.7 (–24.2–27.7)	0.889
Speaking distress	70 ± 31 (0–100)	72 ± 31 (0–100)	66 ± 33 (15–100)	6.9 (–25.3–39.2)	0.657
Experience of care					
Information	75 ± 19 (33–100)	74 ± 21 (33–100)	76 ± 17 (52–100)	–1.8 (–22.1–18.4)	0.853

Values are expressed as mean ± Standard deviation (minimum-maximum), PROM: Patient-reported outcome measurement; FACE-Q: FACE-Q Head and Neck Cancer Questionnaire; CI; 95% Confidence Interval of the Difference; QoL: Quality of Life.

*One patient missing.

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The authors declare that they have no conflicts of interest.

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