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Head and neck free-flap reconstruction in the elderly

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Summary

Objective: To evaluate the reliability of free-flap head and neck reconstruction in the elderly.

Material and methods: All patients who underwent free-flap head and neck reconstruction in our institution between 2000 and 2010 were included in this retrospective study. In all, 418 patients (301 men and 117 women) were enrolled, including 95 patients aged 70 years or older (mean age = 60.2 ± 11.6 years). The impact of age on free-flap failure and local and general complication rates was assessed on univariate and multivariate analysis.

Results: Advanced age had no impact on free-flap failure and local complications rate but was correlated with a higher risk of general complications (multivariate analysis: $P=0.007$). A high level of comorbidity also had a significant impact on the general complications rate (multivariate analysis: $P=0.001$). Patients who underwent circular total pharyngolaryngectomy showed elevated risk of free-flap failure ($P=0.005$) and local complications ($P=0.001$) on multivariate analysis.

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Conclusion: Free-flap reconstruction of the head and neck is safe and reliable in the elderly. Nevertheless, meticulous patient selection, mainly based on the level of comorbidity, is necessary.

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Introduction

The use of microvascularized free flaps for head and neck reconstruction following oncological surgery has been developing rapidly, to become one of the most widespread attitudes. Free flaps have many advantages, especially as compared to pediculated musculo-cutaneous flaps: selection of the best-adapted tissue for a given type of reconstruction, two-team protocol, 3D freedom of flap positioning, and improved vascularization. Free flaps have been shown to be reliable, with success rates approaching 95% in the literature [1,2]. The operation is, however, complex, with an often long and difficult postoperative course, and rigorous patient selection is mandatory. With the aging of the general population, elderly patients are increasingly receiving treatment, and the feasibility of heavy surgery involving free-flap reconstruction is an issue. The present study sought to determine the feasibility of free-flap reconstruction in elderly patients, in terms of the rates of reconstruction success, local or general complications and hospital stay.

Material and methods

A retrospective study was conducted on all cases of free-flap head and neck reconstruction performed in our center between January 1st, 2000 and June 30th, 2010. In all, 418 patients were included: 301 male, 117 female; mean age, 60.2 ± 11.6 years. Comorbidity was assessed on the Kaplan Feinstein Index (KFI) [3]. Patients were categorized in four groups by incremental KFI score: KFI=0: 85 patients; KFI=1: 136; KFI=2: 141; and KFI=3: 56. Presenting pathologies comprised: epidermoid carcinoma of the upper aerodigestive tract (UAT), 349 cases; other UAT malignancy, 25 cases; mandibular osteoradionecrosis, 24 cases; benign mandibular tumor, 11 cases; and malignant skin tumor, nine cases. Ninety-seven of the cases of malignancy concerned recurrence. In the 271 patients presenting with non-treated UAT epidermoid carcinoma, tumor stage was assessed on the 2002 tumor nodes metastases (TNM) classification of the Union internationale contre le cancer (UICC).

Four groups were distinguished in terms of type of surgery:

- group 1: oral cavity or oropharynx fascio-cutaneous free-flap repair, conserving mandibular continuity;
- group 2: oral cavity or oropharynx free bone-flap repair, interrupting mandibular continuity;
- group 3: circular total pharyngolaryngectomy with fascio-cutaneous free-flap repair;
- group 4: other.

Table 1 details clinical characteristics for patients as a whole and according to age greater or less than 70 years.

The impact of age on rates of free-flap failure and local and general complications was analyzed. Reconstruction failure was defined by complete flap necrosis. Local and general complications were systematically retrieved from the computerized patient records. Age effects were tested on univariate and then multivariate analysis, according to the following parameters: gender, comorbidity, preoperative radiation therapy, tumor stage, recurrence, and type of surgery.

Statistically, age effects were assessed using two complementary methods. Age was first treated as a continuous quantitative variable, and then converted into a qualitative variable according to two groups: age less than vs. greater than 70 years. Free-flap failure and local and general complications were treated as qualitative variables: present vs. absent. Univariate analysis was on χ^2 test for qualitative variables and non-parametric Mann-Whitney *U*-test for quantitative variables. Multivariate analysis used a logistic regression model, including age and all other variables showing significant influence on univariate analysis. Statistical analysis used R.2.10.1 software for Windows, with a 5% two-tailed significance threshold.

Results

Free-flap failure

Free-flap failure was observed in 42 of the 418 patients: i.e., overall success rate = 90%. Free-flap failure was observed in 36 of the 323 patients aged less than 70 years and in six of the 95 aged more than 70 years: i.e., failure rates of 11% and 6%, respectively. No significant correlation was found between age and free-flap failure, whether on univariate (χ^2 , $P=0.24$; Mann-Whitney *U*, $P=0.53$) or multivariate analysis ($P=0.19$). The sole factor found to influence the failure rate was the type of surgery, with significantly more failures in group 3 (univariate analysis, $P=0.002$; multivariate analysis, $P=0.005$).

Local complications

In all, 133 patients (32%) had at least one local cervicofacial surgery site complication. The three most frequent complications were surgical site infection (61 cases), salivary fistula (52 cases) and hematoma (35 cases), certain patients presenting more than one local complication. At least one local complication occurred in 104 (32%) of patients aged less than and in 29 (31%) of those aged more

Table 1 Clinical characteristics.

Characteristics	Overall (%) n = 418	Age < 70 years (%) n = 323	Age ≥ 70 years (%) n = 95	P
Sex				0.001
Female	117 (28)	78 (24)	39 (41)	
Male	301 (72)	245 (76)	56 (59)	
Comorbidity				0.070
KFI < 2	221 (53)	179 (55)	42 (44)	
KFI ≥ 2	197 (47)	144 (45)	53 (56)	
History of radiation therapy	136 (33)	106 (33)	30 (32)	0.918
Recurrence^a	97 (23)	68 (21)	29 (31)	0.074
T stage^b				0.874
T2	62 (23)	48 (23)	14 (23)	
T3 or T4	209 (77)	162 (77)	47 (77)	
N stage^b				0.560
N0	171 (63)	135 (64)	36 (59)	
N ≥ 1	100 (37)	75 (36)	25 (41)	
Group				0.029
1	212 (51)	159 (49)	53 (56)	
2	142 (34)	116 (36)	26 (27)	
3	44 (10)	37 (11)	7 (7)	
4	20 (5)	11 (3)	9 (9)	

P-values are for comparisons between < 70 years and > 70 years groups.

^a Recurrence: surgery for recurrent tumor.

^b TNM stage determined only for the 271 patients with non-treated UAT epidermoid carcinoma (210 patients less than 70 years, 61 patients greater than 70 years).

than 70 years; there was no correlation between age and the occurrence of local complications, whether on univariate (χ^2 , $P=0.84$; Mann-Whitney U , $P=0.85$) or multivariate analysis ($P=0.78$). Factors significantly impacting occurrence of local complications on univariate analysis were: type of surgery, with a significantly elevated complications rate in group 3 ($P<0.0001$), and high comorbidity ($P=0.002$); on multivariate analysis, only type of surgery remained associated with elevated local complications rate ($P=0.001$).

General complications

Fifty-three patients (13%) had at least one general complication. The three most frequent complications were infectious pneumopathy (33 cases), cardiovascular complications (nine cases) and urinary infection (three cases). Ten patients (2.4%) died during the first postoperative month (four more than 70 years, six less than 70 years). At least one general complication occurred in 33 (10%) of patients aged less than and in 20 (21%) of those aged more than 70 years. Age correlated significantly with general complications on univariate (χ^2 , $P=0.009$; Mann-Whitney U , $P=0.003$) and multivariate analysis ($P=0.007$); the correlation was linear, without threshold effect. It did not, however, persist on analyzing general complications separately. High comorbidity also correlated with general complications (univariate analysis, $P=0.008$; multivariate analysis, $P=0.001$). There was no statistical link between local and general complications.

Table 2 details the influence of the various study parameters on free-flap failure and local and general complications.

Discussion

Free-flaps are one of the major advances in head and neck reconstructive surgery to have been developed over the last 20 years. Their overall reliability is now proven, but application in certain "particular terrains", and notably in the elderly, is controversial. Several studies reported them to be reliable in elderly subjects, but this conclusion seems not to be unanimously accepted and certainly not to be sufficiently well known [4–7]: in clinical practice, free-flap reconstruction in elderly patients remains a subject of discussion. The age at which an individual becomes elderly is obviously debatable and subjective. In UAT oncology, and notably with regard to chemotherapy and radiation therapy, age less than 70 years is a frequent inclusion criterion in clinical trials. Like most authors interested in this topic, we therefore adopted this age threshold for elderliness in the present study. However, so as to analyze more fully the impact of age on free-flap reliability, we studied age both as a qualitative variable (patients aged more vs. less than 70 years) and as a quantitative variable, using the appropriate statistical tests. With 418 patients, almost a quarter of whom were aged over 70, this was one of the largest series focusing on free flaps in the elderly.

Observed comorbidity was higher in the older age group. This is one of the major assessment issues for any surgical

Table 2 Influence of the various study parameters on the rate of free-flap failure and onset of local and general complications.

Parameters	Free-flap failure (P)	Local complications (P)	General complications (P)
Age (quantitative variable)	0.53	0.85	0.003
Age (qualitative variable: >/< 70 years)	0.24	0.84	0.009 ^a OR = 2.4 95% CI [1.2–4.5]
Sex	0.32	0.37	0.65
Comorbidity	0.47	0.002	0.008 ^a OR = 2.3 95% CI [1.3–4.4]
Preoperative radiation therapy	0.09	0.07	0.13
T stage	0.91	0.13	0.78
N stage	0.91	0.97	0.81
Surgery for tumor recurrence	0.15	0.10	0.09
Type of surgery (group 3 vs. other groups)	0.002 ^a OR = 4.3 95% CI [1.7–10.8]	< 0.0001 ^a OR = 6.2 95% CI [3.0–12.6]	0.34

P-values calculated on univariate analysis by χ^2 test for qualitative variables and Mann-Whitney *U*-test for quantitative variables.

^a For parameters shown relevant on multivariate analysis, *P*-value is followed by odds ratio (OR) and 95% confidence interval (CI).

technique in the elderly. To highlight the specific impact of age, multivariate analysis is necessary to distinguish age from other variables, and notably from comorbidity, affecting any given parameter.

The present results showed that advanced age did not impair the success of free-flap repair: the success rate was actually slightly higher in the older age group, although not significantly so. The reliability of free flaps in the elderly was previously reported by several authors, in both head and neck and other types of reconstruction [4–9]. In mammary reconstruction, Serletti et al., in a series of 100 patients aged over 65 years, reported a 97% free-flap success rate, comparable to the usual findings with younger patients [8]. Howard et al., in a series of 197 patients aged over 70 years undergoing free-flap reconstruction, mainly in the head and neck region, reported a 97% success rate in 70–79 year-olds and 100% in those aged over 80 [6].

In agreement with previous reports, there was no correlation in the present series between advanced age and local complications [9–12]: rates were almost identical between under- and over-70 year-olds. In a series of 39 patients aged over 70 years, Malata et al. reported a 28% local complications rate, comparable to the present findings [10]. Likewise, Howard et al. found a rate of surgical complications of almost 30%, regardless of whether patients were in the 70–79 or over-80 years age group [6]. In the present study, on univariate analysis, high comorbidity was associated with a higher local complications rate, but this correlation was not confirmed by multivariate analysis. Other authors have suggested a relation between comorbidity and local complications [13]. Cicatrization problems and hemorrhagic and infectious complications may, for example, be induced by vascular or coagulation disorder, reduced immune defense or feeding problems.

In the present study, advanced age was associated with an elevated rate of general complications, which were twice as frequent in the older age group. High comorbidity was likewise associated with an elevated rate of general

complications, in agreement with the literature. Coskunfira et al. in a series of 94 patients aged over 70 years, found a rate of medical complications of almost 30%, correlated with the degree of comorbidity on the American Society of Anesthesiologists (ASA) score [14]. A similar correlation was found by Howard et al., with a rate of medical complications of 11.8% in patients aged 70–79 years and of 40.7% in those over 80 years [6].

The patients who underwent circular total pharyngolaryngectomy (group 3) showed higher rates of free-flap failure and local complications than with the other types of surgery. There may be several reasons for this, notably including the difficulty of monitoring the free flap following this procedure, surgery generally performed as oncologic salvage in previously irradiated patients, and elevated risk of salivary fistula [13].

Conclusion

The use of free microvascularized flaps in head and neck reconstruction in elderly subjects is reliable, with success rates comparable to those found in younger patients. Advanced age is not associated with the occurrence of local complications, but is associated with more frequent general complications. This highlights the need for adapted patient selection, mainly based on comorbidity levels.

Conflict of interest statement

None.

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