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Short-Term Patient-Reported Outcomes of Donor Site Morbidity After Radial Artery Forearm Free Flap in Oral Cancer Reconstruction Surgery

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Abstract

Introduction: The radial artery forearm free flap (RAFF) is a standard option for reconstruction after resection of oral cancer, but donor site morbidity remains a concern, and early patient-reported outcomes in advanced disease are poorly described. We assessed short-term donor site morbidity after radial forearm free flap reconstruction in patients with stage IVA oral cancer. The primary objective was to quantify patient-reported donor site morbidity, using a 14-item questionnaire and a derived morbidity score. The secondary objectives were to describe clinician-assessed donor site findings (scar characteristics, sensation, grip, and forearm circumference).

Materials and methods: In this descriptive cross-sectional study, 11 right-hand-dominant patients whose donor sites were closed with a split-thickness skin graft completed a 14-item questionnaire (five cosmesis and sensibility items and nine forearm disability items, each scored 1 to 4) and underwent a clinical examination of the forearm at a median of eight months after completion of treatment. A morbidity score from 0 (no complaints) to 100 (severe) was calculated. Proportions are reported with exact 95% confidence intervals (CI), and nonparametric tests were used for exploratory comparisons because of the small sample.

Results: The mean age was 59.9 years (standard deviation (SD): 5.8), and seven patients (63.6%) were women. The flap was taken from the nondominant arm in seven patients. Hand numbness (six patients: 54.5%) and concern about donor site appearance (four patients: 36.4%) were the commonest complaints. Two patients (18.2%) reported difficulty lifting heavy objects, and no patient reported itching, difficulty moving the wrist, or difficulty writing. Hand grip was normal in all patients, and forearm circumference did not differ between arms (Wilcoxon signed-rank: $W = 12.5$; $p = 0.31$). The mean morbidity score was 6.7 (SD: 7.2); three patients (27.3%) had no complaints, and nine (81.8%) would undergo the procedure again. Complaints did not differ significantly by sex or arm dominance.

Conclusions: Short-term donor site morbidity was characterized by low severity, though hypoaesthesia, and aesthetic concerns regarding scarring were prevalent. As these descriptive findings are derived from a limited, single-institution cohort, further validation in larger multicenter studies is warranted; nonetheless, these data may refine preoperative patient counseling.

Categories: Plastic Surgery, General Surgery, Oncology
Keywords: donor site morbidity, head and neck cancer, microvascular reconstruction, oral cancer, patient-reported outcomes, radial artery forearm free flap

Introduction

The radial artery forearm free flap (RAFF) was first described by Yang et al. in 1981 [1] and was popularized for intraoral reconstruction by Soutar et al. [2]. The skin paddle is thin and pliable, and the pedicle is long with a vessel of large caliber, which makes the flap a frequent choice for resurfacing defects after resection of oral cancer. Because reconstruction in this setting must aim to restore speech, swallowing, and appearance, the flap remains a workhorse for soft-tissue defects of the tongue, floor of mouth, and buccal mucosa.

These advantages are offset by donor site morbidity. The forearm defect usually needs skin grafting, and reported complaints include numbness, cold intolerance, scar problems, and reduced hand strength [3-6]. Objective testing generally shows small differences between the donor and nondonor arm, yet patients still report symptoms when asked directly [4,5]. Such complaints have led some surgeons to consider alternatives such as the ulnar forearm flap or the thinned anterolateral thigh flap [7,8].

The timing of assessment matters, because scar maturation and sensory recovery continue for many months

after harvest. Most published series assess patients late, and in Indian practice patient-reported outcomes have been described mainly in a cohort assessed at least two years after surgery [3]. Counselling before surgery depends on this short-term outcomes information.

We therefore evaluated short-term patient-reported and clinical donor site outcomes after RAFF reconstruction in a clinically uniform group of patients with stage IVA oral cancer. The group was uniform for tumor stage (all stage IVA), surgical technique (suprafascial elevation), donor site closure (split-thickness skin graft in all), and hand dominance (all right-handed).

The primary objective was to quantify patient-reported donor site morbidity, using a 14-item questionnaire and a derived morbidity score. The secondary objectives were to describe clinician-assessed donor site findings (scar characteristics, sensation, grip, and forearm circumference).

Materials And Methods

Study design and participants

This cross-sectional study was carried out at ESIC MC and PGIMSR Rajajinagar, Bangalore, between May 2025 and February 2026. The ethics committee approved the protocol, and all participants gave written informed consent. We included patients who had undergone RAFF reconstruction after resection of stage IVA oral cancer and had completed their planned treatment, above the age of 18 years, with normal preoperative Allen's test, willing and able to give consent for study participation; without any pre-existing neurological, orthopedic, or vascular disease of the donor forearm; or any prior surgery or scarring. Eleven patients met these criteria and were evaluated on follow-up after completion of treatment (Figures *1*-*2*). The sample size was limited by the annual caseload at our institution.

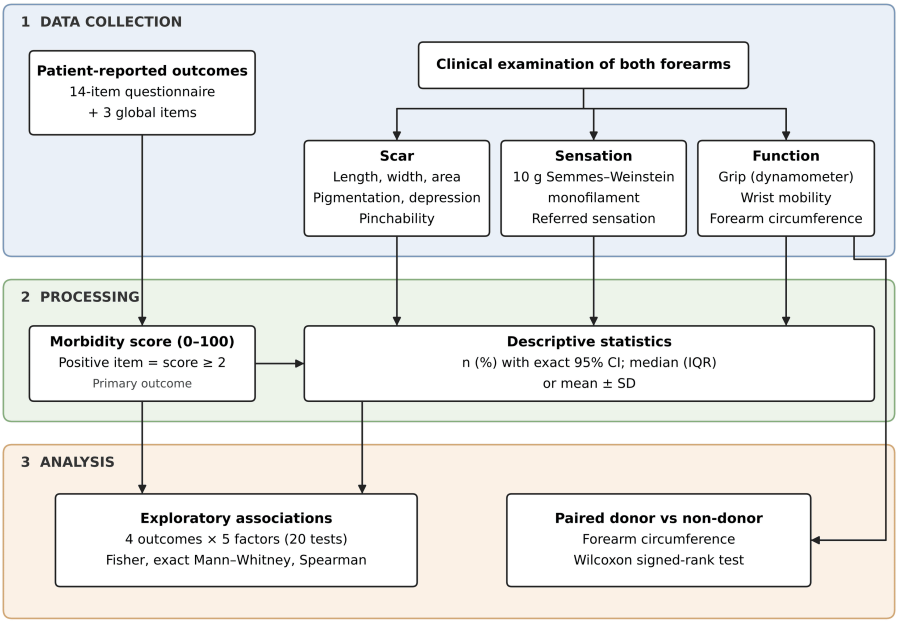


FIGURE 1: Workflow for the integrated assessment of donor site morbidity

CI: confidence interval; IQR: interquartile range; SD: standard deviation. Figure created in Python version 3.13 (Python Software Foundation, 2024)

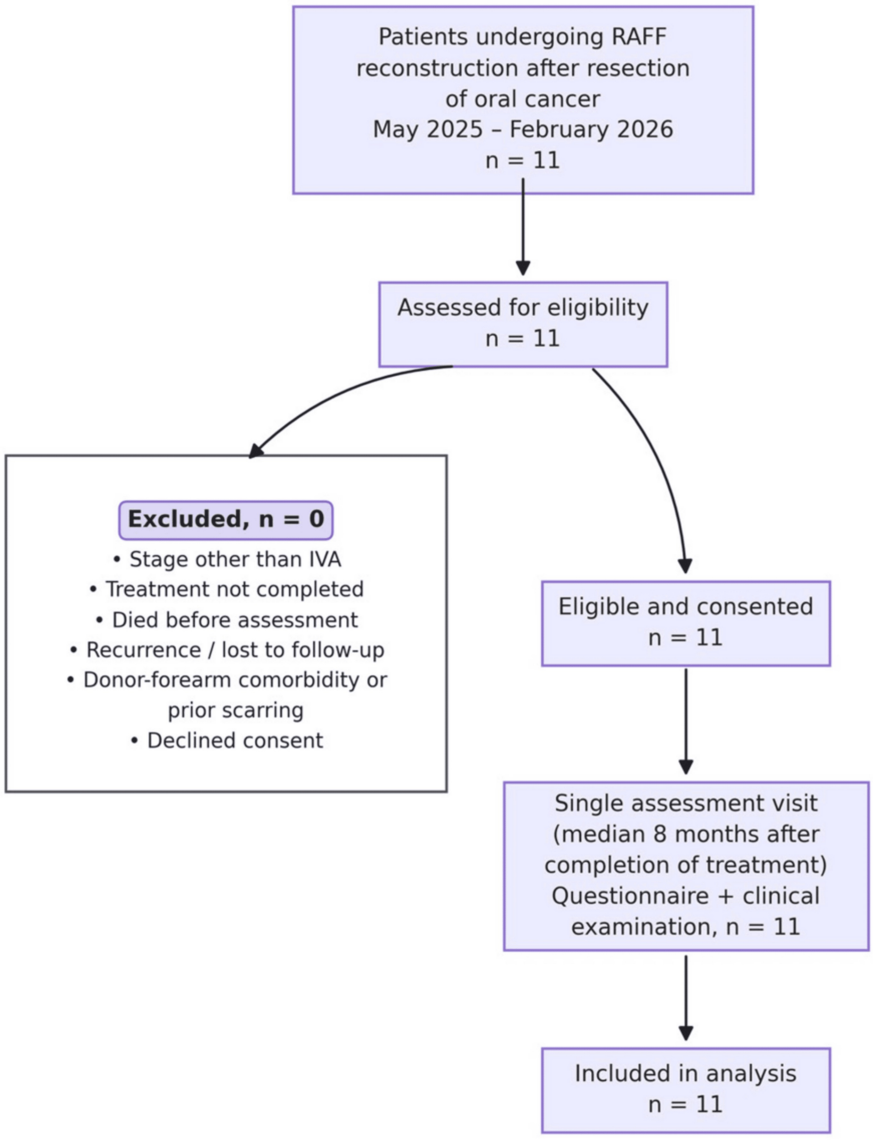


FIGURE 2: Flow of patients through the study

All 11 were eligible and assessed, none excluded. All were cancer free at assessment

Surgical technique

All flaps were raised by the same surgical team using the technique described below (suprafascial radial forearm free flap). After a modified Allen's test, the radial artery course is marked between brachioradialis and flexor carpi radialis (FCR) in the forearm. Septocutaneous perforators are mapped with a handheld Doppler and marked with their distance from the wrist crease. The skin paddle is designed to match the expected defect after resection of the primary oral cancer, centered over the dominant perforator(s) along the radial artery axis. Under tourniquet, the flap is incised along the markings and elevated in the suprafascial plane from the ulnar side toward the lateral intermuscular septum. The deep fascia and paratenon are preserved, and the superficial radial nerve branches are protected. Perforators are confirmed against the Doppler markings, keeping a small fascial cuff, and the radial artery with venae comitantes is dissected proximally; the cephalic vein is taken as an additional drain. After tourniquet release, flap perfusion and ulnar-artery hand perfusion are checked before the pedicle is divided. The flap is inset, and end-to-end anastomoses are done to the recipient artery (facial or superior thyroid) and vein (internal jugular vein (IJV), facial or external jugular vein (EJV)). A split-thickness skin graft is placed directly on the preserved paratenon, with a tie-over or negative-pressure dressing and a volar slab. Doppler mapping allows accurate perforator-based design, and the suprafascial plane improves graft take and reduces tendon exposure. All patients received adjuvant radiotherapy alone; none received chemoradiation.

Clinical Assessment

All clinical examinations were performed by a single examiner who was a member of the operating surgical team and was therefore not blinded to the treatment or to the questionnaire responses. The scar items were adapted from those described by Ito et al. [9].

Scar size: Scar length and width at their greatest dimensions were measured in centimeters with a flexible tape, and the scar area was calculated as length multiplied by width. This rectangular approximation overestimates the area of elliptical scars and was used for comparison between patients only.

Pigmentation: Graft color was compared with the surrounding forearm skin and classed as hyperpigmentation or hypopigmentation, with the percentage of the scar affected estimated visually to the nearest 10%.

Scar depression (graft surface below the level of the surrounding skin on inspection and palpation) and restriction of wrist mobility (active flexion or extension less than on the contralateral side, assessed by goniometer): These were recorded as present or absent.

Hand grip: Grip strength was measured on both sides with a Jamar Hydraulic Hand Dynamometer (Model 5030J1), with the patient seated, the shoulder adducted, the elbow flexed at 90°, and the forearm in neutral rotation. Three trials were made on each side with 60 seconds of rest between trials, and the mean was recorded. Grip was graded 0 (absent), 1 (reduced compared with the contralateral side), or 2 (normal).

Sensation over the graft: Protective sensation was tested with a 10 g (5.07) Semmes-Weinstein monofilament applied perpendicular to the skin until it bent, with the patient's eyes closed, at five sites over the grafted area. Sensation was graded 1 (present) if the patient correctly detected the stimulus at least two of three applications at each point, and 0 (absent) otherwise. This item describes the grafted skin only and is distinct from numbness of the hand, which was captured by the questionnaire.

Referred sensation: This was recorded as present when the patient perceived the monofilament stimulus at a site other than the one touched

Pinchability: This was the percentage of the grafted area that the examiner could lift between the thumb and index finger from the underlying tissue, as an indicator of graft mobility over the tendons.

Forearm circumference: This was measured on both sides with a flexible tape at the midpoint between the lateral epicondyle of the humerus and the radial styloid, to the nearest 0.1 cm.

Questionnaire

Patients completed a 14-item questionnaire based on the cosmesis and sensibility and forearm disability questionnaires of de Witt et al. [5]. Five items covered cosmesis and sensibility (difficulty wearing a bracelet or wristwatch, hand numbness, scar itching, problems in the cold, and concern about the appearance of the forearm). Nine items covered disability (waking at night, lying on the forearm, daily activities, wrist movement, leaning on the elbow or hand, writing or typing, holding a steering wheel or handlebar, lifting heavy objects, and opening or closing doors). Each item was scored from 1 (no complaint) to 4 (severe), and a score of 2 or more was counted as a positive response. A blank response for one patient who was illiterate, couldn’t comment on any difficulty in writing or typing, and was counted as no complaint. A morbidity score from 0 to 100 was calculated as the sum of item scores minus 14, divided by 42, multiplied by 100. Patients also rated satisfaction with donor site appearance from 1 (least satisfied) to 4 (most satisfied). One patient expressed significant emotional distress and dissatisfaction upon viewing the donor site postoperatively. Patients rated hand function compared with before surgery (reduced or normal) and stated whether they would undergo the same procedure again.

Statistical analysis

Because the sample was small, we used exact and nonparametric methods. Continuous variables are given as median and interquartile range (IQR) and, where useful, as mean and SD. Categorical variables are given as numbers (percentages) with exact Clopper-Pearson 95% confidence intervals (CI). Donor and nondonor forearm circumference were compared with the Wilcoxon signed-rank test, because the paired differences were not normally distributed (Shapiro-Wilk: $W = 0.84$; $p = 0.033$). Associations were explored with Fisher's exact test, the exact Mann-Whitney U test, and Spearman's rank correlation. All tests were two-sided with a significance level of 0.05. No correction was made for multiple comparisons, so all comparisons are exploratory. Analyses were done in Python 3 (Python Software Foundation, 2024) with SciPy 1.17.1.

Results

Patient and treatment characteristics

Eleven patients were evaluated (Table 1).

Characteristic	Value
Age, years: mean ± SD (range)	**59.9 ± 5.8 (50-71)**
Sex: female/male, n (%)	7 (63.6)/4 (36.4)
Hand dominance: right, n (%)	11 (100)
Donor arm: left (nondominant)/right (dominant), n (%)	7 (63.6)/4 (36.4)
Stage IVA oral cancer, n (%)	11 (100)
Donor site closure: split-thickness skin graft, n (%)	11 (100)
Flap dehiscence, n (%)	0 (0)
Follow-up after completion of treatment, months: median	8
Occupation: farmer/plumber/security guard/other (one each: welder, homemaker, packaging worker, laborer), n	3/2/2/4

TABLE 1: Patient and treatment characteristics (n = 11)

SD: standard deviation

Stage according to the American Joint Committee on Cancer, 8th edition. Follow-up is the interval from completion of all planned treatment to the single-study assessment. All patients received adjuvant radiotherapy alone; none received chemoradiation. All patients had >90% graft take and no tendon exposure

The mean age was 59.9 years (SD: 5.8; range: 50-71), and seven patients (7/11) (63.6%) were women. All were right-hand dominant. The flap came from the left, nondominant forearm in seven patients (7/11) (63.6%) and from the right, dominant forearm in four (4/11)(36.4%). No patient had flap dehiscence. The median interval from completion of treatment to assessment was eight months. Eight patients did manual work (three farmers, two plumbers, one welder, one packaging worker and one laborer); the others were two security guards and one homemaker.

Clinical examination

The findings are shown in Table 2, in the order in which they are described here. The median scar length was 7.5 cm (IQR: 5.3-8.0), the median width was 3.0 cm (IQR: 2.5-3.5), and the median scar area was 16.5 cm^2 (IQR: 13.8-30.0). Ten patients (90.9%) had hyperpigmentation, affecting a median of 77.5% of the scar (IQR: 50-100%), and one patient (9.1%) had hypopigmentation affecting 20% of the scar. Scar depression was present in five patients (45.5%). One patient (9.1%) had restricted wrist mobility, associated with a wrist flexion contracture; finger movement and grip strength were normal. Sensation over the graft was present in three patients (27.3%) and absent in eight (72.7%). Referred sensation was present in four patients (36.4%). The median pinchability of the donor site was 50% (IQR: 15-82.5): the entire area was pinchable in two patients (18.2%), part of it in seven (63.6%), and none of it in two (18.2%). Forearm circumference did not differ between the donor side (21.0 ± 2.9 cm) and the nondonor side (21.2 ± 2.7 cm; mean difference: -0.23 cm; SD: 0.56; Wilcoxon signed-rank: W = 12.5; p = 0.31).

Parameter	Result	95% CI or range
Scar length, cm: median (IQR)	**7.5 (5.3-8.0)**	**3.5-10.0**
Scar width, cm: median (IQR)	3.0 (2.5-3.5)	2.0-4.0
Scar area, cm²: median (IQR)	16.5 (13.8-30.0)	11.3-32.0
Hyperpigmentation, n (%)	10 (90.9)	58.7-99.8
Hypopigmentation (20% of scar), n (%)	1 (9.1)	0.2-41.3
Extent of hyperpigmentation, % of scar (n = 10): median (IQR)	77.5 (50-100)	10-100
Scar depression, n (%)	5 (45.5)	16.7-76.6
Restricted wrist mobility, n (%)	1 (9.1)	0.2-41.3
Normal hand grip, n (%)	11 (100)	71.5-100
Sensation present at donor site, n (%)	3 (27.3)	6.0-61.0
Referred sensation present, n (%)	4 (36.4)	10.9-69.2
Donor site pinchability, %: median (IQR)	50 (15-82.5)	0-100
Forearm circumference, donor side, cm: mean ± SD	21.0 ± 2.9	
Forearm circumference, nondonor side, cm: mean ± SD	21.2 ± 2.7	
Difference (donor minus nondonor), cm: mean ± SD	-0.23 ± 0.56	Wilcoxon signed rank, w = 12.5; p = 0.31

TABLE 2: Clinical examination findings (n = 11)

CI: confidence interval (exact Clopper-Pearson for proportions; minimum–maximum for continuous variables); IQR: interquartile range; SD: standard deviation

Scar area = length × width. Pigmentation was judged against the surrounding forearm skin. Hand grip was graded 0 (absent), 1 (reduced), or 2 (normal) against the contralateral side using a dynamometer. Sensation over the graft was tested with a 10 g Semmes-Weinstein monofilament. Pinchability is the percentage of the grafted area that could be lifted from the underlying tissue. Donor and nondonor forearm circumference were compared with the two-sided Wilcoxon signed-rank test (W = 12.5, the smaller signed-rank sum; two zero differences were dropped, so n = 9, and the p-value uses the normal approximation with tie correction; paired differences were nonnormal by the Shapiro-Wilk test: W = 0.84; p = 0.033)

Questionnaire responses

In the cosmesis and sensibility domain, one patient (9.1%) reported moderate difficulty wearing a bracelet or wristwatch. Hand numbness was the commonest complaint, reported by six patients (54.5%; 95% CI: 23.4-83.3); two graded it as mild, one as moderate, and three as severe. No patient reported itching, and one patient (9.1%) reported mild problems in the cold. Four patients (36.4%; 95% CI 10.9-69.2) were bothered by the appearance of the forearm, two mildly and two severely. Overall, three patients (27.3%; 95% CI 6.0-61.0) reported no complaints in this domain.

In the disability domain, no patient reported waking at night because of the forearm. One patient (9.1%) reported mild complaints lying on the forearm and mild difficulty with daily activities. No patient reported difficulty moving the wrist, discomfort leaning on the elbow or hand, or discomfort writing or typing. One patient (9.1%) reported mild difficulty holding a steering wheel or handlebar, and two patients (18.2%) had difficulty lifting heavy objects, one mild and one severe. No patient had trouble opening or closing doors. Seven patients (63.6%; 95% CI: 30.8-89.1) reported no complaints in this domain, and three (27.3%) had no complaints on any of the 14 items (Table *3*).

Item	Positive responses, n (%)	95% CI	Grade 2/3/4
Difficulty wearing a bracelet or wristwatch	**1 (9.1)**	**0.2-41.3**	**0/1/0**
Hand feels numb	6 (54.5)	23.4-83.3	2/1/3
Scar itches	0 (0)	0-28.5	0/0/0
Problems in the cold	1 (9.1)	0.2-41.3	1/0/ 0
Appearance of the forearm bothers	4 (36.4)	10.9-69.2	2/0/2
No complaint in cosmesis and sensibility domain	3 (27.3)	6.0-61.0	
Waking at night because of the forearm	0 (0)	0-28.5	0/0/0
Complaints lying on the forearm	1 (9.1)	0.2-41.3	1/0/0
Difficulty with daily activities	1 (9.1)	0.2-41.3	1/0/0
Difficulty moving the wrist	0 (0)	0-28.5	0/0/0
Discomfort leaning on elbow or hand	0 (0)	0-28.5	0/0/0
Discomfort writing or typing	0 (0)	0-28.5	0/0/0
Difficulty holding a steering wheel or handlebar	1 (9.1)	0.2-41.3	1/0/0
Difficulty lifting heavy objects	2 (18.2)	2.3-51.8	1/0/1
Trouble opening or closing doors	0 (0)	0-28.5	0/0/0
No complaint in disability domain	7 (63.6)	30.8-89.1	

TABLE 3: Questionnaire responses (n = 11)

CI: confidence interval

A positive response is an item score of 2 or more. Grades 2/3/4 are mild/moderate/severe. The 95% CI is the exact Clopper-Pearson interval. The bracelet/wristwatch item was reverse-scored. One illiterate patient left the writing/typing item blank, and it was counted as no complaint

Morbidity score and global outcomes

The mean morbidity score was 6.7 (SD: 7.2; median: 4.8; IQR: 1.2-9.5; range: 0-21.4), and three patients (3/11) (27.3%) scored 0 (Table *4*). Nine patients (9/11) (81.8%; 95% CI: 48.2-97.7) would undergo the same procedure again, one would not, and one was unsure. Six patients (6/11) (54.5%) gave the highest satisfaction rating for donor site appearance. Seven patients (7/11) (63.6%) rated their hand function as normal compared with before surgery, and four (4/11) (36.4%) rated it as reduced.

Outcome	Result
Morbidity score (0-100): mean ± SD	**6.7 ± 7.2**
Morbidity score: median (IQR); range	4.8 (1.2-9.5); 0-21.4
Morbidity score of 0, n (%)	3 (27.3)
Satisfaction with donor site appearance (1-4): median (IQR)	4 (2-4)
Satisfaction rating 4/3/2/1, n	6/0/3/2
Hand function compared with before surgery: reduced/normal, n (%)	4 (36.4)/7 (63.6)
Would undergo the same procedure again: yes, n (%; 95% CI)	9 (81.8; 48.2-97.7)
Would undergo the same procedure again: no/not sure, n (%)	1 (9.1)/1 (9.1)

TABLE 4: Morbidity score and global outcomes (n = 11)

SD: standard deviation; IQR: interquartile range; CI: confidence interval

Morbidity score = (sum of the 14 item scores-14)/42×100, where 0 = no complaints and 100 = most severe. Satisfaction with appearance was rated from 1 (least satisfied) to 4 (most satisfied). The global questions were not part of the morbidity score. The 95% CI is the exact Clopper-Pearson interval

Exploratory associations

We made 20 exploratory comparisons, and selected results are shown in Table 5. Only one reached $p < 0.05$: patients who were bothered by the appearance of the forearm were younger than those who were not (median: 55 vs 62 years; Mann-Whitney $U = 2$; $p = 0.024$). Numbness, difficulty lifting, and the morbidity score did not differ significantly by sex, arm dominance, scar area, or scar depression.

Comparison	Group A	Group B	Test	Test statistic	p
Numbness vs donor arm dominance	Nondominant 5/7 (71.4%)	Dominant 1/4 (25.0%)	Fisher's exact	OR = 7.5	0.242
Appearance concern vs scar depression	Depression 1/5 (20.0%)	No depression 3/6 (50.0%)	Fisher's exact	OR = 0.25	0.545
Appearance concern vs age, median years	Bothered 55.0 (n = 4)	Not bothered 62.0 (n = 7)	Exact Mann-Whitney U	U = 2	**0.024***
Appearance concern vs scar area, median cm²	Bothered 28.1 (n = 4)	Not bothered 16.0 (n = 7)	Exact Mann-Whitney U	U = 10	0.527
Difficulty lifting vs donor arm dominance	Nondominant 2/7 (28.6%)	Dominant 0/4 (0%)	Fisher's exact	OR not estimable (zero cell)	0.491
Morbidity score vs age	Spearman ρ = -0.52		Spearman rank correlation	ρ = -0.52; t(9) = -1.83	0.102

TABLE 5: Selected exploratory associations (n = 11)

OR: odds ratio

Group A and Group B give the number with the complaint/number in the group (%) for categorical comparisons, and the median value for continuous comparisons. OR (odds of the complaint in Group A relative to Group B); not estimable when a cell contains zero. Fisher's exact and exact Mann-Whitney U tests are two-sided. For Spearman's correlation, the p-value is from the t distribution with n-2 = 9 degrees of freedom. * $p < 0.05$, uncorrected for multiple testing; 6 of the 20 exploratory comparisons are shown

Discussion

Principal findings

We studied 11 patients treated for stage IVA oral cancer, at a median of eight months after treatment.

Overall donor site morbidity was low. The mean morbidity score was 6.7 out of 100, and hand grip was normal in every patient. Nine of 11 patients (81.8%) would not hesitate to undergo the operation again if necessary. The main problems were hand numbness (54.5%) and concern about the appearance of the forearm (36.4%).

Comparison With Earlier Studies

Table 6 compares our questionnaire results with three earlier studies of patient-reported complaints [3-5].

Complaint	This study (n = 11)	Jani et al. [3] (n = 52)	de Bree et al. [4] (n = 37)	de Witt et al. [5] (n = 50)
Follow-up	**Median 8 months after treatment**	**At least 2 years**	**Not stated**	**At least 6 months**
Hand numbness	54.5	40.4	46	-
Scar itching	0	13.5	14	-
Problems in the cold	9.1	1.9	16	-
Difficulty wearing a bracelet or wristwatch	9.1	0	38	-
Concern about appearance	36.4	5.8	14	27
Difficulty lifting heavy objects	18.2	42.3	-	-
No complaint, cosmesis and sensibility domain	27.3	46.2	-	35
No complaint, disability domain	63.6	57.7	-	75

TABLE 6: Patient-reported complaints in this study and in earlier studies, % of patients

Values are the percentages of patients reporting each complaint. "-" means not reported. Earlier study figures are from the published reports [3-5]. Those studies differ in follow-up time and questionnaire, so the comparison is descriptive only

Numbness: Numbness was more common in our patients (54.5%) than in the Indian long-term cohort (40.4%) [3] and was close to the 46% reported by de Bree et al. [4]. Our patients were seen earlier, so some of the sensory loss may still have been improving, but we did not follow them over time.

Appearance: Concern about appearance (36.4%) was higher than in the earlier studies, where it ranged from 5.8% to 27% [3-5], and than in the 18% reported by Hekner et al. [7]. Ten of our 11 patients had hyperpigmentation and 45.5% had a depressed scar. Scar depression was also the most common scar complaint (30%) in a series of 23 patients [9]. Our scars were also young. Patients who were bothered by appearance were younger (median 55 vs 62 years), but this was one of 20 unadjusted tests and may be due to chance.

Function: Hand grip was normal in all patients, and forearm circumference did not differ between arms. Difficulty lifting heavy objects was less common than in the Indian long-term cohort (18.2% vs 42.3%) [3]. In a six-month series, wrist movement was reduced in 3.7% of patients, cold intolerance occurred in 4.6%, and persistent pain in 5.5% [10]. In our series, one patient (9.1%) had restricted wrist movement from a flexion contracture of the medial three digits, and one (9.1%) had problems in the cold. In another study, 89% of patients rated their hand function at 80% to 100% of the preoperative level [11]. In ours, 63.6% rated it as normal, although the two measures are not directly comparable.

Arm dominance: All our patients were right-handed, and the nondominant left arm was used in seven. Both patients with lifting difficulty were in this group, but the difference was not significant (2/7 vs 0/4, Fisher's exact test, $p = 0.49$). Eight of the 11 patients did manual work, so some lifting difficulty may have been present before surgery.

Skin Grafting and Scar Appearance

All donor sites were closed with a split-thickness skin graft. A series using suprafascial dissection reported that 98% of patients rated the aesthetic result as satisfactory [12]. Other options include a full-thickness

graft, a split-thickness graft over a dermal matrix [13], a full-thickness graft from the inner upper arm [14], and the prelaminated fasciomucosal flap [15]. Because so many of our patients were concerned about appearance, comparing closure techniques in this population would be worthwhile. Table 7 summarizes other published findings.

Study	Main finding
Ito et al. [9]	**Scar depression was the commonest scar complaint (30% of 23 patients)**
Hekner et al. [7]	18% were dissatisfied with the appearance of the donor site
Ali et al. [10]	At six months, cold intolerance in 4.6%, persistent pain in 5.5% and reduced wrist movement in 3.7%
Toschka et al. [11]	94% rated the aesthetic result as fair or good, and 89% rated hand function at 80% to 100% of the preoperative level
Lutz et al. [12]	After suprafascial elevation in 95 patients, 98% rated the aesthetic result as satisfactory
Ho et al. [13]	Full-thickness grafts, split-thickness grafts and split-thickness grafts over a dermal matrix gave comparably low morbidity
Avery et al. [14]	A full-thickness graft from the inner upper arm gave good aesthetic results
Nehrer-Tairych et al. [15]	The prelaminated fasciomucosal flap was proposed to reduce donor site morbidity, in a small series

TABLE 7: Other published findings on donor site outcomes

The studies differ in design, sample size, follow-up and outcome measures, so their figures cannot be compared directly with this study

Donor site outcomes after radial forearm free flap harvest have been reported since the late 1990s, with attention first to the dissection plane and later to closure technique and patient-reported results. Lutz et al. studied 95 consecutive patients after suprafascial elevation and found that 98% rated the aesthetic result as satisfactory [12]. Toschka et al. then assessed both appearance and function: 94% rated the aesthetic result as fair or good, and 89% rated hand function at 80% to 100% of the preoperative level [11]. Nehrer-Tairych et al. compared the prelaminated fasciomucosal flap with the fasciocutaneous radial forearm flap and proposed that the former reduces donor site morbidity, although their series was small [15]. In 2005, Ito et al. examined the donor site in 23 patients and found that scar depression was the commonest scar complaint (30%) [9]. In the same year, Avery et al. reported good aesthetic results when the donor site was repaired with a full-thickness skin graft taken from the inner arm [14]. Ho et al. later compared closure methods and found comparably low morbidity with full-thickness grafts, split-thickness grafts, and split-thickness grafts over a dermal matrix [13]. Hekner et al. compared the radial with the ulnar forearm free flap and found that 18% of patients were dissatisfied with the appearance of the donor site [7]. More recently, Ali et al. reported a six-month case series with cold intolerance in 4.6%, persistent pain in 5.5%, and reduced wrist movement in 3.7% [10].

Taken together, these studies suggest that functional morbidity after radial forearm flap harvest is generally low, whereas scar appearance and sensory complaints are the most variable outcomes. The studies differ in design, follow-up, and the instruments used, so their percentages cannot be compared directly with ours.

Limitations

This study has several limitations. The examiner was a member of the operating team and was not blinded, which may bias subjective outcomes such as pigmentation and scar depression. The sample was small because of a low caseload, so confidence intervals are wide and comparisons were underpowered. There was no preoperative baseline, so we cannot separate the effect of surgery from existing differences between the arms. Follow-up was short, and scar appearance and sensation may change later. The study was done at an institute that is not dedicated to cancer care, where fewer free flap reconstructions are performed than at a high-volume cancer center, so the findings may not apply elsewhere. The questionnaire was adapted from a published one and has not been validated in this form, and the results are subjective. We made 20 comparisons without correction, so the age finding may be due to chance. The strengths are a uniform group, with one tumor stage, one closure method, and right-handed patients only, and the use of both patient-reported and clinical measures.

Conclusions

In this descriptive cross-sectional study of 11 patients with stage IVA oral cancer, donor site morbidity after

suprafascial radial forearm free flap reconstruction was low in overall severity at a median of eight months after completion of treatment (mean morbidity score: 6.7 out of 100). Hand grip was normal in all patients, forearm circumference did not differ between arms, and nine of 11 patients (81.8%) would undergo the procedure again, although one would not and one was unsure. Low overall severity does not mean an absence of complaints. Hand numbness (54.5%) and concern about the appearance of the forearm (36.4%) were common, and most scars showed hyperpigmentation or depression. These two concerns should be discussed with patients before surgery. These findings must be interpreted cautiously. The sample was small, CIs were wide, there was no preoperative baseline, the examiner was not blinded, and the questionnaire was adapted and not validated in this form. The study therefore cannot exclude clinically meaningful functional impairment, and the results should not be generalized beyond similar patients. The association between younger age and concern about appearance was exploratory and may be due to chance. Larger, preferably multicenter studies are needed. They should assess patients before surgery and at fixed intervals (e.g., 3, 6, 12, and 24 months), use a validated and culturally adapted patient-reported instrument, measure grip and pinch strength and sensory recovery quantitatively, record skin phototype, and compare donor site closure techniques for scar appearance.

Appendices

Each item in the cosmesis, sensibility, and disability domains was scored from 1 (no complaint) to 4 (severe). The bracelet or wristwatch item is worded positively and is scored so that a higher score means more difficulty. The questionnaire was adapted from de Witt et al. (5).

No.	Domain	Question
1	**Cosmesis and sensibility**	**Can you wear a bracelet or wristwatch comfortably?**
2	Cosmesis and sensibility	Does your hand feel numb?
3	Cosmesis and sensibility	Does the scar itch?
4	Cosmesis and sensibility	Do you experience problems when exposed to cold?
5	Cosmesis and sensibility	Does the appearance of your forearm bother you?
6	Disability	Do you wake up at night because of discomfort in your forearm?
7	Disability	Do you have complaints while lying on your forearm?
8	Disability	Do you have difficulty in performing daily life activities?
9	Disability	Do you have difficulty moving your wrist?
10	Disability	Do you experience pain or discomfort while leaning on your elbows or hands?
11	Disability	Do you have discomfort during writing or typing?
12	Disability	Do you have difficulty while holding the steering wheel of a car or bike?
13	Disability	Do you experience difficulty lifting heavy objects?
14	Disability	Do you have trouble opening or closing doors?
-	Global	How satisfied are you with the appearance of your donor site? (1, least satisfied, to 4, most satisfied)
-	Global	How would you rate your hand function compared to before surgery? (reduced or normal)
-	Global	Would you undergo the same procedure again if required? (yes, no or not sure)

TABLE 8: Questionnaire used in this study

Items 1-14 were scored 1 (no complaint), 2 (mild), 3 (moderate) or 4 (severe); item 1 was reverse-scored. The three global questions were not included in the morbidity score

Additional Information

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All authors have reviewed the final version to be published and agreed to be accountable for all aspects of the work.

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Disclosures

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