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One-stage tunneled de-epithelialized deltopectoral flap for huge head and neck cancer defects in the era of free flaps

Shadi Awny[1], Mohammad Zuhdy[1,2], Ibrahim Nazif[3], Ahmed M. Abdellatif[4], Khalid Atallah[1], Ahmed Fareed[1], Ahmed Abdallah[1]

[1]Department of Surgical Oncology, OCMU Oncology Center - Mansoura University Faculty of Medicine, Mansoura, Egypt
[2]Department of Surgical Oncology, King Abdullah Medical City, Makkah, Saudi Arabia
[3]Department of Surgical Oncology, Mansoura Health Insurance Hospital, Mansoura, Egypt
[4]Department of Otorhinolyrngolgy and Head & Neck Surgery, October 6 Insurance Hospital, Giza, Egypt

ABSTRACT

Objective: The deltopectoral (DP) flap was and still is a workhorse flap in the reconstruction of head and neck defects following tumor resection, even in the current era of free microvascular flaps.

Material and Methods: We retrospectively recruited, from a prospectively maintained database, all patients with a history of defect reconstruction using one-stage tunneled de-epithelialized fasciocutaneous DP flap following resection of head and neck cancer between June 2020 and June 2023. Patient and disease characteristics, surgery parameters, flap specifics, oncological outcomes, and follow-up data were analyzed and reported.

Results: Eleven patients were recruited; 6 of them were females (54.54%). Head and neck squamous cell carcinoma is the most common pathology (54.5%), followed by papillary carcinoma of the thyroid gland (27.3%). Six patients were operated upon for recurrences, and tumor fungation and/or ulceration was reported in 81.8%. The median age at the time of flap reconstruction was 71 years (range: 46.5-77). Wound complications were reported in 36.4% of patients, with the overall rate of flap necrosis being 27.3%, including 3 patients who suffered from major necrosis at the distal 1/3 of the flap. No delay in receiving adjuvant therapies, according to treatment protocols, was reported for any of the surviving patients.

Conclusion: The one-stage tunneled de-epithelialized fasciocutaneous DP flap is an effective choice with acceptable outcomes for defect reconstruction following resection of locally advanced head and neck cancer, whether on a curative or palliative basis, in relatively old patients with different comorbidities who require rapid treatment sequencing.

Keywords: Surgical flaps, pedicled flap, deltopectoral flap, head and neck defect

INTRODUCTION

The two most common causes of head and neck defects requiring reconstruction are trauma and tumors, with trauma being more reported in the younger population, while head and neck tumors in a relatively older one (1-6).

Therefore, reconstruction for such defects aims to restore aesthetics, enhance residual functions, cover vital structures, and allow good mobility of the preserved structures around the resected area (7,8).

Currently, microvascular free flaps are the standard of care (9,10) for reconstruction of head and neck defects, with Kakarala et al. (11) reporting increased utilization of free flaps associated with an increase in efficiency and flap survivability.

However, there are possible limitations in using the microvascular free flaps regarding the defect site, the patient, the surgeon, and the health care system.

Possible limitations of microvascular free flaps have rekindled interest in pedicled flaps generally, especially the deltopectoral (DP) flap, which was a greatly popular reconstructive tool in the 1960s.

Our study aims to present experience in performing the one-stage tunneled de-epithelialized technique of the DP flap and to evaluate its versatility, success rate, associated morbidity, and oncologic outcomes in a specific group of patients.

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Corresponding Author
Mohammad Zuhdy
E-mail: mzuhdy@mans.edu.eg
ORCID ID: orcid.org/0000-0001-6841

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MATERIAL and METHODS

Patient Cohort and Study Design

All procedures performed in the study involving human participants were following the ethical standards of the institutional research committee and were concordant with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards. All the patients signed a written consent for the surgical maneuvers for resection and reconstruction. This is a retrospective study. Consent for participation in the study itself is not applicable. Approval was obtained from the Institutional Review Board at the Faculty of Medicine Mansoura University (MFM-IRB) (date: 21.07.2024, number: R.24.05.2636).

The prospectively maintained databases of Oncology Center Mansoura University (OCMU) and Mansoura Health Insurance Hospital, Egypt, were searched for cases of locally advanced head and neck cancer that underwent post-resection reconstruction of large defects using one-stage tunneled de-epithelialized fasciocutaneous DP flap between June 2020 and June 2023. All patients signed a written informed consent before any planned procedure.

Data Collection

Patient characteristics such as age, sex, comorbidities, body mass index (BMI), smoking history, type of malignancy and site, and previous therapies were retrieved. Current tumor status and treatment parameters—including the aim and type of surgery, flap specifics, postoperative complications and their management, and adjuvant therapies with oncological outcomes, were evaluated and reported. Patients were followed up until 24 May 2025.

Statistical Analysis

Patient data were analyzed, and statistical values were obtained using SPSS version 26 (SPSS Inc., Chicago, IL). Mean values with standard deviation when symmetrical, or median and range when asymmetrical, were used for continuous variables, and categorical variables were presented as proportions.

Flap Design

In our study of 11 patients, we used a one-stage tunneled de-epithelialized DP flap with no delay technique. After completing the surgical resection and hemostasis check of the recipient site, the flap was classically designed through drawing the conventional two horizontal incisions, starting 2 cm lateral to the parasternal border to incorporate the 2nd-4th internal thoracic artery perforators. The distal end of the flap was designed to extend beyond the DP groove into the anterior shoulder area; however, no delay technique was needed (Figure 1A). The flap was harvested in a lateral-to-medial direction in a subfascial plane, just over the deltoid muscle and deep to its fascia, extending over the deltoid muscle, DP groove, and the pectoralis major muscle (Figure 1B, C). The subcutaneous (SC) tunnel connecting the donor and recipient site was prepared, and the harvested flap was delivered through the tunnel to the recipient site to precisely mark the skin island and determine the exact length of the flap to be de-epithelialized (Figure 1D). The flap was then returned to the donor site to meticulously de-epithelialize the marked skin length while preserving the rich dermal-subdermal plexus (Figure 1E). Again, the flap was transferred through the SC tunnel to suture the edge of the skin island to the edge of the recipient site, and the edge of the de-epithelialized part to the edge of the skin bridge, thus finalizing the flap transfer in one stage (Figure 1F). In the majority of our cases, the donor site was

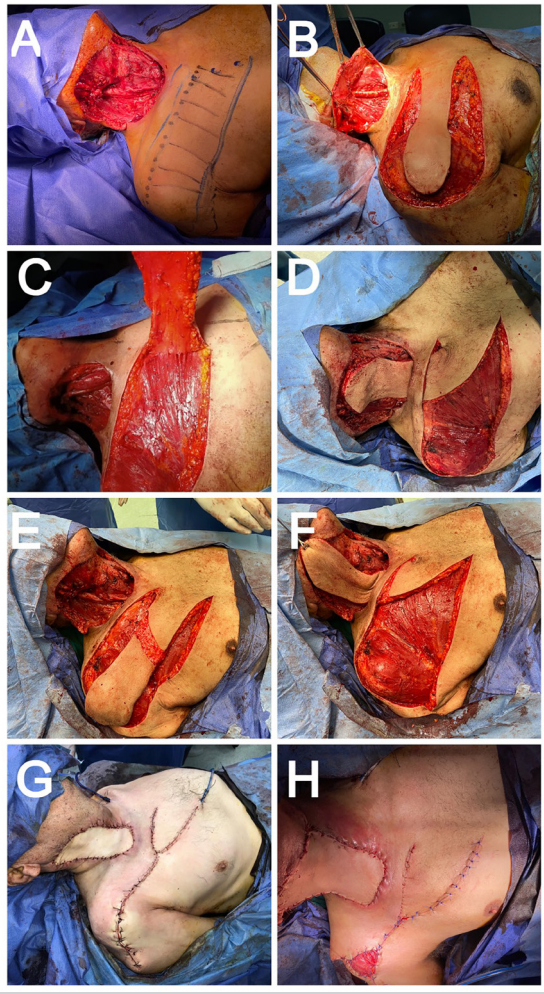

Figure 1. A. Post-resection defect and flap markings. **B, C.** Flap harvest in a lateral to medial direction in the subfascial plane. **D.** Subcutaneous tunnel creation and precisely marking the skin island and part of the flap to be de-epithelialized. **E.** De-epithelialization of the length to be buried under the skin bridge. **F.** Suturing the edge of the skin island to the edge of the recipient site, and the edge of the de-epithelialized length to the edge of the skin bridge. **G.** Final view after full flap insertion and primary wound closure. **H.** Flap insertion with near-primary wound closure leaving a small raw area over the anterior shoulder.

closed primarily by undermining the skin flaps around with no need for skin grafting (Figure 1G), while in others a small raw area was left over the anterior shoulder area (Figure 1H).

Peri-operative Care Regimen

Per our institutional protocol, we administer a single dose of prophylactic low-molecular-weight heparin (LMWH) (enoxaparin sodium 4000-8000 U), at night, and a single dose of preoperative antibiotic prophylaxis 30 minutes before skin incision. The post-operative care involves regular monitoring of vital signs and flap viability, wound care, early mobilization and oral feeding, limiting excessive head and neck movement, deep breathing exercises, and medications such as simple analgesics. Intravenous (IV) antibiotics (sulbactam 500 mg/ampicillin 1000 mg/twice daily) are provided while inpatient, followed by an outpatient oral equivalent for another week; LMWH (enoxaparin sodium 4000-8000 u/once daily) is administered while inpatient and continued for at least two weeks while outpatient. Some patients received therapeutic doses of LMWH based on cardiologists' recommendations. Additionally, oral anti-inflammatory enzyme therapy (chymotrypsin 5 mg/trypsin 5 mg/2 tablets/3 times daily) is prescribed for at least two weeks. Patients with postoperative surgical site infection received IV antibiotics according to culture and sensitivity results.

RESULTS

Our study reports on a total of 11 patients. Five were males (45.45%) and six were females (54.54%). Most were diagnosed with locally advanced head and neck cancer and were treated through surgical resection and reconstruction of the resulting defects using a one-stage tunneled de-epithelialized fasciocutaneous DP flap.

Patient and Disease Characteristics (Table 1)

The median age at the time of flap reconstruction was 71 years (range: 46.5-77), and the median BMI was 27.3 (range: 20.5-36.8). The majority of patients, 7 (63.6%), were non-smokers. Cardiovascular disease was reported in 7 patients (63.6%), followed by hypertension in 4 patients (36.4%) and diabetes mellitus (DM) in only 2 patients (18.2%), with 5 patients (45.45%) having at least two comorbidities.

Head and neck squamous cell carcinoma of different sites was the most common pathology, reported in 6 patients (54.5%), followed by papillary carcinoma of the thyroid gland (PTC) in 3 patients (27.3%).

Six patients (54.5%) were operated upon for recurrent disease, and tumor fungation/ulceration was reported in 9 cases (81.8% of the group) (Figure 2A-C-E).

Of the 5 cases with primary tumors, one case had stage II PTC, one case had stage III skin verrucous SCC, and three cases had stage IV disease: Two cases with stage IVA laryngeal SCC and tongue SCC, and one case with stage IVB mucoepidermoid carcinoma of the parotid gland.

Five of the 6 cases with recurrent disease had malignant pathology: Two cases had stage N1b PTC, two had stage N2b SCC of the lip and tongue, and one had stage N3 nasopharyngeal SCC.

Surgery Parameters and Flap Specifics (Table 2)

Surgery was performed on a curative basis in 9 patients (81.8%) and on a palliative basis in 2 patients (18.2%), based on clinical tumor staging and following the multidisciplinary team (MDT) recommendations, taking into consideration the intraoperative findings,.

Following surgical resections, R0 margins were reported in 6 patients (54.5%), R1 in 3 patients (27.3%), and R2 in 2 patients (18.2%).

The median total operative time was 300 minutes (range: 210-480), and surgical resection resulted in soft tissue defects in the neck region in 7 patients (63.6%), the parotid/neck region in 1 patient (9.1%), and the lower face/neck in another 2 patients (18.2%) (Figure 2B-D-F).

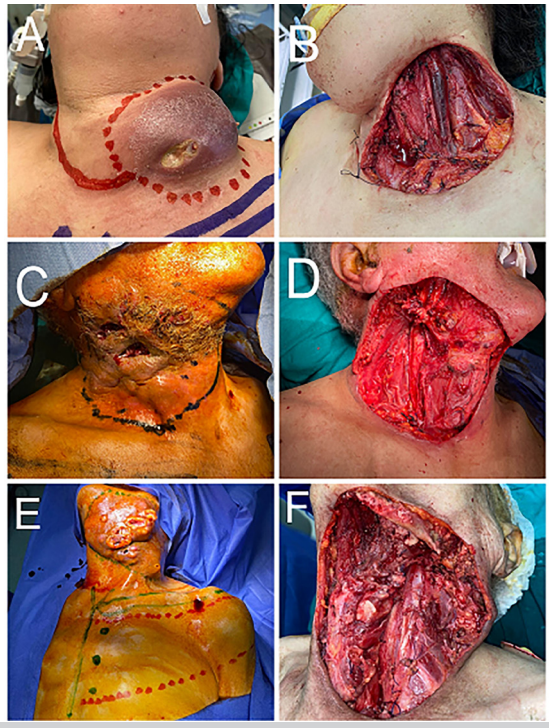

Figure 2. A. Pre-resection and **B.** Post-resection (bilateral BND) (case no. 1). **C.** Pre-resection and **D.** Post-resection of fungating nodal disease in (case no. 5). **E.** Pre-resection and **F.** Post-resection of fungating nodal disease in (case no. 6).

BND: Block neck dissection, PTC: Papillary thyroid cancer, SCC: Squamous cell carcinoma

Table 1. Patient and disease characteristics

Patient	Age at surgery, year	Sex	Comorbidities					Smoking	BMI	Primary Ds; site, pathological type, grade, and TNM	Previous treatment	Current condition (to be treated)/tumor status, TNM, and stage
			DM	HTN	CVD	Hepatic	Others					
1	46.5	F	-	-	-	-	Hypo-thyrodism	-	36.8	Thyroid, PTC (conventional type) (pT3acN0M0, stage I)	TT 1 year before + L-thyroxine suppressive dose	Nodal recurrence, fungating De-differentiated (N1bM0)
2	63	M	+	+	+	-	-	-	32.7	Parotid, mucoepidermoid carcinoma, G3 (T4bN2bM0, stage IVB)	-	Primary, fungating
3	72	F	-	-	-	-	-	-	25.7	Submndibular, PMA	Surgery for 6 times	Local recurrence, multiple/diffuse
4	72.5	F	-	+	+ Valvular HD	-	-	-	20.5	LIP, SCC, G1 (T1N0M0, stage I)	WLE with free margins on lip + lv I, II, III BND	Nodal recurrence, fungating, G2 (N2bM0)
5	71	M	-	-	+ IHD, AF stenting	-	COPD	+	27.3	Larnyx, SCC, G3 (T4aN2cM0, stage IVA)	-	Nodal 1ry, fungating
6	77	F	-	+	+ IHD stenting	-	-	-	25.1	Tongue, SCC, G1 (T3N2bM0, stage IVA)	Chemotherapy (due to critical cardiac condition precluding surgery at a time)	Nodal 1ry, fungating (progress on chemotherapy)
7	60	M	-	-	-	+	-	NA	30.8	Thyroid, PTC (conventional type) (pT1bN1bM, stage II)	TT + central + type 1 modified lateral BND + RAI	Nodal recurrence (N1bM0)
8	53	F	-	-	-	-	-	-	22.2	Tongue , SCC, G2 (T3N0M0, stage III)	Compartmental resection with lv I, II, III BND with SCAIF + CCRT	Nodal recurrence, fungating, G2 (N2bM0)
9	76	M	-	-	+	-	-	NA	27.9	Thyroid, PTC (T3aN1bM0, stage II)	-	Nodal 1ry, infected, about to fungate
10	65	M	-	+	+	-	-	+	26	Nasopharyngeal, SCC (T3N0M0, stage III)	CCRT	Nodal recurrence, fungating (N3M0)
11	75	F	+	-	+	-	-	-	29	Neck skin, Verrucous carcinoma (T3N0M0, stage III)	-	Primary, ulcerating

F: Female, M: Male, DM: Diabetes mellitus, HTN: Hypertensive disease, CVD: Cardiovascular disease, IHD: Ischemic heart disease, AF: Atrial fibrillation, COPD: Chronic obstructive pulmonary disease, (+): Positive, (-): Negative, PTC: Papillary thyroid cancer, SCC: Squamous cell carcinoma, PMA: Pleomorphic adenoma, TT: Total thyroidectomy, BND: Block neck dissection, SCAIF: Supraclavicular artery island flap, CCRT: Concurrent chemo-radiotherapy, 1ry: Primary, NA: Not available.

Table 2. Surgery parameters and flap specifics

Patient	Aim of surgery	Type of surgery, safety margins status	Operative time, minute	Defect anatomical site	Defect size, cm	Flap harvest time, minute	Hospital stay, days	Postoperative complications			
								Wound	Flap necrosis	Timing, (POD)	Management
1	Curative	Bilateral BND (free margins; R0)	390	Neck	10*9	45	3	-	-	-	-
2	Curative	Total parotidectomy + WLE of the fungating lesion + sacrification of cranial nerve X, XII and lower trunk of VII (infiltrated deep margin; R1)	330	Parotid and neck	12*11	50	3	Infection, resistant Diplococcus bacteria	Major, distal end, category: Partial failure (2aP)	20*	Debridement, skin graft from anterior lateral thigh
3	Curative	Radical resection (free margins; R0)	360	Lower face, neck	15*10	40	3	-	-	-	-
4	Curative	WLE of fungating lesion + marginal mandibulectomy (infiltration of bone safety margin; R1)	210	Neck	7*5.5	55	4	Infection, resistant Gram-negative Bacilli bacteria	Major, distal end, Category: Partial success (1bP)	16*	Debridement, healed by secondary intention
5	Palliative	WLE of fungating lesion + IJV sacrification (tumor residue; R2)	360	Neck	12*8	45	8	Infection	-	2	Conservative measures
6	Palliative	WLE of fungating lesion, ECA sacrification, (tumor residue; R2)	285	Lower face, Neck	14*7	45	10	-	-	-	-
7	Curative	Selective BND (R0)	270	-	-	50	4	-	-	-	-
8	Curative	WLE, sacrification of sternomastoid + IJV + upper trunk of brachial plexus (infiltrated deep and lateral margins; R1)	270	Neck	9*7	40	5	-	-		-
9	Curative	TT + central + radical BND (free margins; R0)	480	Neck	10*5	55	4	Hematoma then seroma at donor site, small area of skin necrosis at donor site	Major, distal end, category: (1bP)	1,15*	Surgical hemostasis, conservative measures
10	Curative	Radical BND (free margins; R0)	240	Neck	8*6	50	3	-	-	-	-
11	Curative	WLE (free margins; R0)	300	neck	11*7	45	3	-	-	-	-

BND: Block neck dissection, WLE: Wide local excision, INJ: Internal jugular vein, ECA: External carotid artery, POD: Postoperative day
(2aP): Partial failure = second flap (free or pedicled) required to rehabilitate defect, (1bP): Reconstruction successful = partial success with loss of some components of flap, but no secondary reconstruction or prosthesis required, *: Timing of evident flap necrosis.

Ten of the 11 patients (90.9%) received a DP flap to cover large skin defects, and in 1 case (9.1%), it was used to provide an additional protective layer over the common carotid artery (CCA). This was necessary due to thinned overlying skin from the previous type 1 modified block neck dissection (BND) and the current resection for nodal recurrence encasing the artery.

The defect size ranged from 7x5.5 cm to 15x10 cm. The median flap harvest time was 45 minutes (range: 40-55). The donor site was primarily closed in 10 patients (90.9%), with a small raw area left at the anterior shoulder region in 1 patient (9.1%).

Wound complications were reported in 36.4% of patients, including wound infection in 3 patients (27.3%) and hematoma followed by seroma collection in 1 patient (9.1%), with a small area of skin necrosis at the donor site in the same patient. Another patient had a cerebral stroke one month postoperatively, followed by an upper limb deep venous thrombosis. The median hospital stay was 4 days (range: 3-10).

The overall rate of flap survival in our study was 72.7% (Figure 3A-H), with flap necrosis reported in 27.3% of patients, as 3 patients suffered from major necrosis at the distal 1/3 of the flap (Figure 4A-H).

Oncological Outcomes and Follow-up Data (Table 3)

The 90-day mortality rate was 36.4%, with no more deaths reported until the end of the follow-up period. The median overall survival was 14.6 months (range: 0-41).

The 4 cases of mortality included the 1st case, who presented to the emergency department with very poor general condition due to rapidly aggressive recurrence, was admitted to the intensive care unit and succumbed just 1 day after. The 2nd, 3rd, and 4th cases had a combination of different risk factors: Old age, chronic comorbidities, and fungating locally advanced tumors, with a resistant wound infection in the 2nd case and gross tumor residues in the 3rd and 4th cases. The cause of death in the second case was sudden cardiac arrest, 2 days after managing flap necrosis; in the third and fourth cases, it was difficult postoperative recovery with cardiopulmonary deterioration.

Following the MDT recommendations, two patients with PTC received treatment: Case no. 7 (with nodal recurrence) and case no. 9 (with locally advanced primary disease) were given adjuvant RAI plus levothyroxine suppressive dose, with case no. 7 also receiving external beam radiotherapy. Patient case no. 4 (with nodal recurrence of lip SCC) received adjuvant weekly paclitaxel 100 mg for 9 weeks. Unfortunately, case no. 8 (with nodal recurrence of tongue SCC) did not receive her planned therapy due to postoperative cerebral stroke, resulting in lost follow-up. The last patient, case no. 3, (with frequently recurrent submandibular pleomorphic adenoma), received adjuvant tamoxifen 20 mg/daily.

No delay in receiving the adjuvant therapies was reported for any of the surviving patients.

The recurrence rate was 54.5% with the most common pattern being nodal recurrence (36.4%), followed by distant and local recurrence in 18.2% and 9.1%, respectively. The median disease-free survival (DFS) was 8 months (range: 1-36).

DISCUSSION

Microvascular free flaps are considered the standard of care for reconstruction of head and neck defects (9,10). However, there are possible limitations for its use regarding the defect site, patient, surgeon, and health care system. For example, the vessel-depleted necks, resulting from previous neck dissection, severe atherosclerotic disease, heavily irradiated tissues, and the donor/recipient sites' aesthetic requirements, are to be considered when choosing these flaps for reconstruction (10,12-15). Age may impact the viability of the donor sites, with poor surgical outcomes (16); however, many studies showed that age is not considered a risk factor for flap failure even in patients up to 90 years old (17,18). Some authors reported that general

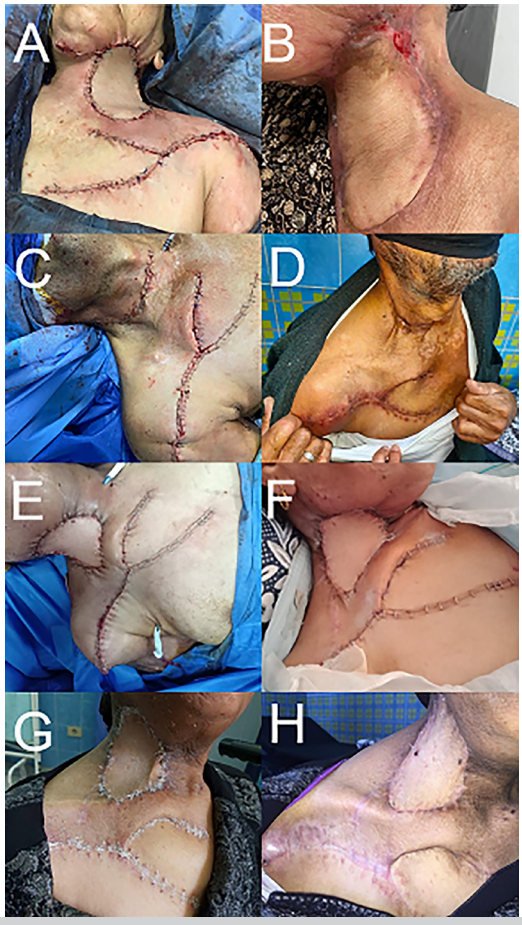

Figure 3. A. Intraoperative and **B.** Eight weeks postoperative of (case no. 3). **C.** Intraoperative and **D.** Three weeks postoperative of (case no. 7). **E.** Intraoperative **F.** Immediately postoperative **G.** Three weeks postoperative and H. Seven weeks postoperative of (case no. 8).

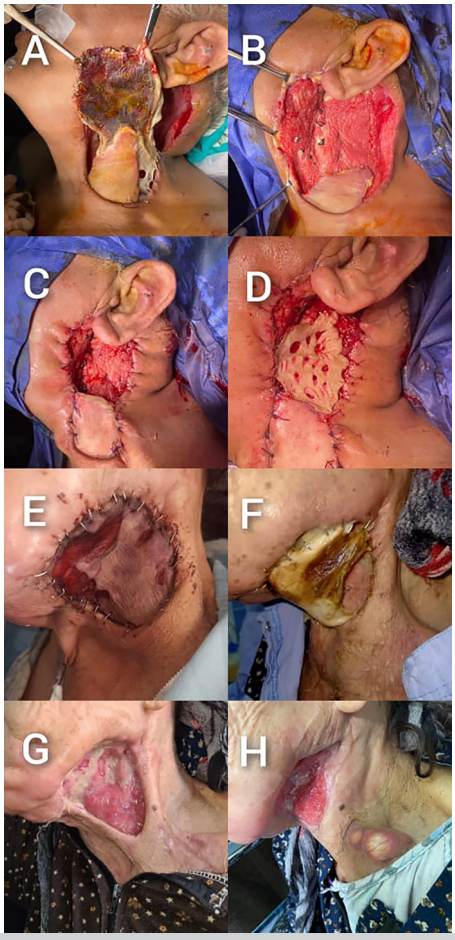

Figure 4. A. Evident major necrosis of the distal end of the flap. **B.** Complete removal of the necrotic tissue. **C.** Approximation of the wound edges as possible to narrow the defect. **D.** Reconstruction by skin graft from anterior lateral thigh. (case no. 2) **E.** Congested distal end of the flap with wound dehiscence. **F.** Evident major necrosis of the distal end of the flap. **G, H.** Healing of the defect by secondary intention (case no. 4).

health and comorbidities such as diabetes may interfere with the flaps' survivability (19,20), while others argue that normal glycaemia must be maintained for improved outcomes (21). Another issue is that patients pretreated with chemotherapy and/or radiotherapy, or presenting with recurrent diseases, may not be the best candidates for free flaps (22,23). Despite that, high-volume institutions had extended their indications for the use of free flaps to include many of these conditions (24).

Also, the microvascular free flaps require expertise in microvascular techniques (25) with longer operating time, and a higher rate of revision surgery (9). In contrast, the pedicled flaps are more accessible to both academic and community surgeons (26). Free flaps have logistic, financial, and training burdens on any health system (20,27,28).

Taking into consideration such possible limitations of the microvascular free flaps, interest in the pedicled flaps has been rekindled in general, with special attention given to the workhorse in the head and neck reconstruction, the DP flap.

There are many advantages of using DP flap in the reconstruction of the head and neck defects: It is technically simple with fast harvesting, thus it shortens both operative and anesthesia time. Has a reliable blood supply (29); it provides a large surface area for harvesting thin pliable tissue with minimal bulk (10,30). The procedure has an excellent color and texture matching for the recipient site with minimal functional deficit in the donor site (31,32). It can rotate and easily reach a defect up to the zygomatic arch, increasing its versatility. of course, it can be raised in one stage through either de-epithelialization and tunneling (33), a single incision in the donor area (34,35), or excision of the skin between the recipient and donor site (31).

Table 3. Oncological outcomes and follow-up

Patient	Adjuvant therapy	Recurrence	Pattern of recurrence	Status at last visit	Overall survival, months	Disease free survival, months
1	-	+	Nodal	Died	2	1
2	-	-	-	Died	1	-
3	Tamoxifen 20 mg/daily	+	Local	Alive	43	14
4	Weekly paclitaxel 100 mg/9 weeks	+	Nodal + distant	Alive	8	2
5	-	-	-	Died	0	-
6	-	-	-	Died	0	-
7	RAI + L-thyroxine suppressive dose + EBRT	+	Distant	Alive	46	36
8	-	+	Nodal	Alive	3	2
9	RAI + L-thyroxine suppressive dose	+	Nodal	Alive	31	31
10	-	-	-	Alive	23	-
11	-	-	-	Alive	17	-

(+): Oositive, (-): Negative, RAI: Radio-active iodine, EBRT: External beam radiotherapy, CCRT; Concurrent chemo-radiotherapy.

However, such a flap doesn't come without disadvantages. There may be a need for skin grafting for the donor area (32); however, it could be primarily closed through undermining of the surrounding skin (10), especially in patients with lax skin (31), as was the case in our study of relatively old patients. However, the donor site in only 1 patient was not completely closed in a primary fashion, leaving a very small raw area, without the need for skin grafting.

Another disadvantage is breast asymmetry and nipple distortion affecting cosmetic outcomes in female patients (31); however, given the clinical staging of the tumors and the patients' old age, it did not greatly impact patients' decisions regarding flap selection or their quality of life in our study.

Flap necrosis or failure is considered the most feared complication in the realm of reconstructive surgery, as it leads to prolonged hospitalization, readmission, increased morbidity and mortality, and functional deficits (36); the common causes of DP flap necrosis include pedicle constriction or twisting, flap traction, and folding (37).

A higher incidence of complications, such as flap loss, dehiscence, or fistula reappearance was seen in cases where the DP flap was used for the repair of mucosal-only defects while using techniques such as the reverse tubulation procedure, creating a slit for stoma formation or esophageal anastomosis, or in the reconstruction of the total pharynx, the tongue, its base, and the mouth floor. These complications are mostly due to the high incidence of infection from the contaminated aerodigestive secretions, malignant ulceration, or nearby infected teeth in such a dark, moist and warm environment, thus favoring bacterial growth (29,37-41).

Gilas et al. (29) reported no statistically significant difference in the rate of complications between patients who had received radiotherapy versus those who had not (215 vs. 463 flaps, respectively), albeit with a higher rate of major flap necrosis related to the radiotherapy group (15.1% vs. 21% $p<0.005$). Kirkby et al. (40) reported a 49% flap failure rate in previously irradiated recipient sites. On the contrary, other authors have reported no or minimal flap failure due to recipient site irradiation (36,42).

We used the one stage tunneled de-epithelialized fasciocutaneous DP flap in our group of 11 older and fragile patients for the reconstruction of large soft tissue defects following resection of locally advanced head and neck cancer, with compromised overlying skin. This approach also provided additional coverage for a possibly jeopardized CCA with thin overlying skin from both previous type 1 modified BND and the current resection for nodal recurrence encasing the artery.

We followed the same classic steps described by both Bakamjian (43) and Lash et al. (33), except for the original delay technique used to reduce the risk of necrosis in the distal part of the flap. The delay technique was not used by Gilas et al. (29), with Bakamjian (43) as a co-author. They reported in their article, based on 678 DP flaps over 20 years of experience that there was no statistically significant difference between delayed and non-delayed DP flaps regarding the complication rate. Therefore they abandoned the routine use of the original delay technique. Other studies from Kingdom and Singer (36) did not report that any of their 24 patients experienced flap necrosis when their flaps were extended laterally to the DP groove without using a delaying procedure. In another study of 86 DP flaps by Kirkby et al. (40), the risk of complications was higher, although not statistically significant. Also, Pecorari et al. (44) reported a no-delay technique in their 31 patients with the same frequency of complications, even in comorbid patients, except for those with DM who had a different frequency. Moreover, two comparative trials by Chen et al. (45) and Mir et al. (46) compared conventional DP flaps with laterally extended DP flaps without the delay technique (23 vs. 10, and 15 vs. 17 patients, respectively) that reported comparable rates of overall complications and flap necrosis between groups. Therefore, we did not use a delay technique in our series, which resulted in only 3 cases of necrosis in the distal end of the flap.

Chan and Chan (31) reported a total of 54 patients with a median age of 60 years (range: 37-99). We reported an older group of patients with a median age of 71 years and a narrower range of 46.5-77. They used the DP flaps to cover the skin defects in 63% of their cohort and opted for reconstruction in the form of a one-stage procedure through excision of the skin bridge between the defect and donor site; or through tubulization of the DP flaps over the skin bridge, which was later divided in a staged procedure.

The reported overall complication rates of the DP flap have reached 51% (29). Taking into consideration the different techniques and modifications of the DP flap over the years, and the variable scenarios in which it is being used, Chan and Chan (31) reported a 3.7% rate of partial tip necrosis in 54 patients. Krizek and Robson (38) reported a rate of major necrosis of 10.5% in 86 patients. Andrews et al. (47) reported 16% distal flap loss in 25 patients. Gilas et al. (29) reported in their series of 604 patients 16.9% and 14.2% overall rates of major and minor necrosis, respectively. Mendelson et al. (37) reported a 23% rate of major flap loss in 63 patients. Kingdom and Singer (36) and Mortensen and Genden (35) reported total flap survival with no necrosis in their series of 24 and 16 patients.

Wound complications were reported in 36.4% of our patients, with the overall rate of flap necrosis 27.3%, given the low number of patients, which was 11. Their outcomes were categorized as: 1 case as (2aP) and another two as (1bP), based on a proposed categorization system for results/outcomes for reconstruction with a pedicled flap by Ho et al. (48), which aims to reflect the

complexity of reconstructive surgery and accurately define its outcomes beyond QOL or functional measures.

We thought that the causes for flap necrosis in our three patients were possible pedicle constriction by a tight skin bridge or excess flap traction in irritable patients postoperatively, coupled with the superimposed postoperative infection in two patients that may impair the flap vascularity and promote necrosis in the already randomly extended distal end.

As emphasized by Shaw et al. (28), surgeons should appreciate the broader context of treatment plans devised by the MDT approach when a flap is being selected for defect reconstruction following tumor surgery in the head and neck region, as the most common indication is locally advanced SCC, representing 54.5% of our patients, which often leads to early patient demise. Therefore, any delay to the start of adjuvant therapy due to flap complications may represent only a limited surgical success and could contribute to a broader treatment failure.

There was no reported delay in administering adjuvant therapies according to treatment protocols in our patients. The 4 cases of 90-day mortality were due to multiple factors: Old age, multiple chronic comorbidities, aggressive locally advanced, mostly fungating, diseases, or early aggressive recurrence. None were related to the flap complications. Also, one patient did not receive her therapy due to cerebral stroke and loss of follow-up.

So, we presume that the adoption of the one-stage tunneled de-epithelialized fasciocutaneous DP flap technique in such a clinical scenario proved to be a success in the broader context of treatment plans in our patients, despite some yet acceptable surgical failures.

CONCLUSION

The one-stage tunneled de-epithelialized fasciocutaneous DP flap is an effective choice with acceptable outcomes for defect reconstruction following resection of locally advanced head and neck cancer, whether on a curative or palliative basis, in relatively old patients with different comorbidities requiring a rapid sequence of their treatment plans.

Ethics

Ethics Committee Approval: Approval was obtained from the Institutional Review Board at the Faculty of Medicine Mansoura University (MFM-IRB) (date: 21.07.2024, number: R.24.05.2636).

Informed Consent: All patients signed a written informed consent before any planned maneuver.

Footnotes

Author Contributions

Surgical and Medical Practices - S.A., M.Z., I.N., A.M.A., K.A., A.F., A.A.; Concept - S.A.; Design - S.A., A.A.; Data Collection or Processing - S.A., M.Z., I.N., A.M.A., K.A., A.F., A.A.; Literature Search - S.A., A.M.A.; Writing - S.A., M.Z., A.F., A.A.

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