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Pedicled latissimus dorsi myocutaneous flap in the reconstruction of the head and neck region: Experience with 17 patients

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ABSTRACT

Objective: To assess the efficacy of a modified pedicled latissimus dorsi myocutaneous flap (LDMF) in the reconstruction of defects of the head and neck region.

Methods: The retrospective analysis of 17 consecutive patients operated between 2010 and 2014 in the Plastic and Reconstructive Surgery Department of a tertiary care center was performed. Among them, four (23.5%) were initially diagnosed with trauma, while 13 (76.5%) had squamous cell carcinoma originating from the head and neck region. Tumor recurrence, necrosis of the free flap, advanced age, presence of a comorbidity, and previous history of radiotherapy were indicators for a pedicled LDMF. The pedicled LDMF technique was performed via the modified subcutaneous tunnel method in all patients. Demographic, clinical, and peroperative data as well as complications in and a survey of our patients were documented.

Results: Our series comprised 11 males (64.7%) and six females (35.3%); the average age was 64.29±5.43 (range, 51 to 72) years. Seroma (5/17, 29.4%) and partial flap necrosis (3/17, 17.6%) were the most common complications, while the rate of mortality during the follow-up period was 17.6% (3/17). One patient died during the early postoperative period, while two died during their oncological treatment and follow-up. No remarkable functional disabilities or restrictions were postoperatively observed.

Conclusion: Our results showed that a pedicled LDMF can constitute a safe and effective alternative for the reconstruction of head and neck defects in selected patients. However, further controlled clinical trials on larger series are warranted to precisely unveil the indications, contraindications, and outcomes of a pedicled LDMF.

Keywords: Latissimus dorsi, pedicle, myocutaneous flap, head and neck, reconstruction

Introduction

Reconstruction of defects is one of the most challenging issues faced after head and neck surgery. Owing to the complex anatomy, outcomes after reconstruction may not always be satisfactory (1). Vigorously seeking the achievement of adequate functional and cosmetic results after head and neck surgery has led to the development of many alternative surgical techniques (2, 3).

Free microvascular tissue flaps reportedly yield fairly good results after reconstruction (3). However, pedicled regional flaps are still used as they are less complicated, cheaper, and easier to use than free microvascular tissue flaps (4). Proximity to the operation site, ease of the surgical procedure, and the high rates of success are other advantages offered by regional flaps, but there is still no consensus for the ideal method of the reconstruction of defects of the head and neck region (4, 5).

A latissimus dorsi myocutaneous flap (LDMF) is one of the reconstruction methods currently employed in the head and neck region (3-5), particularly in cases where the general health status, socioeconomic status, and history of previous surgery, radiotherapy, or trauma may interfere with the use of free flaps. In such circumstances, an LDMF may be the only reconstruction option; therefore, it must be included as an alternative for even the most challenging cases.

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An LDMF offers advantages such as length of the pedicle, ease of dissection, and multi-directional usage. Owing to the popularity of and advancement in microsurgical techniques, LDMFs have been frequently used as free flaps (1, 4, 5). However, they can also be used as pedicled flaps, particularly in elderly patients, in the presence of comorbidities and in patients with compromise of vasculature in the recipient tissue or with a history of loss of a free flap (6, 7).

For the reconstruction of head and neck defects, a pedicled pectoralis major myocutaneous flap, a trapezius myocutaneous flap, and a superficial cervical artery flap can be used for the same purpose (8). Initially described by Quillen et al. (5), a pedicled LDMF has been widely accepted and has become the flap of choice for the reconstruction of defects of the head and neck region.

The transfer of a pedicled LDMF to the head and neck region can be achieved via pectoral tunnel, subscapular, or subcutaneous routes (7). If a flap is completely released from humeral insertion together with the dissection of the pedicle, it can be successfully transferred to distal regions such as the vertex of the cranium (8).

The aim of the current study was to present our results on 17 patients who underwent reconstruction for defects of the head and neck region using a pedicled LDMF along with a brief review of literature.

Methods

Study Design: All patients included in this series were informed prior to the surgical intervention, and strict adherence to the principles of Helsinki Declaration was followed. A total of 17 patients (6 women, 11 men) were operated using a pedicled LDMF in the Plastic and Reconstructive Surgery Department of a tertiary care center between 2010 and 2014. Indications for a pedicled LDMF included compromise of vascularization in the recipient site, advanced age, coexisting systemic disorders, history of radiotherapy, and failure of a free flap.

Surgical Technique: After interventions for the recipient site had been performed in the supine position, a patient has been taken to the lateral decubitus position. A plan for the composition, size, and rotational axis of the flap was made with respect to the size and composition of the defect as well as the distance to the axillary region. As suggested by Kuvat *et al.*, the cutaneous island of the flap extended distally for defects of the middle or upper facial region, necessitating augmentation of the rotational arc (9). Elevation of the flap was started as incisions surrounding the cutaneous islands extending distally, whereas a proximal incision was from the posterior axillary line to the anterior axillary line. In 16 patients, the branch of the pedicle extending to the serratus was ligated, and the pedicle was dissected to the subscapular system. In only one patient, the serratus was included in the preparation of the flap. The latissimus dorsi muscle was completely separated from its humeral insertion, and the thoracodorsal nerve was transected. A subcutaneous tunnel was formed above the clavicle and pectoralis muscle to allow the transfer of the flap between the neck and the anterior axillary line. In patients without a history of radiotherapy, scoring was performed in the subcutaneous plane of the tunnel. The pectoralis major muscle was partially transected along the route of the flap. The flap was then carefully passed through the tunnel with the aid of a suture placed on its distal tip. In patients with a previous history of neck dissection, the incision was extended to the clavicle in the recipient site. The flap was adapted to the clavicular region separated with the incision providing the relief of any compression over the flap and the pedicle. After the flap was transferred to the recipient site, perfusion of the flap was evaluated for venous congestion and/or arterial insufficiency before it was adapted. With this aim, perfusion of the flap was evaluated with the color of the flap, capillary refill, and bleeding in the distal zone of the flap. Drains were placed in donor and recipient sites, and the distal half of the donor site was sutured. After confirmation of the sufficiency of flap circulation, the flap was adapted to the recipient site, and the donor site was completely sutured (Figures 1-3).

Results

Criteria for the use of the pedicled LDMF consisted of the presence of comorbidities in all patients (100%), advanced age (>65 years) in eight (47%), tumor recurrence in four (23.5%), history of radiotherapy in three (17.6%), and failure of the free flap in two (11.8%).

Demographic features, preoperative diagnoses, complications, secondary surgical interventions, and prognostic details are displayed in Table 1. The mean age of the patients was 64.29±5.43 (range, 51 to 72) years.

Partial loss of the flap occurred in three patients (17.6%), and revision interventions of debridement and split thickness skin grafts were performed. In one patient who was under follow-up in the intensive care unit postoperatively, total loss of the flap was observed in conjunction with deterioration of systemic circulation. This patient died soon due to systemic circulatory insufficiency. Seroma and hematoma were noted in five patients (29.4%) and one patient (5.9%), respectively. One patient (1.4%) died during the course of oncological treatment and follow-up within several years after our surgical intervention.

Partial incision of the pectoralis muscle did not yield any remarkable functional compromise in our series. Similarly, subcutaneous scoring performed for widening the tunnel did not lead to problems such as necrosis. No noteworthy complications regarding flap viability, wound healing, or donor site problems were encountered (Table 1).

Figure 1. Appearance of the defect of the head and neck region before repair with a pedicled LDMF.
LDMF: Latissimus Dorsi Myocutaneous Flap

Figure 2. Harvesting of the pedicled LDMF.
LDMF: Latissimus Dorsi Myocutaneous Flap

Even though the thoracodorsal nerve was transected during the harvest of the pedicled LDMF, a bulky mass appeared on the clavicle postoperatively. Partial division of the pectoralis muscle attenuated this partial division. All patients seemed to tolerate this deformity well, and none of them requested any surgical intervention for the correction or alleviation of this deformity during the follow-up period up to now (Figures 4, 5).

Figure 3. Coverage of the defect with the pedicled LDMF.
LDMF: Latissimus Dorsi Myocutaneous Flap

Discussion

Latissimus dorsi myocutaneous flap is not a very popular reconstruction modality these days; the reason for this is the presence of many reconstruction methods. The pectoralis major flap, deltopectoral flap, sternocleidomastoid flap, forehead flap, trapezius flap, and temporalis myofascial flap may all be mentioned among such modalities (6). Although the application of these reconstruction methods is easier, they may not necessarily be the most appropriate choice for the reconstruction of the particular defect or they may simply be inapplicable under specific circumstances. In these conditions, the use of an LDMF for reconstruction may prove to be vital (2, 4, 5). In the head and neck region, free flaps seem to provide better results in terms of swallowing and articulation than pedicled flaps (6, 7). The selection of appropriate patients is crucial for avoiding flap loss in free flap transfer (6-8).

Rates of complication seem to increase after free flap transfer in elderly patients (7). The number and severity of complications tend to be higher in advanced age. In patients who are >60 years of age, the mortality rate due to surgery increases three times every year. The presence of comorbidities is another factor that leads to increased rates of complications and failure of the flap. Pedicled flaps are preferred over free flaps in patients with a history of diabetes mellitus or radiotherapy (8). In other words, indications for a pedicled LDMF may be limited. Nevertheless, when the clinical situation necessitates, it can be a valuable armamentarium for any reconstruction procedure. The most common indications for a pedicled LDMF are salvage surgery or patients with compromised neck vessels (6).

A pedicled LDMF is superior to other pedicled flaps as it is wider and has a larger rotational arc in addition to a longer, consistent pedicle. It exhibits less morbidity in the donor site

Figure 4. Early postoperative view after repair with the pedicled LDMF (4 weeks).
LDMF: Latissimus Dorsi Myocutaneous Flap

Figure 5. Late postoperative view after repair with the pedicled LDMF (36 months).
LDMF: Latissimus Dorsi Myocutaneous Flap

in women and contains fewer hair follicles than the pectoralis major flap in men. The mobility of a pedicled LDMF can improve after the release of the humeral insertion, skeletonization of the pedicle up to the subscapular system, and ligation of the serratus branch (8,10).

The bulky nature of pedicled flaps allows their usage in the coverage of vital tissues such as the great vessels. The mass appearance over the tunnel through which a pedicle passes may be a cosmetic disadvantage (6). In our series, no restriction of the rotational arc was observed owing to the preparation of the pedicled LDMF with a distal and extensive skin island.

The anterior transfer of a pedicled LDMF can be accomplished via subclavicular or subcutaneous approaches and the pectoralis tunnel and transaxillary subclavian routes. A pedicle can be exposed to compression in the tunnel between the pectoralis muscle and the clavicle due to the function of the pectoralis muscle. The subclavian and transaxillary-subclavian approaches mandate the dissection of the subclavian vein and brachial plexus (6, 10). In our technique, the width of the subcutaneous tunnel was enlarged by dissection above the muscular plane, and the height of the tunnel was improved by partial division of the pectoralis muscle. Thus, the pedicle was protected from the pectoralis muscle function and morbidity due to dissection in close proximity to the subclavian vein and brachial plexus is avoided.

In this study, we transferred flaps through a wide subcutaneous tunnel and not through the plane posterior to the clavicle. We modified the subcutaneous tunnel technique by applying limited scoring to the subcutaneous tissue in the tunnel. Moreover, a partial transection was made at the base of the subcutaneous tunnel in the pectoralis muscle region above which the flap passes. With these two maneuvers, we aimed to relieve and avoid any compression of the flap and pedicle within the tunnel.

Osteotomy of the clavicle may be required for subclavian passage, and injury to the major vessels and brachial plexus is possible (7). Therefore, the subclavian transfer method is dependent on the experience and skill of a surgeon, therefore calling for a challenging and long learning curve. In contrast, our technique is not only safer and easier to learn but also is independent from surgeon-related factors.

The subscapular approach for the transfer of a pedicled LDMF has been reported by Prakash and Gupta (10). In their series, patients were relatively younger, and comorbidities were not mentioned. Partial necrosis in two flaps was the only complication reported. With this method, the flap can reach the posterior and lateral zones of the head and neck region. The relationship with the major vessels and brachial plexus during the transfer of the flap to the posterior cervical regions is obscure. In addition, the impact of scapular function on the viability of the flap and restriction of scapular motility due to the transfer of the flap have not been elucidated.

Table 1. Demographic, clinical and peroperative data in our series

Patient no.	Gender	Age	Preoperative status	Etiology	Comorbidity	Complication	Secondary surgery	Survey (years)
1	M	69			DM, HT			2
2	M	59			CRF, HT			3
3	M	51	FFF		DM, HT	Hematoma		4
4	M	67			COPD	Seroma		4
5	M	71		Trauma	CRF, HT			3
6	M	72		Trauma	CRF, HT	PFN	Debridement	Exitus (2+)
7	M	68			DM, HT			3
8	M	69	TR, RT		DM, HT	TFN, seroma		Exitus (PO)
9	M	65	TR		COPD			1
10	M	59		Trauma	DM, HT	Seroma		1
11	M	59	FFF		ASTHMA	PFN	Debridement	3
12	F	61			CRF, HT	Seroma		2
13	F	62	TR, RT		DM, HT	Seroma		3
14	F	66		Trauma	DM, HT			1
15	F	68	TR		HT	PFN	Debridement, graft	4
16	F	63			DM, HT			3
17	F	64			DM, HT			4

M: male; F: female; TR: tumor recurrence; RT: radiotherapy; DM: type 2 diabetes mellitus; HT: hypertension; CRF: chronic renal failure; COPD: chronic obstructive pulmonary disease; FFF: free flap failure; PFN: partial flap necrosis; TFN: total flap necrosis; PO: early postoperative period; 2+: at the 2nd year of follow-up

Jeong et al. (8) reported the usage of a latissimus dorsi flap in conjunction with a split thickness skin graft, and they suggested that the pedicle can be completely divided postoperatively. Our technique avoided these additional interventions and has protected the exposure of flap during transfer.

The need for a positional change during the harvesting of the flap, necessity for the preservation of the ipsilateral spinal accessory nerve, requirement of a partial division of the pectoralis muscle and large subcutaneous dissection, and cosmetic disadvantages due to the bulky appearance over the clavicle constitute the drawbacks of our technique.

The main limitations of our study include the retrospective design, small number of patients, and lack of a control group. In addition, patient- and surgeon-related factors must be taken into account during the extrapolation of these results to larger populations.

Conclusion

Pedicled flaps are useful for the reconstruction of complicated defects of the head and neck region where free flaps cannot be used. From this point of view, a pedicled LDMF can constitute a safe and effective modality. The complete separation of a muscle from its humeral insertion, maintenance of the cutaneous island in an extensive and distal fashion, dissection of the serratus branch and circumflex scapular vessels, and amplification of the rotational arc may increase the success of a pedicled LDMF. The rapid and safe transfer of a flap to the recipient site can be facilitated with a modified transaxillary subcutaneous tunnel.

Ethics Committee Approval: Authors declared that the research was conducted according to the principles of the World Medical Association Declaration of Helsinki "Ethical Principles for Medical Research Involving Human Subjects", (amended in October 2013).

Informed Consent: Written informed consent was obtained from participant.

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