

Lattissimus dorsi myocutaneous flap in head and neck surgery

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Abstract

Background: Latissimus dorsi flap was the first myocutaneous flap reported in the literature. Tansini published in 1906 his experience in breast reconstruction. Quillen in 1978 used it as a pedicled flap for the first time in the head and neck region. Our study presents how to use this technique in head and neck reconstructive surgery. The purpose of this report is to show functional and aesthetic results and to report complications with our patients.

Methods: We performed a retrospective review of the clinical charts of 30 consecutive patients with various cancers admitted to the Institute of Oncology in Havana, Cuba between September 1998 and August 2002 and who underwent latissimus dorsi myocutaneous flap (LDMF) reconstruction. We focus our report on functional and aesthetic results and postoperative complications.

Results: Tissue coverage was provided for eight large defects of the skin and soft tissues of the neck, ten hypopharyngo-esophageal resections, eight oral cavity resections including two with full thickness loss of the cheek, two large parotid skin defects and two orbitomaxillary defects. Complete flap necrosis was present in three cases, all with hypopharyngo-esophageal reconstructions. Partial necrosis occurred in two cases.

Conclusions: LDMF is a reliable method in head and neck reconstruction. Because of its exposed pedicle it is more likely to necrose after local infection and fistula in hypopharyngo-esophageal reconstructions.

Key words: latissimus dorsi myocutaneous flap.

Introduction

In 1906, Tansini¹ first reported in the medical literature the use of the pedicled latissimus dorsi myocutaneous flap (LDMF) for postmastectomy patients, which makes this technique the oldest of its type (Figure 1). In 1912, D'este² reported a new publication on this topic, despite the fact that this technique was forgotten for many years. Olivari³ in 1976 and Mühlbauer and Olbrisch⁴ in 1977 revived the idea once again, applying the idea in breast reconstruction.

Deprez et al. reported its usefulness in dorsal reconstruction defects such as myelomeningocele closure.⁵ McCraw et al.⁶ used it to perform closures of thoracic wall defects.

More than 70 years after its initial description, it is finally beginning to be used in the cervicofacial area. Quillen⁷ pioneered the procedure in 1978, describing the first case of reconstruction of a cheek defect after excision of a recurrent carcinoma. The publication of a review by the author in 1979 recommended its use in the oral cavity, oropharynx, and other defects of the head and neck.⁸

Since then, the technique has become popularized both in its pediculated as well as a free microvascularized modality. Sabatier and Bakamjiam,⁹ Barton,¹⁰ Bricout,¹¹ McCraw,¹² and Labbé¹³ reflect the widespread use both in U.S. and Europe. The paternity of its use as a microvascular free flap in head and neck was disputed by several authors at the end of the 1970s.¹⁴⁻¹⁶

In 1998, its use began in Cuba. Preliminary results of the first 15 cases demonstrated the practical application of this technique in multiple defects of the cervicofacial area in our environment. With the experience acquired we have also used it in combination with other flaps in complex reconstructions or as rescue therapy after failure of other techniques.

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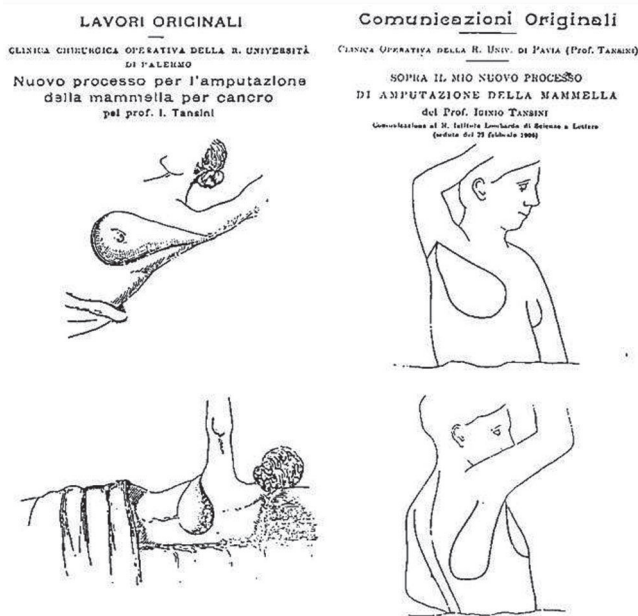


Figure 1. Original publication of Tansini dating back to 1906 where he outlined for the first time the latissimus dorsi myocutaneous flap, in this case for postmastectomy reconstruction.

The purpose of our study is to describe the effectiveness as well as the aesthetic and functional results in the first 30 cases, also discussing the complications and comparing this technique to the traditional pectoralis myocutaneous flap.

Materials and Methods

We designed a retrospective descriptive study from September 1, 1998 to August 31, 2002. We reviewed the medical records of 30 patients who consecutively underwent, for different reasons, the technique of pedicled LDMF, collecting general information regarding the disease, defect to be reconstructed, postoperative complications, and aesthetic and functional results. Most cases were operated on in the Head and Neck Service of the National Cancer Institute of Havana, Cuba (INOR). A small proportion (three patients) was operated on in other hospitals on the island. We compared our series with the literature review. The surgical technique consisted of making an island of skin of varying size depending on the defect to be reconstructed, but not $<8 \times 5$ cm in the region of the back, from the outer edge of the latissimus dorsi muscle medially and slightly oblique oriented in the direction of muscle fibers, including all underlying muscle disinserted from the humeral tendon and its dorsolumbar unions only remaining attached to its thoracodorsal pedicle, which allows a wide arc of rotation in the cephalad direction through a tunnel dissection between

the clavicle and the pectoralis major with enough space to move the flap without tension and allowing it to reach the recipient site. The publications of Quillen,⁷ Sabatier,⁹ Ferbeyre¹⁷ and other authors¹⁸⁻²⁴ allow us to go further into the technical details.

Usually the work of excision and reconstruction was carried out by two surgical teams simultaneously and when the defect to reconstruct also included the mandibular bone, as in the case of oral cavity tumors with bone invasion, a third team worked simultaneously in the preparation of the microvascularized fibular flap. The position of the patient was never changed during the perioperative period. For statistical analysis, the information was entered and processed into a computerized database using the Access program for Office 2003.

Results

Description of the Sample

There were 27 males and three females treated. Ages ranged between 27 and 73 years with a mean age of 59 years. Mean follow-up time was 26 months (range: 11-48 months).

The reconstructed areas were eight large defects of skin and soft tissue of the neck, ten pharyngoesophageal defects, eight oral cavity defects, two orbital skull defect and two defects in the parotid region.

Skin Defects of the Neck

We report on eight large skin defects of the neck reconstructed by LDMF. Seven of these patients had extracapsular extension bulky adenopathies and large extension to the skin, making it necessary to sacrifice a significant segment of it during the extended radical neck dissection. One of these patients was reconstructed due to necrosis of skin flaps after radical neck dissection post-radiation therapy salvage where there was exposure of the carotid artery (Figure 2).

The relative simplicity of the reconstruction enabled the best results without partial or total necrosis in these patients because for these defects an opening of the mucosa is not done, and there is no need for a very wide arc of rotation. The only complication reported in the recipient site and not immediately, but rather late, is the appearance of tumor recurrence outside the area of resected skin.

Pharyngoesophageal Defects

Ten patients had replacement of a pharyngoesophageal segment by the latissimus dorsi technique. Of these, six were

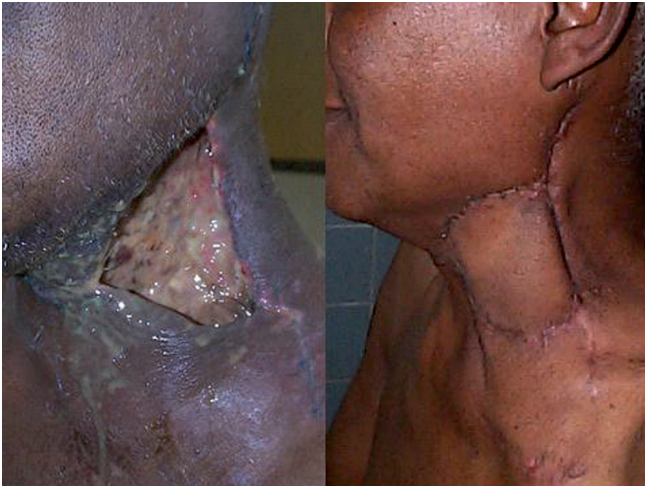


Figure 2. Postoperative defects due to necrosis of skin flaps in irradiated patients who benefited from the immediate reconstruction with pedicle flap of latissimus dorsi.

total circumferential defects and four partial, secondary to postlaryngectomy pharyngostoma. In the latter only the anterior hemicircumference was reconstructed. This type of reconstruction does not require large arc of rotation because the defect is always below the hyoid and its tubulization is not redundant as in the case of pectoralis major flap. Therefore, with an island of $\sim 10 \times 10$ cm, pharyngeal transit is re-established without stenosis. It is important to note that partial or total pharyngeal resection together with the larynx implies opening of potentially septic cavities and is potentially prone to fistula due to the presence of saliva, secretions or gastric fluid regurgitation. This makes this reconstruction an area more prone to complications, especially if the patient has received prior radiation at radical doses.

Total necrosis appeared in 3/10 cases and, in turn, these were the only cases of total necrosis of the entire series. However, this represents 30% of pharyngeal reconstructions done using this technique (3/10 cases). Taking into account that two cases also fistularized, total morbidity of the series according to this specific type of reconstruction is 50%. We believe that this is a process, in our experience, very prone to complications when it comes to pharyngoesophageal reconstruction. Flap necrosis occurred in these patients by the output of saliva into the neck from a fistula in some of the anastomoses. The accumulation of saliva in the supraclavicular fossa caused sepsis and thrombosis of the thoracodorsal vein exposed in the area of pivot of the pedicle flap, above the clavicle, causing a total loss thereof. This exposed pedicle makes this flap technique vulnerable to fistula, so extra care should be taken in these cases or opt for another technique such as the microvascular jejunum or the classic pectoralis major.¹⁷ With the latter, these three pa-

tients were able to be rehabilitated. Total necrosis according to the literature^{10,13} may have an incidence of 5-11%. The fundamental causes are pedicle injury due to hematoma, sepsis or inadvertent surgical trauma, clamping of the pivot point by the circumflex scapular artery or the taking of a too distal or too small island of skin. Specifically, in this flap the greater the skin island the more collateral perfusion because more myocutaneous perforants are included.^{9,13}

Another two cases had peristomal fistulas which, because they were away from the pedicle, did not cause major complications, and both closed spontaneously. One patient, in addition to the anterior hemicircumferential pharyngoesophageal reconstruction, had a large part of the skin of the region of the anterior neck reconstructed using a dorsal flap in double island or double pallet as has been described.⁹ In the seven patients where the flap survived, there was a satisfactory swallowing rehabilitation without a restricted diet at the time of study follow-up.

Oral Cavity Defects

The oral cavity is one of the sites with the most diverse defects. The arc of rotation is greater than that needed for the neck and pharynx as it is above the hyoid, but it is not a critical limit. However, the opening of the mucosa and bone involvement can make this type of intervention more complex. Reconstruction varies depending on the structures affected and sometimes compromise of the jaw requires us to use a second microvascularized fibular and iliac crest flap. These types of reconstruction designs are more labor intensive in head and neck surgery, especially when the anterior mandible is sacrificed in combination with skin and soft tissue of the chin. We had two patients with these characteristics. In one of them a fibula was used for the mandible and the dorsal skin island was taken from the underlying muscle to cover with it the floor of the mouth and with the skin palette to cover the skin defect of the chin and neck (Figure 3).

These patients progressed satisfactorily except for an intra-oral exposure of the fibula in one of them, which was closed with reapproximation (Figure 4).

To avoid this complication it is recommended to bring part of the muscle between the bone and skin, which is accomplished by providing a muscular plane using the dorsal and the buccinator covering the fibular graft, before suturing the skin flap to the mucosa. Two full-thickness cheek reconstructions were performed. In this case, the island of skin is de-epithelialized in a central band creating two skin paddles, one for intraoral closure and one for the skin of the cheek (Figure 5).^{24,25}

In one of these patients there appeared a salivary fistula apparently because of sectioning of Stensen's duct during

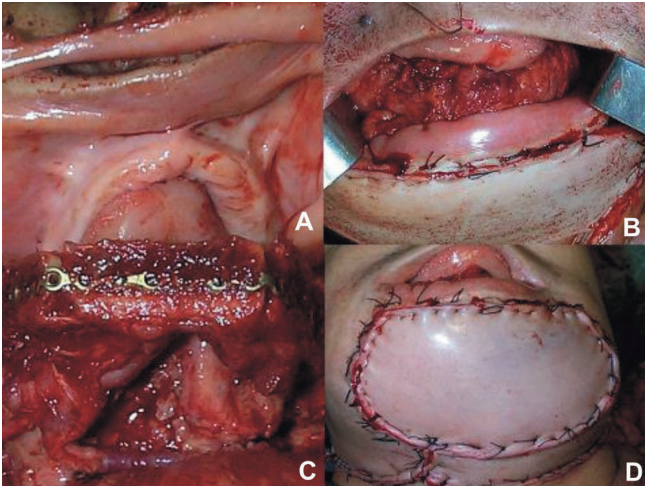


Figure 3. Reconstruction of an extensive defect of the anterior section with microvascularized double fibula flap (A) for the mandible (B), latissimus dorsi to the floor of the mouth (C) and dorsal skin flap paddle to the chin (D).



Figure 4. Intraoral exposure of the fibula bone due to dehiscence of the suture between the new tongue made from the dorsal and buccal mucosa in a patient with total transmaxillary glossectomy.

tumor resection, which is relatively frequent in tumors of the cheek and was draining saliva through a small opening in the neck wound and disappeared spontaneously after 3 weeks during radiation therapy. Also reconstructed were two total lower lip defects involving the lip mucosa and most of the skin of the chin, where it was able to make the mucosa and skin by folding the dorsal skin flap. One of these defects had already been reconstructed with a pectoralis major that became septic and caused almost total necrosis, forcing its removal. This patient also had partial necrosis of the latissimus dorsi, with loss of some of the skin flap. The remaining oral cavity cases were without complications.



Figure 5. Reconstruction of a full thickness cheek defect due to an infiltrating skin carcinoma (A) by latissimus dorsi double paddle, one superior or proximal for the cheek (B) and an inferior or distal for the cheek (C).

Cranioorbital Defects

These are defects in which the maximum arc of rotation of the flap is exploited so that it can come up to the frontal region. To achieve this it is necessary to take skin caudal to the lower edge of the latissimus dorsi, nearest to the iliac crest. This skin, as has been described,²⁶ is fed from the subdermal arteriovenous plexus as it has no direct perforators from the dorsal muscle. It is necessary to include in the paddle a good portion of proximal skin, which offers the perforators necessary to provide the nutrition required for the distal portion of the paddle. The most proximal skin not used in the closure of the defect must be de-epithelialized and never removed as this would compromise the blood supply to the distal part that ultimately covers the defect. The remaining de-epithelialized skin is buried under the skin of the neck or face upon closure (Figure 6).

One patient suffered partial necrosis, leaving a frontal sinus fistula that was closed with granules from the iliac crest and local skin flaps. Partial necrosis occurs precisely for not preserving the proximal skin paddle. According to the literature, the incidence of this complication may be 10-20%. This treatment varies from simple observation up to debridement under general anesthesia.^{7-10,13}

Another important technical detail is the ligation of the circumflex scapular artery during proximal vascular pedicle dissection, which can result in limiting the arc of rotation particularly when trying to get too high with the skin island. With ligation of this vessel the pedicle is freed even more. The island of skin can be advanced about 2 or 3 cm



Figure 6. Recurrent adenocarcinoma of the maxilla with orbital invasion whose defect was closed with latissimus dorsi muscle flap with de-epithelialized proximal portion and placed under the skin of the neck. Note the marks for radiotherapy.

in cephalad direction, otherwise the strain on this branch may result in tear with a hematoma or in clamping with difficulties in venous return, manifested by a persistent and progressive cyanotic hue.

Parotid Region Defects

These are usually parotid gland tumors that invade the overlying skin. Included in the study were two cases of this type. In one case, the facial area, part of the earlobe and external ear canal were sacrificed, resulting in facial paralysis. These defects require a large rotation arc, but not as extreme as the orbital cases and are usually without complications. Soft diet is important the first days after surgery to prevent movement of the receiving area, allowing for faster healing.

Donor Site Complications

The most frequent complication reported at the donor site is seroma,^{9-10,17} which occurred in 40% of cases. Treatment consists of draining of fluid collection and a compressive bandage keeping a small opening to prevent further accumulation. This complication often occurs after removing the suction drainage. Seroma, in turn, predisposes to sepsis, wound dehiscence, patient discomfort and delayed healing. The evacuation by puncture and compression bandage, re-opening a portion of the wound and replacement of drains are solutions to resolve this complication.^{9, 27,28}

Talc is used to prevent seroma.²⁷ Fibrin glue has reduced the incidence from 35-11%.^{29,30} Other authors have used

the mattress suture (quilting) or have used minimal access techniques for flap dissection.³¹ Other complications were keloids (one case), local sepsis (two cases), and transient brachial plexus injury (one case).

Discussion

There are literature reports on all types of cervicofacial reconstructions either as a single technique or combined with other flaps.¹⁸⁻²⁴ The wide spectrum of indications reflects the versatility of this flap in locations ranging from the clavicle up to the most remote arc of rotation and the fronto-orbital region.

LDMF has become the workhorse of reconstructive surgery for cancer in many centers worldwide due to its many advantages over other reconstruction techniques. Among its advantages are immediate reconstruction of large defects,^{8,32} pedicled and free as few,²⁸ large amount of skin (up to 30 × 20 cm),¹³ large volume of tissue,^{23,28,33} devoid of skin hair,^{9-10,13,23} aesthetic donor site especially for women,^{10,28} wide arc of rotation,³³ excellent mobility and rotation of 180°,⁸ double-skin paddle can also be made,¹³ pedicle far from any field of radiotherapy,^{8,9,23} may be used in combination without compromising the viability of other flaps such as microvascularized flaps,²³ may be simultaneously elevated with other flaps that depend on the same pedicle such as the serratus anterior pedicle, rib, scapula and iliac crest, and has good tolerance to postoperative radiotherapy.²⁵ Regarding the vascular pedicle, it is constant and rarely affected by atherosclerosis.³³ It is also long and of good diameter³³ (artery 2-4 mm and vein 2.5-4.5 mm) with the possibility of retrovascularization by the serratus branch³³ and, if accidentally transected, the flap can be “retro” or microsurgically redesigned.⁹ The average time of hospitalization with this technique is 7-21 days; therefore, it is justified as a palliative or toilet surgery for advanced lesions. Another advantage is that full-thickness lesions of the oral cavity or pharynx can be reconstructed,¹³ and excessive deviation of the mandible in transmaxillary oropharyngectomies without bone reconstruction can be avoided.¹³ In turn this serves to protect the neck vessels after radical dissection^{13,28} and restores the neck contour after radical neck dissection simulating a sternocleidomastoid¹³ with easy closure of the donor site²⁸ (except skin islands over 15 × 15 cm) and an occult donor site.²⁸ Functional loss is minimal at the donor site,⁷ and it can be used as a muscular flap without the skin and be grafted immediately or at a later time. The flap can also be taken immediately or as a delayed flap with good reliability in expert hands. With respect to the pectoralis major, it is preferred in cases of hairy chest, pectoral atrophy, excessive fat in the anterior chest, small breasts where

closure distorts much of the area, need for a large amount of skin, need for smaller thickness and large surface.¹⁷

It should be noted that the technique also has its disadvantages such as changing the position of the patient to lateral decubitus (not always necessary and in our experience we never do),^{8,10,17,28} tedious axillary dissection especially in obese patients,^{8,10,28} risk of accidental section of the pedicle,²⁸ paralysis or damage to the brachial plexus due to arm position during surgery,^{9,28} and when in addition to loss of function is added the spinal accessory nerve section, shoulder limitation is important.⁸ Greater blood loss has been reported compared with the pectoral procedure,⁹ longer operative time compared with the pectoral procedure,⁹ very bulky flap in the obese,⁸ need for radical neck dissection if neck is at risk for recurrence because of diagnostic difficulty under the flap, and finally a pedicle exposed to saliva in case of a fistula.¹⁷

In conclusion, with cumulative experience we find that there are very few defects of skin, mucous membranes or soft tissues in the cervicofacial area that cannot be resolved with the LDMF in any combination, including those that traditionally are done with the pectoralis major. The dorsal flap has greater cephalic reach and skin extension with less bulk, among other advantages. Mastering this technique offers the head and neck surgeon a wide range of reconstructive options.

The prevention and timely management of complications is the basis of experience where the design is unique to each patient, and staff surgeons should strive to achieve the best aesthetic and functional results for the best quality of life for these patients. The surgeon's learning curve and the plethora of information in the literature are the basis for improvement in decision-making and implementation of procedures.

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