

ORIGINAL ARTICLE

A MODIFIED TECHNIQUE TO ENABLE THE BAKAMJIAN DELTOPECTORAL FLAP TO REACH AND COVER A MORE DISTANT DEFECT

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Abstract

Aim: Modifications were added to the standard technique of elevating Bakamjian deltopectoral flap by taking excess of the fascial component (which carries the subdermal vascular plexus feeding the skin). This modification enabled the flap to reach at more distant sites safely.

Patients and Methods: A prospective study which was done in the period between 2008 and 2012, six patients (4 males, 2 females) with different malignant skin lesions in whom surgical resections for cancer has resulted in skin defects above the zygomatic arch. For these patients the modified deltopectoral flap was used to cover the skin defects. Proper post-operative care and care to the flap were adopted.

Results: Four out of six patients passed uneventful convalescence with completely viable flaps. One patient showed partial distal flap discoloration. Total flap failure occurred in only one patient.

Conclusion: This modified technique enable the deltopectoral flap to safely reach and cover skin defects above the zygomatic arch.

Keywords: Deltopectoral flap, skin defect coverage, skin defects above zygomatic arch.

INTRODUCTION

In 1965, Bakamjian⁽¹⁻⁷⁾ described the fasciocutaneous deltopectoral flap which was named after his name, the Bakamjian flap, and was considered the workhorse of pharyngoesophageal reconstruction and provided skin coverage for a variety of cutaneous defects of face and neck.

The deltopectoral skin has a dual blood supply arising from the medially based second and third perforators of the internal mammary artery and laterally based

cutaneous branches from the thoracoacromial, subscapular, and circumflex humeral vessels.⁽⁸⁾ A rich dermal-subdermal plexus connects the medial and lateral blood supply, the deltopectoral flap is generally raised on the more robust and reliable medial perforators as an axial pattern flap. Anatomic studies have described the following 2 distinct areas of the deltopectoral flap: a medial arterial pedicled flap and a lateral cutaneous (random pattern) flap.^(8,11) The line of demarcation between these 2 portions of the flap is the cephalic vein, with all tissue harvested lateral to the vein relying solely on the dermal-subdermal plexus of perforators, whereas tissue medial to the vein receives direct arterial-axial

pattern flow. In an effort to increase the arc of rotation and reach of this flap into the face below the zygomatic arch, surgeons have extended the lateral limit of the flap well over the shoulder tip. Unfortunately, with such extended flaps, even a delay procedure (incising and/ or raising the flap to condition it to a reduced reoriented blood supply) has been associated with partial or complete flap loss in 10% to 25% of cases after elevation of the flap.⁽⁹⁾

The deltopectoral flap can reach as high as below the zygomatic arch on its own side. It is not hairy over its deltoid part and provides larger amounts of skin than either the forehead or cervical flaps and the donor area is hidden from view by clothing. Since the 1980s the pectoralis major myocutaneous flap and the microvascular flap have gained greater popularity than the deltopectoral flap in head and neck reconstruction.⁽⁹⁾

PATIENTS AND METHODS

A prospective study which was carried out during the period from January 2008 to December 2012 in the pyramid hospital and Nile Insurance hospital in Cairo. Six patients (4 males and 2 females) were selected and operated by major ablative resection for their cancer that results in large tissue defects which needs to be covered. The author used certain modifications to the standard technique of the conventional Bakamjian deltopectoral flap that enables the distal part of the flap to reach and cover a defect above the zygomatico-orbital arch. Pre-operative evaluation and patient selection:

1. The expected defect after curative ablative resection will be above the zygomatico-orbital arch.
2. The Tumor bed was not irradiated.
3. No prior cardiac surgery with use of internal mammary artery for bypass.
4. No other alternative for reconstruction after resection except free microvascular surgery.
5. Patient cannot tolerate prolonged anaesthesia for microvascular surgery.
6. Microvascular surgery is not available for the patient.
7. Patient consented for chest scar, possible need for skin grafting to shoulder region and possibility for flap failure (distal flap necrosis).

The adopted surgical procedure herein is the same formal standard steps of the standard deltopectoral flap as described by Bakamjian.⁽⁶⁾ but with certain modifications:

1. an excess of 3 to 4 cm of the underlying fascia are elevated with the flap all around and this necessitate to begin by cutting the skin only all around and then the edges of the skin above and below the flap are undermined for 3cm to allow exposure of the excess fascia and then the fascia is cut all around 3-4 cm away from the skin incision then the fasciocutaneous flap is elevated with the excess fascia all around (Fig. 1).

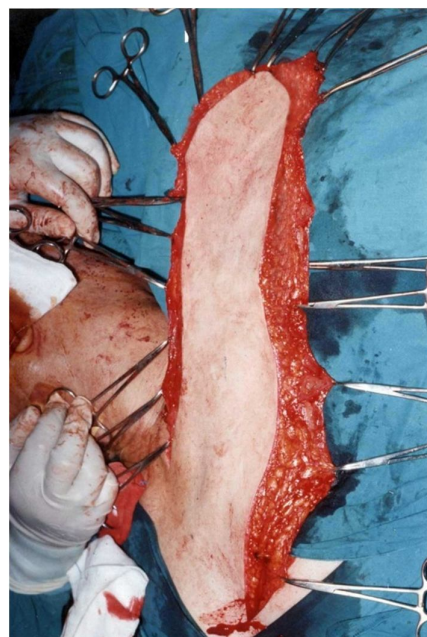


Fig 1.

2. The upper boundary of the skin incision is not done along-side the clavicle but 3 cm below it to allow for undermining of the opposing skin edge up to the clavicle and the exposed fascia is cut alongside the clavicle to allow excess fascia to be taken at this side of the flap.
3. During tubing of the elevated fasciocutaneous flap, the excess elevated fascia is rolled in inside the resulting tube and should not be allowed to kink or crumble or to be displaced. The excess fascia is helped to project snugly inside the tube (Figs. 2,3). The edges of the tube are approximated by interrupted fine skin sutures which will approximate the edges of the skin tube and should never reach or traumatize the fascia because if these skin stitches include the fascia, this avoidable mistake, will strangulate the fascia and will impede the blood flow in this site.

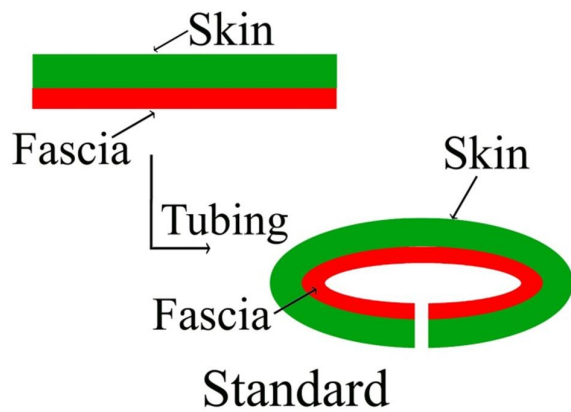


Fig 2. Standard

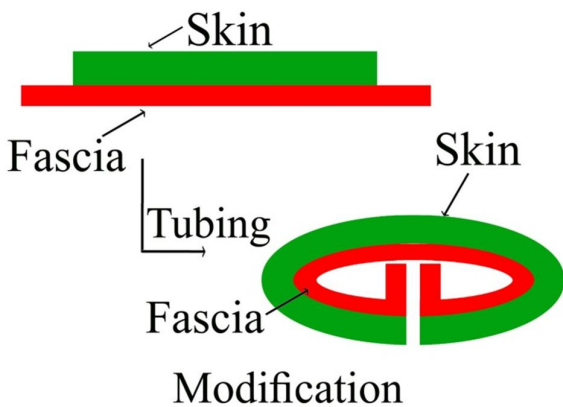


Fig 3. Modified

4. The edges of the skin defect are undermined all around for 3 cm. this will allow the excess fascia at the distal part of the flap to spread comfortably and to lie under the skin edges of the defect Fig. 4. Fine interrupted skin sutures are taken to approximate the skin edges of the defect to skin edges of the flap (only skin to skin) without reaching or perforating or traumatizing the fascia.

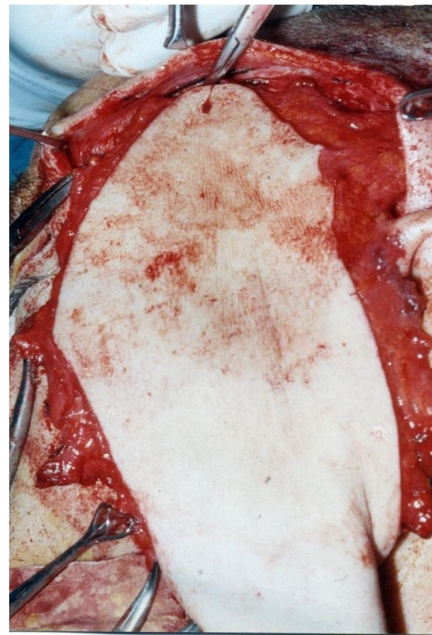


Fig 4.

5. The fourth and fifth perforators of internal mammary artery are included in the formation of the sub-dermal vascular plexus through the base of the excess fascia.

Post-operative Care was adopted properly and the flap was protected from compression or tight dressing. After 6 weeks the flap is cut at the lower border of the recipient site and the rest of the flap is returned back to its bed as described by Bakamjian.⁽⁶⁾

Adequate nutritional support, hydration, care of the wound and correction of anaemia.

RESULTS

For all patients there were no intraoperative complications. The blood loss ranged from 200 to 500 ml during flap elevation. All patients were ambulant on the 2nd post-operative day. Convalescence was uneventful in 4 patients.

Total flap failure occurred in one patient and distal flap discoloration occurred in another patient.

The results are described separately according to the clinical material for each patient.

Case 1 is a 55 year old male with squamous cell carcinoma above the left zygomatic arch. After resection, the skin defect was 4x5 cm. The flap was completely viable and the rest of the flap has returned to its bed (Fig. 5).



Fig 5.

Case 2 is a 68 year old male with pigmented superficial basal cell carcinoma in the left temporal region. After resection, the skin defect was 5.5x5 cm. The flap was completely viable and the rest of the flap has returned to its bed (Figs. 6,7).



Fig 7.



Fig 6

Case 3 is a 65 year old male with superficial basal cell carcinoma in the right temporal region. After resection, the skin defect was 4.5x4cm. The distal end of the flap showed bluish discoloration on the 3rd post-operative day. Excision of the distal end of the flap was done, the residual defect was 4x1 cm which was left as a raw area to granulate. The rest of the flap was completely viable. Successful repositioning of proximal part was done after 2 months.

Case 4 is a 50 year old female with superficial spreading melanoma in the right temporal region. After resection, the skin defect was 4.5x5cm. The flap was completely viable and the rest of the flap was returned to its bed.

Case 5 is a 72 year old obese male with squamous cell carcinoma in the right side of forehead. After resection, the skin defect was 4x3.5 cm. On the 3rd post-operative day, the flap begins to show progressive discoloration at its distal zones. on the 5th post-operative day, the necrotic segment was resected. After debridement, the viable proximal half of the flap was returned to its bed. The skin defect was managed as a raw area to granulate and after two months it was covered by a split thickness skin graft.

Case 6 is a 60 year old female with right buccal carcinoma infiltrating the skin of cheek. The deltopectoral flap was used as an outer coverage for a 4x3.5cm skin defect. Pectoralis major myocutaneous flap was used as an inner coverage. The deltopectoral flap was elevated using the described modifications before elevating the pectoralis major myocutaneous flap. The integrity of the

pectoralis major flap was not affected but in fact it was obligatory to take a less amount of the excess fascia during elevation of the deltopectoral flap near the site of the proposed pectoralis major myocutaneous flap and the medial wide base of the elevated deltopectoral flap was compromised. The flap was completely viable (Fig. 8) and also the pectoralis major myocutaneous was completely viable (Fig 9).



Fig 8



Fig 9.

DISCUSSION

In 1965, Bakamjian⁽⁴⁻⁶⁾ described the deltopectoral (DP) flap as a reconstructive option in head and neck surgery.

It served as the premier flap for reconstructing complex head and neck defects until the late 1970s. Today, the DP flap is often overlooked, although its role has diminished, its use is still warranted in certain select clinical situation. The technical simplicity of the DP flap, coupled with its predictable vascular supply, has allowed it to maintain a niche role in contemporary reconstructive surgery. The DP flap provides an excellent method of reconstruction in select cases in which vascularized skin coverage of the neck is needed. The DP flap also provides a valuable salvage option in situations in which other reconstructive techniques are not possible.⁽¹⁰⁾

The deltopectoral skin has a dual blood supply arising from the medially based second and third perforators of the internal mammary artery and laterally based cutaneous branches from the thoracoacromial, subscapular, and circumflex humeral vessels.⁽⁸⁾ A rich dermal-subdermal plexus connects the medial and lateral blood supply, the deltopectoral flap is generally raised on the more robust and reliable medial perforators as an axial pattern flap. Anatomic studies have described the following 2 distinct areas of the deltopectoral flap: a medial arterial pedicled flap and a lateral cutaneous (random pattern) flap.^(8,11) The line of demarcation between these 2 portions of the flap is the cephalic vein, with all tissue harvested lateral to the vein relying solely on the dermal-subdermal plexus of perforators, whereas tissue medial to the vein receives direct arterial-axial pattern flow.^(8,11) According to these vascular considerations, Guerrissi.⁽¹²⁾ described his innovation of the lateral based extended deltopectoral flap which is based on the lateral pedicles and this new flap is used when either parasternal skin or pectoralis major muscle must be resected.⁽¹²⁾ It is clear that both the medial pedicle and the lateral pedicle of the still unelevated deltopectoral flap (skin, subcutaneous tissue and underlying fascia) communicate with each other through the dermal vascular plexus, but the most important fact, is that they intercommunicate through the subdermal vascular plexus which is present on the external or the outer surface of the pectoral and deltoid fascia. For this reason the ample excess fascia which is elevated all around the flap (as a new modification added to the standard technique of standard deltopectoral flap), this fascia is carrying the subdermal vascular plexus. It is well known that the undersurface of this fascia is avascular plane. The excess fascia elevated with the flap in this work help to gain more blood supply to the distal segment of the flap which enabled the flap to reach at a more distant site. In other words, increasing the fascial component of the fasciocutaneous deltopectoral flap will help much in increasing the volume and integrity of the subdermal vascular plexus that feeds the overlying skin component.

When microvascular surgery is not available, or when the patient cannot tolerate prolonged anesthesia for microvascular surgery or when a forehead flap is not suitable, patients will benefit from this modified deltopectoral flap.

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