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Primary closure of the deltopectoral flap-donor site without skin grafting

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Abstract

Background and objective: Deltopectoral flap is a two staged flap requiring skin graft of the donor site. This study was conducted to evaluate the possibility of primary closure of the deltopectoral flap-donor site without skin grafting.

Methods: The operations were conducted at Rizgari Teaching Hospital in the center of Erbil City, Kurdistan Region of Iraq. From January 2009 to December 2012, 14 deltopectoral flaps for reconstruction of oral/facial cancer ablative defects were done. Data on the age, gender, tumor site, and postoperative complications related to primarily closed deltopectoral flap-donor site (fistula, dehiscence, or hematoma leading to impairment of wound healing) and postoperative hospital stay were recorded.

Results: Of the 14 head-and-neck tumours, 10 were squamous cell carcinomas and four were ameloblastomas. Eleven of the patients were males and only three were females. The mean age (±SD) of the patients was 59±13 years. There was no evidence of partial or complete loss of the flap in any of the patients studied. There was no case of breakdown of the primarily closed donor site. The only registered complication was slight localized dehiscence at the most proximal and distal part of the primarily sutured flap donor site in one patient.

Conclusion: Primary closure of deltopectoral flap donor site is possible with minimal complication that overcomes the problem of skin grafting. Minimal wound breakdown in younger patients had been noted and left to heal by secondary intention.

Keywords: Deltopectoral flap, skin graft, primary closure, donor site.

Introduction

Reliable and simultaneous reconstruction of head-and-neck defects has been made possible by the development and application of different flap techniques. It is possible to reconstruct most defects immediately, which leads to better restoration of form and function.[1] Free microvascular and regional flaps are the main reconstructive techniques for head-and neck defects after excision of an oral cancer. Although the free microvascular flap, with its rich vascular pedicle, allows more flexible and reliable designs, donor-site morbidity, such as reduced strength and sensation, is still unavoidable when harvesting flaps. Thus, regional flaps are still used.[2] In developing countries, including Iraq, the pedicled flaps are still the mainly used flaps in reconstructive surgery because of logistic problems and the high number of patients requiring such kind of surgery. Although first described by Aymard in 1917 for nasal reconstruction, the versatility of the deltopectoral flap was not fully elucidated until a 1965 report by Bakamjian of pharyngoesophageal reconstruction with this flap.[3] Five years later McGregor and Jackson[4] extended the range of the flap, noting that an undelayed flap will generally reach as far back as the ear. Bakamjian[5] stated that the externally transferred flap will reach the orbit and zygoma and the nasopharynx internally. The Bakamjian flap, as it was commonly termed, became the workhorse flap for cutaneous defects of the face and neck Daniel and coworkers[6] identified three main vascular contributions to the

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deltopectoral area. Most of the skin from the sternal border to the deltopectoral groove is supplied by the first four perforating branches of the internal mammary artery, and primarily the second and third branches (axial pattern). At the upper portion of the deltopectoral groove, branches from the thoracoacromial area supply the upper midportion of the deltopectoral flap. The area of the flap overlying the deltoid muscle (random pattern) is supplied by perforating vessels (Figure 1). The deltoid portion constitutes a random flap transported on the end of the axially supplied pectoral skin. David et al[6] have reviewed the various patterns of delay that are possible with this system. Most authors agree that the flap may be transferred without a delay procedure so long as the skin paddle in the deltoid portion distal to the cephalic groove does not exceed a 1:1 length:width ratio. The advantages of the flap are that it provides thin, pliable skin with an excellent color match for reconstructing head and neck defects. Furthermore, harvest of the flap is straightforward. The major disadvantage of the flap is that the donor site usually requires a skin graft and is unsightly. Moreover, the arc of rotation of the flap is such that surgical delay is required if the flap extends over the deltoid region, and this extension is usually necessary for the flap to be useful in most reconstructions. It has a relatively wide base, and this also limits its rotation.[7] The deltopectoral flap is generally transferred in two stages to the recipient site. The staged procedure is required to excise or to return the tubed component to its donor site. Attempts at converting this procedure into single stage was centered on de-epithelializing the proximal portion and passing it deep to the neck skin between the clavicle and the defect, but it unnecessarily discards normal cervical skin.[8] Other adopted method for primary closure of the donor site without skin grafting include ballooning expansion of the donor site before harvesting the flap.[9] This study was conducted to evaluate the possibility of primary closure of the deltopectoral flap-donor site without skin grafting.

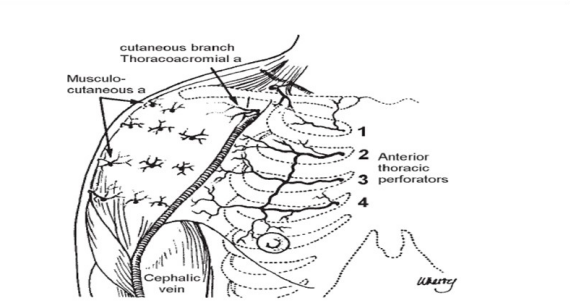

Figure 1: Blood supply of deltopectoral flap

Methods

The operations were conducted at the Division of Oral Maxillofacial Surgery of Rizgari Teaching Hospital in the center of Erbil City, Kurdistan Region of Iraq. From January 2009 to December 2012, 14 deltopectoral flaps for reconstruction of oral/facial cancer ablative defects were done. Data on the age, gender, tumor site, and postoperative complications related to primarily closed deltopectoral flap -donor site (fistula, dehiscence, or hematoma leading to impairment of wound healing) and postoperative hospital stay were recorded. The technique of raising deltopectoral flap include performing two parallel incisions; the upper one extend just below the clavicle from 2 cm medial to the sternum to deltoid region. The lower incision parallel the upper one and designed so that the flap base will incorporates the first four intercostal perforating branches of the internal mammary artery. The flap was tubed and transferred to close the oral/facial cancer resection-created defect. The donor site of the flap was extensively undermined and sutured primarily with interrupted 0 silk suture. Vacum drain was used for the primarily closed donor site. The blood supply of the flap was examined after three weeks by ligating it with a tourniquet for 10 minutes. If the distal side of the flap did not become cyanotic, it was considered

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Figure 2: Top left: Squamous cell carcinoma of left submandibular region with deltopectoral flap marked; Top right: deltopectoral flap-donor site closed primarily; Bottom: After 2 months of operation).

safe to divide the flap, and the unused portion of the flap was excised and discarded during the second stage surgery, which was conducted under local anaesthesia (Figure 2). All the patients gave their consent to the treatment. This study was approved by the Research Ethics Committee of the College of Dentistry, Hawler Medical University.

Results

Patients' characteristics are summarized in Table 1. Of the 14 head-and-neck tumours, 10 were squamous cell carcinomas and four were ameloblastomas. Eleven of the patients were males and only three were females. The mean age (±SD) of the patients was 59±13 years. The mean hospital stay was three days (range of 2-7days) The deltopectoral flap was successfully used in 14 consecutive patients after ablative procedures in the face and neck that resulted in significant cutaneous defects. There was no evidence of partial or complete loss of the flap in any of the patients studied. There was no case of breakdown of the primarily closed donor site. The only registered complication was slight localized dehiscence at the most proximal and distal part of the primarily sutured flap donor site. This complication was noted in only one patient (Figure 3a). Another case of hypertrophic scar was noted in a young patient (Figure 3b).

Table 1: Characteristics of the study patients.

Patient No.	Age	Sex	Defect location	Primary tumour
1	44	male	mandible	ameloblastoma
2	48	male	mandible	ameloblastoma
3	80	male	alveolus	SCC
4	63	male	mandible	ameloblastoma
5	45	male	mandible	ameloblastoma
6	58	male	alveolus	SCC
7	50	male	cheek	SCC
8	70	male	Mouth floor	SCC
9	50	male	Lower lip	SCC
10	47	male	Lower lip	SCC
11	67	female	alveolus	SCC
12	80	male	Mouth floor	SCC
13	61	female	cheek	SCC
14	54	female	Lower lip	SCC

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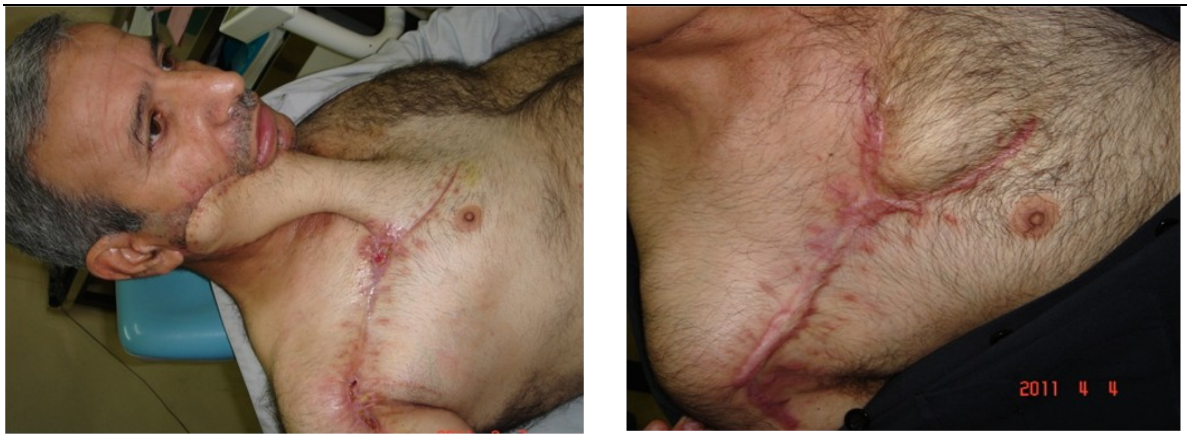

a **b**

Figure 3: a: partial dehiscence at most proximal and distal parts of the closed donor site; b: Hypertrophic scar of the closed donor site wound.

Discussion

Because of facial deformities and masticatory disabilities after tumor excision, head-and-neck defects are challenging to reconstruct. Typically, there are several methods to choose from when correcting a particular head or neck defect, including treatment by secondary intention, primary closure, skin grafting, and mobilizing local or regional tissues.[1] Perhaps the first large perforator-based cutaneous flap to come into widespread use was the deltopectoral flap, often called by its eponym as the ‘‘Bakamjian’’ flap. Jackson recognized that the robustness of this particular flap was due to its unique vascular arrangement deriving from the perforating branches of the internal mammary system.[7] However, there are several drawbacks to using deltopectoral flap, such as the need for a second operation for flap separation, longer hospital stay, more attention needed to wound care, and resulting cosmetic problems in the deltoid area.[10] Several attempts have been made to modify this flap to overcome the complications related to flap design, two staged surgery and the need for skin graft for the donor site. Preoperative endoscopic dissection and insertion of expander has been described by Balakrishnan and colleaques.[9] The procedure is considered as a nonaggressive technique to increase the surface area of the flap and to increase its vascularization (delay phenomenon) by opening 'choke' vessels thus augmenting the territories of adjacent angiosomes. A secondary benefit of expansion procedure is that primary closure of the donor site, traditionally treated by skin graft, was possible. Neligan and colleaques[8] described a modification of the deltopectoral flap in which one or two of the internal mammary perforators, once identified, are dissected through the muscle to the underlying internal mammary vessels. A segment of costal cartilage is removed to gain access to the internal mammary vessels and facilitate mobilization of the pedicle. The internal mammary vessels are divided distal to the origin of the perforators and are further mobilized as far as possible cephalad. This increases the length of the pedicle considerably and allows the flap to be easily pedicled into the neck. It has the added advantage of allowing primary closure of the donor site. Thus, it captures all the advantages of the deltopectoral flap while disposing of all the disadvantages. In this study the deltopectoral flap-donor site closure was possible, without the need for preoperative expansion, after extensive undermining. In our opinion, expansion is not practicable in cancer surgery because it will delay the operation for 7-10 days; however, it could be useful for previously

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created defects. The primary closure of the flap donor wound was further facilitated by the laxity of the skin of the elderly patients, who where the main patients affected by orofacial cancer in our study. The partial wound breakdown which was noted in our study was recorded in younger and obese patients and was dealt with by dressing and allowed to heal by secondary intention. The use of internal mammary artery perforator-based deltopectoral flap is not useful for oral cancer reconstruction because it will not extend beyond the mandible. Therefore, reconstruction of only neck defects is possible with this type of deltopectoral flap with an added advantage of flap donor wound primary closure.

Conclusion

Primary closure of deltopectoral flap donor site is possible with minimal complication that overcomes the problem of skin grafting. Minimal wound breakdown in younger patients had been noted and left to heal by secondary intention.

Conflicts of interest

The author reports no conflicts of interest.

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