THE PECTORALIS MAJOR MYOCUTANEOUS FLAP IN THE PRIMARY RECONSTRUCTION OF ORO-FACIAL DEFECTS

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SUMMARY

Pectoralis major myocutaneous flap reconstruction of the defect following surgery for oral cancer in fourteen patients is described. The problems and complications encountered have been found to be minimal. Functional and cosmetic results were acceptable.

INTRODUCTION

Definitive surgical treatment of intra-oral cancer with excision of a wide area of surrounding normal tissue should plan for primary reconstruction of this defect, with a genuine concern for cosmesis and restoration of function. Since the advent of the pectoralis major myocutaneous flap, it has come to stay as the workhorse of head and neck surgeons. [1,2]

As a contribution to further clarification on the subject we hereby present results from our study and follow-up on 14 patients with intra-oral cancers who had pectoralis major myocutaneous flap reconstruction following surgery. All were treated at the University Hospital, Kuala Lumpur over a period of 18 months.

ANATOMY

The pectoralis major is a thin, long, fan-shaped muscle that extends from the front of the chest to the humerus. [3] It arises from three heads, the upper from the medial half of the front of the clavicle, the second head from the anterior surface of the sternum and upper six costal cartilages, forming the bulk of the muscle, and the third component arises from the aponeurosis of the external oblique which overlies the junction of the fascia of serratus anterior and rectus abdominis muscles. This muscle is inserted to the lateral lip of the bicipital groove of the humerus. The arrangement of the tendon and the muscle fibres is such that, the sternal component inserts posterior to the clavicular component at the humerus, thereby producing the rounded anterior axillary fold.

The pectoralis major muscle is mainly supplied by the thoracoacromial artery, a branch off from the second part of the axillary artery. This vessel emerges above the upper border of the pectoralis minor piercing the clavipectoral fascia and the

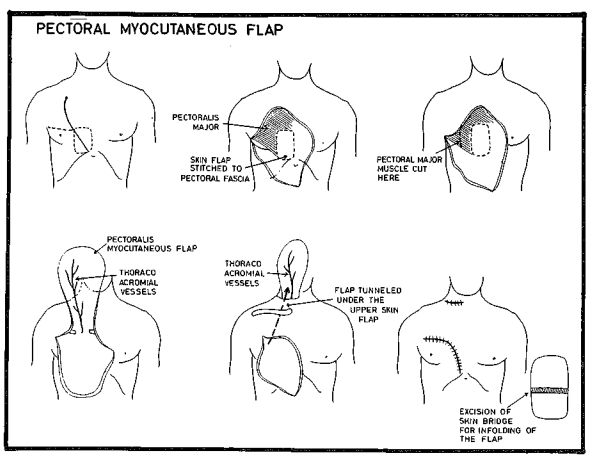

Fig. 1 Diagrams showing the operative procedures of raising a pectoralis major myocutaneous flap.

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surface marking of which is about 2 cm below the mid-clavicular point. (Fig. 1) This short vessel divides into the acromial, the deltoid, the pectoral and the clavicular branches, of these the pectoral is the largest branch. It courses downwards between the pectoralis minor and major, adherent to the under surface of the pectoralis major. This dominant blood supply of the pectoralis major permeates the muscle through its undersurface, and arborises over the pectoral fascia anteriorly. The pectoralis major also receives blood supply from the lateral thoracic artery and the intercostal perforators of the internal mammary artery.

This muscle is supplied by the lateral and medial pectoral nerves. It is an adductor and medial rotator of the upper limb. The upper sternal portion of the pectoralis major is responsible for elevation of the arm from 0° to 45° and the clavicular portion from 45° to 110°. The lower sternal portion aids in depression of the humerus. The pectoralis major acts in conjunction with the other muscles around the shoulder joint. In view of the combination of action of these muscles the loss of the pectoralis major when used as a myocutaneous flap is well compensated.

OPERATIVE TECHNIQUE

The surface marking of the pectoral branch of the thoracoacromial vessel is made over the chest wall. This vessel emerges 2 cm below the mid-point of the clavicle to join perpendicularly a line joining the acromion to the xiphoid process. Along this line the skin is marked, matching the size and shape of the defect intra-orally, (Fig. 1) the site of which should be long enough to allow the elevation of the myocutaneous flap with its pedicle to reach the defect in the head and neck region. The inferior part of the skin paddle could overlie the fascia of serratus and rectus abdominis, and be raised with its fascia without these muscles. [1] An incision is made all around the paddle of skin to the fascia overlying the pectoralis major. Tacking sutures are then placed between the dermis and fascia to prevent separation which may jeopardise the perforating vessels supplying the skin. The incision is deepened medially, laterally and inferiorly separating the muscle origins and entering the under surface of the muscle. A long retractor is used to elevate the muscle to visualise the vascular pedicle on its under surface. The skin incision is extended from the supero-lateral aspect of the skin paddle to the anterior axillary fold, this helps in dissection and elevation of the flap without undue strain on the vascular pedicle. The humeral attachment of the muscle is transected preserving the muscle fibres over the vascular pedicle. The dissection is continued superiorly up to the clavicle.

This flap with its vascular pedicle is brought in front of the clavicle and tunnelled up the neck in the sub-platysmal plane to reach the intra-oral defect. The muscle bulk over the vascular pedicle fills the defect in the neck caused by radical neck dissection and it also protects the carotid vessels, especially in irradiated cases. The skin flap is correctly positioned in the oral cavity and where necessary is folded around a de-epithelialised bridge to resurface the cheek or neck externally. Care has to be taken during intra-oral closure to prevent post-operative leak and infection Interrupted 3/0 "Dexon" sutures are used to ensure close approximation of tissues without eversion of edges.

The defect in the chest is closed primarily by undermining and advancement of the skin edges. If rib graft is required, the fifth or sixth rib with its periosteal attachments could be included in the flap taking care to preserve the rib's attachment to the pectoralis major.

MATERIAL AND METHODS

Pectoral myocutaneous flap reconstruction for head and neck defects following ablative surgery for intra-oral cancers were performed on 14 patients over a period of eighteen months. (Table I). All but five were women. The median age in the series was 54 years (Range 35-66 years). The race distribution was 9 Indian, 3 Malay and 2 Chinese. Their median body weight was 48 kilogrammes (Range 28-64 kilogrammes). The average length of stay in hospital was 36 days (Range 22-76 days), with a post-operative stay averaging 32 days (Range 21-48 days). Five patients had carcinoma of the cheek, five of the mandibular alveolus, and four of the tongue as the primary site of malignancy. The tumours were staged according to the UICC classification 1978 [4](Table I), and majority of these were T_4 lesions (Fig. 2). Well differentiated squamous cell carcinomas were seen in eight patients, four had moderately differentiated lesions, and two poorly differentiated infiltrating squamous cell carcinomas. Orthopantomographs of the mandible were taken in all the patients and 12 showed mandibular involvement (85 percent). All but four had a haemoglobin concentration above 10.1 gm/dl. Except for one all had serum

TABLE I
FOURTEEN PATIENTS WITH INTRAORAL CANCERS WHO HAD PECTORAL MYOCUTANEOUS FLAP RECONSTRUCTION

Age in years	Sex	Race	Site	Pre-op DXT	TNM Classification (UICC 1978)	Remarks
47	M	I.P.	Cheek + sulcus	+	$T_2N_{1a}M_o$	Forehead flap for intraoral reconstruction
49	F	M	Inf. alveolar ridge + Gingivo-buccal sulcus	−ve	$T_4N_{1b}M_o$	
62	F	C	Tongue + floor of mouth + mandible	+	$T_4N_{1b}M_o$	
64	F	I	Inf. alveolar ridge + floor + Gingivo-buccal sulcus + mandible	+	$T_4N_{1b}M_o$	Post-op mortality
35	F	I	Cheek + mandible	+	$T_4N_{1b}M_o$	Infolding of the myocutaneous flap
66	F	I	Cheek + mandible	+ve	$T_4N_{1b}M_o$	Forehead flap for Intraoral Eipthelial cover
44	F	I	Inf. alveolar ridge + floor of mouth + sulcus	−ve	$T_4N_{1b}M_o$	
52	M	M	Tongue + floor of mouth	+	$T_4N_{1b}M_o$	
52	F	M	Ca Cheek	+	$T_4N_{1b}M_o$	Orocutaneous fistula with myiasis
55	F	I	Ca alveolus with lip	+	$T_4N_{1a}M_o$	Osteomyocutaneous flap
58	M	I	Ca Tongue	+	$T_4N_{1b}M_o$	
65	M	I	Ca Cheek	−ve	$T_3N_{1a}M_o$	Necrosis of flap
64	F	I	Ca mandibular alveolus involving floor of mouth	+	$T_4N_{1a}M_o$	
44	M	C	Ca Tongue	+	$T_4N_{1b}M_o$	

protein above 72 gm/dl.

Ten patients (72 percent) had radiotherapy as the primary treatment prior to surgery. One patient had post-operative radiotherapy for residual tumour in the pterygoid region. In all patients surgical margins were subjected to frozen section examination and adequate clearance obtained. Eleven patients had radical neck dissection (77 percent) through a McFee incision and three had suprahyoid and submental dissections only.

In 13 patients a pectoralis major myocutaneous flap was used for reconstruction and one had a pectoralis major osteo-myocutaneous flap. In three patients (21 percent) the flap was folded to give internal and external cover. Forehead flaps were used in two patients (14 percent) to obtain inner lining.

RESULTS

Complete necrosis of the flap occurred in the one patient (7 percent). Marginal necrosis involving less than one-fourth of the flap was seen in two patients (14 percent). The patient who had the fifth rib incorporated in the osteo-myocutaneous flap had marginal necrosis of the flap along with a greater part of the rib, which had to be excised. Mild to moderate infection occurred in eight patients (56 percent) without any evidence of skin necrosis. Delayed wound healing needing secondary sutures and closure of orocutaneous fistula were done on seven patients (49 percent). These were all seen in

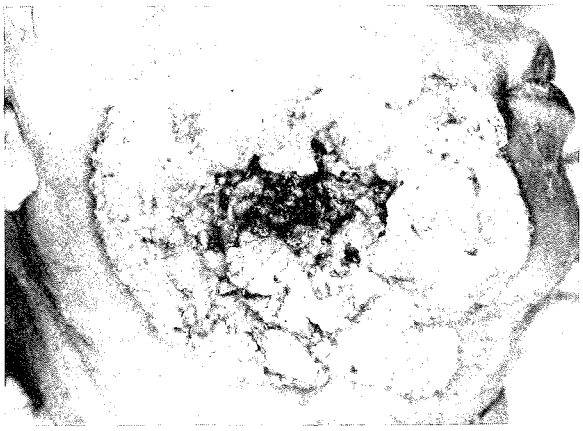

Fig. 2 Case No. 9 showing advanced carcinoma of the cheek with maggots (T_4 lesion).

patients who had pre-operative radiotherapy.

Mild wound infection at the donor site was seen in five patients (35 percent), pseudomonas was isolated in three and staplylococcus aureus in two. Only one patient needed secondary suturing for wound closure.

Two patients in this series (14 percent) who were primarily treated with radiotherapy had extensive recurrences following surgery, and this probably can be attributed to the biological behaviour of the tumour rather than on the modality of treatment.

There was one mortality in the third post-operative day due to myocardial infarction (7 percent).

The increased median length of stay in hospital following operation of 32 days is attributed to the time involved in rehabilitation of feeding and speech.

DISCUSSION

The approach to the surgical management of intra-oral cancer has undergone substantial change in recent years from primary excision and delayed reconstruction to immediate reconstruction using a forehead flap, [5] bipolar scalp flap, [6] and the deltopectoral flap. [7]

The deltopectoral flap is a useful flap in reconstructive surgery and had served the head and neck surgeons for over a decade and helped in primary closure after surgical excision of cancer in the head and neck region, but its use is limited by virtue of its smaller arc of rotation and that it needs staged procedures such as delaying and division of

Fig. 3 Case No. 9 after surgery following pectoralis major myocutaneous flap reconstruction.

the flap. The donor site needs to be grafted as well and may not be cosmetically acceptable in women.

The myocutaneous flaps have now more or less replaced the use of the deltopectoral flap and eliminated the above-mentioned problems. Approximately 20 myocutaneous flaps have been described, [8] of which the following six are being used in the head and neck region: sternomastoid, [9] trapezius, [10,11] platysma, [12,13] latissimus dorsi, [14] and pectoralis major. [15]

The great appeal of the pectoralis major myocutaneous flap reconstruction is that it affords the transfer of a well-vascularised skin and muscle flap to cover the oro-facial and cervical defects. The loss of the mandible and tissues in the neck in radical neck dissection is made good by the vascularised muscle-pedicle. It provides protection to the great vessels in the irradiated neck. The cervical and facial contour is reasonably well restored (Fig. 3). With this procedure, there is no

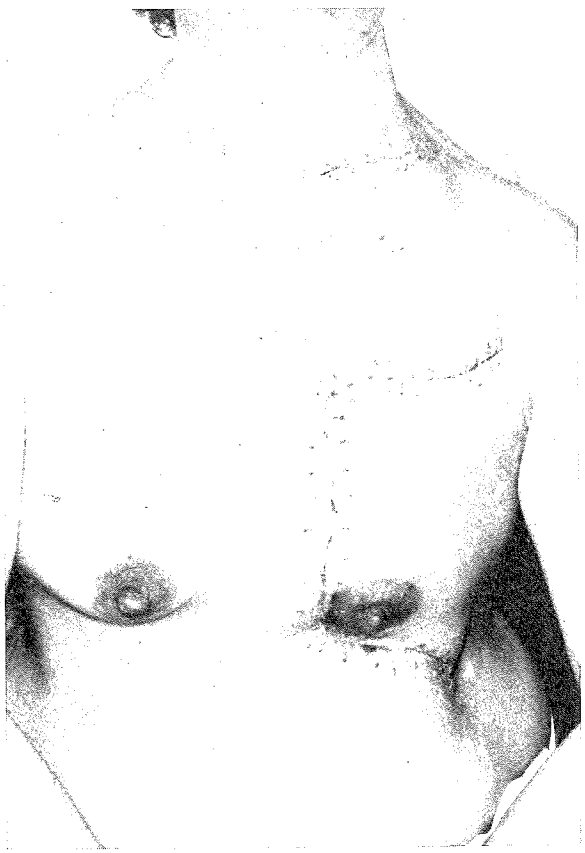

Fig. 4 Case No. 3 showing the donor site of the pectoralis major myocutaneous flap after closure with an acceptable cosmesis.

need for skin cover to the donor site, and cosmesis at the donor and recipient sites is acceptable (Fig. 4). The vascularised myocutaneous flap minimises the risk of oro-cutaneous fistulisation. In our series four patients (28 percent) had a minor leak which was closed by secondary sutures. This is a low figure in that ten patients (71 percent) had pre-operative radiotherapy.

The pectoralis major myocutaneous flap has come out as the most popular and primary flap for reconstruction procedures in the head and neck region. [7,15] Modification to the pectoralis major flap in the form of the "Gemini flap" obviates the need of the folding to cover the internal and external surfaces. [16]

The patient with head and neck cancer requires total care covering the many physical, functional and emotional aspects of the disease. While the appearance of a patient can never be fully restored to that of his or her pre-operative state, reconstructive surgery with the pectoralis major myocutaneous flap offers a great deal of relief.

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