The Pectoralis Major Myocutaneous Flap in Head and Neck Reconstruction

Ranjit Rajan, Sridhar Reddy, Rajamma Rajan,

"Rajashri", R-16, Jai Nagar, Kumarapuram, Trivandrum-695011.

The pectoralis major myocutaneous flap (PMMC flap) represents a landmark in the development of head and neck reconstructive surgery. After Stephan Ariyan first described its use for head and neck reconstruction in 1979, it has become tremendously popular and has revolutionised head and neck cancer surgery. Here, we present our initial experience with fourteen PMMC flaps in head and neck reconstruction. In most of the instances it was used for oral or oropharyngeal reconstruction. It was used for five other reconstructive tasks as well. Wound infection was the most common complication. There was no case of total flap loss. It has proven to be a reliable method of reconstruction in the head and neck.

INTRODUCTION

In 1990, while delivering the guest oration at the Annual Conference of the Association of Otolaryngologists of India, Prof. Sir D.F.N. Harrison described the Pectoralis Major Myocutaneous flap (PMMC flap) as one of the three major advances in the field of head and neck surgery during the last thirty years, the other two in his opinion being the gastric pull-up operation and craniofacial resection for maxillo-ethmoidal cancers. It was Stephan Ariyan in 1979 who first described the use of the PMMC flap in head and neck reconstruction (Ariyan, 1979). An axial myocutaneous flap based on the pectoral branch of the thoraco-acromial artery, it is arguably the most dependable and versatile of all reconstructive measures available to the head and neck surgeon at present.

We present our experience with fourteen pectoralis major myocutaneous flap

reconstructions in the head and neck performed over a two and a half year period in our unit.

PATIENTS AND METHODS

This retrospective study is based on fourteen consecutive PMMC flap reconstruction performed on an identical number of patients in the head and neck during the period from July 1990 to November 1992 in our unit.

The flaps were raised after completing the ablative surgery and determining the size and shape of the defects, except when they were used to repair pre-existing defects. The donor site is prepared, draped and covered at the beginning of resection. The same team performed both the ablative as well as the reconstructive surgery (new gloves and instruments are used during reconstruction). The skin incision on the chest is usually made along the lower part of the vascular axis and taken towards the anterior axillary fold, leaving the upper chest skin intact. This permits a deltopectoral flap to be raised, if needed, later on.

In all patients the vascular pedicle of the flap with the related muscle (the "carrier portion" of the flap) was tunnelled under the neck skin, except in one where it was carried externally. In this patient the flap was used to repair a large facial defect resulting from wound dehiscence after a total maxillectomy.

OBSERVATIONS

The age of the patients in this series ranged from 34 to 66 years. The mean age was 50 years. All were males.

Defects reconstructed

In eleven patients the flap was used for immediate reconstruction of defects resulting from surgical extirpation of head and neck cancer primaries. In the remaining three patients it was used to repair pre-existing defects (see Table I). Most of the reconstructions involved repair of oropharyngeal or oral cavity defect (6/14; 43%). The pre-existing defects repaired were two pharyngocutaneous fistulae which developed after laryngectomy and one facial defect resulting from wound dehiscence after a previous

maxillectomy in another.

Reconstruction was successful in all cases except one (13/14; 93%). In one patient the pharyngocutaneous fistula repair failed totally (case no.7). No further surgical intervention was carried out. Though another patient (case no.5) developed necrosis of the distal portion of the flap, reconstruction could be completed at a second sitting (*vide infra*).

In all patients in whom oropharyngeal or oral cavity reconstruction was performed, no leak

Table I
Tumours resected and reconstruction done (n=14)

Patients No.	Disease ablated/Defect reconstructed	Area reconstructed with PMMC flap
1.	(R) Tonsillar growth (T ₃ N _{2b} M ₀ , Stage IV)	(R) Lateral wall of oropharynx, and oral tongue and adjoining floor of mouth
2.	Growth (L) Genukarynx with skin involvement (T ₄ N ₀ M ₀ , Stage IV)	Skin & subcutaneous tissue defect — anterior neck
3.	(R) Tonsillar growth (T ₃ N _{2b} M ₀ , Stage IV)	(R) Lateral wall of oropharynx
4.	(L) tonsillar growth (T ₃ N _{2b} M ₀ , Stage IV)	(L) Lateral wall of oropharynx
5.	Carcinoma (L) external and middle ear with parotid involvement (T ₃ N ₀ M ₀ , Stage III)	Defect produced by subtotal petrosectomy with (L) pinna, surrounding skin, (L) parotid, (L) TM joint and base of the zygoma.
6.	Growth (L) border oral tongue and adjacent base tongue (T ₄ N ₀ M ₀ , Stage IV)	(L) half of tongue except portion adjacent to Vallecula.
7.	Pharyngocutaneous fistula following salvage laryngectomy.	Pharyngocutaneous fistula
8.	Facial defect following total maxillectomy	Facial defect.
9.	(L) Tonsillar growth (T ₄ N ₀ M ₀ , Stage IV)	(L) lateral oropharyngeal wall and adjacent base tongue.
10.	Pyriform Sinus Growth with neck skin involvement (T ₄ N ₀ M ₀ , Stage IV)	Skin and subcutaneous tissue defect— anterior neck
11.	(R) Buccal mucosa growth with involvement of cheek skin (T ₄ N ₀ M ₀ , Stage IV)	(R) Cheek defect
12.	Pharyngocutaneous fistula following total laryngectomy	Pharyngocutaneous fistula repair
13.	(L) Tonsillar growth (T ₄ N _{2a} M ₀ , Stage IV)	(L) Lateral wall of oropharynx
14.	(L) Buccal muacosa growth with skin involvement (T ₄ N ₁ M ₀ , Stage IV)	(L) Cheek defect

Note : Defect resulting from necrosis of the distal portion of the flap in Case No: 5 was repaired by suturing the edges after giving a releasing incision in the scalp
Suturing of cervical flap edges stopped a minimal persistent leak in Case No: 12.

developed and normal oral feeds were resumed.

Flap Survival

All the fourteen flaps in this series survived. However, in one patient (case no.5) the distal third of the flap developed dusky discolouration on the first post-operative day. This later progressed to bleb formation and necrosis of the distal portion of the flap (see figure 1).

Fig.1

Bleb formation and discolouration of the flap due to compression of the vascular pedicle

Pre- and post-operative radiation

In seven patients the flaps survived post-operative radiation in doses ranging from 55 Gys to 60 Gys. Three patients had received pre-operative radiotherapy and in one of them reconstruction failed. The other four patients did not receive radiotherapy

Donor defect closure

In all cases except one (case no. 5) the donor defect was closed primarily. In the aforesaid case, where a large 11 x 9 cm flap was raised, the donor area had to be covered using a split-skin graft.

Complications

The complication in our series were as shown in Table II. Wound infection and variable degrees of wound gaping, neither of which is specific to reconstruction using the PMMC flap, were the

Table II

COMPLICATIONS			
I Wound Infection			
– Donor site	– 2/14		
– Recipient site*	– 3/7	7/31	
– Neck wound**	– 2/10		
II Wound gaping/disruption			
– Donor site	– 1/14		
– Recipient site	– 6/14	8/38	
– Neck	– 1/10		
III Flap Necrosis (Partial)			
	– 1/14		
IV Non-union – Mandibulotomy			
	– 2		
V Donor site haematoma			
	– 2		
VI Hypoglossal paralysis			
	– 1		
VII Post-Op. death			
	– 1		
(Pneumonitis and septicaemia)			

Note :

* Seven out of the fourteen recipient sites were intrapharyngeal/intra-oral and hence were not assessed for wound infection.

** One patient had no neck incision (No : 8). In three others (Nos : 2, 10 and 12) the neck wound and recipient site wound were the same.

complications most often seen. There was one post-operative death (case no. 13).

Other flaps used

In the two instances where the flap was used for repair of pharyngocutaneous fistulae, it was used simultaneously with a deltopectoral flap in one and with a cervical flap in the other (case nos. 7 and 12). Intraoral lining was provided by forehead flaps where it was used for repair of cheek defects (case nos. 11 & 14).

Re-operation for repair

Two patients had to be re-operated for completing the repair (case nos. 5 & 12; see Table I). In two others, skin wound gaping was secondarily sutured.

DISCUSSION

Our initial experience with the PMMC flap, although limited, has shown it to be a versatile and extremely dependable flap. Jurkiewicz and Hester (1982) list the following as the major indications for PMMC flap reconstruction –

- 1) Resurfacing of skin of face and neck.
- 2) Coverage of orbital defects.
- 3) Intra-oral and pharyngeal lining.
- 4) Carrier for rib and skin in mandibular reconstruction.
- 5) Reconstruction of the oesophagus.

RECONSTRUCTION OF OROPHARYNGEAL AND INTRA-ORAL DEFECTS

This accounted for the majority in our series (6/14; 43%). Five resumed oral feeds. One died post-operatively. There were no fistulae. Schuller (1983) and Biller et al (1981) have also used it mostly for reconstructing such defects.

Fig.2

Reconstruction of neck skin with PMMC flap

The remaining eight cases in our series illustrate five other situations where pectoralis major flaps have proven to be effective :–

1. Reconstruction of neck skin (see Table I)

Skin ulceration produced by invasion from laryngeal cancer is not very common (Rifai et al, 1990). Rifai et al. reported twelve cases of laryngeal cancer with skin involvement for which wide excision of the neck skin was done en bloc with total laryngectomy followed by PMMC flap reconstruction in eleven. Two of our patients underwent a similar procedure successfully (See Figure 2).

2. Reconstruction after sub-total petrosectomy (see Table I)

The PMMC flap is the one advocated for reconstruction of such defects now (Ariyan, 1980; Stell, 1987). The advantages include the rich vascularity of the flap which helps to prevent osteoradionecrosis, the muscle bulk which provides an effective seal if a CSF leak develops and its ability to withstand post-operative radiotherapy, not to mention the one-stage reconstruction. Our patient developed necrosis of the distal margin of the flap. Completion of repair entailed suturing of the defect after giving a releasing scalp incision.

3. Closure of pharyngocutaneous fistulae (see Table I)

The repair failed in case no. 7 due to flap separation from the pharyngeal wall. In the other patient a minimal leak developed on the ninth post-operative day. Re-exploration done due to persistence of the leak revealed a disruption in the inner cervical flap suture line. This was repaired and the fistula healed promptly.

The adverse quality of the recipient bed as a result of irradiation, as well as oral contamination and subsequent infection have been termed as being “of no concern” for the PMMC flap in pharyngeal reconstruction (Biller et al, 1981). However, Vasconez et al (1980) caution that breakdown along the flap margins is likely if used in irradiated areas without adequately resecting irradiated

tissues. Instead of simultaneous use of the deltopectoral flap, which is of much inferior vascularity, a bipaddled "Gemini" PMMC flap has been advocated when doubled flaps are needed for repair (Weaver et al, 1982).

4. Repair of facial defect (see Table I)

Use of the PMMC flap to repair a facial defect, taking the carrier portion of the flap outside the neck, was prompted by the description of a similar technique for repair after orbital exenteration (Ariyan, 1980). As the recipient area was irradiated, division and discard of the carrier portion of the flap and completion of the repair was delayed until seven weeks later, as recommended by Alpert et al (1982). This was the only case in our series where the reconstruction entailed two planned operative interventions.

5. Reconstruction of cheek skin involved by buccal mucosal cancer (see Table I)

The flap was used for external cover along with forehead flap for inner lining in two patients with advanced buccal cancers.

COMPLICATIONS

The complications described after PMMC flap reconstruction include wound infection, wound dehiscence, partial and total flap necrosis, orocutaneous and pharyngocutaneous fistula, donor site haematoma, dysphagia and pharyngeal stenosis. The common complications we encountered were wound infection and wound dehiscence (Table II). Two patients (14%) developed donor site haematoma. Biller et al (1981) report a 7% incidence of this complication in their series of 42 patients.

Partial necrosis of the flap developed in one patient (case no. 5) due to compression of the vascular pedicle, the 'Achilles heel' of the PMMC flap, inside a tight skin tunnel over the clavicle. The risk of vascular compression has been highlighted by several authors (Vasconez et al, 1980; Schuller, 1980; Mathes and Nahai, 1982; Shank and Patow, 1992). The skin tunnel, especially over the clavicle has to be quite large.

One has to leave an adequate margin to allow for post-operative swelling of the muscle pedicle in the carrier portion of the flap post-operatively. Flap discolouration is a definite sign of vascular compromise, and calls for decompression forthwith. However, we found many flaps to be cold during the first post-operative day and, in the absence of discolouration, this should not cause concern.

Vascular compression can occur while approximating the mandibular cut ends after mandibulotomy done for oropharyngeal excision and reconstruction. In case no. 6 the thickness of the pedicle and apprehension of vascular compression prevented us from properly approximating the mandibular cut ends. This patient developed non-union of the mandible. This difficulty may be over-come by keeping the muscle about the vascular pedicle to a minimum (Ariyan 1980), but extreme thinning of the muscle pedicle can increase the risk of damaging the vascular pedicle and, further more, may induce vascular spasm (Shank and Patow, 1992).

Advantages and disadvantages

The advantages of this flap are legion (Ariyan 1980, Schuller 1980 and 1983, Shank and Patow, 1992). The overwhelming advantage is its vascularity and, hence, its reliability. Other advantages include its ability to effect one-stage reconstruction and its versatility exemplified by its use in a variety of reconstructions. Moreover, no special technical expertise is required unlike in microvascular free-flap reconstruction.

Its major disadvantage is its bulkiness which makes inseting it difficult and hampers contouring it, as is required in pharyngoesophageal and tongue reconstructions. The weight of the flap will tend to pull apart suture lines, especially when the pedicle is taken external to the neck skin and in pharyngoesophageal reconstructions. The bulk of the flap interferes with detection of nodal recurrence in the neck.

SUMMARY

The pectoralis major myocutaneous flap has greatly enhanced reconstructive capability in the

head and neck because of its excellent vascularity and versatility and ability to effect one-stage reconstruction. It is a reliable flap and reconstruction can be safely performed, provided

due caution is exercised with regard to the vascular pedicle. Our initial experience with fourteen PMMC flaps has been encouraging with 93% of the reconstructions proving successful.

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