LEAD ARTICLE

Abstract

Most of the head and neck cancer patients in India present to the Otolaryngologist, Head and Neck surgeon in the advanced stages of their disease. Extensive resection followed by acceptable morphological & functional reconstruction is the goal for the surgeon. Use of the pectoralis major myocutaneous (PMMC) flap enables extensive ablative procedures to be carried out followed by immediate and reliable reconstruction. Thirty consecutive cases of biopsy proven squamous cell carcinoma of the head and neck region were studied. All underwent extensive resection of the tumour with pectoralis major myocutaneous flap reconstruction, with pre- or post-operative external irradiation. This study concentrates on the indications for and complications encountered with the use of the pectoralis major myocutaneous flap. Also included is an extensive review of the literature relating to the complications encountered with the use of this method of reconstruction.

Key Words

Pectoralis Major Myocutaneous Flap, Musculocutaneous Flaps, Head and Neck Surgery

The Indications and Complications of Pectoralis Major Myocutaneous Flap Reconstruction in Head and Neck Surgery-Our Experience

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Malignant tumours of the head and neck region are common in India, the incidence being about one-third of all new cancer patients. This is due to the low socio-economic status of the patients, the abuse of tobacco and alcohol, and poor oral hygiene. Most of these patients present late in the course of the disease, leaving no option for the head and neck surgeon other than extensive and aggressive resection of the tumour. The PMMC flap is quick and easy to prepare, reliable, and sufficiently close to most head and neck reconstruction sites. Its rich blood supply makes the flap extremely safe, as regards its viability and resistance to infection. It is arguably the most dependable and versatile of all reconstructive measures available to the head & neck surgeon at present.

The aim of reconstructive surgery after surgical resection in head & neck malignancies is to restore structure & function as soon as possible with minimum necessary additional trauma to the patient. Ariyan & Krizek in 1977 were the first to report the use of the PMMC flap in head and neck reconstruction (Ariyan & Cuono, 1980). Since then, this flap has earned the synonym "the workhorse of head & neck reconstructive surgery".

This paper deals with the indications for the use of this flap and the complications encountered in the post operative period.

Materials & Methods

Thirty patients were included in this study. All these cases were biopsy proven cases of squamous cell carcinoma of the head and neck region, and underwent extensive surgical resection followed by PMMC flap reconstruction in the Department of Otolaryngology-Head & Neck Surgery at Kasturba Hospital, Manipal. External radiotherapy was given at the Department of Radiation Oncology in the same hospital. Data was collected with respect to the site of malignancy, its extent and the TNM staging, any previous treatment modality (surgery or radiotherapy) and the complications encountered in the postoperative period. Based on the clinical, endoscopic and radiographic evaluation of the patient, the lesions were staged according to the UICC TNM staging system (1987). All the thirty patients were operated upon by a surgical team led by a senior surgeon. The elevation of the flap was along the same lines as described by Shank & Patow (1992).

Fig. 1 the PMMC flap markings prior to surgery

Cases with postoperative neck wound infection and dehiscence were managed with longer courses of appropriate antibiotics and daily wound dressings. One of the patients who developed infection and dehiscence at the donor site was managed by local dressings soaked in povidone iodine solution, and subsequent split skin grafting.

Observations

Thirty patients were studied with ages ranging from 34 to 74 years. 23 (77%) patients were in the 5th & 6th decades of life. The male to female ratio was 29 to 1 and the follow up period ranged from six months to three and a half years. The sites of malignancy were as shown in Table 1. The majority of the patients belonged to the T₃ & T₄ categories with N₀ nodal status. Most of the cases belonged to stage III^(43%) & stage IV^(43%) categories.. Seven patients (23%) had received radical external radiotherapy of 65 Gy in fractionated doses over a period of 35-40 days as the primary form of treatment. These cases of radiation

Table - 1 Site of Malignancy	
Site	No. of patients
Oral cavity	
Buccal mucosa	8 (27%)
Floor of mouth	2 (7%)
Oral tongue	2 (7%)
Gingiva (inferior)	1 (3%)
Oropharynx	
Tonsil	6 (20%)
Hypopharynx	
Pyriform Fossa	5 (17%)
Larynx	
Glottic	4 (23%)
Maxillo Ethmoidal Complex	1 (3%)
External & Middle Ear	1 (3%)
	30

Table - II Type of Reconstruction		
No. of Patients	Percentage	(Rounded)
Primary Reconstruction	22/30	73%
Oropharyngeal / Intraoral	8	36%
Anterior neck skin & subcutaneous tissues	5	23%
Cheek skin	8	36%
Subtotal petrosectomy	1	5%
Pre-Existing Defect Closure	8/30	27%
Pharyngocutaneous fistula	3	38%
Maxillectomy wound dehiscence	1	13%
Anterior neck skin & subcutaneous tissues	3	28%
Cheek skin	1	13%

failure underwent salvage surgery with PMMC flap reconstruction. As depicted in Table 2, 22 patients (73%) underwent primary reconstruction while 8 patients (27%) had preexisting defect closures. No tubed flap was used as there was no circumferential pharyngeal defect. All cases of total laryngectomy with total pharyngectomy were reconstructed by oesophageal stripping and gastric transposition. The donor defect was closed primarily in 29 cases (97%), while the one remaining defect was closed with a split

**Table III
Complications**

Recipient Site		
Wound Infection	7	(23%)
Dehiscence	8	(27%)
Partial Flap Necrosis (Skin)	1	(3%)
Donor Site		
Haematoma	2	(7%)
Dehiscence	1	(3%)

**Table IV
Wound Dehiscence**

Site of reconstruction	Number of Cases (%)
Hypopharynx	1 (3%)
Anterior neck skin & subcutaneous tissues	3 (10%)
Cheek skin	2 (10%)
Pharyngocutaneous fistula	1 (3%)
Intra oral / Oropharyngeal	1 (3%)

skin graft (3%). Fourteen patients (47%) received post-operative external irradiation of 55 grays in 25 fractionated doses over a period of 35-40 days.

The survival of the PMMC flap was excellent (100%). All the flaps survived, irrespective of the recipient site or any previous treatment modality (Radiotherapy/ Surgery). As can be seen in Table 3, the commonest complications in this study were mainly wound infection (23%) and dehiscence (27%) at the recipient site. The cases that underwent wound dehiscence are listed in Table 4.

Discussion

The PMMC flap is one of the most versatile flaps as far as survival of the flap is concerned, and one of the most suitable flaps for reconstruction of the oropharynx, partial pharyngeal reconstruction after pharyngo-laryngectomy, and to provide cover for the major vessels in the neck following radical neck dissection in post irradiated cases. The PMMC flap is technically easy and quick to prepare (Brusati et al. 1988). No special expertise is necessary for the use of PMMC flaps (Schuller, 1983) compared to the latissimus dorsii and trapezius myocutaneous flaps. Since its survival rate is better, the PMMC flap is more commonly used for head and neck reconstruction.

The local randomized flaps usually do not survive in previously irradiated or operated cases, where their blood supply has been compromised. However, the PMMC flap in head and neck reconstruction has an excellent survival rate following radiation therapy (Keidan & Kusiak, 1992 ; Vasconez, McCraw & Hall, 1980).

Fig 2 same patient with the vascular pe dicle & part of the Island flap raised

The PMMC flap is used for reconstruction at various sites. In the oral cavity, large full thickness defects of the cheek; floor of the mouth or lateral border of the tongue can be closed adequately with the PMMC flap. In general, a higher complication rate can be expected when the PMMC flap is used to resurface intraoral defects (Mehrhof, 1983). It can also be expected that

Fig 3 : the flap used to reconstruct cheek skin and subcutaneous tissues after hemimandibulotomy

the majority of complications seen will heal without the need for secondary procedures.

Oropharyngeal defects after Commando's procedure for tonsillar malignancies which result in large defects of the soft palate and oropharyngeal wall can be reconstructed with the PMMC flap. However, smaller defects are better closed primarily without using any myocutaneous flaps.

The PMMC flap is indicated in cases of total laryngectomy with partial pharyngectomy where inadequate pharyngeal mucosa is left for primary closure. The tubed PMMC flap can be used for one stage total cervical oesophageal reconstruction. However, the thickness of the flap coupled with the

Fig 4 the donor and recipient sites healing well, with the tracheo-oesophageal voice prosthesis in situ

weight of the muscular paddle may be detrimental when using the flap for this purpose (Schuller, 1980). The high incidence of muco-cutaneous junction stenosis seems related to the propensity for stenosis that exists whenever skin is sutured to a

Table - V
Complications reported in other series

Complication	Schuller 1980	Biller 1981	Baek 1982	Mehrhof 1983	Ueda 1985	Brusati 1988	Nagral 1992
No. of Patients	15	42	133	73	7	100	19
Total necrosis	-	-	1.5%	4.0%	-	2.0%	-
Partial Necrosis	6.6%	7.0%	7.0%	12.3%	18.6%	9.0%	32%
Dehiscence	-	9.5%	13.0%	12.3%	-	19.0%	-
Fistulae	20.0%	9.5%	13.5%	16.6%	28.6%	9.0%	35%
Thoracic osteochondritis	-	-	-	-	-	4.0%	-
Neck wound infection	-	31.0%	-	10.9%	-	-	10.5%
Donor site haematoma	-	-	-	1.3%	-	7.0%	-
Severe facial oedema	-	-	-	-	28.6%	-	-
Donor site infection	-	-	-	-	-	-	10.5%

circumferential mucosal structure such as the oesophagus (Schuller, 1983).

For reconstruction of the external and middle ear, the PMMC flap provides adequate bulk and soft tissue to permit healing in this area and rich vascularity to permit a full course of postoperative radiation therapy.

In the present study, prior radical radiation therapy as the primary form of treatment did not adversely affect the subsequent survival of the PMMC flap following salvage surgery and PMMC flap reconstruction, which was 100%, the same as that in the nonirradiated group. This compares with an approximately 25% failure rate for free flaps (Biller, Baek & Lawson, 1981) and a 20% failure rate for deltopectoral flaps (Bone R, 1981).

Total necrosis of the flap has been reported by Baek et al 1982, Mehrof et al 1983, Brusati et al 1988 and Conley & Parke 1981 in 1.5%, 4.0%, 2.0% and 15% of their cases respectively, in contrast to other authors (Table 5) and the present study where no total flap necrosis was seen. But partial flap necrosis was reported by various authors ranging from 6.6% to 32.0% (Table 5), in contrast to the present study where this was seen in one case (3%). This may be due to better selection of cases and because the vascular pedicles of the flap were not kinked or compromised in any of the cases, as a result of prior planning.

Various authors experienced wound dehiscence rates of 0% to 19% in their cases (Table 5), in contrast to the present study where wound dehiscence was noted in 27% of cases. This may be because of the pre-existing poor oro-dental hygiene or poor nutritional status of our patients and the presence of diabetes mellitus in four cases who developed complications. One case of post irradiated residual carcinoma of tonsil with osteoradionecrosis of the mandible underwent hemimandibulectomy with wide excision of growth and PMMC flap reconstruction, and later developed wound dehiscence followed by an orocutaneous fistula. This healed with conservative management.

All the hypopharyngeal defects repaired using the PMMC flap were cases of total laryngectomy with partial pharyngectomy where there was inadequate

residual pharyngeal mucosa for primary closure. The PMMC flap was turned in so that the skin paddle lining was on the inside and the edges of this were sutured to the residual pharyngeal mucosa. No tubed flaps have been used in this series as the policy in our department is to proceed with a gastric pull up and transposition for all cases of total laryngectomy and total pharyngectomy, as this provides early swallowing with better healing.

The PMMC flap has many advantages and some disadvantages. The disadvantages are the bulk of the flap, which may make delicate pharyngeal reconstruction difficult, and may prevent adequate oncological examination of the neck on subsequent follow up (Schuller, 1989; Shank & Patow, 1992). Hair may also be transferred to the reconstructive area, however we do not feel this to be a significant problem. Distortion & asymmetry of the breasts following reconstruction usually precludes its use in women (Shank & Patow, 1992).

The advantages are the excellent viability (Schuller, 1983) & dependability of the flap, due to its rich blood supply. Good carotid protection, and better cosmesis whenever bulk is required for reconstruction (Withers et al, 1979). The quality of the recipient bed or a prior history of irradiation are almost of no consequence, and large skin defects can be easily covered along with primary closure of the donor site (Shank & Patow, 1992; Ariyan, 1980). The patient remains supine throughout the procedure, unlike the awkward positioning and moving of the patient required for both trapezius and latissimus dorsi myocutaneous flaps.

Conclusion

To conclude, the Pectoralis Major Myocutaneous Flap is an excellent flap for head & neck reconstruction, especially in post irradiated cases. However, proper selection and planning of cases is an important prerequisite for excellent results.

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