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Oncology

UTILITY OF PECTORALIS MAJOR MYO-CUTANEOUS FLAP FOR RECONSTRUCTION OF HEAD AND NECK DEFECTS IN DEVELOPING COUNTRIES

KEY WORDS: PMMC flap, head and neck cancers, oral cancers

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ABSTRACT

Though free flaps are presently the gold standard for head and neck reconstruction, PMMC flaps still remains a robust versatile pedicled workhorse flap used for a variety of head and neck reconstructions with a comparatively easier learning curve and a shorter operating time to ease the huge workload in our hospitals in a developing country like India.

In this article we have reviewed 30 head and neck cancer cases which we had done in the General Surgery department of Medical College Hospital Kolkata in which we have used the PMMC flap as a reconstructive tool for various defects produced after resection of head and neck malignancies. These include buccal mucosal cancers, cancer of the floor of mouth, tongue ,retromolar trigone, lip ,mandible and parotid gland.

We did not have even one case of total flap necrosis. However minor complications like partial flap necrosis ,infection, wound dehiscence and oro-cutaneous fistula were present in few of our cases.

We thus conclude that PMMC flap is still a good work horse flap for reconstructions of defects created after resection of head and neck malignancies with good functional outcome.

INTRODUCTION

Free flaps are presently the gold standard for reconstructive surgeries for head and neck defects. However, they need a lot of medical resources and training to master. Here comes the role of a robust and a versatile pedicled flap like the PMMC flap which has a relatively easier learning curve and a shorter operating time.This is specially required to deal with the huge patient load in a developing country like India where most of the patients present in an advanced stage of the disease. Ariyan first described the PMMC flap in 1979.

MATERIALS AND METHODS

30 patients with head and neck malignancies were operated from 2015 to early 2018 where PMMC flap reconstruction was performed. All the operations were done at Medical College, Kolkata. Clearance from ethical committee was obtained for this study. All patients gave written & informed consent for operation and also consent for preoperative, operative and postoperative photographs to be produced for this study and further publication.

For this study the demographic details of the patients were recorded along with the pathological stage of disease in which they presented to us. Also the comorbidities of the patients, any previous treatment taken, the surgical resection procedures undertaken and the post-operative complications either flap related or not were all recorded. Ipsilateral PMMC flap was harvested in each case using the standard techniques and was used for reconstruction after resection of the lesion.

RESULTS & ANALYSIS

Out of 30 patients 24(80%) were male and 6(20%) were female. 8 patients (26.67%) out of 30 were in the of 7th decade of life, 18(60%) in the 5th and 6th decades and 2 each (6.67%) in the 3rd and 4th decades. 27 patient(90%) had malignancy in the oral cavity, 2 with malignancy in the base of tongue i.e. oropharynx(6.67%) and 1 with adenoid cystic carcinoma of the parotid gland (3.33%). All the malignancies in the oral cavity and oropharynx were squamous cell carcinoma. 3 out of those 30 cases (10%) were recurrence where PMMC flap was used after resection of the recurrence to cover the defect. Two of the three recurrent lesions were from outside Medical College, Kolkata who had primary closure after excision of the primary lesion. One patient was our own follow up case that developed recurrence & did not receive radiotherapy after excision of the primary tumour and modified radical neck dissection with histopathologically confirmed negative margins and metastatic cervical lymph nodes. Out of the 27 oral cavity cancers 12(40% of total) were in the buccal mucosa and 3 each (10%) in the floor of mouth, tongue (within anterior two-third), retro molar trigone. 2 patients (6.67%) had lesion in the lip and 4 patients (13.33%) in the mandible.

Only 6 cases (20%) reported with early disease i.e. stage I and II of the disease. 12 patients (40%) reported with stages III disease and 12 with stage IV. All patients were undertaken for operation without prior radiotherapy. PMMC flap reconstruction was performed in all cases as primary procedure. Temporary tracheostomy had to be done in 10 cases (33.33%) which were weaned off during follow up in all the 10 cases that required it.

Post-operative complications were categorized under two broad headings i.e. flap related and flap unrelated. No perioperative deaths occurred. 18 patients (60%) had uneventful recovery without any complication. Flap unrelated complications like chest infection, superficial thromb ophlebitis developed in few patients which were not major and did not prolong hospital stay.

Flap related complications: None of the patients had total flap necrosis. 6 patients (20%) had partial flap necrosis of which 2(6.6%) were major i.e. full thickness. 4 patients (3.33%) had marginal or superficial flap necrosis. Other flap related complications were wound dehiscence, oro-cutaneous fistula , infection etc. Donor site wound dehiscence developed in 3 patients (10%). None of these patients with complications required any salvage procedure.They all gradually recovered completely with regular dressing and conservative approach though this prolonged the hospital stay and increased the cost of treatment. Overall cosmetic outcome was satisfactory in these patients. All the patients were referred for radiation therapy and asked to follow up in our OPD at regular intervals.

One patient (3.33%) who had a buccal mucosal growth close to the mandible and excised with 1cm margins & neck dissection and which was reconstructed at the index operation by scalp and forehead flaps ,developed recurrence and was taken up for re-resection. That patient had to undergo

a second reconstructive procedure using the PMMC flap from the ipsilateral side. Now he is doing fine.

Table 1: Age distribution

Age group	No. of patients	Percentage (%)
31 – 40	2	6.67
41 – 50	2	6.67
51 – 60	9	30
61 – 70	9	30
71 – 80	8	26.67

Table 2: Distribution of primary site of tumour

Primary site	No. of patients	Percentage(%)
Oral Cavity		
Buccal mucosa	12	40
Floor of mouth	3	10
Anterior two-third of Tongue	3	10
Retro-molar trigone	3	10
Lip	2	6.67
Mandible	4	13.33
Oro-pharynx Base of tongue	2	6.67
Parotid gland	1	3.33

Table 3: Complications

Complications	No. of patients
Flap related	
Total flap necrosis	NIL
Partial flap necrosis Major i.e. full thickness Minor i.e. marginal/superficial	 2 4
Others Oro-cutaneous fistula Wound dehiscence Infection Donor site wound dehiscence	 4 7 6 3
Flap unrelated	Few (insignificant)
Uneventful recovery	18
Peri-operative death	NIL

DISCUSSION

Currently free flap reconstruction is undoubtedly the first choice for head and neck cancers providing one stage restoration with better cosmetic and functional results (Ref.1). However even in hands of experienced microsurgeon total flap necrosis occurs in free flap reconstructions; but total flap loss in PMMC flap is uncommon (Ref.2). This fact coupled with the relatively short learning curve for PMMC makes it a very attractive flap for head and neck reconstruction in a developing country like India with limited medical resources and a huge patient load which demands a robust flap. It would utilise less resources and could be accomplished as a single team approach with relatively fast flap harvest and inset thereby avoiding the logistics of getting two teams to work together always (Ref.3). PMMC is a flap which can be used not only as a flap for primary constructions of head and neck defects but also as a salvage procedure in case of free flap necrosis and in patients were free flap reconstructions are contraindicated as in cases with inadequate recipient vessels and medical comorbidities making the patient unfit for a long surgery. It can also be used in conjunction with a free flap to cover very large soft tissue defects overlying major vessels (Ref.1,2).

The Pectoralis Major is a thick fan shaped muscle that helps in adduction and internal rotation of the arm. It has four sites of origin- clavicle/ the manubrium and sternum extending inferiorly to where the 6th and 7th costal cartilages are attached/ the costal cartilage from second to sixth ribs and the aponeurosis of the external oblique muscle. From this wide origin the muscle insert into the crest of the greater tubercle of humerus. It is a type 5 muscle according to Mathees Nahai classification. The main blood supply comes from the thoraco-acromial artery which is a branch of the second part of the axillary artery and it divides into four branches - pectoral, clavicular, acromial and deltoid .The pectoral branch of the thoracoacromial artery is the main branch of the sterno-costal part of the muscle which descends along the posterior surface of the muscle within the sheet of the muscle and enters the deep surface of the muscle at the midpoint and some of these vessels pierce the surface of the muscle to supply the overlying skin. The terminal branch of the pectoral artery passes around the inferio-lateral border of the pectoralis muscle to reach the skin. Many of the arterial branches pass medially along the fascial septa and anastomose with segmental anterior perforating branches from the internal thoracic artery. These perforators penetrate the medial part of the pectoralis to reach the overlying skin as a direct cutaneous vessel and thus if the third perforating branch of the internal thoracic artery is taken, it ensures blood supply of the distal part of the skin paddle(especially if the skin paddle is taken caudally and medial to the nipple) due to the choke anastomosis of the internal thoracic and thoracoacromial artery. A further anastomosis may exist with a branch of the lateral thoracic artery which runs along the lateral edge of the muscle.

The skin paddle of PMMC flap can be of the following types - inferomedial, lateral, parasternal, extended, bipaddled and as an osteo-musculocutaneous flap. Placing the flap inferomedial was a common method of reconstruction in our series . Exposure of the muscle was usually achieved by an open approach by a skin incision from the proper skin Island along the anterior axillary fold so that direct access was gained to the lateral margin of the pectoralis muscle. Incision was then made along the proposed marking of the skin paddle and the dermis of the paddle was fixed to the underlying pectoral muscle by interrupted sutures. First the superior flap containing skin and subcutaneous tissue was raised up to the clavicle. .The skin paddle was then lifted from the inferior margin to the superior portion usually including the third perforating branch of the internal thoracic artery. As the muscle along with skin paddle was lifted from "down up", the thoracoacromial pedicle was located at the undersurface of the pectoralis major muscle and this pedicle was followed superiorly and the muscle trimmed both medially and laterally by cutting it with diathermy, always keeping an eye on the thoracoacromial pedicle so that it was not injured. The flap was then tunneled into the neck over the clavicle keeping in mind to keep the width of the tunnel to at least four fingers so that there is no compression over the pedicle. The sternocleidomastoid muscle was usually resected at the time of neck dissection to accommodate the pedicle of the PMMC flap to reach the oral cavity for reconstruction of various defects created after resection of different head and neck cancers. (figure 1-6)

Figure 1 Retromolar Trigone SCC excised with wide local margins , segmental Mandibulectomy & Rt. sided MRND

Figure 2 Rt. sided PMMC Flap being harvested

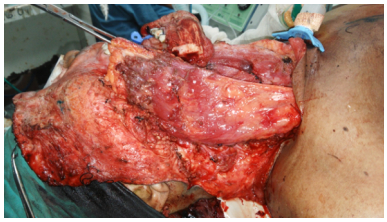

Figure 3 Rt. Sided PMMC flap being transposed to the defect after its harvest

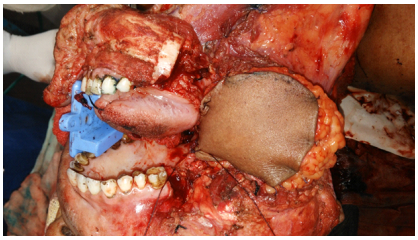

Figure 4 Rt. sided PMMC flap being inset into the defect keeping the jaw opener in proper position

Figure 5 Immediate Post Operative picture

Figure 6 Two months follow up showing well settled PMMC FLAP with good mouth opening

When a PMMC and a DP flap were concomitantly required for reconstruction, the DP flap territory was elevated first keeping the second intercostal artery intact and this give access to the lateral margin of the PMMC flap. Then a similar method was employed for elevation of the PMMC flap.

We have used this flap to reconstruct a variety of defects resulting after wide local excision of cancers of the oral cavity, total glossectomy and radical parotidectomy.

We have also used PMMC as a salvage flap in 3 cases used to reconstruct defects created after wide local excision of recurrent cancers.

Reported complication rate in various series varies from 17 % to 63% (Ref. 1,4,5,6). In our series we did not observe even a single case of full thickness necrosis of PMMC flap. 20% (6 patients) had partial flap necrosis of which 2 patients(6.66%) had partial full thickness flap necrosis and 4 (13.33%) patients had only marginal and superficial flap necrosis which is comparable to the findings in other studies(Ref.1,5,7,8,9).

One major advantage of PMMC flap is its survival as total flap loss is extremely uncommon. However this incidence of necrosis in free flap, done even by an experienced microsurgeon is high. Many factors have been suggested for partial flap necrosis like presence of a random portion of skin at the distal end of the flap, the flap harvest going beyond the 7th rib, not creating a wide enough tunnel during transfer of the flap, preservation versus removing clavicular attachment of pectoralis muscle.

Hence in most cases we tried to encompass skin perforator vessels that arise from the intercostal branches of the internal thoracic artery by positioning the skin Island just medial to the nipple over the 4th , 5th and 6th intercostal spaces as proposed by Rikimani et al. (Ref.10). The cutaneous vessels are supplied by pectoral branches of thoracoacromial artery through open choke vessels when the main blood flow through the internal thoracic artery is interrupted during PMMC flap elevation (Ref.10). Thus by including this modification, a total axial myocutaneous flap may be created.

However if an extended PMMC is done by taking skin Island below the 7th rib, it increases the chance of partial flap loss as this portion of an island will have a random blood supply as they are originally supplied by cutaneous branches of superior epigastric artery.

Another pitfall relates to lateral pectoral nerve division (Ref.11), as this nerve lies parallel/ oblique to the thoracoacromial pedicle and so as the flap is rotated through 180 degrees the nerve becomes taut especially when it runs oblique to the pedicle and thereby presses against the pedicle. Hence this nerve should be dissected and divided when this situation happens (Ref.11).

Other complications include haematoma formation which developed in no patient in our series. Other series have reported hematoma in 7% of patients (Ref.7).We attribute this to two factors. We think that it is the extra care we took in continuous suturing the raw margins of the raised pectoralis major muscle with 3- 0 vicryl (taking care that the vascular pedicle is not included in the suture) and meticulous hemostasis that we achieved in every stage of the operation; which was responsible for the fact that none of our patients develop this complication.

Fistula developed only in 4 of our patients (13.3%) and had occurred in only those cases which had some degree of marginal flap necrosis or had diabetes. This figure corroborates with Tripathy et al.(Ref.7) who developed fistula in 12% of their patients. They had opined that the internal part of PMMC stays in a contaminated environment of saliva and food and consequently is not accessible for mechanical cleansing resulting in infection and fistula. They also took extra care while putting the tripointer suture in the anterior region between flap/ mucosa of the floor of the mouth and muco-periosteum of the cut edge of the mandible.

In our series all fistula healed spontaneously. Other complications like infection occurred in 6(20%) of our patients which is comparable to other studies in literature.

CONCLUSION

To conclude, we feel that PMMC is still the workhorse flap for head and neck reconstruction with good functional outcomes.

This is because it has an easy learning curve, a constant and a robust vascular pedicle, versatile and can be done easily in places which have a huge workload and limited resources.

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