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Use of Folded Pectoralis major myocutaneous flap for reconstruction of advanced oral malignancy; short term outcomes.

Oncology

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ABSTRACT

Aim: The aim of the study is to evaluate the feasibility and effectiveness of the Folded Pectoralis major myocutaneous flap (PMMC) flap with tram track de-epithelization in the patients with advanced oral malignancy requiring full thickness cheek excision.

Material and methods: This was a prospective study undertaken on patient of full thickness cheek tissue defect (having both skin and mucosal defect) after resection of the tumor. A total of 24 patients was included. After resection, the resultant defect was covered with folded pectoralis major myocutaneous flap with tram track de-epithelization. The patients were grouped separately depending on the site of defect reconstructed pertaining to the oral cancer. The site of the defect reconstructed, the size of the flap harvested and outcome were analyzed in detail.

Results: Flap survived in all the patients and we were able to cover even large defects involving full thickness of cheek simultaneously. In one patient who had recurrence following resection, the reconstruction during first operation was with ipsilateral folded pectoralis major myocutaneous flap and subsequent reconstruction after surgery for recurrence was with contralateral flap using the same technique. None required flap revision and all complications were managed conservatively.

Conclusion: Folded pectoralis major myocutaneous flap with tram track de epithelization has proved itself as a workhorse for the full thickness reconstruction and is obviously superior to double flaps such as a combination of pectoralis major myocutaneous with deltopectral flap which require two stage procedure.

KEYWORDS

Folded PMMC Flap, tram track de epithelization, reconstruction.

Introduction: Management of head and neck malignancy is a summative effort of new oncologic and reconstructive techniques. Since 1940, with the advent of newer techniques of ablative surgery and in-continuity neck dissection, patient survival and functional rehabilitation have extremely improved [1]. While majority of the cases of head and neck malignancies present in an advanced stage, it is not uncommon to find the mucosal tumor infiltrating deep into the cheek to involve the skin, curative resection often is followed by the formidable challenge of complex three dimensional defect reconstruction. These defects can have dramatic effect on the function and appearance which, in turn, may significantly impact the patient's quality of life, this has lead the surgeons to find even better ways of defect reconstruction.

The flowering of reconstructive techniques including the microvascular surgical techniques revolutionized the success of head and neck surgery. Unfortunately, the complex reconstructive techniques such as the free flap transfer are not possible outside specifically designed facility and hence not used widely. It was in the late 1970s and early 1980s that pedicled pectoralis major myocutaneous (PMMC) flap was popularized and became the sovereign method used in the reconstruction of head and neck [1]. Since then several other regional flaps viz. latissimus dorsi, trapezius, sternomastoid, platysma muscle based flaps have evolved but PMMC has stood the test of time and is still considered the ambassador [2]of head and neck reconstruction since its introduction by Ariyan [3] in 1979.

The distinct advantage of Pectoralis major myocutaneous flap (PMMC) lies in the fact that it is reliable, easy to harvest, raised in a short time, has acceptable donor site morbidity, plenty of bulk and size for versatile use, can be combined with other flaps such as free flap or other fasciocutaneous flaps and can be used for single stage reconstruction of inner mucosal and/or outer skin defects in head and neck region and is within the realms of head and neck oncosurgeon. Moreover, it serves the need of bring an oxygenated tissue with good blood supply to the surgical defect which may have theoretical advantage in today's chemotherapy and radiotherapy protocols.

Traditionally, PMMC is being used predominantly for lining mucosal defects and combined with other flaps like deltopectoral fascio-cutaneous flap or forehead flap for covering the cheek skin defect [4]. Folded PMMC with tram track de-epithelization, which is the name given by us to a relatively large PMMC flap folded upon itself according to the actual size of mucosal and cheek skin defect to be simultaneously reconstructed, bearing an strip of five to seven millimeter width of de-epithelization running from cranial to caudal end on the folded portion, provides one step reconstructive solution to full thickness cheek defects by lining the mucosal and cheek skin defect simultaneously and the de-epithelized area serves to anchor the ipsilateral oral commissure or forms the new commissure by upper and lower lip attaching to this portion as a part of new commissure resection. We have found this flap to be sturdy and reliable with distinct advantage over the traditional combination of PMMC with other flaps for simultaneous cover of mucosal and skin defect.

Material and methods: We prospectively followed the patients of oral cavity squamous cell carcinoma requiring full thickness cheek excision whose defects were reconstructed using folded PMMC with tram track de-epithelization, operated by us in between October 2013 to May 2016.

Inclusion criteria: All patients who were diagnosed case of Squamous cell carcinoma of oral cavity and were considered fit for the surgery at presentation and who underwent reconstruction of the defect using this technique were included for the study and prospectively followed. This included patients undergoing upfront surgery, surgery for recurrence and surgery after neoadjuvant chemotherapy.

Exclusion Criteria: All those patients whose defect was reconstructed using other flaps were excluded from the study.

Procedure: For the purpose of this study, a proforma was prepared

which included patient's registration details, details of previous treatment received for the tumor, size of the mucosal tumor and the area of skin involved, the sub-sites of oral cavity involved by the tumor, details of procedure, measurements of the resultant defect after surgery, size of flap harvested, complications arising within fifteen days of surgery were noted, time for surgery and flap was noted, the time to remove suture was noted, also a measurement of pre and post-operative mouth opening and oral competence (which was defined as no drooling) was done, hospital stay was also noted.

Technique of Flap Elevation and preparation: Neck dissection was done in standard fashion as the first part of surgery and modified radical neck dissection type II or radical neck dissection being the most common procedure. Then, the primary was excised which needed hemimandibulectomy in the majority with or without upper alveolectomy or limited maxillectomy. The resultant defect was measured and the appropriate sized folded PMMC flap with tram track de-epithelization was used to reconstruct the defect. The PMMC flap was harvested in the standard fashion, however due to a need for lengthy flap nipple was always included in the flap. The length of flap harvested was about 1 cm more than the total length required to cover both mucosal and skin defect. The reconstruction was started by suturing the flap to the mucosal defect from posterior anteriorly and when mucosal defect was covered the flap was folded outwards and this folded portion was intended to be utilized for attachment of ipsilateral oral commissure or cut end of lips, to do so the most prominent part of the fold, which was also corresponding to the residual commissure or cut ends of lip,was de-epithelized cranio-caudally in a strip of five to seven millimeter width resembling tram track, remaining part lateral to this de-epithelized area was utilized for cheek skin reconstruction and was sutures to remaining cheek skin. Neck was closed over suction drain and the endotracheal tube electively kept overnight.

Results: Of the 24patients, between the age of 24 years to 62 years, 16 were males while 8 patients were females. All patients underwent modified radical neck dissection or radical neck dissection, if neck was not already addressed previously, with resection of the primary with minimal 1 cm gross margin and Folded PMMC with tram track de epithelization was used to reconstruct the oral mucosa along with outer skin defect in all the patients. After resection the mucosal defects (table no 1) ranged from smallest about 4 x 3 centimeters to largest being 7 x 8 centimeters and the skin defects ranged from smallest about 3 x 3 cm to largest 8 x 7 cm in various combinations of both values. PMMC skin paddle size ranged from 8 centimeters in smallest defects to 17 cm in largest length wise and 5 to 8 cm in width the most commonly used width was 5 centimeters to 5.5 centimeters. In all cases nipple was included in the flap and the chest skin defect was closed primarily. The average total operation time calculated from skin incision to skin closure was three and half hours. Average flap raising time was about one hour. The overall flap survival rate was 100 %. The complications noted in the study were grouped under two headings namely complications noted at the donor site and those noted at the recipient site. The complications encountered at the recipient site (table no 3) were collection of serous fluid between flap and overlying skin in one case, minimal flap edge necrosis in one case and partial suture line cut through defect in one case. There were no other complications at the donor or the recipient site. None of the patients required flap revision or debridement. All minor complications mentioned above were successfully managed conservatively. None of the patients had decrease in mouth opening compared to preoperative clinical measurement. We were able to cover defects of entire buccal mucosa upto retromolar trigone and tonsillar fossa and in the largest of the flaps a part of the maxilla, entire buccal mucosa on one side inferiorly upto half of the floor of the mouth was reconstructed along with a large skin paddle. One of the patients, who was a treated case of carcinoma oral cavity with exhausted ipsilateral PMMC flap, which also was a folded PMMC flap with tram track de-epithelisation, underwent resection of the recurrence with contralateral folded PMMC flap, which served the purpose well albeit with a small suture coaptation defect which is already referred to above.

Table no I (Range of the Skin and Mucosal defect obtained after resection of the oral malignancy)

Defect size	Range
Mucosal defect	4 x 3 cm to 7 x 8 cm
Skin defect	3 x 3 cm to 8 x 7 cm

Table no II (Showing primary site of oral malignancy and number of cases)

Primary site of oral malignancy	No of case
Ca Buccal mucosa with lower GB sulcus	18
Ca Buccal mucosa with upper GB sulcus	4
Ca Central Arch	1
Contralateral recurrence	1

Table no III (Complication at the recipient site)

Complication	Number of patients
Oro-cutaneous fistula	0
Collection of serous fluid between flap and overlying skin	1
Flap edge necrosis	1
Flap rejection	0
Suture line coaptation defect	1



Discussion: The primary aim of head and neck cancer surgery is to provide a cure or significant palliation with a dire attempt to restore the patient to the pre-morbid level of functioning and quality of life with the best reconstruction possible. One principle which needs to be kept in mind is that no reconstruction procedure at any cost should compromise on adequate tumor resection.

Distinct options for all head and neck defect reconstruction can widely be classified as; primary closure, healing by secondary intention, skin graft, local flap, regional flap and free flap. Small defect with adequate lax tissue can be closed primarily. However larger defects need to be closed by skin graft, local, regional or free flap depending on the structure which requires to be reconstructed.

In most of the cases of oral malignancy, surgeon would close the defect with pectoralis major myocutaneous and or deltopectoral flap [5]. However, recently free flaps are considered the gold standard method for reconstruction of major defect following head and neck cancer surgery [6]. The advantages of free flaps are that they can reconstruct larger head and neck three-dimensional defects with limited donor site morbidity and complications. Further it gives a better functional and aesthetic outcome as compared to regional pedicled flaps. However, free flaps require special and costly instruments, specialized surgical skills and rigorous postoperative monitoring. The stringent requirements make it difficult to do free flaps in common practice.

The PMMC flap has been considered a remarkable step in the history of head and neck reconstruction since its description. The unique anatomy [7,8] of the pectoralis major muscle makes it the most preferred muscle for head and neck reconstruction. The advantages [9,10] of PMMC which still make it the preferred choice even today are that the vascular supply of this muscle is very constant and it is covered by small amount of soft tissue and is situated clearly along definite tissue planes making its isolation relatively easy. The pectoralis muscle is well vascularized and has abundant perforators to supply the overlying skin hence it can survive under suboptimal conditions even when transferred to an infected bed. PMMC is a very reliable flap with failure rate of less than 1% and is in close proximity to the head and neck region. The flap can provide a large bulk of well vascularized tissue to cover skin and/or mucosal defects of neck and midface up to the level of tragus.

In addition, the low morbidity to the donor site, execution as a single stage procedure without changing the patient's position has resulted in the broad acceptance of this flap by head and neck reconstructive surgeons. The PMMC flap can also be performed in association with other flaps like the free flaps, deltopectoral and contralateral PMMC flap usually to offer a soft tissue component to a large reconstruction, to

protect major vessels namely the carotid artery at risk of radiation induced blow out. Also it can be used as a salvage procedure after the necrosis of micro vascularized flaps and in cases where contraindication to free flaps exists, such as medical conditions that make the patient unable to withstand long surgical procedure or inadequate recipient vessels in the neck of patients who previously underwent high-dose radiotherapy. Further advantages of PMMC are that it is easy to elevate and its arc of rotation is adequate for most oropharyngeal and facial defects.

However, there are several disadvantages [9,10]. It reduces the vital capacity of the lung postoperatively and donor site defect can be cosmetically unacceptable as there is distortion of symmetry especially in female patients. The flap can be too bulky at times for the proposed reconstruction. Moreover, it cannot be used for defects above the level of external auditory canal. The defect at the donor site can lead to impairment of shoulder function occasionally and in males, hirsute chest skin placed intra-orally can be bothersome and the distal skin on the flap is not considered to be reliable. The PMMC flap is relatively immobile and occasionally the flap can dangerously conceal recurrences, making follow-up difficult.

For locally advanced oral malignancy, most of the centers in India use simultaneous use of PMMC flap and the deltopectoral flap for reconstruction. PMMC flap is used to cover the mucosal defect and the deltopectoral to cover the skin defect. This deltopectoral flap again requires a flap division surgery after the flap has been taken up at the defect site, which is about 21 days from the first surgery thereafter another 10 days for removal of flap division sutures. This delays the adjuvant treatment. Also the deltopectoral fasciocutaneous flap donor site requires skin graft further complicating the procedure.

The technique of using Folded PMMC flap with tram track de epithelization as in our cases has an advantage of covering the skin and mucosal defect by a single flap. It thus reduced the operative time plus the morbidity associated with the longer surgical time. It is also a single stage surgery as there was no need of a flap division surgery which used to be required in reconstruction using deltopectoral flaps. Our procedure had better aesthetic outcomes as well. We had no difficulty in covering even the larger defects which otherwise pose a difficulty for even deltopectoral flap, the de-epithelised area attaches commissure very well and does not compromise mouth opening. We were able to cover posteriorly far back upto retromolar trigone and Tonsillar fossa, superiorly upto a part of soft palate and maxilla and inferiorly a part of floor of mouth. Important aspect of the advanced oral malignancy treatment is adjuvant treatment which can be started only after wound healing and suture removal. By using folded PMMC, suture can be removed in 10 – 12 days and adjuvant treatment can be started early. All those defects that can be closed by a combination of PMMC flap with other flaps like deltopectoral flap for full thickness cheek defects can be very effectively and easily closed by this flap and we recommend it as the preferred flap for such reconstruction due to obvious advantages.

Conclusion: Folded PMMC flap with tram track de epithelization has done wonders in the reconstruction after ablative resection in oral malignancy. Folded PMMC flap with tram track de epithelisation has proved itself as a workhorse for the reconstruction especially when there is contraindication for free flap, or there is unavailability of the resources for free flap. This flap is quite superior when compared with the conventional DP and PMMC flap for the composite defects. In our experience this flap has come up as a reliable source for full thickness reconstruction after radical head and neck resections involving oral cavity.

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