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PMMC WITH TWO SEPARATE SKIN ISLANDS -AN UNIQUE TECHNIQUE AND ITS USE IN COMPLEX HEAD AND NECK DEFECTS

Oncology

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ABSTRACT

More than two thirds of oral cancer patients present in advanced stage in India, from subsites like Buccal mucosa and tongue often present with N3b nodes with skin involvement. This type of advanced disease usually requires composite resection and extended radical neck dissection. If both the defects are adjacent to each other can be addressed by bipaddle PMMC. If the significant normal tissue lies between the primary and neck defects [level 2b,3,5] it should be Reconstruction with a single free flap or combination of free and locoregional flaps. Free flap reconstruction requires expertise and other ancillary instruments which is difficult to organize in COVID situation. We overcame this problem by designing the PMMC in a unique manner with two island skin paddles based on the pectoral branch of thoraco-acromial vessels to cover both the defects.

KEYWORDS

INTRODUCTION:

In India, oral cancers are third most common cancers[1,2] constituting 30%[3] of overall cancer burden and 60-80 % of them present in advanced stage[4]. We commonly encounter advanced oral cancers with concurrent cervical nodal metastasis involving adjacent skin. surgical resection of these tumors results in multiple complex defects at nonadjacent sites making reconstruction challenging. Such defects require flexible flap with multiplanar configuration that can provide multiple skin paddles which can be rotated and extended to fit the defect at non adjacent sites. Anterolateral thigh free flap (ALT) has been considered standard of care for such defects. Various studies have proven the versatility of ALT free flap to reconstruct complex nonadjacent defects [5-7]. Pandemic status of SARS -CoV-2 was confirmed on March 11,2020 and since then aerosolizing surgical procedures of head and neck malignancies have placed both ablative and reconstructive surgeons at risk of nosocomial infection [8,9]. Most cancer centers continued to provide surgical care and various modifications were made in perioperative and reconstructive options to mitigate risk of SARS – CoV-2 infection. Despite these concerns, we continued to provide care at our center and complex nonadjacent head and neck defects were reconstructed with modifications of pectoralis major myocutaneous flap (PMMC) to reduce operative time and provide adequate reconstruction as a single staged procedure.

The following article is aimed to describe our technique of harvesting PMMC with two skin islands to reconstruct complex nonadjacent defects arising from oral cancer resections.

MATERIALS AND METHODS

A retrospective review of patient records operated from 2020 to 2021, at a tertiary Cancer center was conducted. Patients who underwent reconstruction with pectoralis major myocutaneous flap with multiple skin islands for non-adjacent head and neck defects were included in the study. Patient demographics, clinical details, operative technique and postoperative outcomes were analyzed. Outcomes were measured by flap success, fistula rate and wound healing. Institutional ethical approval and Appropriate consent from patients was obtained prior to the study.

SURGICAL PROCEDURE:

Under general anesthesia, extended radical neck dissection and resection of the primary tumor was performed following standard oncology protocols.

Harvest technique of PMMC with multiple skin Paddles:

Surface marking of vascular pedicle

The clavicle and sternal lateral ends were marked. An imaginary line was drawn connecting the acromion process to the xiphoid process, Another perpendicular line was dropped from the mid part of the clavicle to meet the previous line.

Marking the skin island are over chest wall

The primary and neck defect area was measured in centimeters (cm). The reach and marking of skin islands over the anterior chest wall include three distance measurements unlike conventional PMMC with single skin island which requires a single measurement to ensure adequate reach of the skin island. First- distance is measured from lower end of neck defect to pedicle origin and same distance is marked on chest wall from pedicle origin to upper border of upper skin island (FIG 1). The upper skin island is marked area lateral to the xiphi-acromial line. The upper skin island is designed keeping in mind the neck defect.

We have marked elliptical skin island lateral to the line of vascular pedicles. the dimensions should match the skin defect in the neck. the distance of neck defect from the clavicle should be measured, add 1-2cm to the above measured value, it gives an estimate the distance from the clavicle at which upper end of upper skin flap to be designed. It should always be designed lateral to the imaginary line which will help in flap insert without much twist on pedicle.

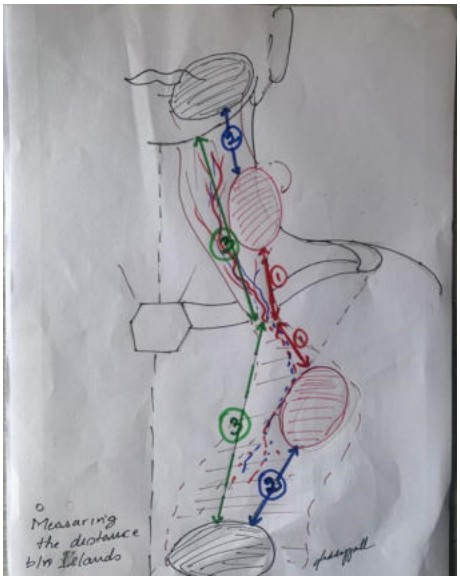


FIG-1

Second- Distance is measured between the two skin islands. the length of the interconnecting distance should be equal to the distance between the primary tumor defect and neck skin defect (FIG-1)). Third– distance is measured from the lower end of primary tumor defect to vascular pedicle origin. The same distance is marked on the chest wall inferior and medial to the nipple and coincides with the distance from the midpoint of the clavicle to the proximal end of the skin island designed for primary tumor defect. now the primary defect Area is marked inferior to this point. The lower skin island is designed to reconstruct the primary tumor defect adequately. An average of 8-12cm x 4-6 cm size skin island was designed in our series based upon the defect of primary tumor. the distal part of the lower skin island may become random part in its blood supply but with modified technique we can safely harvest 5-6 cm of random part of the flap[10]

Always harvest 10-20% larger skin island than the required size. Both the skin islands are connected by an interconnecting fat / breast tissue to maintain adequate blood supply to both skin islands. In females intertwining breast tissue increases the bulk and hence the chance of compression between flap and cervical skin is also more. excess intertwining tissue can be carefully debulked depending on intraoperative assessment. Rest of the procedure is like conventional technique.

The rotation of the PMMC flap should always be towards the midline or from lateral to medial direction (FIG2). Since the bulk of the upper island is lateral to the pedicle, rotating towards midline is safe and prevents vascular pedicle compression.

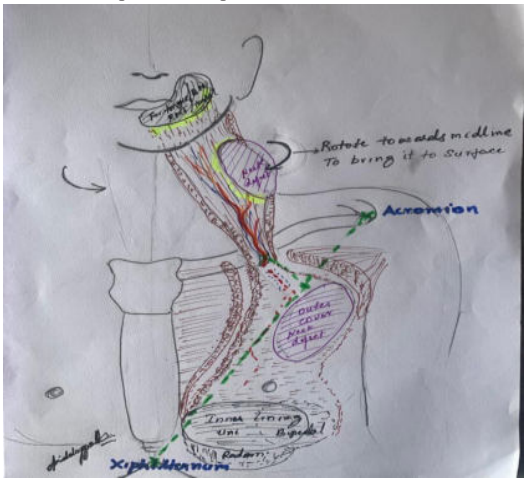
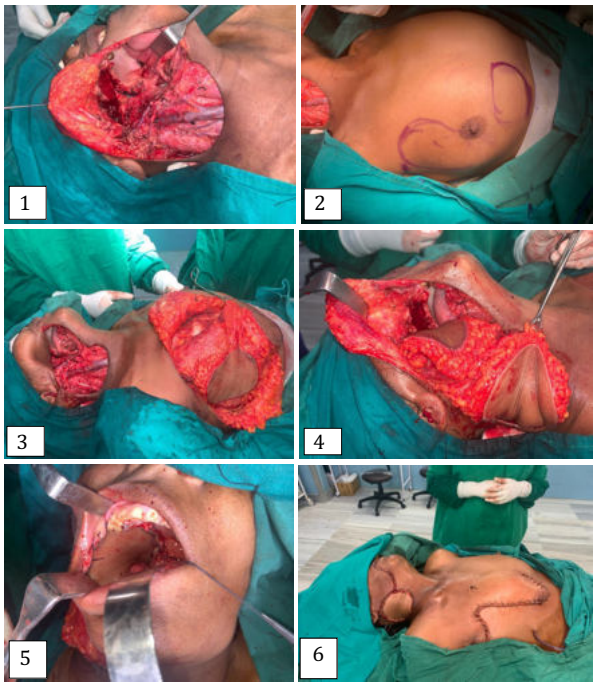


FIG-2

If we rotate from medial to lateral (under and medial to the flap) the arc of rotation is more than 180-Degree and the compression on pedicel is high. It leads to inefficient vascularity or venous insufficiency resulting in partial or total flap loss.

Upper skin island is initially sutured to the lateral end of remnant tongue in the neck and then tongue with pmmc is transferred into oral cavity. Lateral end of the PMMC flap is anchored to the mandible with the help of interdental sutures. The buccal mucosal defect is reconstructed by suturing the skin island from posterior to anterior direction. lower skin island is fed into the neck defect. Heamostasis was achieved and suction drains secured. The wound was closed in layers.

Picture 1 to 6 shows the Steps Of Planning And Executing The PMMC Flap With Two Separate Skin Islands



1.PICTURE SHOWING PRIMARY BUCCAL MUCOSAL DEFECT AND NECK SKIN DEFECT 2. DESIGNING THE SKIN PADDLE/PMMC TO COVER BOTH THE PRIMARY AS WELL AS NECK DEFECT 3. ELEVATING THE FLAP 4. INSERTING THE DISTAL SKIN PADDLE OF PMMC INTO BUCCAL DEFECT AND PROXIMAL PMMC PART INTO NECK 5. DISTAL PART OF PMMC COVERING THE BUCCAL/ORAL/PRIMARY DEFECT 6. PROXIMAL PART OF PMMC COVERING THE NECK DEFECT AND PRIMARY CLOSURE OF PMMC DONOR SITE

RESULTS:

Consecutive Patients who underwent resection of oral cancer with non-adjacent primary tumor and neck skin defects and reconstruction with PMMC two skin paddles were included in the study. A total of six patients were included with most patients being men. patients were aged between 43-62 years. PMMC with two skin islands technique was used in four buccal mucosa cancer and two tongue cancer patients. The demographic and clinical details are represented in the table 1

TABLE 1

Demographic details	n
Age	
41-50 years	2
51-60 years	3
61-70 years	1
Gender	
Male	4
Female	2
Tumor staging	
pT	
T4	6
pN	
N3b	6

Surgical details

in our series 4/6[66%] cases were buccal cancers and 2/6[33.3%] were

tongue cancers.3 out of 4[75%] buccal mucosal defects required unipaddle PMMC at primary site and one [25%] required bipaddle at the primary site in addition to neck defect closure.2/6 cases required hemiglossectomy defect reconstruction in addition to neck defect.

TABLE 2

Defects	n
Buccal mucosa and neck	3
Buccal mucosal, check skin and neck skin defect (requiring bipaddle at primary)	1
Tongue defect and neck	2
Defect measurement	In cm
Buccal mucosa and neck	8 -10 cm for primary tumor defect 6-8 cm for neck skin defect
Buccal mucosal, check skin and neck skin defect (requiring bipaddle at primary)	12 cm for primary tumor defect 6 cm for neck skin defect
Tongue defect and neck	8-10 cm for primary tumor defect 8-10 cm for neck skin defect

TABLE4

	Partial necrosis	Total flap loss	Minor complications related to wound healing	Others
Pmmc at primary site/distal part	0	0	1	-
Pmmc at neck site/proximal part	0	0	1	Venous congestion in the immediate post op for one-improved with intervention

There was no partial or total flap loss, but minor wound healing complications were encountered which is represented in table no 3. They were addressed in the initial postoperative period and managed conservatively. At a median of three months follow up, all the six patients were on oral alimentation and tracheostomy tube was decannulated.

DISCUSSION:

Pectoralis major myocutaneous (PMMC) flap is based on pectoral branch of the thoracoacromial artery and its first description is commonly attributed to Ariyan in 1979[12] who exhaustively described the technique and its anatomical basis. He has used this flap extensively for reconstruction of head and neck defects. The PMMC flap has been a workhorse of head and neck reconstruction ever since. Although free flaps are current standard of care, PMMC flap is still used extensively and is not completely replaced by free flaps [13]. PMMC is easy, reliable and with lowest complications even in beginners. Over a period of time various modifications were made to the original technique to achieve different goals. dividing the clavicle[14] or sub clavicular mobization[15] were suggested to increase arc of rotation. in order to reduce donor site morbidity various suggestions such as minimal incision[16],sub mammary harvestation[17,] or uni-paddle flap with Split Skin Graft under surface of PMMC a week prior to definitive resection and reconstruction day [18] Has been published. through and through oral cavity defects can be reconstructed by bipaddling[19,20], by deepithelizing the intertwining tissue or vertical splitting of PMMC with two skin islands adjacent to each other to achieve closure of primary and neck defect. Vertical splitting carries a high risk for flap marginal necrosis due to vascular injury while splitting the flap[21]. Our concept is that blood supply to skin over the Pectoralis major muscle is uniform all over surface of the muscle[22] and lies within the territory of pectoral branch of thoracoacromial artery, hence it is safe to harvest the two-skin island which are distant but lie within the periphery of the muscle . In most of the reported articles, skin is designed medial or inferior to nipple or including it[19,20]. Our technique harvests two skin islands with upper island superolateral to nipple and along the line or lateral to acromion-xiphi line and lower skin island inferior to nipple. Our proposed technique of harvesting PMMC flap with multiple skin islands have the advantage of short operative time and a short learning curve[table 5]. PMMC can reliably support two skin paddles which can reconstruct nonadjacent defects in a single setting even in a constraint setting. We are describing two island flaps based on the single muscle with the same blood supply which can cover two defects at different sites without vascular compromise. In all cases we were able to close the donor site primarily.

TABLE5

ADVANTAGES	DISADVANTAGES
1. single flap can address both the defects 2. the donor sites can be closed primarily with least morbidity 3. reliable vascularity if properly designed 4. short operating time 5. short learning curve as many ablative and reconstructive surgeons are well versed with PMMC	1. bulky female breasts it is difficult to harvest and insert (but huge tissue is available and easy for closure at donor site) 2. distal end of lower flap can go for partial loss due to random part of blood supply if flap is not properly designed

CONCLUSION:

The PMMC flap described by ariyan has undergone tremendous technical modifications over a period of time to cover the majority of head and neck defects and evolved as a workhorse for head and neck reconstruction. This unique design of PMMC will address the need of both the primary tumour and neck defects in free flap and resource constraints situations and replace the need of combination flaps .With adequate planning and short learning curve we can master this technique to give maximum benefit to the selected patients.

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