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Salvaging the Lateral Thoracic Artery in PMMC Flap is it Worth an Effort?

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Abstract:- BACKGROUND: - The pectoralis major myocutaneous (PMMC) flap has been used as a versatile and reliable flap since its first description by Ariyan in 1979, utilizing single arterial supply from thoracoacromial artery.

AIM: - This study is designed to evaluate the outcome of the preservation versus sacrificing the lateral thoracic artery in pmmc flap while salvaging the head and neck defects.

METHOD: - Study was conducted on patients who reported and were undergoing treatment for malignant lesions within the oral cavity at the department of Oral and Maxillofacial surgery in Rama dental college, Hospital and Research Centre, Kanpur.

RESULTS: - In a study of total of 50 patients divided randomly in 2 groups with 25 in each group, 38 were males (76%) and 12 were female (24%) patients. Group 1 comprised of 20 male and 5 female patients and 18 male patients and 7 female patients were in group 2. Eventually we noted that in both the groups where the length of the flap was variable, either preserving or sacrificing the LTA, we couldn't find any distal skin necrosis in the flap in majority of cases.

CONCLUSSION: - An overall conclusion drawn from this study is that both groups had more or less similar results, except of a particular case from the preservation group where despite preserving the artery in a female patient there was a flap failure, it is fair to state that in some cases, mostly females' patients due to presence excessive fibro fatty tissues arterial compression may lead to flap failure.

Keywords:- *PMMC, Thoracoacromial, Tumour, CMS, Xiphoacromial.*

I. INTRODUCTION

In India the head and neck cancer patients every so often report with an advanced stage cancer and reconstruction becomes challenge for low economy classes as a result Pectoralis major myocutaneous flap (PMMC) has been a preferred option for reconstruction. Although free flap using the microvascular technique is newest standard of care, its use continues to be limited by the homogeneity of experience and resources within the developing world.3-6 Since its first description in 1979 by Ariyan, PMMC flap is commonly used to salvage and is that the first choice for patients who aren't the candidate for free flaps.7, 8

The lateral thoracic artery (LTA), which is believed to contribute to blood perfusion of the inferior and lateral mammary area, isn't preserved during a conventionally harvested PMMC flap with regards to the blood supply, it's been suggested that the LTA should be preserved, additionally to the pectoral branch of the thoraco acromial artery.9-11 as this arterial preservation doesn't affects the length of the flap.

The Development of the Pectoralis Paddle was well documented by Magee et al (1980) there work briefly shared an insight about various principles of myocutaneous flaps, they highlighted that the fascia over the muscle contained an arborization of small vessels that is just superior to this fascia.2

This arborization of vessels was found to be in direct continuity with the parent vessels which came from the surrounding muscle. the muscle that had this single dominant pedicle were far and away and the easiest ones to understand and use and it was realized that while taking a segment of skin distant to the parent muscle, it is extremely important to carry the fascia that is deep to this skin. Else the local paddle of skin that extends from the muscle would become similar to a random flap, with its obvious limitations. Nevertheless, if the

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fascia was being used, the significant areas of the skin would be taken distal to the of a definite dimension of the muscle.2, 13, 14

At present, perforators and fasciocutaneous flaps have grown in acceptance; the muscle and myocutaneous flaps have their vascular supply from named vessels and have a standardized blood supply, and remain an honest option for several different reconstructions. Furthermore, the muscle flaps are dominantly competent in filling the dead spaces and diminishing the bacterial concentration of the wounds and they continue to be an essential part of the reconstructive armamentarium for the contemporary reconstructive surgeons.5-8, 15

II. METHODS

The study was conducted on patients of head and neck cancer undergoing resection of oral cavity tumor's and reconstruction using Pectoralis major myocutaneous flap, in the Department of Oral and Maxillofacial surgery, Rama Dental College, Hospital and Research Centre, Kanpur. Duration of the study was from December 2019 to September 2021.

The study was a prospective analysis of patients undergoing wide lesion excision and neck dissection for head and neck cancer. We selected a group of 50 patients undergoing flap reconstruction using pectoralis major myocutaneous flap.
We divided these 50 patients in two groups of 25 individuals in each group.

- Group 1: - In this group we included a patient in which the lateral thoracic artery was identified along the P.M.M.C flap and the length and the area of the flap was marked for the reconstruction of the intraoral defects followed by preservation of the lateral thoracic artery. All patient were observed and recorded according to the criteria decided and tabulated.

- Group 2: - In this group we included a patient in which the lateral thoracic artery was identified along the P.M.M.C flap and the length and the area of the flap was marked for the reconstruction of the intraoral defects followed by sacrificing the lateral thoracic artery. All patient were observed and recorded according to the criteria decided and tabulated

Postoperative follow up was done on the 3rd, 5th, 10th, 21st, & 30th day for evaluation on, Vitality of Zones in the distal skin of the harvested flap (postop), Area of defect(intraop), Length of flap(intraop), bleeding(intraop), infection(postop), Shrinkage of the flap(postop).

III. RESULT

A total of 50 patients were taken as part of the study. The patients were divided in two groups: -
Group 1: - In this group 25 patients were included in which the lateral thoracic artery
was preserved.
Group 2: - In this group 25 patients were included in which the lateral thoracic artery
was sacrificed.

The Reconstruction was done by pectoralis major myocutaneous flap to salvage the oncological defects which has proved to be reliable, robust and versatile. We did a study to evaluate the outcome of the pmmc flap in which we had sacrificed as well preserved the lateral thoracic artery. 50 patients undergoing oncological resection followed by the reconstruction with PMMC flap were selected, out of which 38 were males (76%) and 12 were females (24%). Out of which 20 male patients (80%) and 5 female patients (20%) in group 1 and 18 male patients (72%) and 7 female patients (28%) in group 2.

There was no statistically significant difference in terms of sex distribution between the two groups. Interestingly majority of patients who accepted to be a part of study between the two groups. Interestingly majority of patients who accepted in the study fell in the age group of 25-65 year. Follow-up was done on 1st 3rd 5th 15th & 30th Postoperatively.

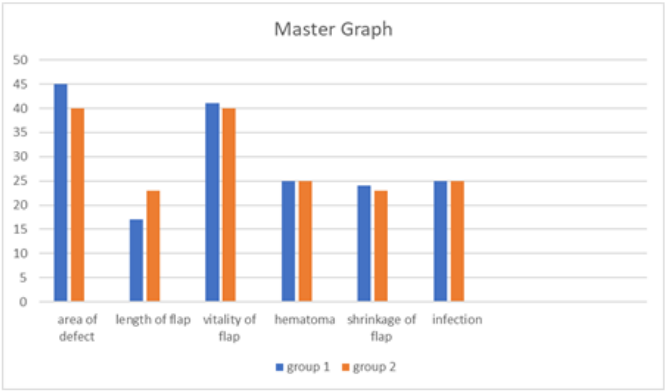

Fig 1

We had evaluated patients on criteria including vitality of flap (postoperative), area of defect (intra-op) and length of the flap (intra-op). Viability of the flap was recorded postoperatively on the criteria like color, capillary refill, texture and temperature.

In the terms of color, we discovered changes in flap tone on third and fourth postop follow-up day in 1 patient from group 1 which progressed into necrosis, however in group 2 similar results in colour change towards necrosis was seen towards 4th post-operative day but it progressively returned to normal colour by 5th post-operative day (30th day), showing that in spite sacrificing the L.T.A none of the flap went into necrosis. In capillary refill there was no significant changes

between both groups. In group 1 avg refill was about 2.47% table 8 and in group 2 it was 2.62%.

All the patients in both the groups had spongy texture without any significant difference in the inter group statistics calculation group 1 (1.08%) and group 2 (1.06%).

The flap was warm on touch among all patients in both groups. Statistically the overall temperature change on average was 2.97% patients in group 1 and 2.87% patients' group 2.

So, in group 1 only 1 patient and 2 patients in group 2, where the warmth was much less than desired. However, it was statistically not significant. None of the patients had any shrinkage of flap in both groups event after the 5th follow up on 30th day. Statistically the average length in group 1 patients was 17.66% and in group 2 it was 21.92%, so as an average 19cms length flap could be harvested in group 1 and in group 2 patients, due to sacrificing the LTA we could achieve 23 cm's of flap length as an average, though statistically not significant clinically this difference of 3-4 cms could prove vital, especially during to reconstruction of distant and larger defects, this additional length was found to be convenient.

Post operatively none of the patient in both of the groups had any hematoma formation however there was mild infection in 1 patient in group 1 and 2 patients in group 2, which were treated with mild antibiotics and dressing, this post-operative infection was attributed to poor hygiene and cleaning technique followed by the patients. We didn't find any flap shrinkage in both of the groups during the study so the statistical data was insignificant.

- *GROUP 1 -LATERAL THORACIC ARTERY WAS PRESERVED*

Fig 2 Intraop incision markings

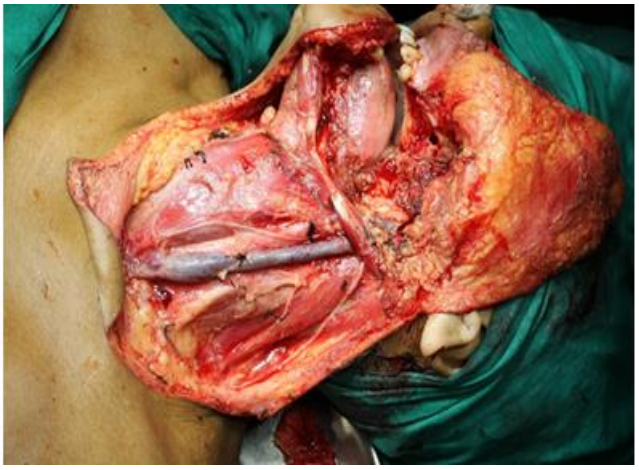

Fig 3 Fibrofatty tissue removal from level I TO V along primary tumour excision.

Fig 4 Marking of the Pmmc Flap

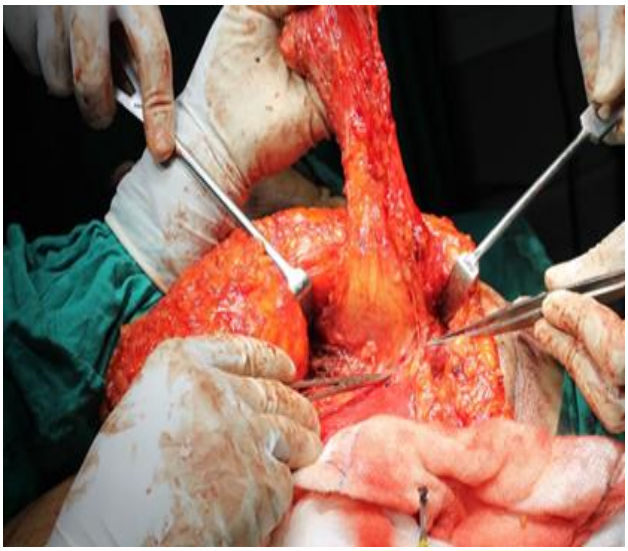

Fig 5 Flap raised after preserving the lateral thoracic artery

Fig 6 Post operative follow up

- *GROUP 2 -LATERAL THORACIC ARTERY WAS SACRIFICED*

Fig 7 INCISION MARKING

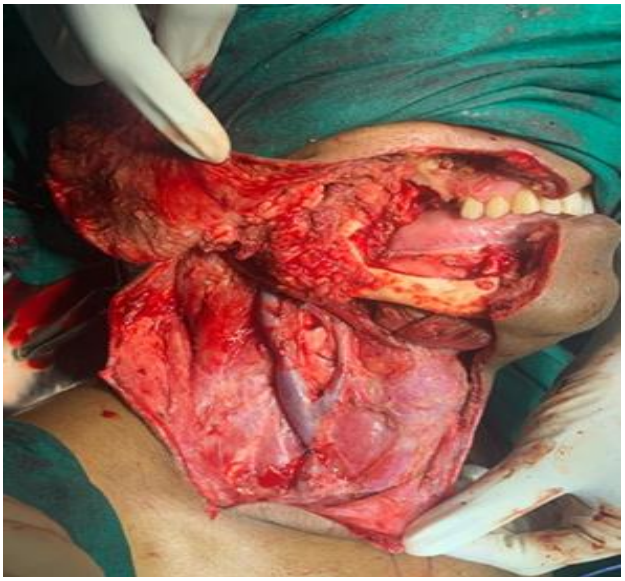

Fig 8 REMOVAL OF FIBROFATTY TISSUE WITH PRIMARY TUMOUR EXCISION

FIG 9 MARKING OF THE PMMC FLAP

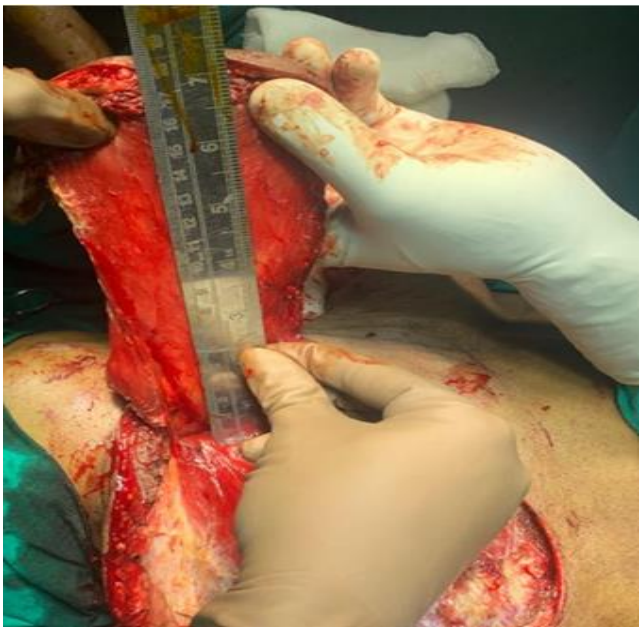

FIG 10 LENGTH OF THE FLAP BEFORE SACRIFICE

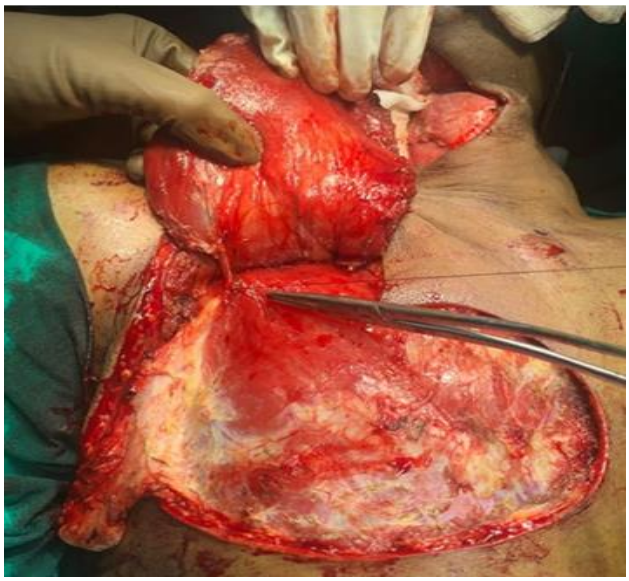

FIG 11 LATERAL THORACIC ARTERY IDENTIFIED

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FIG 12 LENGTH OF THE FLAP AFTER SACRIFICE

FIG 13 POSTOP FOLLOWUP OF THE PATIENT

IV. DISCUSSION

In our study the age range was in between 25-65 years in both groups and in group 1, 80 % were male and 20% were female and in group 2 72% were male and 28% were female sex predilection. However, free flaps requires specialized surgical expertise, distinctive and exorbitant instrumentation, and laborious postoperative observation. These factors are not available in many head and neck centers, 4,9 especially in developing countries. Tsue et al reported a possible increase in cost, but better functional results and low complication rates with free flaps compared with pedicled myocutaneous flaps that could justify its use. As suggested by Anehosur et al.

Free flaps have distinctive advantages over pedicled flap like better cosmetic results, less bulk of the flap and better rehabilitation although one important finding that it was noted in there study that the PMMC flap could be used as salvage procedure after failure of free flaps.

Anehosur et al also stated that it is the final backup plan in cases of free flaps failure because it is more cost effective in patients with poor socio-economic status who are common in developing countries. Similar outcomes were reflected by Schneider et al. who stated PMMC flap was used as salvage procedure in 38% of their case series and another study done by Saito et al. stated that 75% of cases operated for PMMC flaps were only used as salvage procedure. Kroll et al and Funk et al25 did not demonstrate an increase in the cost of free flaps compared with regional pedicled flaps However, this topic is still controversial and a matter for further debate

V. SUMMARY

The Aim of the present clinical study was to evaluate the viability of the distal skin of the PMMC flap where the lateral thoracic artery was preserved and sacrificed respectively in two groups with equal number of patients in 50 patients from November 2019 to September 2021. The classical descriptions of the pectoralis flap harvesting technique described that the xiphoacromial line is defined and a vertical perpendicular line is then dropped from the midpoint of the clavicle to help find the pectoral branch of the thoracoacromial trunk.

The skin paddle position is determined based an estimated pedicle location and the anticipated arc of rotation extends in oblique fashion from the lateral head of the clavicle to the xiphoid process, it is to be noted that to improve the arc of rotation it has been suggested that remove the insertion part into the humerous and to sacrifice the lateral and medial pectoral nerves.

The modifications advocate that to gain addition length the first maneuver is to transect the PMMC muscle just below the clavicle, while preserving the vascular pedicle and the suggested second maneuver to gain the surplus length is through passing the flap behind the clavicle. Occasionally, the skin paddle ends up at the caudal most aspect of the pectoralis muscle, extending onto the superior rectus sheath. However in our study we distinguished that Lateral Thoracic Artery doesn't play a significant role in maintaining the vitality of the distal skin of the flap which in the Ariyan technique used to be sacrificed until the modifications were done which mainly suggested to preserve the LTA.12,13,14

Multiple anatomical studies on vascularity have defined this distal skin area to have a random blood supply, and several prior studies have hinted that the inclusion of this area into the skin paddle may be a cause of partial skin paddle necrosis.5,8-11 It is this difference in blood supply that distinguishes the distal skin paddle vascularity from the reliable blood supply to the myofascial portion of the flap.

Based on the findings in our study it is our opinion that extension of the flap onto the rectus sheath leads to the frequent distal skin necrosis that has been reported in

numerous studies in the past. We also noted that there were other factors which were responsible to flap necrosis that includes the presence fatty or even muscular bulk which may cause the vascular compression, however statistically its insignificant in our study but clinically our observation suggested that in one case were the lateral artery was preserved flap failure was still perceived.

So, it will be fair enough to state the LTA doesn't alone play any significant role on distal skin necrosis and the fact that PMMC is largely recognized as a highly versatile and dependable flap with a tremendous vascularity, a wider arc of rotation, larger flap dimensions, easier to harvest, reasonably affordable along with minimal donor site morbidity and limited complications.2,11,13

VI. CONCLUSSION

We would like to conclude that PMMC flap along with its modifications is the most cost effective and reliable method of reconstruction in head and neck surgery and there are numerous advantages of PMMC flap relating to its versatility and viability due to abundant blood supply and the LTA being secondary to the chief artery doesn't affects the viability of the distal skin of the flap, usually there is no change noticeable.

However other local factors, such as the bulk of musculature or the arc of rotation could attribute to partial necrosis of the distal skin without affecting the overall vascularity of the flap.

It can be stated that based on numerous studies the Pectoralis major myocutaneous flap with all its advantages like versatility, local availability, ease of harvesting, excellent blood supply with reliable pedicle, with very good reach to all the corners of oral cavity and with minimal morbidity forms still remains an excellent workhorse for reconstruction of oral cavity defects.

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