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ORIGINAL ARTICLE

Comparison of the Surgical Outcomes of Free Flap Reconstruction in Head and Neck Cancer Patients

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ABSTRACT

Objective: The goals of this research were to (1) assess the efficacy of free flap reconstruction in patients with early and recurrent head and neck cancers, and (2) investigate the variables associated with these surgeries that increase the risk of problems.

Study Design: Retrospective Study

Place and Duration: Frontier Medical College, Abbottabad, from March, 2022 to August, 2022.

Methods: Total 200 patients of head and neck cancer were included in this study. Patients were both males and females with primary and recurrent cancer types were underwent for free flap reconstruction. After receiving informed written consent, in-depth demographic information about the cases that were enrolled was recorded. Patients were divided in two groups. Hundred patients of recurrent cancers were included in group I and 100 patients of primary cancers were included in group II. Surgical outcomes among both groups were assessed and compared. SPSS 24.0 was used to analyze all data.

Results: We found that 87 (87%) patients in group I and 81 (81%) patients in group II were males. Mean age of the patients in group I was 49.8±11.37 years and in group II mean age was 51.4±7.42 years. Majority of the patients had tumor stage 5. Smoking, betel nut and alcohol were the most common causes found in all cases. Anterior lateral thigh (ALT) and anterior medial thigh (AMT) were the most common flap types among both groups. We found that free flap reconstruction had higher success rate in primary cancers found in 96 (96%) as compared to recurrent cancers group in 92 (92%). There was no any significant difference found among both groups in terms of post-surgery complications.

Conclusion: This study's findings suggest a greater failure rate for free flap reconstruction in the recurrent group compared to the primary group, however this finding may be attributable to the varied patient characteristics between the two groups.

INTRODUCTION

In the last several decades, there has been a trend toward reconstructing oncologic defects in the head and neck using either a free or pedicled flap. This change occurred because free flap reconstruction is less invasive than pedicled flap reconstruction. Around the year 800 BC, while Susruta was talking about flaps, he mentioned a forehead flap that's the first pedicled flap (PF) [1]. McGregor popularized the transposition flap in 1963, which was a defining moment in reconstructive surgery because it was the first transposition flap to be consistently successful [2]. After its initial success, the transposition flap was successful for McGregor in 1963, which led to its widespread use. The pectoralis major myocutaneous flap (PMMF) was initially reported by Ariyan in 1979 [3]. It is a free flap that obtains its blood supply from the pectoral branches of the thoracoacromial artery. As a result of the PMMF's achievements in clinical settings, it was subjected to significant research and eventually became the flap of choice for head and neck reconstruction in a variety of medical facilities. As a result of concerns over the free flap's ability to successfully treat specific problems, two new flap procedures—the supraclavicular artery island flap (SCAIF) and the submental island flap—have arisen as potential replacements for it (SMIF).

With the advent of micro surgery in the 1970s came a rise in popularity for the technique of harvesting free flaps used in head and neck reconstruction surgery. Several authors explained the notion of free tissue transfer, including Daniel and Taylor, who reported the first cutaneous free flap in 1973 [4]. When it comes to correcting major head and neck malformations, free flap reconstruction, often known as FF reconstruction, has evolved through time to become the gold standard.

Several papers have discussed the POCs of free replacement for head and neck tumours, with reported rates ranging from 15% to 62% [5]. In general, problems were not accurately characterised or documented in terms of their frequency or severity [6]. The bulk of these papers are summaries of other studies that have been undertaken with the use of medical records and other public or private databases. Although many indexes, including the Frailty indicator [7], the Kaplan-Feinstein score morbidities indicator [8], the Middle At the college Head and Neck Comorbidity Index (WUHNCI), so the Individual Comorbidity Evaluation-27 (ACE-27), have been used to assess the pre-operative status of populaces with head and neck cancers and been linked to increased risks of complications and decreased survivability, standardised methods for risk prediction remain lacking. [9]

Since of this, many instances of cancer affecting the head and neck that were formerly thought to be incurable are now deemed treatable because reconstructive surgery is readily available. Patients who have advanced head and neck cancer now have a better chance of receiving the potentially life-saving radical resection that they need. [10,11] Additionally, free flaps promote speedier healing, which is beneficial for patients who must undergo rapid post-operative radiotherapy. Our study set out to address these issues concerning free flaps by conducting an in-depth analysis of the vascular problems associated with them and determining the overall survival rates of free flaps. This is a really essential topic to address since there hasn't been a lot of study done on what causes a surgeon to recommend a second surgery and what they find during the second procedure. [12]

As a consequence, the objective of this study was to investigate the efficacy of free flap reconstruction after cancer resection in patients with primary and recurrent head and neck cancer, utilising a selected cohort that was matched for propensity score.

MATERIAL AND METHODS

This retrospective study was conducted at Frontier Medical College, Abbottabad, from March, 2022 to August, 2022 and comprised of 200 patients of neck and head cancers. After receiving informed written permission, in-depth demographic information about the patients that were enrolled was documented. Information on the following factors was gathered from medical

records for each patient: Flap types (including ALT, AMT, freestyle, MSAP, fibula, and forearm), vein grafts, cancer stage, and tumour site are also factors to consider. Conditions such as diabetes mellitus, high blood pressure, stroke, heart disease, kidney disease, and liver disease are all examples of what are called "comorbidities" (hours). Randomly harvested flaps, also called as "freestyle" flaps, were taken following photo evidence of the wound using echocardiographic signals in that region. The main result was whether or not the flap was successful; other results included problems such wound infections, fistula, hematoma, and full flap necrosis.

All primary cancer patients (n = 100) and all secondary cancer patients (n = 100) were compared. In order to examine and contrast the information, we utilised IBM SPSS Statistics version 24. The Fisher's exact test (two-tailed) and the Pearson Chi-square test (two-sample) were used to compare the two nominal groups (two-tailed). Since non-normal data were only provided as a median, we used the Mann-Whitney U-test to make comparisons. Thus, we produced a propensity score-matched study population of 1:1 using the Greedy technique in R software, calculating with a 0.2 calliper width to lessen the impact of clinical populations on the outcome assessment, which would otherwise have been introduced by the nonrandomized assignment. After estimating propensity scores, researchers often use a matching algorithm like the Greedy technique to generate a fresh sample of cases that have comparable probabilities of being placed in the treatment condition. To do this, it first chooses a subject from the main group and then, from the recurrent group, picks the person with the highest propensity score to serve as a control subject. If there are numerous participants with recurring tumours that are all within the same relative distance of the main tumour, only one of them will be chosen at random in the 1:1 ratio. Median and interquartile range (IQR) or number and percentage (n,%) displays are used to convey all data. Statistical significance was assumed when the p-value was less than 0.05.

RESULTS

We found that 87 (87%) patients in group I and 81 (81%) patients in group II were males. Mean age of the patients in group I was 49.8±11.37 years and in group II mean age was 51.4±7.42 years. Mean BMI in group I was 21.4±4.16 kg/m^2 and in group II mean BMI was 22.4±8.25 kg/m^2. Smoking, betel nut and alcohol were the most common causes found in all cases. DM, HTN, cardiovascular disease and renal disease were the most common comorbidities. Majority of the patients had tumor stage 5. (table 1)

Table-1: Demographics of the enrolled cases

Variables	Group I	Group II
Gender		
Male	87 (87%)	81 (81%)
Female	13 (13%)	19 (19%)
Mean age (years)	49.8±11.37	51.4±7.42
Mean BMI (kg/m^2)	21.4±4.16	22.4±8.25
Causes		
Smoking	60 (60%)	57 (57%)
Betel nut	55 (55%)	46 (46%)
Alcohol	42 (42%)	38 (38%)
Comorbidities		
DM	27 (27%)	20 (20%)
HTN	31 (31%)	26 (26%)
Cardiovascular disease	22 (22%)	37 (37%)
Renal disease	20 (20%)	17 (17%)
Tumor Stage		
1	17	11
2	11	13
3	17	19
4	14	20
5	37	31
6	4	6

Anterior lateral thigh (ALT) and anterior medial thigh (AMT) were the most common flap types among both groups.(Figure-1)

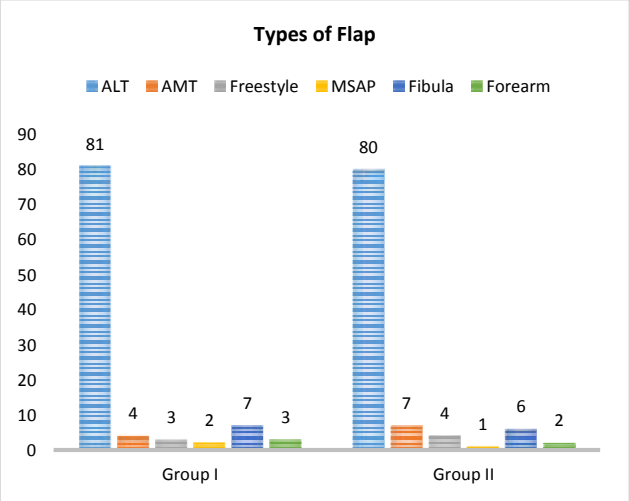

Figure-1: Types of flap among both groups

We found that free flap reconstruction had higher success rate in primary cancers found in 96 (96%) as compared to recurrent cancers group in 92 (92%).(table 2)

Table-2: Comparison of success rate among both groups

Variables	Group I	Group II
Success rate		
Yes	92 (92%)	96 (96%)
No	8 (8%)	4 (4%)

There was no any significant difference found among both groups in terms of post-surgery complications.(table 3)

Table-3: Surgical complications in both groups

Variables	Group I (100)	Group II (100)
Complications		
Partial necrosis	13(13%)	11 (11%)
Hematoma	7 (7%)	6 (6%)
Fistula	10 (10%)	8 (8%)
Wound infection	23 (23%)	20 (20%)
Total flap loss	8 (8%)	4 (4%)

DISCUSSION

Patients and recurrent malignancies in this research were considerably dissimilar in their usage of flap kinds for reconstruction before and after statistical model matching. Cancer patients who had recurrences utilized fewer ALT flaps than cancer patients who had initial tumours. For free flap reconstruction after recurrent cancer excision, surgeons are less likely to select an anterolateral thigh flap, even though taken from the contralateral thigh, due to the ALT flap's history as the first choice[13,14]. This is borne up by the fact that recurring cancer patients are more likely to get a freestyle flap than primary cancer patients and that AMT flaps are utilized more often.

In this study 200 patients of neck and head cancers were presented. Majority of the patients in our study was males. Mean age of the patients was 50.3±8.71 years. Smoking, betel nut and alcohol were the most common causes found in all cases. DM, HTN, cardiovascular disease and renal disease were the most common comorbidities. Majority of the patients had tumor stage 5. These findings were comparable to the prior studies.[15,16] Less postoperative complications (POCs), fewer days in the hospital, lower overall treatment costs, and better cosmetic and functional outcomes are typically associated with immediate flap reconstruction after cancer resection [17]. Reconstructive surgery

utilising a microvascular free flap, on the other hand, is viewed as a significant challenge because of the increased risk of postoperative complications (POCs) related to the surgery's potential for a longer operating time and increased blood loss. [18] As a result, it is difficult to assess the impact of free flap reconstruction on the prognosis and the development of complications in patients with HNSCC [19].

No significant difference in the utilisation of vein grafts among study participants with primary or those with recurrent malignancies was seen either before or after using propensity score matching. Free flap repair using contralateral microanastomosis was more common in patients with recurring malignancies, even when patients were matched using propensity scores. One possible explanation for this is because the patient has already had surgery to repair the area around the initial cancer[20]. Surgeons may have predicted the drawbacks of utilising the vasculature on the same side in a prior surgery or radiation and opted against employing a vein graft in favour of contra microanastomosis, making vascular microanastomosis the crucial step for a free throw flap transfer[21]. This indicated a possible difference between primary and secondary tumours in terms of reconstructive treatment options.

In our study, free flap reconstruction had higher success rate in primary cancers found in 96 (96%) as compared to recurrent cancers group in 92 (92%). In our study failure of free-flap reconstruction was higher in recurrent group 8 (8%) as compared to primary cancer group 4 (4%). There was no any significant difference found among both groups in terms of post-surgery complications. Propensity score-matching analysis was used in this research, and it proved to be a powerful tool for significantly reducing bias in covariate analysis. There are, however, a number of caveats to this research. At the outset, we have to think about the biases that come with using retroactive data. Varied surgeons may have different opinions on whether to employ a flap and what kind of repair is best[22]. It's also not probable to ensure that the main and recurrent groups have the same amount of unmeasured confounders. For instance, compared to patients with original malignancies, those with recurrent cancers may have worse nutrition statuses or immunocompromised states that led to the cancer's return[23,24]. Patients with recurrent cancers may also have worse vascular conditions and hemostasis.

CONCLUSION

This study's findings suggest a greater failure rate for free flap reconstruction in the recurrent group compared to the primary group, however this finding may be attributable to the varied patient characteristics between the two groups.

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