



RECONSTRUCTION FOR MAXILLOFACIAL DEFECTS - AN INSTITUTIONAL EXPERIENCE

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Abstract

Objectives: One of the primary responsibilities of the oral and maxillofacial surgeon, otorhinolaryngologist, and plastic surgeon is plastic surgery reconstruction. Extensive prior neck surgery, infections, a generally poor vascular condition, or prior radiotherapy may also limit the applicability of microsurgical anastomosis, which is frequently the only alternative for reconstruction. Further technological advancements in recent years should allow for adequate repair even under the most severe conditions. The complete survival of the microsurgically transplanted tissue is the most essential success criterion. Recent research has demonstrated, however, that success cannot be determined solely by flap survival; the patient's judgment of the functional and aesthetic outcome must also be evaluated. The aim of the study is to assess the various techniques used in maxillofacial reconstruction in an Institute and determine which technique leads to the best outcome.

Materials and methods: This retrospective study examined the records of patients from 01 June 2019 to 31st March 2022 who visited Saveetha Dental College and Hospitals. Sample size was 71 patients who presented with maxillofacial defects and were indicated for maxillofacial reconstruction. The necessary data such as age, gender, type of flap harvested and the flap used were included in the study. Data was recorded in Microsoft Excel and exported to the statistical package of social science for Windows (SPSS) and subjected to statistical analysis. Chi Square test was used for comparison of groups.

Results: Out of 71 reconstructions, 13 reconstructions were done using local flaps, 13 were done using loco-regional flaps, 12 using free flaps and 7 using grafts. Chi-square tests were used to associate the flap type harvested and the demographic features such as age and gender. The association between the age of the patient and the type of flap used for reconstruction was found to be statistically significant. Various factors have to be considered when a flap is chosen for reconstruction. The vascularity status of the donor site, the extent of the defect, the need for bone reconstruction, the extent of the palatal defect, functionality of the flap and its associated aesthetics.

Conclusion: Loco-regional flap reconstruction is found to be most commonly employed in a private dental hospital. PMMC flaps are considered to be most clinically feasible owing to its simplicity and affordability. Free flaps were second most commonly used, out of which fibula flaps were more common. Local flaps were also found to be clinically effective.

Key words: Maxillofacial reconstruction, fibula flap, rotational flap, PMMC, maxillofacial defects

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1. Introduction

One of the primary responsibilities of the oral and maxillofacial surgeon, otorhinolaryngologist, and plastic surgeon is plastic surgery reconstruction¹. It is used in almost every aspect of these three surgical disciplines, but it is most typically used in reconstructive treatments following ablative tumor surgery². When grafting is done with microvascular anastomosis, the reported success rates (i.e., a complete "take" of the flap) are between 90% and 95%³. The necessity for functionally and aesthetically high-quality reconstruction is now higher than ever, due to an increase not just in tumor frequency, but also in patients' expectations regarding their quality of life after surgery⁴.

Among the many donor sites that have been described since microsurgical tissue transfer was initially presented through anatomical studies, the most useful have shown to be those with reasonably consistent anatomy that allow for technically uncomplicated flap harvesting⁵. When the flap tissue can be harvested concurrently with surgery in the afflicted area of the head and neck, i.e., when the patient does not need to be relocated intraoperatively, the operating time is significantly reduced^{5,6}. Microsurgical anastomosis of the flap vessels, on the other hand, can only be achieved if adequate vessels are available to connect to at the site of the tissue defect⁶. Extensive prior neck surgery, infections, a generally poor vascular condition, or prior radiotherapy may also limit the applicability of microsurgical anastomosis, which is frequently the only alternative for reconstruction⁷. While flap vessel anastomosis to pre irradiated vessels in the oral and maxillofacial area may still be performed in the hands of skilled surgeons, the unique operating techniques required in the "vessel-depleted neck" involve a higher surgical risk⁸. An unfavorable event, usually thrombosis of a vascular pedicle, can result in total loss of the transplanted tissue, necessitating the urgent removal of a second flap for microsurgical transplantation⁹.

The following particular methods are required in the vessel-depleted neck: The thoraco-acromial vessel system is used. Interpositional flaps or vascular loops can be used. Use the cephalic vein for isolated venous deficiencies¹⁰. Nevertheless, many mutilated people go untreated since such operations necessitate not only a highly trained surgeon, but also patient compliance and the ability to undergo extensive surgery. Further technological advancements in recent years should allow for adequate repair even under the most severe conditions¹¹.

The complete survival ("take") of the micro surgically transplanted tissue is the most essential success criterion¹². Because complete healing is obvious, the success of specific methods of microsurgical reconstruction with specific types of flaps was measured in the early years of this surgical specialty by the percentage of flap survival¹³. Recent research has demonstrated, however, that success cannot be determined solely by flap survival; the patient's judgment of the functional and aesthetic outcome must also be evaluated¹⁴. Our team has extensive knowledge and research experience that has translate into high quality publications¹⁵⁻²⁴. The aim of the study is to assess the various techniques used in maxillofacial reconstruction in an Institute and determine which technique leads to the best outcome.

2. Materials and Methods

This retrospective study examined the records of patients from 01 June 2019 to 31st March 2022 who visited Saveetha Dental College and Hospitals. Ethical approval was taken from the institutional review board. The study population included patients undergoing reconstructive surgery. Sample size was 71 patients who presented with maxillofacial defects and were indicated for maxillofacial reconstruction. The necessary data such as age, gender, type of flap harvested and the flap used were included in the study. Incomplete patient data was excluded. Data was recorded in Microsoft Excel and exported to the statistical package of social science for Windows (SPSS) and subjected to statistical analysis. Chi Square test was used for comparison of groups.

3. Results

The outcomes of the study are depicted in Figures 1 - 6. Out of 71 reconstructions, 13 were reconstructed using local flaps, 25 were reconstructed using loco-regional flaps, 21 were using free flaps and 12 were using grafts. Out of local flaps, 3 used alar flap, 1 used eyelid flap, 1 used Nasal flap, 1 used buccal advancement flap, 4 used tongue flap, 3 used nasolabial flap and 1 used forehead flap. Majority of loco-regional flaps were PMMC flaps. Chi-square tests were used to associate the flap type harvested and the demographic features such as age and gender. The association between the age of the patient and the type of flap used for reconstruction was found to be statistically significant.

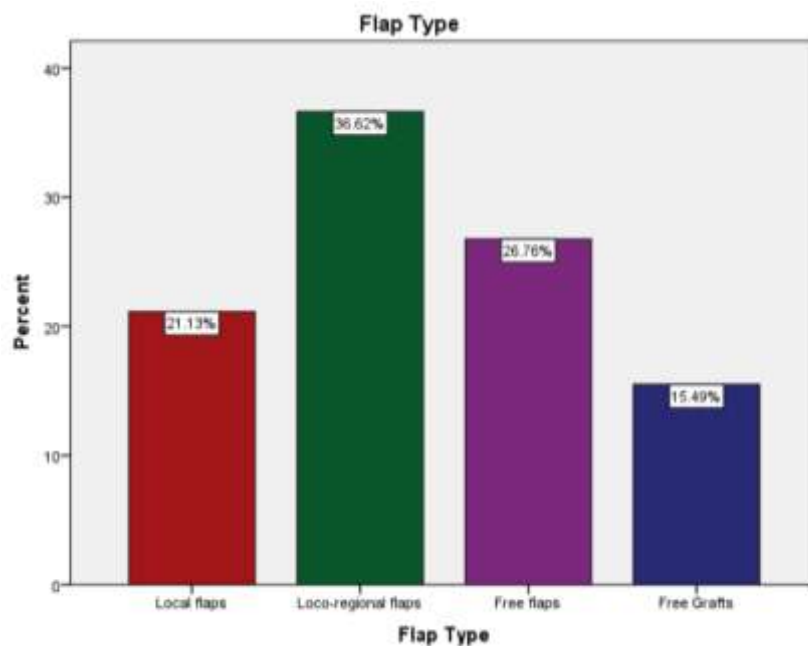


Figure 1: Bar graph representing the frequencies of the flap type used. 21.13% used local flaps (red), 36.62% used loco-regional flaps (Green), 26.76% used free flaps (purple) and 15.49% used free grafts (blue).

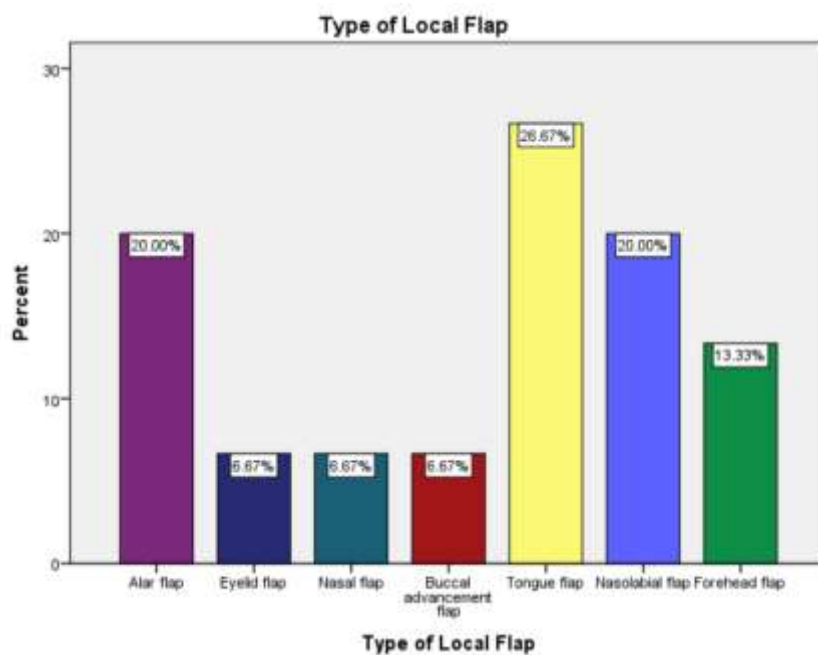


Figure 2: Bar graph representing the type of local flaps used. 20% used alar flap (purple), 6.87% used eyelid flap (dark blue), 6.67% used Nasal flap (light green), 6.67% used buccal advancement flap (red), 26.67% used tongue flap (yellow), 20% used nasolabial flap (light blue) and 13.33% used forehead flap (dark green).

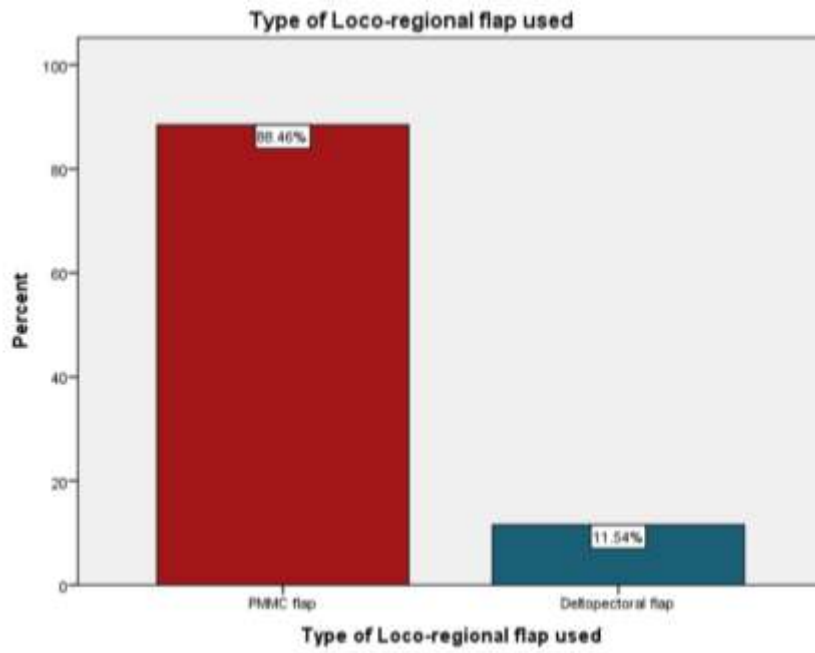


Figure 3: Bar graph representing the type of loco-regional flaps used. 88.46% used PMMC flaps (red), 11.54% used Deltopectoral flaps (green).

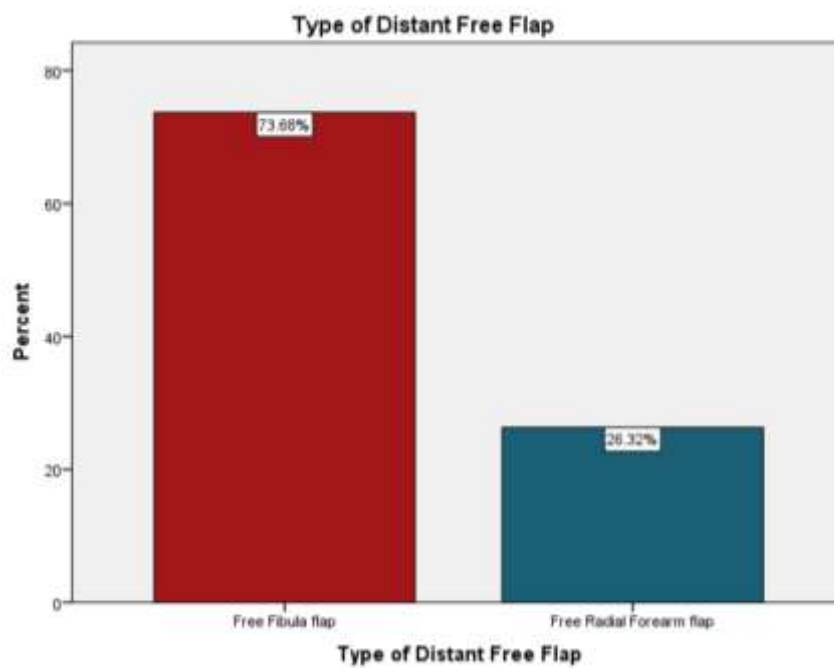


Figure 4: Bar graph representing the type of free flaps used. 73.68% used free fibula flaps (red), 26.32% used free radial forearm flaps (green).

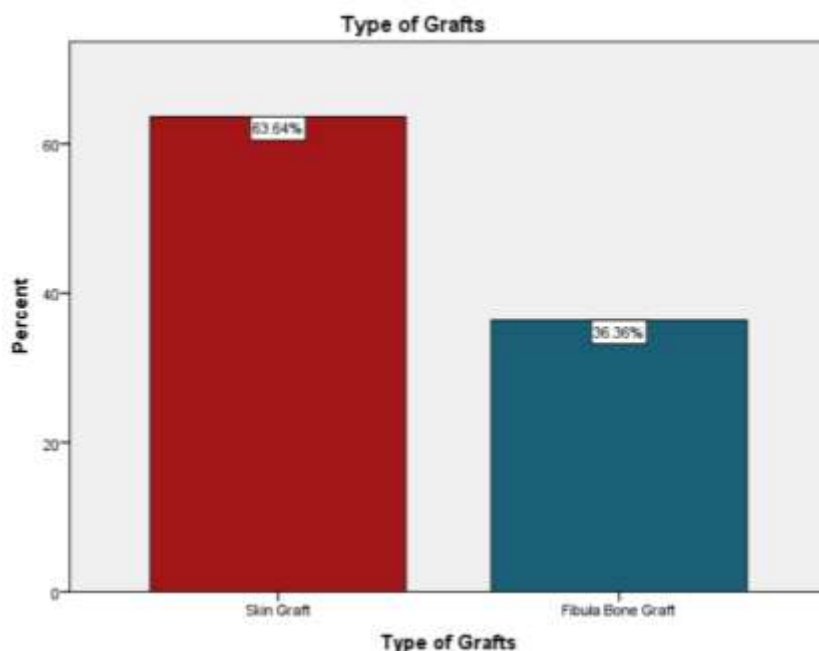


Figure 5: Bar graph representing the type of grafts used. 63.64% used skin grafts (red), 36.36% used fibula bone grafts (green).

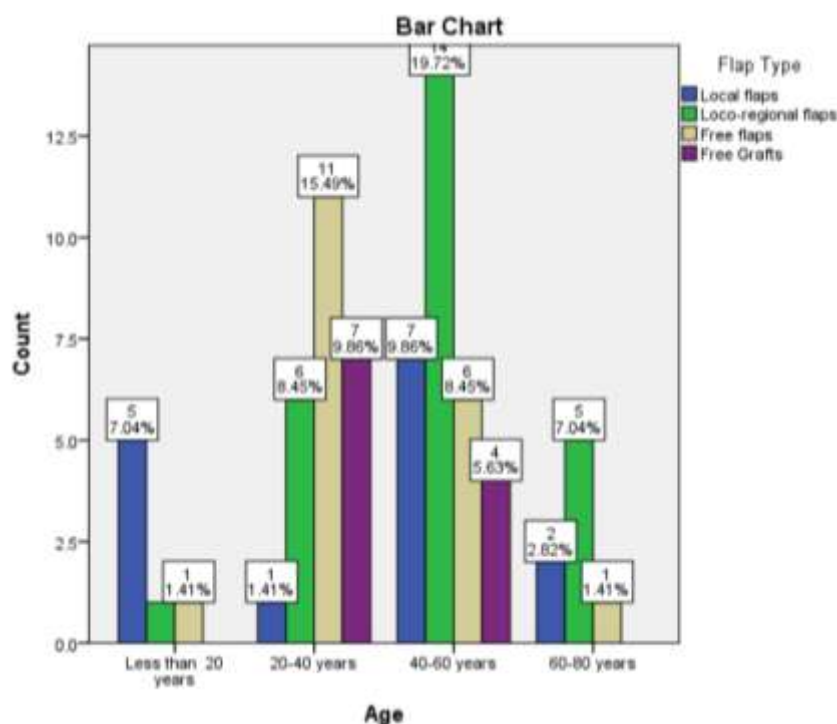


Figure 6: Bar graph representing the association between age and type of flap used. X axis represents the age of the patient and Y axis represents the type of flap used. Chi square test was done and the association was found to be statistically significant. Pearson’s chi square value: 25.473, df: 9, p value: 0.002 ($p < 0.05$); hence it is statistically significant.

4. Discussion

The current study aimed to evaluate the reconstructive flap techniques that were more commonly used in a private dental hospital. It was found that loco-regional flaps were most commonly used, out of which PMMC flap were more

commonly used. Local flaps were second most popular, out of which tongue flap was commonly used. Because of the unique architecture, the presence of a crucial structure, and the range of deficiencies, reconstructing complex cranio-maxillofacial abnormalities is difficult²⁵. Congenital or acquired cranio-maxillofacial

deformities caused by congenital anomalies, post-trauma, tumor excision, or infection necessitate functional and cosmetic considerations²⁶. The importance of physical appearance and speech, deglutition, and visual capabilities in this anatomical area makes defects of the maxilla and midfacial tissues following trauma or oncological ablation a problem for the reconstructive surgeon²⁷.

Various factors have to be considered when a flap is chosen for reconstruction. The vascularity status of the donor site, the extent of the defect, the need for bone reconstruction, the extent of the palatal defect, functionality of the flap and its associated aesthetics²⁸. The basic functional and cosmetic aims of maxillary reconstruction can now be predictably and consistently attained with the advancement of microsurgery and reconstructive surgery of the head and neck²⁹. Free bone flaps can be used to repair both the soft and hard tissues of the maxilla at the same time. Furthermore, to totally hold, support, and maintain the prosthesis, osseointegrated implants can be implanted in the vascularized graft bone³⁰.

The pectoralis major flap's vascularity is usually consistent with the pedicle being positioned between clearly defined tissue planes and supplied by multiple perforators for skin. The pectoralis major myocutaneous flap is one of the most adaptable flaps available and a workhorse for head and neck restoration. Because of its inherent properties, this flap has now replaced other large regional cutaneous flaps. The pectoralis major myocutaneous flap is one of the most adaptable flaps available and a workhorse for head and neck restoration. Because of its inherent properties, this flap has now replaced other large regional cutaneous flaps. Although free flaps have significant advantages over pedicled flaps, such as better cosmetic results, less mass of the flap, and better rehabilitation, one key discovery that we highlighted is the ability of the PMMC flap to be employed as a salvage technique following free flap failure. In circumstances when the use of vascularised flaps is not viable, or in patients with artery anomalies, extremes of age, or patients with medical comorbidities, the PMMC flap is a useful technique. Schneider et al. reported the same results, stating that the PMMC flap was used as a salvage procedure in 38% of their case series, and Saito et al. reported that 75% of cases operated for PMMC flaps were only used as a salvage procedure, supporting our findings.

These outcomes are examples of totally functional maxillary restoration. Radial forearm osteocutaneous free flap, scapular osteocutaneous flap, iliac crest free flap, and fibula free flap were the free composite bone flaps employed in maxillary reconstruction³¹. Frodel et al. found that the iliac crest and fibula flaps had bone dimensions that were consistently adequate for implant placement in a comparative analysis of the dimensions of bone available for implant insertion from the iliac crest,

scapula, fibula, and radius osseous flaps³². Fibulae provide the added benefit of bicortical fixation for implant insertion, which provides more stability and increases the likelihood of osseointegration. The fibula's vertical height is appropriate for maxillary repair³³. The fibula bone is used to repair alveolar abnormalities, and the surgical plate can determine the best position for eventual prosthesis³⁴.

In a broad series of 27 patients, Futran et al. employed the fibula free flap for maxillary reconstruction. In 20 patients with minor abnormalities of the inferior maxilla, excellent results for speech, swallowing, and aesthetics were attained. When the remnant palate and teeth were insufficient to support a traditional prosthesis, the fibula was used to allow for the placement of osseointegrated implants to support dental prostheses³⁵. However, while reconstructing the zygomatic complex and infraorbital rim and floor, this flap was limited in its ability to restore the whole maxillary form³⁶. Three patients developed recipient-site wound infection, while three patients developed donor-site wound dehiscence. All wounds healed entirely in the end.

In comparison to Futran et al, there was one patient with total flap failure, three with venous or arterial obstruction, four with wound dehiscence, and three with extra complications. In general, free flap repair of head and neck deformities is dependable and safe. According to recent statistics, the free flap survival rate ranged from 91.5 percent to 99.2 percent in a series of more than 100 instances of microvascular head and neck reconstructions performed by a single surgeon or institution³⁷. Large clinical series have thoroughly confirmed free flaps' unrivaled dependability (32-40). The effectiveness of the procedure is dependent not only on superb microsurgery expertise, but also on meticulous postoperative management. There are some critical points related to the operation's success. The donor leg should be thoroughly evaluated before surgery (41-43).

5. Conclusion

Within the limitations of the study, it was found that Loco-regional flap reconstruction is found to be most commonly employed in a private dental hospital. PMMC flaps are considered to be most clinically feasible owing to its simplicity and affordability. Free flaps were second most commonly used, out of which fibula flaps were more common. Local flaps were also found to be clinically effective.

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