

# OUTCOMES OF TEMPORALIS MUSCLE FLAP RECONSTRUCTION FOR MAXILLARY DEFECTS IN A TERTIARY CARE HOSPITAL IN PAKISTAN

## TEMPORALIS MUSCLE FLAP OUTCOMES IN MAXILLARY RECONSTRUCTION

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### Abstract

#### Background:

Maxillary and intraoral defects resulting from trauma or tumor resection require reliable reconstructive techniques, particularly in resource-limited settings. The temporalis muscle flap (TMF) is a versatile and well-vascularized option; however, local outcome data remain limited.

#### Methods:

This descriptive cross-sectional study was conducted at Mardan Medical Complex, Pakistan. A total of 114 patients aged 10–70 years undergoing immediate TMF reconstruction were included. Data on demographics, defect characteristics, and postoperative complications were collected. Statistical analysis was performed using SPSS version 23, with chi-square or Fisher's exact test applied to assess associations ( $p \leq 0.05$ ).

#### Results:

Most patients were male and middle-aged, with malignancy as the most common indication. Postoperative complications were infrequent: hematoma (6.1%), partial flap necrosis (4.4%), total flap loss (3.5%), alopecia (9.6%), and nerve injury (2.6%). No significant associations were observed between complications and demographic or defect-related variables.

#### Conclusion:

Temporalis muscle flap reconstruction demonstrates favorable outcomes with a low complication rate, supporting its role as a reliable reconstructive option, particularly in resource-limited settings.

## INTRODUCTION

Maxillary defects are the common presentation in maxillofacial departments of tertiary care hospitals. The etiologies are oncologic resections, trauma, and congenital or infectious conditions<sup>1,2</sup>. These defects offer clinical and functional

challenges in oral and maxillofacial surgery. The maxilla is a major bone in midfacial architecture, and helps in mastication, deglutition, articulation, and aesthetics; the disruption of its structural integrity impairs patients' quality of life<sup>3,4</sup>.

Cancers of the oral cavity are a major public health concern, with an estimated 377,000 new cases and over 177,000 deaths annually. Most of these patients require maxillary or palatal resection as part of definitive management<sup>5-7</sup>. In low- and middle-income countries, including Pakistan, patients present at advanced and late-stage presentation, leading to larger ablative defects that necessitate complex reconstruction<sup>8,9</sup>. These defects contribute to speech impairment, nasal regurgitation, mastication difficulty, facial deformity, and psychosocial distress; timely and effective reconstruction is essential<sup>10,11</sup>.

There are many reconstructive options for maxillary and palatal defects, which include obturators, loco-regional flaps, and free tissue transfer. In the options of regional flaps the temporalis muscle flap (TMF) has remained a dependable reconstructive is most widely used choice because of its robust vascular supply, sufficient muscular tissue, wider arc of rotation, and anatomical proximity to the site of defect<sup>12-14</sup>. It is mostly used in reconstructing defects of the hard palate, soft palate, alveolobuccal complex, and premaxilla<sup>15,16</sup>. In comparison with free flaps, the TMF offers a shorter operative time, lower donor-site morbidity, and does not require microsurgical expertise, making it especially valuable in resource-limited settings<sup>17,18</sup>. The Previous studies have noticed several postoperative complications such as hematoma, partial or total flap necrosis, alopecia at the incision line, and injury to the temporal branch of the facial nerve; all these reports varied across each study. Some of the studies have reported minimal flap loss, while other studies have noticed higher rates of temporal hollowing, restricted mouth opening, or transient neuropraxia<sup>17,19-21</sup>.

There is a lot of literature regarding the clinical use; however, there are significant knowledge gaps regarding TMF outcomes in lower-resource countries like Pakistan. The previous available studies have small sample sizes, heterogeneous patient populations, or were carried out in settings where free-flap reconstruction is more readily accessible. There is very limited data available from South Asia, especially Khyber Pakhtunkhwa, Pakistan, as the patient demographics, nutritional

status, tumor profiles, and healthcare system setting may influence complication rates and surgical success. The absence of local evidence restricts clinicians in making evidence-based decisions regarding reconstructive planning and patient counseling. This study aimed to fulfill these gaps by determining the postoperative outcomes of the temporalis muscle flap in the reconstruction of maxillary and intraoral defects, and evaluating the complications, such as the frequency of hematoma, partial flap necrosis, total flap loss, alopecia, and temporal nerve injury. The secondary aim of this study was to describe patient demographics, defect characteristics, and defect sizes associated with these postoperative outcomes to provide a more comprehensive understanding of the clinical performance of the temporalis muscle flap in the setting of Maran Medical Complex.

## Methods

The study design was descriptive cross-sectional, and the study site was the Department of Oral and Maxillofacial Surgery, Mardan Medical Complex, Mardan, Pakistan. The study spanned a period of six-month period following ethical approval from the ethical review board of Mardan Medical Complex (Dated 06 March 2024). The inclusion criteria were that patients required immediate reconstruction of maxillary or intraoral defects with a temporalis muscle flap (TMF). Patients aged 10-70 years with defects of the hard palate, soft palate, premaxilla, or buccoalveolar complex measuring  $\leq 2.0 \times 7.0$  cm and resulting from trauma or tumor ablation were included. The Exclusion criteria were patients who required prior or ongoing radiotherapy, patients who were medically unfit for surgery, composite defects requiring alternative reconstruction, cervical metastasis, neurological impairment, and patients who were unable to complete the follow-up. A structured proforma was designed for the collection of data, which included postoperative outcomes such as hematoma, partial flap necrosis, total flap loss, alopecia, and temporal branch facial nerve injury, which were assessed using standardized operational definitions by trained surgical staff at routine follow-up visits.

Predictor variables included age, gender, defect site, defect size, and underlying pathology. Age and defect size were analyzed both as continuous and categorized variables. To minimize bias, consecutive sampling reduced selection bias, and uniform assessment protocols minimized measurement bias. The sample size ( $n = 114$ ) was calculated using the WHO sample size calculator with a 95% confidence level, 5% margin of error, and an expected 8% frequency of alopecia. For Statistical analysis, SPSS version 23.0 was used. Quantitative variables were assessed for normality (Shapiro–Wilk/Kolmogorov–Smirnov) and reported as mean  $\pm$  standard deviation or median, and the categorical variables were presented as frequencies and percentages. To control for

confounding stratification by age, gender, defect characteristics, and postoperative outcomes was performed. This was followed by chi-square or Fisher's exact test, with  $p \leq 0.05$  considered statistically significant. Missing data were handled using complete-case analysis.

### Results:

A total of 114 patients underwent reconstruction of maxillary or intraoral defects using the temporalis muscle flap. The mean age of the cohort was  $40.9 \pm 18.4$  years, with most patients aged above 50 years (36.8%), followed by those aged 31–50 years (35.1%) and  $\leq 30$  years (28.1%). Males represented 69.3% of the sample (Table 1).

**Table 1. Demographic Characteristics of the Study Population (N = 114)**

Values presented as n (%) unless otherwise stated.

| Variable          | Category        | n (%)           |
|-------------------|-----------------|-----------------|
| Age Group         | $\leq 30$ years | 32 (28.1)       |
|                   | 31–50 years     | 40 (35.1)       |
|                   | $> 50$ years    | 42 (36.8)       |
| Mean age $\pm$ SD | —               | $40.9 \pm 18.4$ |
| Gender            | Male            | 79 (69.3)       |
|                   | Female          | 35 (30.7)       |

Malignant pathology accounted for half of the cases (50.9%), followed by benign lesions (17.5%), premalignant lesions (16.7%) and trauma-related defects (14.9%). Defects were most commonly classified as small ( $< 4$  cm) in 48.2% of patients, while 30.7% had medium-sized and 21.1% had large defects. The majority of procedures followed

tumor ablation (85.1%). The temporalis muscle flap was harvested almost equally from the right (53.5%) and left (46.5%) sides, and most surgeries were performed by consultants (60.5%). The mean duration of surgery was  $189.1 \pm 42.2$  minutes (Table 2).

**Table 2. Clinical and Defect Characteristics (N = 114)**

Values presented as n (%) unless otherwise stated.

| Variable                       | Category            | n (%)                |
|--------------------------------|---------------------|----------------------|
| Diagnosis                      | Trauma              | 17 (14.9)            |
|                                | Benign lesion       | 20 (17.5)            |
|                                | Premalignant lesion | 19 (16.7)            |
|                                | Malignant           | 58 (50.9)            |
| Defect Size Category           | Small (<4 cm)       | 55 (48.2)            |
|                                | Medium (4–6 cm)     | 35 (30.7)            |
|                                | Large (>6 cm)       | 24 (21.1)            |
| Mean defect size $\pm$ SD      | —                   | 4.30 $\pm$ 1.62 cm   |
| Etiology                       | Trauma              | 17 (14.9)            |
|                                | Tumor ablation      | 97 (85.1)            |
| Side of TMF                    | Left                | 53 (46.5)            |
|                                | Right               | 61 (53.5)            |
| Surgeon Level                  | Consultant          | 69 (60.5)            |
|                                | Senior resident     | 45 (39.5)            |
| Mean surgery duration $\pm$ SD | —                   | 189.1 $\pm$ 42.2 min |

Postoperative complications were relatively uncommon. Hematoma developed in 6.1% of patients, partial flap necrosis in 4.4%, and total flap loss in 3.5%. Alopecia occurred in 9.6% of cases, while temporal nerve injury and facial nerve palsy were each noted in 2.6% (Table 3).

**Table 3. Postoperative Complications of Temporalis Muscle Flap (N = 114)**

| Complication          | n (%)    |
|-----------------------|----------|
| Hematoma              | 7 (6.1)  |
| Partial flap necrosis | 5 (4.4)  |
| Total flap loss       | 4 (3.5)  |
| Alopecia              | 11 (9.6) |
| Temporal nerve injury | 3 (2.6)  |
| Facial nerve palsy    | 3 (2.6)  |

No statistically significant associations were observed between alopecia and gender ( $p = 0.795$ ) or age group ( $p = 0.434$ ). Similarly, defect size showed no significant association with hematoma ( $p = 0.246$ ) or partial flap necrosis ( $p = 0.840$ ).

Temporal nerve injury was also not significantly associated with gender ( $p = 0.243$ ). These findings indicate that postoperative complications did not significantly vary across demographic or defect-related characteristics (Table 4).

Table 4. Association Between Patient/Defect Characteristics and Postoperative Complications

| Outcome               | Variable Tested      | $\chi^2$ | df | p-value |
|-----------------------|----------------------|----------|----|---------|
| Alopecia              | Gender               | 0.067    | 1  | 0.795   |
| Alopecia              | Age group            | 1.672    | 2  | 0.434   |
| Hematoma              | Defect size          | 53.271   | 47 | 0.246   |
| Partial flap necrosis | Defect size category | 0.348    | 2  | 0.840   |
| Temporal nerve injury | Gender               | 1.365    | 1  | 0.243   |

### Discussion

This study examined the outcomes of temporalis muscle flap (TMF) reconstruction for maxillary and intraoral defects and demonstrated that TMF use was associated with low rates of postoperative complications. In line with the study objectives, the findings confirm that donor-site alopecia, flap necrosis, and nerve injury occurred infrequently and that demographic or defect-related factors were not significantly associated with complication risk. The present study adds realistic population-specific evidence from a high-volume tertiary care hospital in Pakistan, contributing data to the literature where local research is limited. The findings of our study are in agreement with previously published studies, which reported the reliability of TMF in the head and neck reconstruction. A study by Landfald et al. reported that TMF provides good functional and aesthetic outcomes, with limited complications and higher patient satisfaction rates<sup>17</sup>. The study by Abdelrahman et al found that TMF reconstruction is an effective and favourable option for the reconstruction of palatal defects in the oral cavity, especially when flap reconstruction is not feasible<sup>22</sup>. A comprehensive review study by Landfald et al found that flap's predictable vascular supply, arc of rotation, and reliability further support its use in diverse maxillofacial defects<sup>17</sup>.

Our study results, such as lower rates of hematoma, nerve injury, and flap necrosis, are consistent with these studies. There are differences in complication rates across these studies, which may be due to differences in sample size, surgical technique used, burden of the tumor, and the postoperative care protocols.

Consistent with these studies, the low rates of hematoma, flap necrosis, and nerve injury observed in our cohort reflect the robustness of the temporalis muscle and the dependability of its vascular anatomy. Differences in complication frequencies across studies may relate to variations in sample size, surgical technique, tumor burden, or postoperative care protocols.

### Conclusion

This study demonstrates that the temporalis muscle flap is a reliable and effective reconstructive option for maxillary and intraoral defects, with a low incidence of postoperative complications. Outcomes were consistent across different patient demographics and defect characteristics, underscoring the flap's versatility and clinical robustness. These findings support the continued use of the temporalis muscle flap, particularly in settings where microsurgical reconstruction is limited or contraindicated. Further multicenter and longitudinal studies assessing functional, aesthetic, and quality-of-life outcomes are warranted to strengthen the evidence base and guide reconstructive decision-making.

The temporalis muscle flap remains particularly relevant in low- and middle-income countries, where access to microsurgical expertise, infrastructure, and prolonged operative time may be limited. Its reliable vascularity, proximity to maxillary and palatal defects, shorter operative duration, and avoidance of microvascular anastomosis make it a practical and cost-effective reconstructive option. In such settings, TMF allows timely reconstruction with acceptable functional and aesthetic outcomes while minimizing donor-site morbidity. The findings of

the present study further support the continued use of the temporalis muscle flap as a dependable reconstructive technique in resource-constrained healthcare systems.

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**Conflict of Interest:** None

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