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Comparative Outcomes of V-Y Advancement Flap Versus Full-Thickness Skin Grafting in Frontotemporal Reconstruction: Aesthetic and Functional Assessment Using FACE-Q Questionnaire

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What is already known on this topic?

- *V-Y advancement flaps and full-thickness skin grafts are both used in frontotemporal reconstruction after oncologic resection.*
- *Skin grafts are easy to apply but often lead to pigmentation mismatch, contour irregularities, and donor site scarring.*
- *V-Y flaps provide better tissue match but have been less frequently compared using standardized patient-reported outcomes.*

What does this study adds on this topic?

- *This study is the first to objectively compare V-Y advancement flaps and full-thickness skin grafts using the validated FACE-Q aesthetic questionnaire.*
- *Statistically significant differences were found in favor of the V-Y flap group in both the "Facial Expression" (P = .002) and "Emotional State" (P = .0021) domains.*
- *These results highlight the V-Y flap's superior aesthetic and emotional outcomes, reinforcing its value as a patient-centered reconstructive option for frontotemporal defects.*

Abstract

Objective: Frontotemporal reconstruction after malignant tumor excision poses aesthetic and functional challenges due to the region's complex anatomy and visibility. This study aimed to compare outcomes of V-Y advancement flaps vs. full-thickness skin grafts in moderate midtemporal defects.

Methods: A retrospective review was conducted on patients who underwent excision of squamous cell carcinoma or malignant melanoma. Defects were reconstructed with either V-Y advancement flaps or full-thickness skin grafts. Aesthetic outcomes were assessed 1 year postoperatively using the FACE-Q Aesthetic Module, evaluated by patients, a plastic surgeon, and a non-plastic specialist.

Results: A total of 14 patients (7 V-Y advancement flap, 7 full-thickness skin graft) were included. The V-Y flap group showed significantly higher FACE-Q scores for skin texture, color match, and facial expression, especially within the "facial expression and emotional state" domain. No significant difference was found in the "psychological function" domain. The V-Y technique preserved regional mobility, avoided donor site morbidity, and minimized risk to the frontal branch of the facial nerve. No complications or recurrences were reported.

Conclusion: V-Y advancement flaps offer a safe, effective, and aesthetically superior option for selected frontotemporal defects, especially when patient emotional expressiveness and facial harmony are critical. They may be preferred over skin grafts in appropriately selected cases.

Keywords: Aesthetic outcomes, FACE-Q score, frontotemporal region, V-Y advancement flap

Introduction

Reconstruction of defects in the frontotemporal region requires a careful balance between achieving optimal aesthetic results and preserving functional outcomes, particularly in relation to facial nerve integrity. One of the major concerns during both tumor resection and subsequent reconstruction is the potential risk of iatrogenic injury to the frontal branch of the facial nerve. This risk is particularly pronounced in the zygomatic and temporal regions, where the nerve travels superficially and is vulnerable to both direct trauma and traction injury. Preservation of facial nerve function is crucial for maintaining facial expression, symmetry, and patient quality of life.

Reconstructive strategies are selected based on the size, location, and depth of the defect, as well as patient-specific factors such as skin quality and oncologic considerations. These strategies may include skin grafting, a variety of locoregional flaps (such as temporoparietal fascia, scalp, preauricular, or postauricular flaps), or, for larger and more complex defects, free tissue transfer.[1] Each option carries its own set of benefits and limitations in terms of tissue match, donor site morbidity, and surgical complexity.

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In this study, the clinical experience with the V-Y advancement flap technique in the reconstruction of moderate frontotemporal defects following malignant tumor excision is presented. This technique, which utilizes adjacent tissue with similar color and texture, offered both functional and aesthetic advantages. It allowed for satisfactory contour restoration and effective defect closure while minimizing donor site morbidity and preserving the integrity of the facial nerve. To objectively assess cosmetic outcomes, FACE-Q scores between patients who underwent flap-based reconstruction and those treated with skin grafts were compared.

Methods

For this study, ethical approval was obtained from the İstanbul University-Cerrahpaşa review board (Approval no: 1ikK1m55, Date: June 14, 2023). Informed consent was obtained from all patients included in the study, with their data being used for research purposes as outlined in the study protocol, and the surgical technique to be applied to the patients was randomly selected. Patients who underwent reconstruction for midtemporal and frontotemporal defects following histopathologically confirmed squamous cell carcinoma (SCC) or malignant melanoma excision between January 2022 and January 2023 were included in this study. Patients were divided into 2 groups based on the reconstruction technique. Patients received reconstruction with a V-Y advancement flap or were treated with full-thickness skin grafting.

At the 1-year follow-up, standardized clinical photographs were taken for aesthetic evaluation. These photographs were independently assessed by a plastic surgeon, a non-plastic surgical specialist, and the patient, using the FACE-Q questionnaire. The collected FACE-Q scores were statistically analyzed to compare aesthetic outcomes between the 2 reconstruction groups.

Surgical Technique

Following tumor resection and intraoperative confirmation of negative margins via frozen section analysis, flap design was performed based on the dimensions of the defect. The superficial temporal artery (STA) course was first marked, and the flap was drawn extending from the inferior aspect of the defect toward the preauricular region. In all cases, flap dimensions were designed slightly larger than the defect to allow tension-free closure, with the inferior border positioned at the level of the superior helix. Flap length ranged from 4 to 6 cm, and width ranged from 3 to 4 cm depending on the defect size. The flap was based on a perforator of the frontal branch of STA, typically located approximately 1-2 cm superior to the zygomatic arch, as described in the literature.[2] This reliable vascular pedicle was preserved throughout the dissection to ensure robust perfusion. Skin incisions were made down to the level of the fascia according to the marked design. The flap was then carefully elevated by releasing the surrounding tissue margins to allow advancement, ensuring that the dissection did not compromise the STA trajectory. The flap was subsequently advanced and adapted to the defect site (Figure 1A and B). In all patients who underwent full-thickness skin grafting, the graft was harvested from the supraclavicular region.

FACE-Q Score Analysis

To compare the aesthetic outcomes of V-Y advancement flaps and skin grafts, the FACE-Q Aesthetic module was used. This validated tool measures patient satisfaction and quality of life using item response theory. Scores are based on a 4-point Likert scale and converted to a 0-100 scale. FACE-Q includes appearance scales, quality of life measures, and complication checklists, allowing flexible use based on clinical needs.[3]

Statistical Analysis

Aesthetic outcomes were evaluated using the FACE-Q questionnaire, with assessments provided by a plastic surgeon, a non-plastic surgeon specialist (an otorhinolaryngologist with expertise in head and neck surgery and familiarity with facial harmony and aesthetic units), and the patients themselves. The scores obtained

Figure 1. A: Postresection defect in the left frontotemporal region and design of the V-Y advancement flap. B: Per-operative adaptation of the local V-Y advancement flap.

from each group were compared statistically. For the comparison of aesthetic satisfaction between the 2 reconstruction techniques (V-Y advancement flap and skin graft), the data were analyzed using the Mann–Whitney *U*-test for non-parametric data due to the small sample size and non-normal distribution of the scores. A *P*-value of <.05 was considered statistically significant for all analyses. Descriptive statistics, including mean and standard deviation, were used to summarize the data.

Results

A total of 14 patients met the inclusion criteria and were analyzed in this study. Seven patients underwent reconstruction with a V-Y advancement flap, and 7 patients were treated with full-thickness skin grafting. The mean age of the patients was 60.42 years (range: 42-72 years). The size of the defects ranged from 3 × 3 cm to 6 × 4 cm. All patients had a histopathological diagnosis of tumor confirmed by incisional biopsy prior to surgery. Among the 14 patients, 6 were diagnosed with moderately differentiated SCC, 4 with well-differentiated SCC, 2 with poorly differentiated SCC, and 3 with malignant melanoma. Surgical margins were negative in all cases. For the lateral surgical margins, the mean clear margin was 1.0 cm, ranging from 0.8 cm to 1.4 cm (Table 1). No local recurrence was observed in any patient during the 1-year postoperative follow-up period.

Representative Cases

Case 1

A 60-year-old male patient presented with a 4 × 4 cm mass located in the left frontotemporal region, which was excised with a 1 cm margin. After frozen section analysis confirmed negative surgical margins, a V-Y advancement flap was designed for reconstruction. Following the adaptation of the flap to the defect, the final diagnosis was confirmed as malignant melanoma. The closest surgical margin was 1.2 cm, and based on this, no indication for adjuvant radiotherapy was established. The patient has been followed for 1 year without any evidence of locoregional or systemic metastasis (Figure 2A and B).

Case 2

A 58-year-old female patient presented with a 3 × 3 cm mass located in the right frontotemporal region, which was excised with a 1 cm margin. After frozen section analysis confirmed negative surgical margins, a V-Y advancement flap was designed for reconstruction. Following the adaptation of the flap to the defect (Figure 3A and B), the final diagnosis was confirmed as well-differentiated SCC. The closest surgical margin was 1 cm, and based on this, no indication for adjuvant radiotherapy was established. The patient has been followed for 1 year without any evidence of locoregional or systemic metastasis.

Case 3

A 64-year-old male patient presented with a 3 × 2 cm mass in the right mid-temporal region. Wide local excision was performed with a 1 cm surgical margin. Intraoperative frozen section analysis confirmed clear margins. Reconstruction was completed using a full-thickness skin graft harvested from the right supraclavicular area. Histopathological examination revealed a well-differentiated SCC, with the closest margin measuring 0.8 cm. As a result, adjuvant radiotherapy was not indicated. The patient has been followed for 1 year with no signs of locoregional recurrence or distant metastasis (Figure 4A-C).

In addition to these representative cases, the comparative FACE-Q scores for all patients are summarized below.

At the 1-year postoperative follow-up, FACE-Q scores were analyzed across 3 modules: facial expression, emotional state, and

Table 1. Patient Demographics and Reconstruction Details

Patient	Age	Defect Size	Comorbidities	Tumor Type	Reconstruction Type	Lateral Surgical Margin (cm)
1	42	3 × 3 cm	None	SCC	V-Y advancement flap	1.0
2	45	4 × 2 cm	Hypothyroidism	SCC	Full-thickness skin graft	0.8
3	43	3 × 3 cm	None	SCC	V-Y advancement flap	1.1
4	55	3 × 2 cm	HT	SCC	Full-thickness skin graft	1.2
5	50	4 × 3 cm	None	SCC	V-Y advancement flap	1.4
6	52	3 × 3 cm	Hypothyroidism, DM	SCC	Full-thickness skin graft	1.0
7	48	3 × 3 cm	None	SCC	V-Y advancement flap	1
8	62	4 × 3 cm	None	MM	Full-thickness skin graft	1.2
9	64	3 × 2 cm	DM	SCC	Full-thickness skin graft	1
10	58	3 × 3 cm	HT	SCC	V-Y advancement flap	0.8
11	60	4 × 4 cm	DM	MM	V-Y advancement flap	1
12	70	4 × 3 cm	HT	SCC	Full-thickness skin graft	0.9
13	58	3 × 3 cm	HT,DM	SCC	V-Y advancement flap	1.0
14	72	3 × 3 cm	HT, DM, BPH	MM	Full-thickness skin graft	1.2

BPH, benign prostate hypertrophy; DM, diabetes mellitus; HT, hypertension; MM, malignant melanoma; SCC, squamous cell carcinoma.

Figure 2. A: A patient with malignant melanoma located in the left frontotemporal region, 1-year postoperative anteroposterior (AP) view, following reconstruction with a left frontotemporal V-Y advancement flap. B: A patient with malignant melanoma located in the left frontotemporal region, 1-year postoperative oblique view, following reconstruction with a left frontotemporal V-Y advancement flap.

psychological assessment. The results revealed statistically significant differences favoring the V-Y advancement flap group over the skin graft group in the Facial Expression and Emotional State modules (Table 2 and Figure 5A-C).

- **Facial expression**: The V-Y advancement flap group had a significantly higher mean score (28.29 ± 3.59) compared to the graft repair group (19.29 ± 2.98), with a *P*-value of .002, indicating strong statistical significance.
- **Emotional state**: Similarly, the V-Y flap group showed higher satisfaction (mean: 28.29 ± 3.20) compared to the graft group (19.29 ± 2.43), with a *P*-value of .0021.
- **Psychological assessment**: Although the V-Y flap group demonstrated a slightly higher mean score (27.86 ± 3.08) than the graft group (26.86 ± 3.02), this difference was not statistically significant (*P* = .358).

Discussion

In the context of oncologic resections, reconstruction of moderate to large defects in the temporal region presents significant aesthetic and functional challenges.[4] The complexity of this anatomical area, characterized by thin soft tissue coverage and the presence of critical neurovascular structures, demands careful surgical planning. While small defects can typically be managed

Figure 3. A: A patient with squamous cell carcinoma (SCC) located in the right frontotemporal region, postoperative anteroposterior (AP) view of the V-Y advancement flap. B: A patient with squamous cell carcinoma (SCC) located in the right frontotemporal region, postoperative oblique view of the V-Y advancement flap.

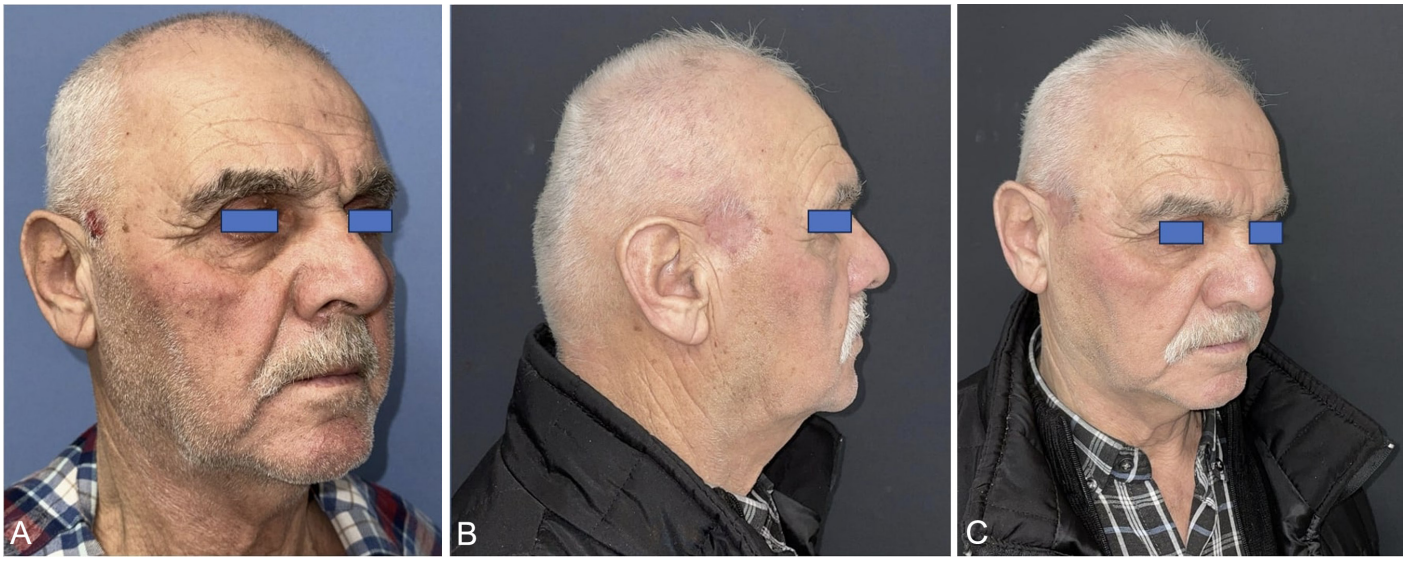

Figure 4. A: Preoperative view of a patient with squamous cell carcinoma (SCC) in the right mid-temporal region, reconstructed with a full-thickness skin graft. B: One-year postoperative left lateral view of a patient with squamous cell carcinoma (SCC) in the right mid-temporal region, reconstructed with a full-thickness skin graft. C: One-year postoperative oblique view of a patient with squamous cell carcinoma (SCC) in the right mid-temporal region, reconstructed with a full-thickness skin graft.

with primary closure, larger or more irregular defects often necessitate alternative approaches such as skin grafts or well-established locoregional flaps.[5]

In this study, V-Y advancement flaps and full-thickness skin grafts were compared in terms of functional outcomes and patient-reported satisfaction using the FACE-Q instrument. The V-Y advancement flap leverages adjacent tissue with similar characteristics, offering superior texture, thickness, and color match. These flaps maintain robust vascularity (based on STA), which facilitates reliable healing and minimizes the risk of complications. Compared to other locoregional flaps, its major advantages include excellent donor site healing due to anatomical proximity, the ability to incorporate sentinel lymph node biopsy (SLNB) within the same incision if required in the parotid region, and the resemblance of the flap tissue to normal, hairless facial skin. In contrast, skin grafts—although technically simpler and more versatile in large defects—often result in noticeable contour irregularities, pigmentation mismatch, and increased scar contracture risk over time.[5] In this study, none of the patients who underwent V-Y advancement flap reconstruction experienced vascular compromise within the flap. A comparable safety profile was also highlighted in a case report on V-Y advancement flap reconstruction after Mohs surgery for a mid-temporal defect, which achieved uneventful healing and satisfactory cosmetic results.[6] The mean time required for flap elevation and inset was approximately 15 minutes, indicating a relatively swift procedure. An additional advantage was the absence of any distant incision lines, thereby avoiding visible donor site scarring. Since the flap is elevated superficial to the superficial temporal fascia, there is no associated risk of injury to the frontal branch of the facial nerve during dissection.

Table 2. Comparison of FACE-Q Scores Between V-Y Advancement Flap and Full-Thickness Skin Grafting Groups

Module	Group	Mean Score	Median	Standard Deviation	*P*
Facial expression	V-Y flap	28.29	30.0	3.59	**.002***
	Graft repair	19.29	20.0	2.98	**.002***
Emotional state	V-Y flap	28.29	28.0	3.20	**.0021***
	Graft repair	19.29	20.0	2.43	**.0021***
Psychological assessment	V-Y flap	27.86	30.0	3.08	.358
	Graft repair	26.86	28.0	3.02	.358

A *P*-value of less than .05 was considered statistically significant. Asterisks indicate statistically significant values.

A significant contribution of the study lies in incorporating patient-reported outcome measures (PROMs) through the FACE-Q, a validated, modular instrument specifically designed to evaluate aesthetic procedures from the patient's perspective. The FACE-Q covers multiple domains, including satisfaction with facial appearance, psychological well-being, and social function.[7] The results revealed that patients in the V-Y flap group reported significantly higher FACE-Q scores across all evaluated domains. This finding underscores the importance of aesthetic harmony and scar concealment, especially in highly visible areas such as the temporal region. Furthermore, compared to island flaps harvested from hair-bearing scalp, the hairless nature of the V-Y advancement flap offers a notable aesthetic advantage, particularly in exposed facial regions where hair presence would be undesirable.[8] This characteristic likely contributed to higher FACE-Q scores in the study, especially in the domains related to facial appearance and patient satisfaction, as the flap better matched the native skin in both texture and appearance without introducing hair-bearing tissue into aesthetically sensitive zones. Functionally, both methods achieved stable coverage without compromising underlying anatomical structures. However, the V-Y flap demonstrated advantages in preserving regional mobility and reducing donor site morbidity, contributing to improved overall outcomes. Compared to skin grafts, the V-Y advancement flap demonstrates superior aesthetic outcomes, particularly in terms of color match and contour. The flap maintains the same level as the surrounding tissue, thereby avoiding the common complications seen with grafts such as contour depression and pigment mismatch.

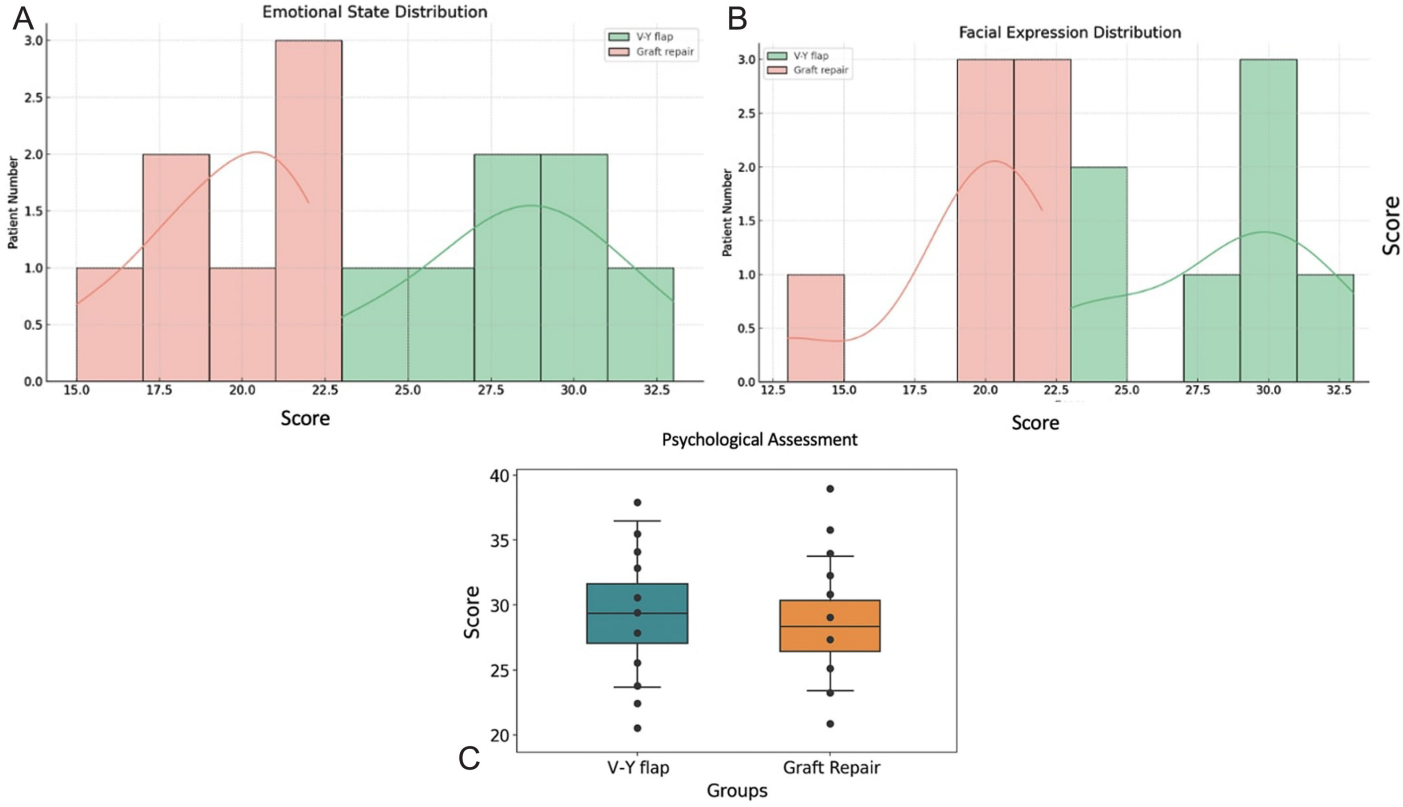

Figure 5. A: Statistical distribution and comparison between groups based on FACE-Q questionnaire results according to emotional state distribution. B: Statistical distribution and comparison between groups based on FACE-Q questionnaire results according to facial expression distribution. C: Statistical distribution and comparison between groups based on FACE-Q questionnaire results according to psychological assessment.

The statistical analysis using the FACE-Q Aesthetic modules highlighted important distinctions between the 2 reconstructive methods. Patients in the V-Y advancement flap group scored significantly higher in both the facial expression and emotional state domains, with *P*-values of .002 and .0021, respectively. These scores reflect not only improved aesthetic outcomes from a clinical standpoint but also a profound impact on patient-reported emotional well-being and facial self-perception.

The increased satisfaction in facial expression may be attributed to the V-Y flap's ability to maintain facial contour, skin texture, and color match more effectively than skin grafts. The preservation of native skin architecture in flap-based reconstruction likely facilitates a more natural postoperative appearance, which is particularly critical in the visible frontotemporal area. Furthermore, the high vascularity of the flap supports robust healing, minimizing complications such as depression or graft contraction that can distort expression. The significant improvement in the emotional state domain also underscores the psychological benefit of aesthetically favorable outcomes. Patients treated with V-Y flaps likely perceived their reconstruction as more harmonious and less stigmatizing, contributing positively to their emotional resilience and confidence during social interactions. In contrast, the psychological assessment domain, which includes broader constructs like self-worth and coping mechanisms, did not show a statistically significant difference ($P = .358$) between the groups. This discrepancy between Emotional State and Psychological Assessment scores may be explained by the nature of the constructs measured. While the emotional state domain reflects short- to medium-term emotional responses to facial appearance—such as self-consciousness, confidence in social interactions, and satisfaction with facial expression—these are more directly influenced by visible aesthetic outcomes, which were clearly superior in the V-Y flap group. In contrast, the psychological assessment domain encompasses more stable, long-term psychological traits, including self-worth, resilience, and coping mechanisms, which are less likely to change dramatically within a 1-year period and may depend on multiple life factors beyond surgical results. Therefore, although improved aesthetic outcomes positively influenced emotional well-being, deeper psychological constructs may require longer follow-up or additional psychosocial interventions to exhibit measurable change. This could suggest that while aesthetic outcomes directly influence facial satisfaction and emotional responses, deeper psychological adaptations may depend on longer-term factors or individual patient coping strategies. The findings are consistent with previous reports demonstrating that local flap reconstructions yield higher patient satisfaction and superior aesthetic integration compared to skin grafts in temporal region reconstruction. In the cited study, these outcomes were assessed using the Vancouver Scar Scale and Manchester Scar Scale, further underscoring the aesthetic benefits of flap-based reconstruction.[9] In this series, the V-Y advancement flap effectively provided these advantages, further supporting its role as a preferred option in appropriately selected temporal defects. These findings are consistent with previous studies that emphasized the superiority of local flap techniques over skin grafting in aesthetically sensitive facial areas. A comparison of local flaps and full-thickness grafts in the temple and forehead region demonstrated significantly

higher patient satisfaction and lower complication rates with advancement and rotation flaps, particularly in terms of color match and contour integrity.[10] Similarly, it was highlighted that full-thickness skin grafts often resulted in higher incidences of postoperative pigmentation mismatch and contour irregularities, especially in mobile or high-visibility facial zones such as the temporal region.[11] These issues can lead to patient dissatisfaction despite technically successful graft take.

The study contributes to the growing body of evidence by quantitatively supporting these observations through the use of the validated FACE-Q instrument. Unlike previous studies that often relied solely on surgeon-reported outcomes or generic quality-of-life surveys, the use of FACE-Q allowed for a more nuanced understanding of how patients themselves perceived the aesthetic and emotional impacts of their reconstruction. This aligns with recent trends in reconstructive surgery, where PROMs are increasingly regarded as critical indicators of success.[12] Notably, the findings also contrast with a subset of studies where full-thickness grafting was deemed sufficient for small temporal defects. However, these studies often did not incorporate patient-reported satisfaction scores or were limited to shorter follow-up durations, potentially underestimating the long-term aesthetic drawbacks of grafting in visible regions.

Despite these findings, it is important to acknowledge limitations. V-Y flaps are generally suitable for small to medium-sized defects and require adequate laxity in the surrounding tissue. In contrast, skin grafts remain indispensable in cases where local tissue is insufficient or compromised. However, skin grafting may not be suitable in cases where the resection margins are deeper or when the wound bed includes exposed structures such as bare bone. Another limitation of this study is the absence of preoperative FACE-Q scores. Because the primary aim was to assess postoperative aesthetic outcomes between reconstruction techniques, only 1-year postoperative data were collected. Moreover, preoperative "Aesthetic" module scores would not have allowed a valid comparison between groups, as the oncologic lesions present prior to surgery substantially alter facial appearance. Future prospective studies including both pre- and postoperative assessments may provide additional insights into the changes in patient-reported outcomes over time.

Overall, while both techniques can yield satisfactory functional results, V-Y advancement flaps offer superior patient-reported aesthetic outcomes when used in appropriately selected cases. The integration of instruments like FACE-Q into surgical evaluation provides valuable insight into the patient's perspective and should be considered a standard component in future reconstructive studies.

V-Y advancement flaps provide superior aesthetic outcomes compared to full-thickness skin grafts for reconstruction of moderate frontotemporal defects, as evidenced by significantly higher FACE-Q scores in the facial expression and emotional state domains. These advantages are likely related to improved skin match, contour preservation, and minimal donor site morbidity, without compromising oncologic safety. Given these benefits, the V-Y flap represents a reliable first-line option in appropriately selected patients, and future larger-scale studies with longer follow-up are warranted to confirm these findings.

Data Availability Statement: The data that support the findings of this study are available on request from the corresponding author.

Ethics Committee Approval: Ethical committee approval was received from the Ethics Committee of Istanbul University-Cerrahpaşa (Approval no: 1ikK1m55, Date: June 14 2023.

Informed Consent: Written informed consent was obtained from the patients who agreed to take part in the study.

Peer-review: Externally peer-reviewed.

Author Contributions: Concept – E.Y.; Design – A.E.; Supervision – A.E.; Resources – E.Y.; Materials – E.Y.; Data Collection and/or Processing – A.E.; Analysis and/or Interpretation – E.Y.; Literature Search – E.Y.; Writing Manuscript – E.Y.; Critical Review – A.E.

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