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The Temporoparietal Fascial Flap: A Versatile and Reliable Tool in Craniofacial Reconstruction

Mohammad N. Albdour [1], Alaa S. Jumeian [1], Imad Z. Mouasher [1], Hussien R. Al-Nawaiseh [1], Nadeen A. Al Adaileh [1]

1. Department of Plastic and Reconstructive Surgery, Royal Rehabilitation Center, Jordanian Royal Medical Services, Amman, JOR

Corresponding author: Mohammad N. Albdour, mbdooor@yahoo.com

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Abstract

Background: The superficial temporal artery (STA) supplies the temporoparietal fascial flap (TPFF), a thin, flexible, well-vascularized fascial flap. Because of its distinct anatomical characteristics, it is particularly well-suited for craniofacial restoration, where intricate three-dimensional abnormalities require thin yet durable coverage. Despite its adaptability, the TPFF is still underutilized due to donor-site morbidity concerns and a lack of knowledge about its full reconstructive potential.

Objectives: This study describes the indications, surgical techniques, and clinical outcomes of TPFF reconstruction in a retrospective craniofacial case series.

Methods: Thirty patients who underwent craniofacial reconstruction using the TPFF at our institution between January 2014 and December 2025 were retrospectively reviewed. Data on patient demographics, defect etiology, flap dimensions, operative technique, postoperative complications, and functional and aesthetic outcomes were analyzed.

Results: Thirty patients were included: 18 males (18/30, 60.0%) and 12 females (12/30, 40.0%). The mean age was 28.2 ± 23.5 years (range: 7-75 years). Indications included auricular reconstruction in 15 patients (15/30, 50.0%), orbital/facial reconstruction in five (5/30, 16.7%), scalp/calvarial reconstruction in five (5/30, 16.7%), and skull-base reconstruction in five (5/30, 16.7%). Flap-related complications occurred in four patients (4/30, 13.3%), including partial flap necrosis in three (3/30, 10.0%) and complete flap loss in one (1/30, 3.3%). No wound infections or facial nerve injuries were documented. At a mean follow-up of 12 months, complete flap survival without necrosis was observed in 26 patients (26/30, 86.7%), while flap viability without complete flap loss was observed in 29 patients (29/30, 96.7%).

Conclusions: For a variety of craniofacial abnormalities, the TPFF represents a dependable and adaptable choice for reconstruction, and careful surgical technique may help reduce donor-site problems.

Categories: Plastic Surgery
Keywords: craniofacial reconstruction, ear reconstruction, orbital reconstruction, skullbase, temporal artery, temporoparietal fascial flap

Introduction

Craniofacial reconstruction represents one of the most challenging domains in plastic and reconstructive surgery. Defects in the head and neck region, whether arising from oncologic resection, trauma, infection, or congenital anomalies, demand reconstructive solutions that not only restore shape but also preserve critical functions, including vision, hearing, mastication, and facial expression [1-5]. Despite its well-established utility, the temporoparietal fascial flap (TPFF) remains underused by many reconstructive surgeons, possibly due to concerns about site alopecia and unfamiliarity with the surgical anatomy or the perceived technical difficulty of the dissection. The purpose of this study is to present our institutional experience with 30 consecutive TPFF reconstructions, delineate the indications and technical nuances, and evaluate clinical outcomes and complications across a diverse range of craniofacial defects [5,6].

Surgical anatomy

Understanding the layered anatomy of the temporal region is essential for safe and effective TPFF harvest [7,8]. The temporal region is organized into five distinct layers from superficial to deep: skin and subcutaneous fat; superficial temporal fascia (temporoparietal fascia/TPFF layer); loose areolar tissue (the critical glide plane during dissection); deep temporal fascia (temporalis fascia), which is divided into superficial and deep leaflets; temporalis muscle.

The superficial temporal fascia

The temporoparietal fascia is a thin (1-2 mm) well-vascularized layer of areolar connective tissue that represents the cranial extension of the superficial musculoaponeurotic system (SMAS). It envelopes the superficial temporal vessels and the auriculotemporal nerve. The fascia is adherent to the dermis superiorly and separated from the deep temporal fascia by a loose areolar plane that facilitates subfacial dissection [7-9].

Vascular supply

The TPFF receives its primary blood supply from the superficial temporal artery (STA), which arises as a terminal branch of the external carotid artery within the parotid gland. The STA divides into frontal and parietal branches approximately three cm above the zygomatic arch [7,9]. These branches course within the superficial temporal fascia and give off multiple fascial perforators, creating a robust vascular network capable of supporting large fascial flaps [8,9].

Innervation considerations

The frontal (frontotemporal) branch of the facial nerve has a variable course in the temporal region. Near the zygomatic arch, it lies deep to the temporoparietal fascia and superficial to the deep temporal fascia, becoming closely related to the undersurface of the temporoparietal fascia more superiorly [10,11]. The overlying scalp flap is elevated in a subfollicular plane, whereas the TPFF is elevated in the loose areolar plane between the TPFF and the deep temporal fascia. Anterior and inferior dissection near the zygomatic arch is performed cautiously, without blind deep dissection, to avoid injury to the frontal branch. Injury to the frontal branch may cause frontalis weakness or paralysis, loss of forehead wrinkling, impaired eyebrow elevation, brow ptosis, and forehead asymmetry, and the deficit may be transient or persistent depending on the severity of nerve injury. No clinical facial nerve injury was documented in this series. The auriculotemporal nerve, which supplies sensation to the anterior auricle and temporal scalp, courses in close proximity to the superficial temporal vessels and is also protected during flap elevation [10,11].

Materials And Methods

Study design

A retrospective observational study review was conducted of all patients who underwent TPFF-based craniofacial reconstruction at the Royal Rehabilitation Center between January 2014 and December 2025. Ethical approval was obtained from the Institutional Review Board of the Jordanian Royal Medical Services (Approval Number: 24-2/2026). Written informed consent for publication of clinical information and identifiable photographs was obtained from all adult patients or from the parents/legal guardians of pediatric patients. Surgical procedures and data use were obtained from all patients in accordance with the Declaration of Helsinki [12].

Inclusion and exclusion criteria

Patients were included if they had a primary craniofacial defect requiring reconstruction, underwent TPFF as the primary or adjunct reconstructive modality, and had a minimum postoperative follow-up of six months, with most patients followed for approximately 12 months. Patients with previous ipsilateral temporal surgery, prior radiation to the donor site, or known comorbidities of the superficial temporal artery were excluded.

Procedure

The procedure begins with careful analysis of the indication for the TPFF flap, the etiology of the defect or the reconstructed part, the size, shape and depth of the defect, and how far it is from the territory of the flap. Preoperative Doppler mapping and documentation of the course of the superficial temporal artery and its parietal and frontal branches were routinely performed in all patients to guide flap design. Accurate design of the flap dimensions is needed according to the defect, the arc of movement of the flap, and the point of movement and contouring, whether advancement, rotation, turnover, or transposition.

The required design of the flap dimension according to the defect must take into consideration not to end with a short flap, to obtain an adequate flap, and to reach and cover the defect. The surgical procedure starts with infiltration of local anaesthetics, 1 to 2% xylocaine in 100,000 adrenaline, in the subfollicular plane superficial to the TPFF, avoiding injecting adrenaline at the site of the mapped superficial temporal artery. The incision used for harvest of the flap is a T-shaped incision, a zigzag scalp incision or a through-the-same incision at the field of reconstruction if a short flap is required.

Careful dissection was done in the subfollicular plane between the TPFF and the subfollicular plane using a scalpel or cutting cautery (Colorado needle, setting 19). This careful, precise dissection is essential in the preservation of the hair follicle and integrity of the TPFF to avoid postoperative alopecia and ensure adequate scalp vascular integrity, avoiding any vascular arterial or venous injury to the flap after elevation. The flap is elevated in the loose areolar plane of tissue, including loose areolar tissue with the flap, to ensure adequate flap viability and thickness and careful anterior and inferior dissection near the

zygomatic arch is undertaken to preserve the frontal branch of the facial nerve.

Routine direct identification of the frontal branch was not performed. Nerve preservation relied on strict maintenance of the correct fascial plane and cautious anterior dissection near the zygomatic arch. After elevation of the flap, the flap is moved to the operation site in the proper contouring, either with advancement, rotation, turnover or transposition according to the site of the reconstruction. Careful hemostasis is secured before insertion of the flap, insetting the flap in a tension-free manner into the required reconstruction field, and the use of drains if indicated.

In our series, Medpor auricular reconstruction was performed as a single-stage procedure. The residual cartilage remnant was removed. Auricular position and symmetry were planned using a transparent template based on measurements from the contralateral normal ear, including total auricular length and width, upper-, middle-, and lower-third projection, and the relationship to the lateral eyebrow, lateral canthus, and subnasale.

The preformed three-dimensional Medpor framework provided the required projection and was stabilized in the mastoid region with polydioxanone (PDS) sutures. The TPFF was then used to envelop the entire framework, including its anterior, superior, inferior, and posterior surfaces, providing complete vascularized coverage and preserving the three-dimensional contour. In Medpor auricular reconstruction, a closed-suction drain was placed between the Medpor framework and the TPFF to create negative pressure and promote close adherence of the fascia to the framework. The overlying skin graft was secured with a tie-over dressing.

Flap dimensions, pedicle configuration, and transfer method were individualized according to the size, location, depth, and reconstructive requirements of each defect. Depending on the defect, the flap was transferred by advancement, rotation, turnover, or transposition. Because this was a retrospective series, detailed quantitative measurements of flap dimensions, pedicle length, pedicle-base width, and transfer configuration were not consistently available in the operative records. For Medpor auricular reconstruction, the TPFF length was typically 13 cm; alternatively, it was designed to be approximately four cm longer than the planned total auricular length. The flap was centered on the superficial temporal artery, with its width extending approximately two cm anterior and two cm posterior to the planned reconstructed auricle. For other reconstructive indications, flap dimensions were individualized after planning the arc and pivot point of rotation to ensure tension-free reach and coverage of the defect.

Preoperative assessment

All patients underwent preoperative clinical assessment and Doppler ultrasonography to confirm the patency and map the course of the superficial temporal artery and its frontal and parietal branches. This mapping was routinely incorporated into flap planning. Intraoperatively, handheld Doppler assessment was repeated selectively when clinical palpation of the artery or flap pedicle was equivocal [13].

Outcome assessment

Primary outcomes included flap survival (total or partial flap loss), achievement of the reconstructive goal, and donor-site morbidity, including alopecia, wound complications, scar quality, and nerve injury. Functional and aesthetic outcomes were assessed during follow-up using a combination of clinical examination by the surgical team, review of standardized postoperative photographs, and patient- or parent-reported satisfaction. Functional success was defined as viable flap coverage, stable wound healing, and achievement of the indication-specific reconstructive goal. In skull-base reconstruction, the absence of cerebrospinal fluid leakage and meningitis was also assessed. Aesthetic assessment included contour, symmetry, skin-graft integration when applicable, scar appearance, and patient or parent satisfaction. No validated functional, aesthetic, or patient-reported outcome scale was used.

Statistical analysis

This was a descriptive retrospective case series. Categorical variables are presented as frequencies and percentages, and continuous variables are summarised using means. No hypothesis tests, p-values, or comparative analysis were performed because no pre-specified comparison groups were included and the cohort was heterogeneous with respect to defect type and reconstructive indication.

Results

Patient demographics and indications

30 patients were included in the retrospective series (18 male[60.0%), 12 female[40.0%]). The mean age was 28.2 ± 23.5 years (median, 17 years; interquartile range, 12-50 years; range, 7-75 years). The mean follow-up period was approximately 12 months. The overall distribution of indications was as follows: Auricular reconstruction accounted for the largest group (15 cases, 50%), followed by skull base reconstruction (5 cases, 16.7%), calvarial and scalp reconstruction (5 cases, 16.7%), and fascial/orbital/zygoma/maxilla coverage (5 cases, 16.7%), as shown in Table *1*.

Indication	Subcategory	n (%)
Auricular reconstruction	Single-stage auricular reconstruction with Medpor and TPFF	6 (20.0)
	Second-stage costal cartilage reconstruction using the Nagata technique	4 (13.3)
	Post-tumor auricular reconstruction	2 (6.7)
	Post-traumatic auricular reconstruction	2 (6.7)
	Post-burn auricular reconstruction	1 (3.3)
Skull base reconstruction	Skull base reconstruction	5 (16.7)
Calvarial/scalp reconstruction	Scalp and calvarial reconstruction	5 (16.7)
Facial/orbital/maxilla reconstruction	Coverage of Orbit, zygoma and maxilla defects	5 (16.7)
Total		30 (100.0)

TABLE 1: Indications for temporoparietal fascial flap reconstruction.

Distribution of reconstructive indications

Auricular reconstruction was performed in 15 patients. This included single-stage total auricular reconstruction with Medpor and TPFF flap coverage in six patients; second-stage costal cartilage construction using the Nagata technique in four patients; post-tumour excision auricular reconstruction in two patients; post-traumatic auricular reconstruction in two patients; post-burn auricular reconstruction in one patient. Skull base reconstruction using TPFF was performed in five patients, including defects following mastoidectomy and oncologic resection involving the mastoid cortex. Calvarial and scalp reconstruction was performed in five patients with post-tumor resection scalp defects, osteoradionecrosis, post-traumatic defects, exposed alloplastic mesh, or a need for dural defect coverage. Facial, orbital, zygoma, and maxilla coverage was performed in five patients, including patients with locally advanced squamous cell carcinoma, basal cell carcinoma, and other neoplastic conditions requiring wide resection with bone exposure or bone resection.

Illustrative cases

The following representative cases illustrate the use of the TPFF flap across the principal reconstructive indications in this series.

Orbital Reconstruction

The TPFF has been demonstrated to be particularly suited for orbital exenteration defects and medial canthal and lower eyelid support due to its thinness, which avoids the bulkiness that impairs prosthetic fitting following exenteration. In those cases, the fascia provides a well-conducted bed for skin grafting, allowing precise recreation of the concave orbital anatomy [13,14].

A 66-year-old man presented with locally advanced squamous cell carcinoma of the lateral canthus and eyelid invading the globe, maxilla, lateral orbital wall, and zygomatic arch. Following a wide excision with negative margins, enucleation, partial maxillectomy, and resection of the lateral orbital wall and zygomatic arch, the resulting defect was reconstructed using a temporoparietal fascial (TPF) flap and split-thickness skin graft (STSG) to provide vascularized coverage of exposed bone and resurface the orbital socket for future prosthetic rehabilitation and facilitate postoperative radiotherapy. The patient remains disease-free with a stable reconstruction and no evidence of local recurrence or metastasis after three years of follow-up. This case is illustrated in Figure *1*.

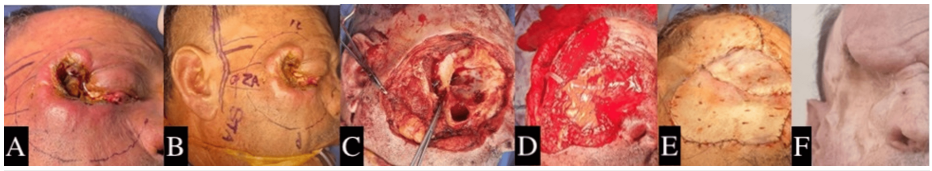


FIGURE 1: Orbital reconstruction in a 66-year-old man with locally advanced squamous cell carcinoma of the lateral canthus and eyelid.

(A) Preoperative view of the locally advanced periocular malignancy. (B) Preoperative markings for the resection and TPFF harvest. (C) Composite orbital defect after wide excision, enucleation, partial maxillectomy, and resection of the lateral orbital wall and zygomatic arch. (D) Pedicled TPFF transferred to provide vascularized coverage of exposed bone. (E) Split-thickness skin graft applied to resurface the reconstructed orbital socket. (F) Stable postoperative result at 3-year follow-up.

Auricular and Ear Canal Reconstruction

It was the most common use in our research; the TPFF has long been considered the standard approach for fascial flap for total and partial auricular reconstruction, as initially described by Brent and subsequently modified by Nagata and Firmin [15,16]. In our series, six patients underwent total auricular and ear canal reconstruction with the Medpore implant, and the TPFF was used to provide vascularized coverage over the framework [17]. The fascia-rich vascularity promotes adherence and viability of the framework scaffold while allowing subsequent skin grafting with minimal contraction [15,16].

A 7-year-old female presented with a failed staged autologous costal cartilage reconstruction for louble type microtia performed at another institution. The previous reconstruction resulted in severe cicatricial deformity, inadequate local soft tissue, an unsatisfactory aesthetic outcome, and significant psychological impairment. Given the depleted local tissue and failed autologous reconstruction, secondary single-stage total auricular reconstruction was undertaken using a porous polyethylene (Medpor) framework covered with a temporoparietal fascial (TPF) flap and split-thickness skin graft. Preoperative Doppler ultrasonography confirmed the patency of the superficial temporal artery and its frontal and parietal branches. The TPFF flap was selected to provide robust vascularized coverage of the alloplastic framework, minimizing the risk of implant exposure and extrusion in the sacred recipient bed. The postoperative course was uneventful with well-conducted aesthetic and reconstructive outcomes. This case is illustrated in Figure *2*.

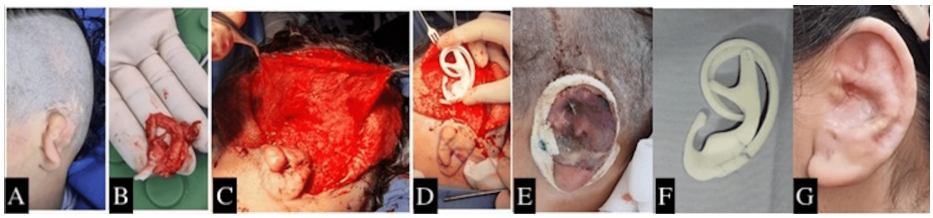


FIGURE 2: Secondary total auricular reconstruction in a 7-year-old girl after failed autologous costal cartilage reconstruction.

(A) Preoperative view showing a severely scarred, deformed auricular remnant. (B) Recipient-site preparation after release of scarred soft tissue. (C) Elevation of a pedicled TPFF based on the superficial temporal vessels. (D) Porous polyethylene (Medpor) auricular framework. (E) TPFF coverage of the Medpor framework and coverage with skin graft. (F) Porous Polyethylene Medpor framework (G) Healed postoperative result.

A 15-year-old male with a history of two failed autologous costal cartilage reconstructions presented with severe scarring of the auricular skin envelope and persistent auricular deformity. Owing to the failed previous reconstruction and compromised local soft tissue, secondary single-stage total auricular reconstruction was performed using a porous polyethylene Medpore framework covered with a temporoparital fascial flap and full-thickness skin graft. The TPF flap was selected to provide reliable vascularized coverage of the alloplastic framework, compensate for the scarred soft tissue envelope, and minimize the risk of implant exposure and extrusion. The postoperative course was uneventful with satisfactory aesthetic and reconstructive outcomes. This case is illustrated in Figure *3*.

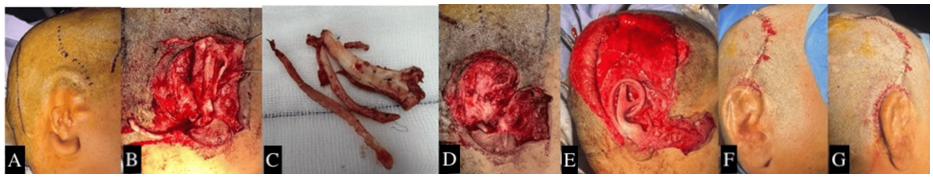


FIGURE 3: Secondary total auricular reconstruction in a 15-year-old boy after two failed autologous costal cartilage reconstructions.

(A) Preoperative view of the scarred auricular deformity. (B) Excision of the scarred soft-tissue envelope and preparation of the recipient site. (C) Removed remnants of the previous costal cartilage framework. (D) Prepared recipient bed for secondary reconstruction. (E) Medpor framework to be covered with a pedicled TPFF. (F) Full-thickness skin-graft inset. (G) Immediate postoperative posterior view after framework coverage and skin-graft inset.

Post-burn Auricular Reconstruction

A 7-year-old female presented with extensive postburn alopecia and partial auricular loss. Reconstruction was performed in a staged manner using serial scalp tissue expansion to restore the hair-bearing scalp, followed by costal cartilage auricular reconstruction covered with a TPFF and split-thickness skin graft. The TPFF provided reliable vascularized coverage of the cartilage framework within the hostile post-burn soft tissue environment, resulting in a stable reconstruction with satisfactory functional and aesthetic outcomes. This case is illustrated in Figure *4*.

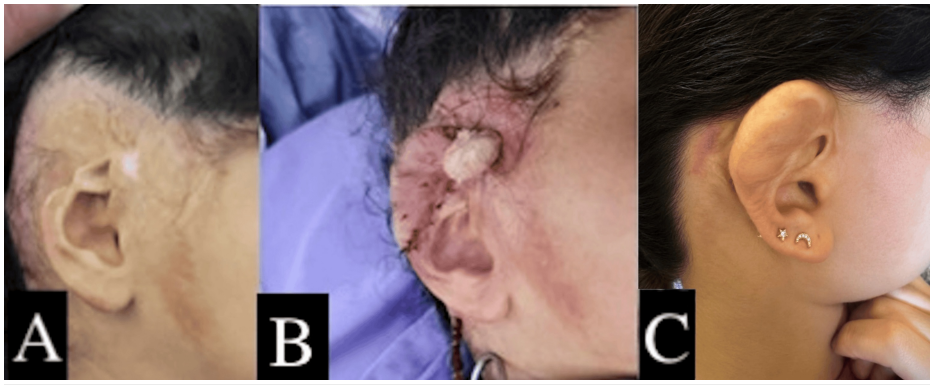


FIGURE 4: Post-burn auricular reconstruction in a 7-year-old girl.

(A) Preoperative view showing post-burn alopecia and partial auricular loss. (B) Staged reconstruction after serial scalp expansion, with costal cartilage framework covered by TPFF. (C) Late postoperative appearance after split-thickness skin-graft coverage.

Second Stage Nagata Elevation With TPFF, Cartilage Block for Elevation and Hair Ablation

A 9-year-old patient underwent second-stage auricular elevation following primary costal cartilage reconstruction with the Nagata technique. A TPFF was used to provide vascularized coverage of the elevated cartilage block and to facilitate hair ablation of the low temporal hairline, thereby optimizing the aesthetic contour of the reconstructed auricle. The postoperative course was uneventful with satisfactory projection and aesthetic outcome. This case is illustrated in Figure *5*.



FIGURE 5: Second-stage Nagata auricular elevation with TPFF in a 9-year-old patient.

(A) Elevation of the reconstructed auricle through a postauricular incision. (B) Cartilage block used to establish auricular projection. (C) TPFF positioned to provide vascularized coverage of the elevated cartilage block and posterior auricular surface. (D) Early postoperative appearance after contour refinement. (E) Healed result with improved auricular projection and temporal hairline.

Post-traumatic Partial Auricular Reconstruction

A 20-year-old male previously healthy presented after two years with partial auricular loss due to a quarrel and human bite; reconstruction was performed in a single stage using a partial costal-cartilage framework to restore the missing auricular aesthetic subunits. The TPFF provided vascularized coverage of the cartilage framework, and a split-thickness skin graft provided the external skin coverage. This case is illustrated in Figure *6*.

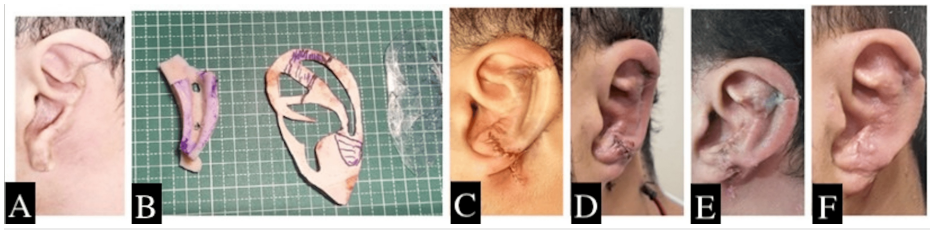


FIGURE 6: Single-stage post-traumatic partial auricular reconstruction in a 20-year-old man after human-bite injury.

(A) Preoperative partial auricular defect. (B) Template and partial costal cartilage framework designed to restore the absent aesthetic subunits. (C) Reconstruction using the partial cartilage framework. (D) Vascularized TPFF coverage of the partial costal-cartilage framework, followed by coverage with a split-thickness skin graft. (E) Intermediate postoperative healing. (F) Final postoperative result.

Skull and Scalp Reconstruction

Skull defects, particularly those arising from ablative tumor surgery, osteoradionecrosis, and trauma, present unique challenges due to the risk of intracranial contamination and the demanding healing environment of an irradiated field [11,18,19]. The TPFF's reliable vascular supply from a pedicle that typically lies outside the radiation field, combined with its resistance to infection, makes it an ideal solution for skull base coverage [18,19].

In our series, five cases of skull base were reconstructed; four involved post-oncological defects in previously irradiated patients. No cases of postoperative meningitis or cerebrospinal fluid leakage were observed, supporting the TPFF effectiveness as a barrier in contaminated fields.

Calvarial Reconstruction With Split Calvarial Bone Graft and TPFF Coverage

A 14-year-old male who had previously undergone craniotomy with artificial bone reconstruction presented with multiple chronic nonhealing ulcers of the left frontotemporal scalp and exposed alloplastic bone material persisting for several months. After removal, the artificial bone reconstruction was accomplished using a split calvarial autologous bone graft harvested from the parietal area combined with TPFF coverage and scalp advancement. The TPFF provided reliable vasculrized coverage over the newly placed autologous bone graft, facilitating wound healing and scalp restoration in a previously compromised field. The patient was followed for 12 months. The late postoperative outcome is illustrated in Figure *7*.

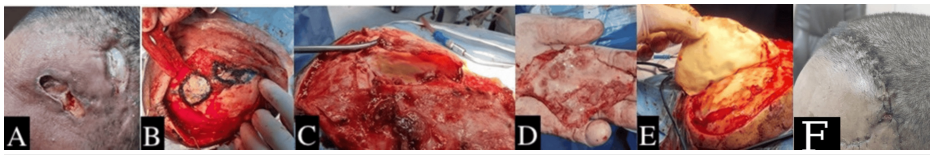


FIGURE 7: Calvarial Reconstruction in a 14-year-old boy with Post-Traumatic Cranioplasty procedure, Exposed Alloplastic Bone Material and Chronic Non Healing Scalp Ulceration

(A) Preoperative view of the chronic nonhealing scalp defect. (B) Left frontotemporal scalp and calvarial defect after removal of the exposed alloplastic cranioplasty material. (C) Split calvarial autologous bone graft harvested from the parietal region. (D) Calvarial defect reconstructed with the split bone graft. (E) Removal of the previously placed infected artificial dural patch. (F) Late postoperative clinical appearance at follow-up.

Reconstruction of Complex Postauricular and Mastoid Defects Following Oncologic Resection

A 50-year-old medically free male presented with a neglected ulcerative lesion involving the left mastoid and postauricular region. Skin biopsy and positron emission tomography (PET) demonstrated a high-risk basosquamous carcinoma with invasion of the conchal cartilage and outer cortex of the mastoid bone. The patient underwent wide local excision with an oncologic safety margin, cortical mastoidectomy, and complete excision of the conchal cartilage while preserving the external auditory canal architecture. Reconstruction was performed using a TPFF based on the STA rotated posteriorly to provide vascularized coverage of the defect in combination with a scalp advancement flap and full-thickness skin graft. The TPFF was selected to provide durable vascularized coverage of the exposed mastoid bone to facilitate wound healing and preserve the contour and stability of the auricular region and provide a well-vascularized bed for postoperative radiation. This case is illustrated in Figure *8*.



FIGURE 8: Reconstruction of complex postauricular and mastoid defects in a 50-year-old man after oncologic resection of basosquamous carcinoma.

(A) Preoperative ulcerative lesion of the postauricular and mastoid region. (B) Composite defect after wide local excision, cortical mastoidectomy, and conchal cartilage resection. (C) Elevation of a TPFF based on the superficial temporal artery. (D) Posterior rotation and inset of the TPFF to cover the exposed mastoid bone. (E) Scalp advancement and full-thickness skin-graft reconstruction. (F) Early postoperative appearance. (G) Healed postoperative result.

Salvage After Complete TPFF Loss During Single-Stage Medpor Auricular Reconstruction

A 10-year-old boy underwent single-stage total auricular reconstruction using Medpor framework and TPFF, which was complicated by complete flap necrosis. Following debridement of the necrotic flap, the reconstructed ear was salvaged using the superficial layer of the deep temporal fascia. Photographs of the secondary salvage procedure and its postoperative outcome were not available in the archived records. The initial reconstruction and complication are illustrated in Figure *9*.

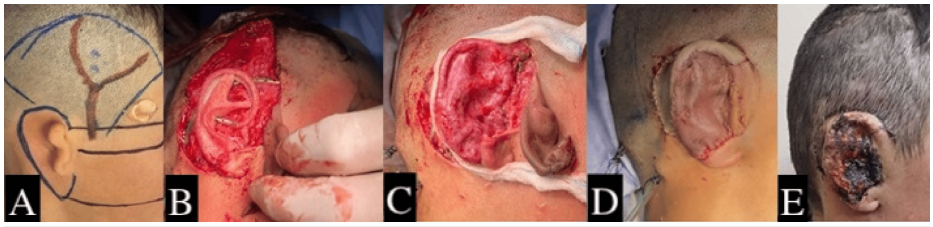


FIGURE 9: Single-stage Medpor total auricular reconstruction in a 10-year-old boy complicated by complete flap necrosis.

(A) Preoperative marking of the superficial temporal vascular pedicle and planned flap. (B) TPFF elevation. (C) Medpor framework coverage. (D) Early postoperative result. (E) Complete flap necrosis requiring debridement, reconstructed later on with superficial layer of deep temporal fascia.

Flap Outcomes and Complications

Complete flap survival, defined as the absence of any flap necrosis, was observed in 26 patients (26/30, 86.7%). Flap-related complications occurred in four patients (4/30, 13.3%), including complete flap loss in one patient (1/30, 3.3%) and partial flap necrosis in three patients (3/30, 10.0%). Flap viability without complete flap loss was therefore observed in 29 patients (29/30, 96.7%). Complete flap loss occurred after single-stage auricular reconstruction with a Medpor framework and TPFF in a previously scarred recipient bed and was attributed to vascular compromise. The Medpor auricular was successfully salvaged using the superficial layer of deep temporal fascia and skin grafting. Partial flap necrosis was managed conservatively with limited debridement and re-advancement and wound care accordingly. All cases were successfully managed, and no patient required repeat flap reconstruction.

The retrospective records did not consistently document the etiologic factors underlying flap complications. Although venous congestion was considered the most likely contributing mechanism in the cases of partial flap necrosis, a definitive case-level causal analysis was not possible.

No wound infections, CSF leaks, meningitis or alopecia along the incision line were reported in any patient, as shown in Table *2*, reflecting the robust vascularity of the TPFF and the meticulous technique employed. The absence of documented alopecia may be related to meticulous subfollicular dissection and preservation of the hair follicles at the donor site. Importantly, no facial nerve injuries were documented across all 30 cases. Preoperative marking of relevant safety landmarks and meticulous dissection within the correct subfascial plane above the loose areolar layer, avoiding injury to the frontal branch of the facial nerve.

Outcome	n (%)
Complete flap survival (no necrosis)	26 (86.7)
Partial flap necrosis	3 (10.0)
Complete flap loss	1 (3.3)
Flap viability without complete flap loss	29 (96.7)
Any flap-related complication*	4 (13.3)
Wound infection	0 (0)
Facial nerve injury	0 (0)
Meningitis	0 (0)
CSF Leak	0 (0)
Alopecia along the incision line	0 (0)

TABLE 2: Flap outcomes and complications.

* Includes partial flap necrosis and complete flap necrosis.

CSF: cerebrospinal fluid.

Discussion

This retrospective case series demonstrates the broad clinical utility (TPFF) in craniofacial reconstruction. Among 30 patients, auricular reconstruction was the most frequent indication (15/30, 50.0%), followed by skull base, calvarial/scalp, and facial/orbital/zgoma/maxilla reconstruction (5/30, 16.7% each). Overall flap survival was 96.7% (29/30). These findings support the use of the TPFF as a thin, pliable, and vascularized local flap when reliable coverage is required without the additional operative demands of free-tissue transfer [3,5,6].

The variety of indications in this study is consistent with previous reports describing TPFF use in auricular, orbital, facial soft-tissue, scalp and skull base reconstruction [3,5,6,13]. The flap is particularly useful when the defect requires conformable vascularized tissue rather than substantial bulk. Its arc rotation and proximity to the orbit, auricle, temporal scalp, and skull base permit reconstruction of selected regional defects while avoiding microvascular anastomosis.

Auricular reconstruction represented half of the present cases. The TPFF has an established role in reconstruction of partial and total auricular defects, including coverage of costal cartilage framework and porous polyethylene implants. [2,15,16,17]. In our series, six patients underwent single-stage auricular reconstruction with Medpor and TPFF coverage, while four underwent second-stage auricular elevation after costal-cartilage reconstruction. In patients with scarred or depleted local soft tissue, vascularized TPFF coverage provided an additional soft tissue layer over the auricular framework. The use of porous polyethylene with TPFF coverage has also been described by Reinisch and Lewin, who emphasized complete vascularized facial coverage of the framework [17].

Five patients underwent skull base reconstruction, including four patients with post-oncologic defects in previously irradiated fields. No post-operative cerebrospinal fluid leakage or meningitis was documented in this subgroup. Although the series is small and uncontrolled, these findings are consistent with reports supporting vascular coverage for complex skull based defects, particularly when the operative field has been compromised by tumor ablation or radiotherapy [4,18,19].

Complications in the present study consisted of one complete flap loss and three cases of partial flap necrosis. The complete flap loss occurred after single-stage medpor auricular reconstruction in a scarred recipient bed; the framework was salvaged with superficial deep temporal fascia and skin grafting. The partial necrosis cases were managed with local wound care, limited debridement, and flap advancement, without repeated flap reconstruction. No wound infection or facial nerve injuries were documented. Published complication rates vary according to indication, recipient- site condition, flap design, and the definition of complications. Therefore, direct comparison with heterogeneous published series should be interpreted cautiously [13].

Versatility of the temporoparietal flap

The present series reinforces the role of the TPFF as a versatile workhorse flap in craniofacial reconstruction [5,13]. Its thin, pliable nature and well-vascularized tissue allow it to conform to complex three-dimensional defects that would challenge thicker, less malleable flaps [6,13]. The TPFF's proximity to critical craniofacial structures and its substantial arc of rotation make it accessible to a wide range of anatomical regions. Including orbit, auricle, ear canal, skull base, nose, and scalp without the complexity of free tissue transfer [3,5,6,13].

Beyond this established application, the TPFF has also been employed in a range of less commonly reported reconstructive indications. These include temporomandibular joint ankylosis, where it has been used as an interposition material alone or in combination with costal cartilage, as well as complex auricular reconstruction, including microtia, secondary ear reconstruction, and post-traumatic or post-burn auricular deformities. Additional applications include intraoral reconstruction for oral submucous fibrosis, orbital socket lining, lower eyelid reconstruction, and correction of scar-related ectropion [13]. The flap has also been used for soft-tissue augmentation of post-tuberculosis, post-traumatic, and post-infective cheek and lip deformities, coverage of post-auricular mastoid fistulae, and composite reconstruction incorporating temporalis muscle and structural grafts such as rib or cartilage. These diverse indications further illustrate adaptability of the TPFF as a vascularized tissue platform that can be tailored to provide soft tissue coverage, graft support, or composite reconstruction according to the specific requirement of the defect [13].

Importantly, its versatility extends beyond pedicled craniofacial reconstruction. The flap can also be harvested as a free vascularized facial flap, allowing transfer to distant recipient sites when thin, pliable, and well-vascularized tissue is required. Free TPFF has been successfully used for reconstruction of hand and finger defects, where its thin profile and smooth gliding surface are particularly advantageous for tendon function [20,21]. Its use as a free flap has subsequently been reported in other distal upper and lower extremity reconstructions, further demonstrating that the TPFF is not restricted to regional efficient applications [20,21].

Comparison with alternative reconstructive options

The TPFF is not a replacement for free flaps in craniofacial defects. Free tissue transfer remains appropriate when a defect requires greater tissue volume, longer reach, or composite tissue replacement [13,22,23]. In contrast, the TPFF is most useful when a thin, pliable, local vascularized flap is sufficient. Selection therefore is individualised according to the defect location, size, depth, previous surgery or radiotherapy, available recipient tissue, and reconstructive goals [6,13]. For craniofacial defects requiring thin, pliable coverage, the principal alternatives to the TPFF include the galeal flap, the radial forearm free flap, and the anterolateral thigh free flap [23,24]. The galeal flap offers comparable thinness but a more limited arc of rotation and reduced vascularity compared to the axial TPFF [6]. Free flaps provide greater reach and volume but at the cost of microsurgical complexity, longer operative time, and potential distant donor site morbidity [23,24]. The TPFF occupies a practical middle ground: it provides robust vascularity, a large surface area, and thin, pliable tissue without the need for microsurgical anastomosis in the majority of cases [3,4]. For patients in whom free-flap harvest is contraindicated, the TPFF represents an outstanding pedicled axial alternative [18].

Limitations

This study is limited by its retrospective design, single-center experience, and the heterogeneity of defects, which preclude direct comparison between reconstructive subgroups or with alternative flap options. The study did not include a control group, and no validated patient-reported outcome measure or formal aesthetic scoring scale was used. In addition, the sample size was insufficient for meaningful subgroup statistical comparisons. In addition, detailed operative measurements, including flap dimensions, pedicle characteristics, and transfer configuration, were not consistently recorded, which limited quantitative comparison across reconstructive indications. Although detailed patient-level operative measurements were not consistently available in this retrospective series, standard Medpor flap design parameters are described above. Donor-site morbidity was not assessed using a standardized or validated instrument. Although no clinical frontal-branch dysfunction or donor-site alopecia was documented, scar widening, temporal hollowing, and patient-reported donor-site outcomes were not consistently recorded; therefore, these outcomes could not be quantified reliably. Moreover, the small number of complications and heterogeneity of reconstructive indications precluded reliable subgroup analysis of complications by indication. Larger, prospective, multicenter studies using standardized functional, aesthetic, and patient-reported outcomes are needed to better define the relative role of the TPFF in craniofacial reconstruction.

Conclusions

The TPFF is a versatile and technically reproducible reconstructive option for a wide spectrum of craniofacial defects. In this retrospective series, most patients demonstrated complete flap survival without necrosis, while nearly all flaps remained viable without complete loss. Its thinness, pliability, robust vascularity, and regional availability make it well suited for orbital, auricular, skull-base, scalp, and midface reconstruction. Careful attention to surgical anatomy and meticulous dissection may help minimize donor-

site morbidity. These findings support the TPFF as a valuable option in the craniofacial reconstructive surgeon's armamentarium. However, prospective studies using standardized outcome measures are needed to confirm long-term functional, aesthetic, and donor-site outcomes.

Additional Information

Author Contributions

All authors have reviewed the final version to be published and agreed to be accountable for all aspects of the work.

Concept and design: Imad Z. Mouasher, Mohammad N. Albdour, Alaa S. Jumeian, Nadeen A. Al Adaileh

Acquisition, analysis, or interpretation of data: Imad Z. Mouasher, Mohammad N. Albdour, Hussien R. Al-Nawaiseh, Nadeen A. Al Adaileh

Drafting of the manuscript: Imad Z. Mouasher, Mohammad N. Albdour, Nadeen A. Al Adaileh

Critical review of the manuscript for important intellectual content: Imad Z. Mouasher, Mohammad N. Albdour, Alaa S. Jumeian, Hussien R. Al-Nawaiseh, Nadeen A. Al Adaileh

Supervision: Imad Z. Mouasher, Mohammad N. Albdour, Alaa S. Jumeian, Hussien R. Al-Nawaiseh

Disclosures

Human subjects: Informed consent for treatment and open access publication was obtained or waived by all participants in this study. Jordanian Royal Medical Services Ethical Committee issued approval 24-2/2026. **Animal subjects:** All authors have confirmed that this study did not involve animal subjects or tissue. **Conflicts of interest:** In compliance with the ICMJE uniform disclosure form, all authors declare the following: **Payment/services info:** All authors have declared that no financial support was received from any organization for the submitted work. **Financial relationships:** All authors have declared that they have no financial relationships at present or within the previous three years with any organizations that might have an interest in the submitted work. **Other relationships:** All authors have declared that there are no other relationships or activities that could appear to have influenced the submitted work.

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