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CASE REPORT
Reconstructive

Fat-augmented Temporal Fascia Flap for Defect Coverage following External Auditory Canal Cancer Resection

Yusuke Shikano, MD*
Hiroki Tashima, MD, PhD†
Kazuya Kuroda, MD, PhD*
Naoya Otani, MD, PhD*
Shien Seike, MD*
Tateki Kubo, MD, PhD*

Summary: Malignant tumors of the external auditory canal are rare and require surgical interventions such as lateral temporal bone resection (LTBR) for localized cases. This study introduces a novel approach, the lipofilling fascia flap technique, for external auditory canal reconstruction following LTBR or modified LTBR. The technique involves augmenting the temporal fascia flap with autologous fat grafting, aiming to enhance volume and improve outcomes. Two cases are presented, demonstrating successful reconstruction with minimal complications.
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Malignant tumors of the external auditory canal (EAC) present a rare clinical challenge, necessitating surgical interventions such as lateral temporal bone resection (LTBR) or modified LTBR (mLTBR).[1–3] However, there remains an ongoing debate about the best postresection reconstruction to prevent complications like delayed wound healing, chronic infections, and bone exposure.[4–6]

Free flaps like the ALT flap can cover large skin defects and provide ample soft tissue volume. However, they may lead to prolonged surgical times and vascular anastomotic complications. Pedicled fascia and muscle flaps are less invasive but have limited coverage. Free fat grafting, though simple, offers restricted volume and carries a risk of postoperative infections due to fat resorption.[6]

In our practice, we primarily use temporal fascia flaps for reconstruction post-LTBR or mLTBR. However, we have observed occasional alterations in postoperative auricular morphology (Fig. 1). Therefore, we hypothesized that fat grafting to the fascial flap could increase flap volume, leading to improved outcomes. Here, we report our experiences with the lipofilling fascia flap technique.

*From the *Department of Plastic and Reconstructive Surgery, Osaka University Hospital, Osaka, Japan; and †Tashima Dermatology and Plastic Surgery Clinic, Osaka, Japan.*
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CASE REPORT

Case 1

A 56-year-old man with right EAC fibrosarcoma (T1N0M0) underwent mLTBR to preserve the tympanic membrane due to localized tumor involvement within the EAC. Partial submandibular gland excision was also performed. Negative lateral margins were confirmed by intraoperative frozen sections. We then performed lipofilling of the temporal fascia flap for EAC reconstruction.

A T-shaped incision was made on the temporal region, and a fan-shaped incision was made to the deep temporal fascia. The temporal fascia flap, which includes temporoparietal fascia and deep temporal fascia, was elevated to the pivot point on the zygomatic arch (Fig. 2). Tumescent solution was then injected into the abdomen, and liposuction was performed. Using a 17-gauge epidural needle, 20 mL of centrifuged fat was injected into the temporal fascia flap using the Coleman technique,[7] taking care not to puncture the superficial temporal artery and vein (Fig. 3).

Full-thickness skin grafting was performed to reconstruct the EAC, stitched above the tympanic membrane. Subsequently, the fat-infected fascia flap was placed over the tissue defect and adhered to the skin graft. The wound healed without complications. The patient did not receive postoperative radiotherapy. The EAC has remained open postoperatively, maintaining an average hearing level of 26.3 dB.

Six months postoperatively, an enhanced computed tomography (CT) scan estimated fat survival using

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Fig. 1. Postoperative photograph showing ear deformity 18 months after reconstruction using only temporal fascia flap (without fat augmentation).

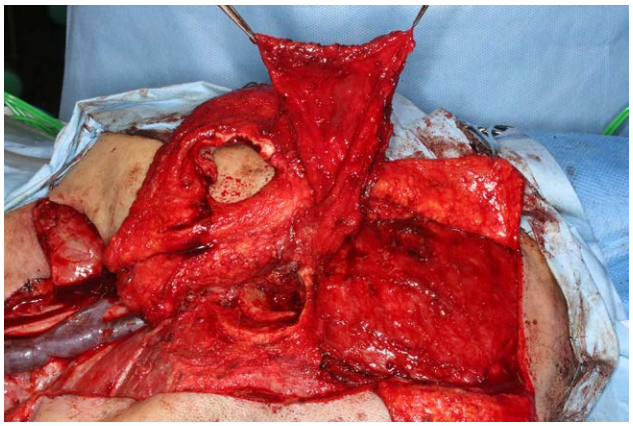

Fig. 2. Intraoperative photograph showing intraoperative temporal fascia flap. The temporal fascia flap, which includes temporoparietal fascia and deep temporal fascia, was elevated.

Synapse Vincent (Fujifilm Medical Co., Tokyo, Japan), at 5.24 mL, corresponding to a survival rate of 26% relative to the injected amount.

Case 2

An 82-year-old man with left EAC squamous cell carcinoma (T2N0M0) underwent LTBR without hearing preservation or tympanoplasty. After tumor resection, a temporal fascia flap was elevated and augmented with 16 mL of centrifuged abdominal fat. The fat-augmented flap was then positioned in the defect. There were no complications during wound healing. The patient received

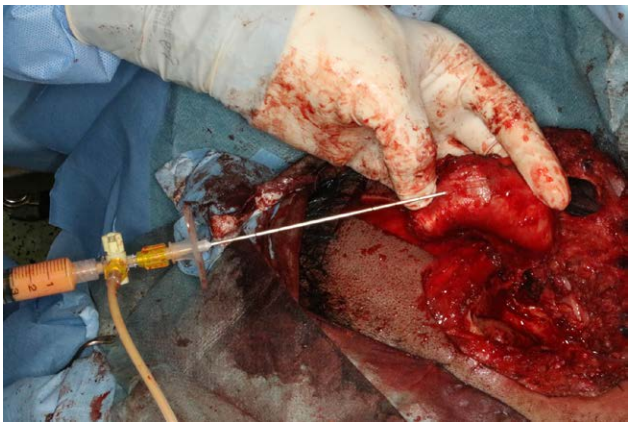

Fig. 3. Intraoperative photograph showing intraoperative fat injection to temporal fascia flap. Using a 17-gauge epidural needle, 20 mL of fat was injected into the temporal fascia flap.

postoperative radiotherapy of 66Gy in 33 fractions. At 6 months postoperatively, an enhanced CT scan showed 4.12 mL fat survival, indicating a 26% survival rate.

DISCUSSION

We achieved favorable outcomes by augmenting the temporal fascia flap with autologous fat grafting for early-stage EAC reconstruction post-LTBR. Over a year after surgery, there is less deformation of the auricular morphology than in previous cases (Fig. 4). (**See figure, Supplemental Digital Content 1,** which displays a photograph showing preoperative ear shape of case 1. **http://links.lww.com/PRSGO/D221**.)

Although temporal muscle flap is an alternative for reconstruction, it can cause concavity in the temporal region, leading us to prefer fascia flap reconstruction. However, in some cases following LTBR, volume shortfall can occur, necessitating an augmentation strategy. In addition, although the combination of muscle flap and skin grafting for EAC reconstruction is a well-established technique,[6,8] we demonstrated successful skin grafting onto a fat-injected fascia flap.

The fat-augmented temporal fascia flap offers several advantages, including inconspicuous scarring and simpler flap elevation technique. Nonetheless, it may not adequately address skin defects and has limitations in accommodating large defects. Moreover, there are risks associated with accidental vessel puncture during fat injection and limited flap placement due to the pivot point at the zygomatic arch. Additionally, harvesting the flap carries a risk of injuring the temporal branch of the facial nerve.

Extensive skin and subcutaneous tissue defects may necessitate a free flap; however, for partial temporal bone defects and EAC reconstruction, satisfactory results can be achieved simply with a fat-injected temporal fascia flap and additional skin grafting. We used a sharp needle for fat injections due to its maneuverability. It should be noted, however, that caution is required during fat injection to avoid puncturing the temporal vessels, which may lead to flap necrosis or fat embolism.

Fig. 4. Postoperative photograph of case 1, showing ear shape 18 months after reconstruction with fat-augmented temporal fascia flap. The ear is less deformed than in the case without fat augmentation.

Determining the correct amount of fat for injection is challenging. In the present cases, injections stopped when fat leakage occurred, indicating potential excess. Further analysis with more cases is needed for conclusive assessment.

In both cases, the fat tissue's engraftment rate within the fascia flap was approximately 26%, lower than that typically observed with intramuscular fat injections such as a fat-augmented latissimus dorsi flap.[9] This may be due to the poorer vascularity and the thinner nature of the fascia. Additionally, the amount of injected fat may be excessive.

The hearing level in case 1, with hearing preservation, remained comparable to the healthy side. In irradiated cases, Morita et al[10] reported that hearing worsens after irradiation, but because case 1 did not receive irradiation, its impact on hearing could not be determined.

Our report has limitations. First, we only describe two cases; so the generalizability of the lipofilling fascia flap technique is unclear. Second, determining the appropriate amount of fat injection relies on subjective evaluation by the surgeon. Third, fat survival rate is estimated via CT rather than direct measurement. Fourth, assessing auricular morphology depends on subjective healthcare provider assessment rather than objective measures. Finally, the 18-month follow-up period is relatively short, leaving uncertainties about the procedure's long-term impact.

CONCLUSIONS

The fat-augmented fascia flap technique offers a valuable alternative for EAC reconstruction post-LTBR or mLTBR, increasing volume with reduced invasiveness. Despite limitations in fat engraftment rates, the technique demonstrates promise in enhancing outcomes in selected cases. Further studies with a longer-term follow-up and larger cohorts are warranted to validate these findings.

Yusuke Shikano, MD
2-2 Yamadaoka, Suita-shi
Osaka 565-0871, Japan
E-mail: yumono0107@gmail.com

DISCLOSURE

The authors have no financial interest to declare in relation to the content of this article.

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