The Eurasia Proceedings of Health, Environment and Life Sciences (EPHELS)
ISSN: 2791-8033

The Eurasia Proceedings of Health, Environment and Life Sciences (EPHELS), 2024

Volume 13, Pages 132-136

ICGeHeS 2024: International Conference on General Health Sciences

Prevention of Venous Congestion in Superficial Temporal Artery Pedicled Scalp Flaps Using Deep Temporal Fascia

Aydin Turan
Gaziosmanpasa University

Abstract: Background: Venous congestion is an important complication in superficial temporal artery pedicled scalp flaps. In this study, we added deep temporal fascia, including the middle temporal vein, to the flap pedicle to prevent venous congestion in these flaps. Methods: A horn-shaped superficial temporal artery pedicled scalp flap was used to repair scalp and facial defects in 16 patients with a mean age of 52 years. The flaps were raised together with the superficial and deep temporal fascia at the base of the pedicle. The flap sizes ranged from 9×4 cm to 23×7 cm, and the mean follow-up period was seven months. Results: Venous congestion did not develop in any of the flaps. Abnormal hair distribution developed in three patients and hematoma in one patient. In all of the patients, the donor site was closed primarily and there was no flap loss. Conclusions: In scalp flaps with a superficial temporal artery pedicle, venous congestion can be prevented, and elevated more safely by adding a deep temporal fascia to the flap pedicle.

Keywords: Scalp flap, Venous congestion, Horn-shaped skin paddle, Deep temporal vein, Deep temporal fascia

Introduction

Superficial temporal artery (STA) pedicle scalp flaps are important surgical tools for scalp and face repairs. The hairless areas on the upper face (such as the frontal area) and hairy areas on the scalp are elevated over the STA or its branches as scalp flaps (Ozdemir et al.,2002; Hiremath et al.,2022). The most important disadvantage of STA pedicle scalp flaps is that they often cause venous congestion (Ozdemir et al.,2002; Ausen et al.,2011; Tenna et al.,2013; Loh et al.,2019). This may occur since the superficial temporal vein (STV) can not be included in the flap pedicle because of its greater variation (Ausen et al.,2011; Loh et al.,2019). When the STV can not be included in the flap pedicle, the venous return of the flap is provided by the thin concomitant veins that run on both sides of the STA and its branches (Beheiry et al.,2007; Imanishi et al.,2002), thus, venous congestion is inevitable in large flaps. Therefore, the deep temporal fascia (DTF), including the middle temporal vein, was added to the flap pedicle to increase venous outflow in the flaps.

Anatomy

The STA is one of the terminal branches of the external carotid artery and it passes 15.55 to 16.68 mm anterior to the tragus and ascends in the superficial temporal fascia (STF) (Pinar et al.,2006; Jean-Philippe et al.,2021). The STV does not have as predictable a course as the artery and generally does not follow the artery except in the most proximal part (Ausen et al.,2011; Loh et al.,2019; Delgova et al.,1991). This peculiarity of the STV can be main cause of the venous congestion observed in flaps raised over the branches of the STA with a narrow fascial pedicle. Thin parallel concomitant veins arise from the STV and run along both sides of the frontal and parietal branches of the STA(Beheiry et al.,2007; Imanishi et al.,2002) . These concomitant veins are the only structures that provide a venous circulation, especially in an axial pedicle flap raised over the branches of the STA; however, this circulation is sometimes insufficient. The middle temporal vein (MTV) has an average diameter of 1.88 mm and runs parallel to the frontal branch of the STA, between the superficial and deep layers

of the deep temporal fascia. Middle temporal vein, which forms a venous plexus with deep and superficial temporal veins in the temporal region and creates an alternative venous drainage system for the temporal region (Yano et al., 2014;Tansatit et al.,2015).

Patients and Methods

Between 2021- 2023, 16 scalp and facial defects were repaired using a horn-shaped STA pedicled scalp flap in 16 patients (15 male and 1 female). The mean patient age was 52 (16–88) years, and the mean follow-up period was seven (2–12) months. The flap sizes ranged from 9 × 4 to 23 × 7 cm.

Surgical Technique

Operations were performed under general anesthesia in all the patients. A horn-shaped skin paddle scalp flap was planned on the STA. The length of the flap skin paddle was planned to be at least twice the length of the defect area (Figure 1, left). Because the distal half was used to cover the donor area. The flap skin island was dissected in the subfascial (superficial temporal fascia) plane, starting from the upper edge. When the superior temporal line (STL) was reached at the lower edge of the flap skin island, the deep temporal fascia was cut and added to the flap pedicle (Figure 1, right). The flap pedicle was dissected down to the zygomatic arch and narrowed to approximately 3 cm from top to bottom (Figure 2, left and right).The flap was sutured to the defect area and donor area was closed primarily (Figure 3, left).

Results

Venous congestion did not develop in any flap and all flaps healed without loss. One patient developed a hematoma under the pedicle, and 3 patients developed abnormal hair distribution.

Case Reports

Case 1. A 88-year-old male with basal cell carcinoma in the right periorbital region was referred for treatment. The lesion was excised within safe surgical margins. A 23 x 7 cm horn-shaped scalp flap was planned (Figure 1, left). After the flap skin island was elevated in the subfascial plane (Figure 1, right), the flap pedicle was dissected at its base along with the STF and DTF (Figure 2, left and right).

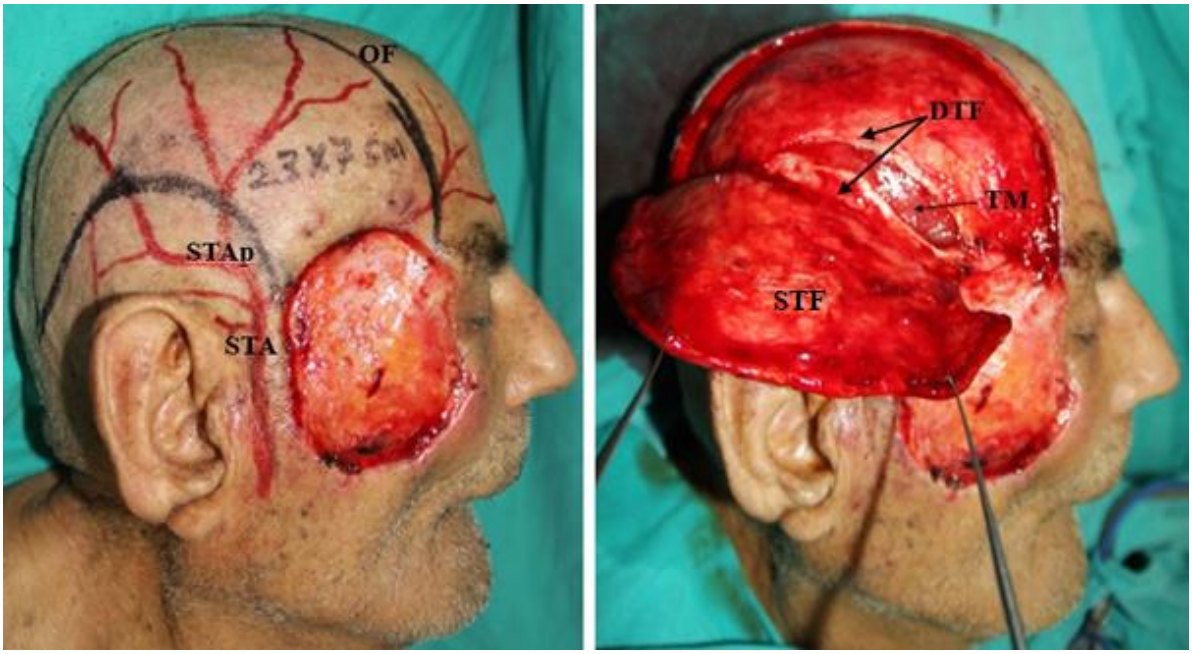

Figure 1. Intraoperative view of Case 1

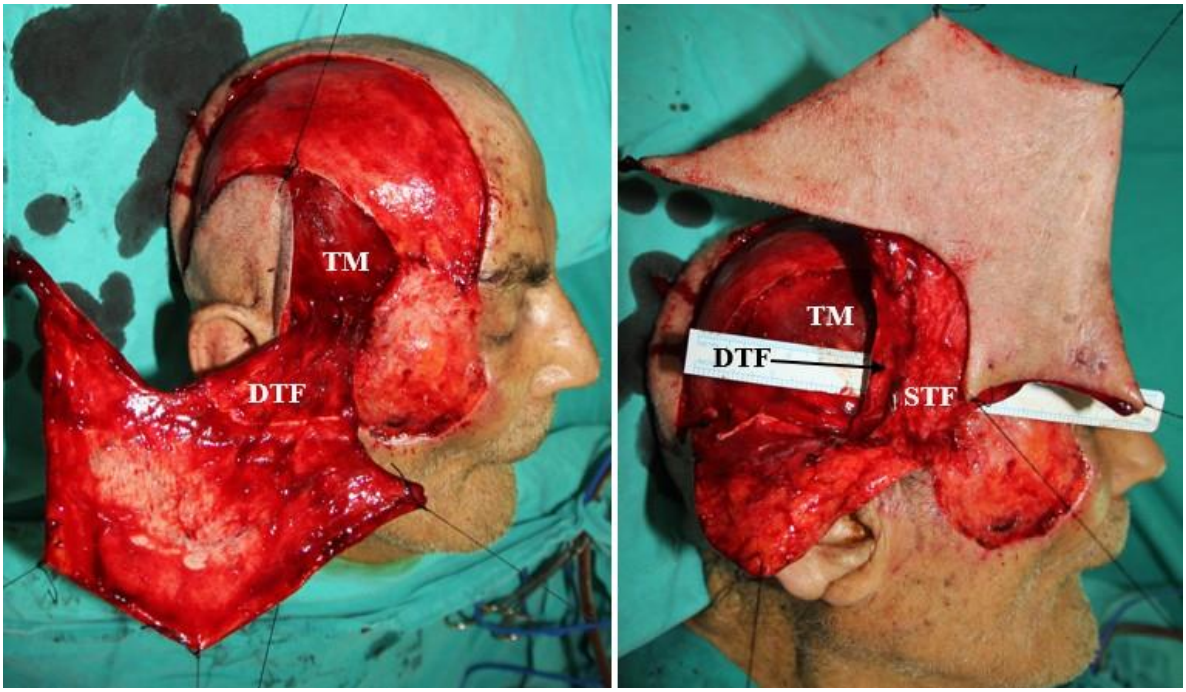

Figure 2. Intraoperative view of Case 1

The flap, whose elevation was completed, was sutured to the defect area and donor area was closed primarily (Figure 3.left). The flap healed without complications (Figure 3, right).

Figure 3. Intraoperative and postoperative view of Case1

Case 2. A 78-year-old male was referred for our clinic with basal cell carcinoma of the left posterior helix and posterior auricular region. After tumor excision, the defect area was closed with a 20 x 5.5 cm horn-shaped scalp flap. The defect and donor area healed without complications (Figure 4, left and right).

Discussion

STA pedicled scalp flaps are very useful for the reconstruction of the scalp and face. However, venous congestion is an important complication in these flaps. The insufficient venous drainage in STA pedicle flaps arises from the absence of the main collectors of the STV within the flap pedicle.

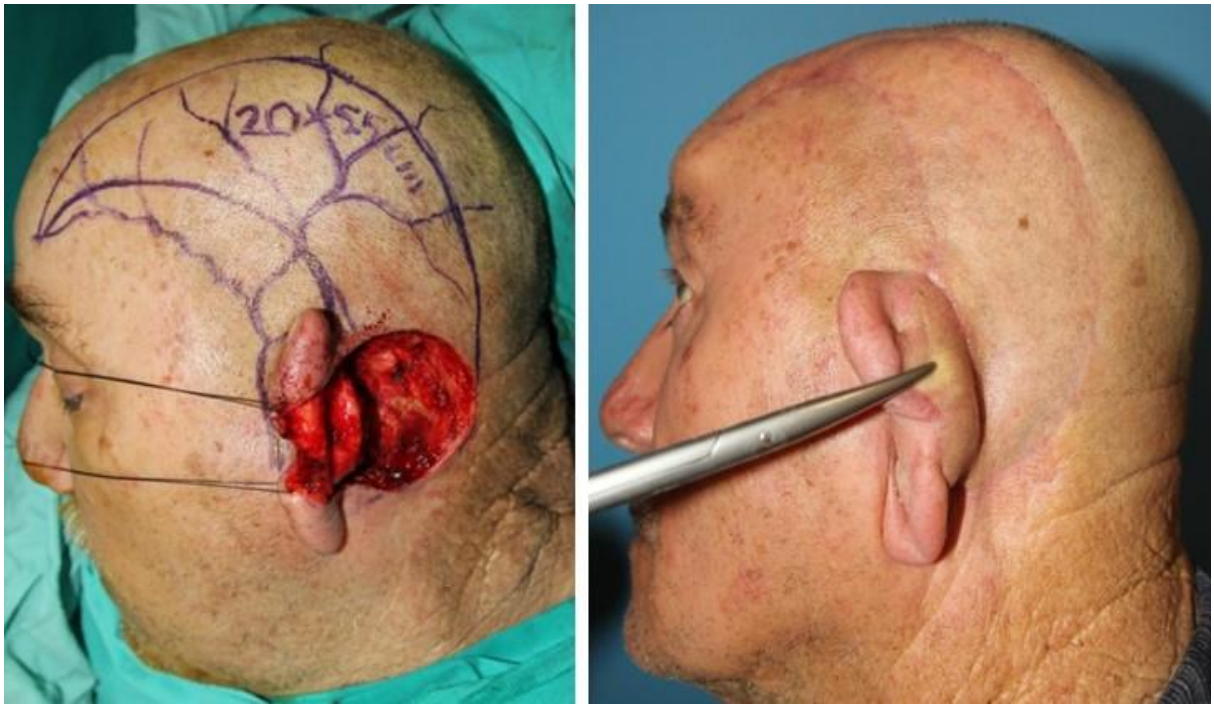

Figure 4. Intraoperative and postoperative view of Case 2

The primary reason for this is that typically, the branches of the STV run separately from the STA, except for the most proximal portion, particularly the frontal branch of the STA, which is not surrounded by a branch of the STV(Ausen et al.,2011; Loh et al.,2019;Imanishi et al.,2002; Delgova et al.,1991; Onishi et al., 2017). As a result, when raising flaps over the STA's frontal and parietal branches, the facial (STF) pedicle's width should be at least 2 cm (1 cm on each side of the artery) (Tenna et al.,2013). This ensures that the concomitant veins of these branches are included in the flap pedicle, which is necessary for proper venous circulation (Ausen et al.,2011;Tenna et al.,2013; Cao et al.,2021). However, these concomitant veins may not provide sufficient venous outflow in larger flaps.

To avoid the venous congestion seen in STA pedicled scalp flaps, we added deep temporal fascia to the flap pedicle. The addition of deep temporal fascia to the flap pedicle increased the venous outflow of the flap, thanks to the MTV it contains. Venous congestion did not develop in our flaps, because MTV serves as a potential alternative venous drainage system in the temporal region(Yano et al.,2014;Tansatit et al.,2015).

Conclucion

Large defects that are difficult to close with local flaps in a single session, can be closed with our flap in a single procedure.

Scientific Ethics Declaration

* The author declares that the scientific ethical and legal responsibility of this article published in EPHELS journal belongs to the author.

* Gazi Osmanpasa University Faculty of Medicine Clinical Research Ethics Committee Decision No: 83116987-419, Project No: 23-KAEK-140, Meetin No: 2023/12, Meeting Date: 22.06.2023

Acknowledgements or Notes

* This article was presented as an oral presentation at the International Conference on General Health Sciences (www.icgehes.net) held in Alanya/Turkey on May, 02-05, 2024.

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Author Information

Aydın Turan
Department of Plastic, Reconstructive and Aesthetic
Surgery, Gaziosmanpaşa University Medical School,
Muhittin Fisunoğlu street, campus
of the Ali Şevki Erek, 60100, Tokat, Türkiye
Contact e-mail: *aturanprs@yahoo.com*

To cite this article:

Turan, A (2024). Prevention of venous congestion in superficial temporal artery pedicled scalp flaps using deep temporal fascia. *The Eurasia Proceedings of Health, Environment and Life Sciences (EPHELS), 13,* 132-136