The Serratus Anterior Microvascular Free Flap for Skull Base and Calvarial Reconstruction

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Abstract

The serratus anterior microvascular free flap is an underutilized reconstructive option for complex defects of the scalp, calvarium, orbit, and skull base regions. It offers a fast, reliable, easily dissected, long, pedicle anatomy of satisfactory caliber, which can be harvested simultaneously in the supine position, and is thus amenable to the reconstruction of many defects of the region, in both acute and late contexts.

This flap has been used by the authors in over a dozen cases over several decades in inflammatory/infectious (refractory mucor sino-orbital infection, infected, nonviable bone flaps, exposed implant hardware, alloplastic cranioplasty (for seizure grid placement, intracranial vascular decompression and evacuation, tumor excision), and benign (NF, Meningioma) and malignant (intracranial and cutaneous carcinomas of scalp) neoplastic contexts.

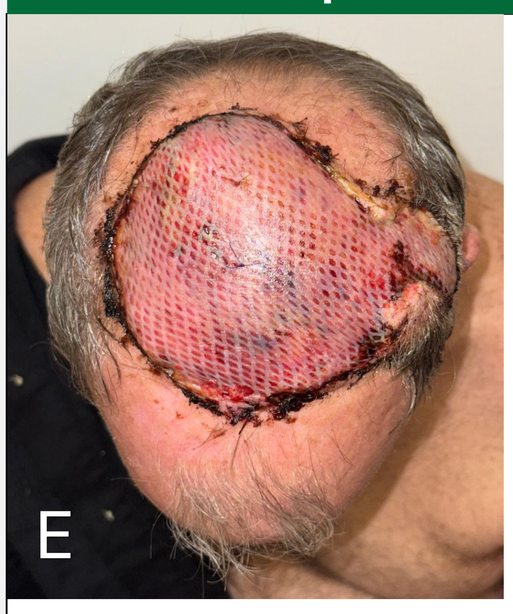
A commonly held, but inaccurate, misperception is that the scapular winging disability will invariably result from use of this donor site, though by harvesting only the lower 3-4 slips of the muscle, functional disability is avoided. The thoracic donor site also allows harvesting a STSG from the margins of the back incision, by advancing and directly closing the site after excising the harvested graft site, obviating the need for a second lower extremity donor site. Dead space reductive closing techniques have resulted in no donor site hematomas or fluid collections. Use of the serratus flap does not preclude use of the larger latissimus flap in the future. Alternatively, pedicle lengthening may be accomplished by including the latissimus pedicle, avoiding in some cases need for interposition vein grafts. In aggregate, misperceptions have resulted in the historical and continued underapplication of this flap option.

The skin grafted muscle flap atrophies rapidly over the first 2-3 months and assumes a neo-anatomical thickness and appearance that has never required revision in over a dozen cases. The construct is particularly useful in orbital reconstruction. As such, this free flap should be among first line choices for microvascular reconstruction of scalp, calvarial (with titanium mesh construct) skull base, and orbital defects of various origin.

Methods

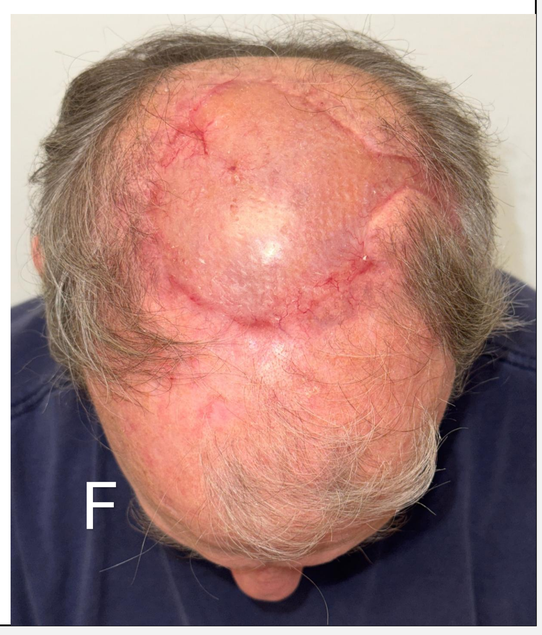
- Design: Single-institution, retrospective review 2023-2026
- Setting: Academic, tertiary referral center
- Patients: Adults undergoing anterior serratus free flap reconstruction of head & neck defects
- Data collected: Patient demographics, surgical indications, tumor staging, 30-day postoperative course, long-term results
  Data analyses: Descriptive only

Postoperative Results



E. 10-day postoperative healing. STSG is adhering to serratus muscle surface. Limited muscle atrophy has occurred. Liberal application of Vaseline and Xeroform is continued.

F. 90-day postoperative healing. STSG has completely taken with excellent color match to the surrounding skin. Muscle has atrophied to the same thickness of scalp with minimum contour difference at flap site.

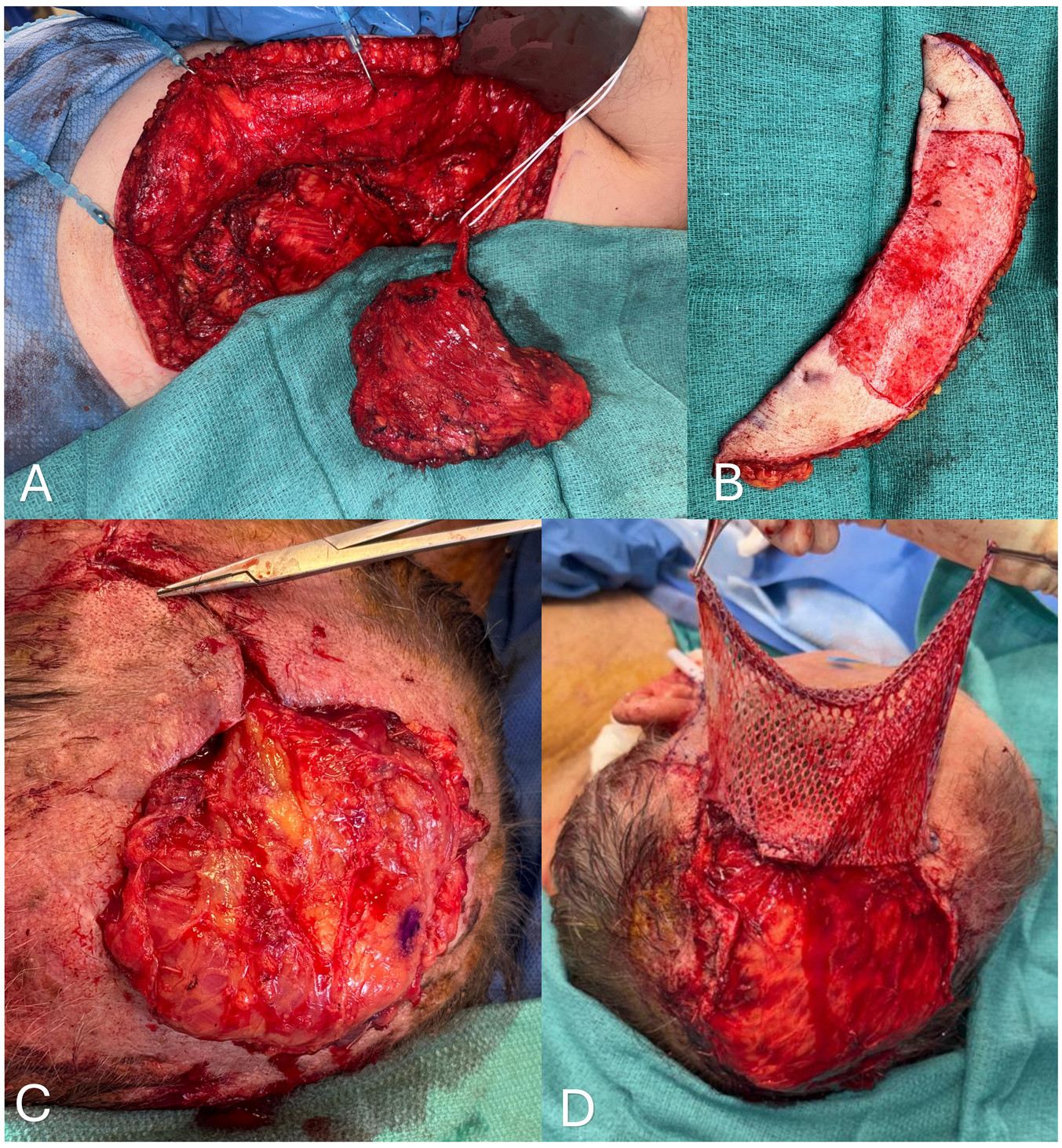


Results

Patient	Age (y)	Sex	Race	Indication	Location	Vessels	Vein Graft	Complications
1	79	M	White	SCC	Scalp	STA/STV	No	None
2	65	M	White	Exposed cranioplasty	Scalp	FA/FV	Yes	Donor site dehiscence
3	74	M	White	ORN	Scalp	STA/EJV	Yes	None
4	77	M	White	SCC	Scalp	STA/STV	No	None
5	77	M	White	Angiosarcoma	Scalp	STA/STV	No	None
6	73	M	White	SCC	Scalp	STA/STV	No	None
7	66	M	White	ORN	Scalp	STA/STV	No	None
8	61	M	White	SCC	Scalp	STA/STV	No	None
9	83	F	White	Exposed cranioplasty	Scalp	STA/STV	No	None
10	67	F	White	Conjunctival melanoma	Orbit	STA/STV	No	None

Table 1. Patient Summary. Abbreviations: F, female; FA, facial artery; FV, facial vein; M, male; ORN, osteoradionecrosis; SCC, squamous cell carcinoma; STA, superficial temporal artery; STV, superficial temporal vein.

Operative Procedure



A. Patient placed in lazy or full lateral decubitus position. Incision made anterior to latissimus. Branches to serratus anterior off thoracodorsal vessels are isolated. Long thoracic nerve identified and spared. Lower 3-4 slips of serratus separated from superior muscle, chest wall, and scapula. Pedicle traced superiorly towards axillary vessels as needed and ligated.
B. A maximally-advanced flap made from the posterior latissimus site skin flap that still allows primary closure. The excess skin is excised and a STSG is harvested from the flap.
C. Serratus flap is placed in defect. Pedicle is tunneled subcutaneously towards recipient vessels and anastomosed.
D. STSG is meshed, placed on serratus surface, and secured circumferentially. Xerform placed over STSG.

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