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# Scalp Reconstruction: About 30 Cases

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## Article History

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**Abstract:** Case Report

***Introduction***: Scalp reconstruction is a surgical procedure used to repair defects in the scalp, whether partial or full-thickness, and congenital or acquired. The goal is to restore hair-bearing tissue and provide stable coverage while maintaining adequate contour. The choice of reconstruction method depends on the size and location of the defect, the patient's overall health, and the surgeon's preference. ***Materials and Methods:*** This is a retrospective study conducted over a 5-year period, from December 2019 to December 2024, within the Department of Plastic, Reconstructive, and Aesthetic Surgery at IBN SINA University Hospital in Rabat, Morocco. ***Results***: The etiologies of the scalp defects were primarily tumor-related, Coverage of these defects was achieved using various techniques, ranging from split-thickness skin grafts to free flap reconstruction. A part from a single case of total flap necrosis, the outcome was good in the other cases**.** ***Conclusion***: The choice of scalp reconstruction technique will depend on its size, etiology, location and the general condition of the patient.

**Keywords:** Scalp Reconstruction, Surgical Techniques, Skin Grafts, Free Flap, Scalp Defects.



## INTRODUCTION

"Scalp reconstruction represents a major surgical challenge due to the unique anatomical characteristics of the region, its rich yet segmented vascularization, and the presence of hair follicles, which significantly impact the aesthetic outcome. The choice of reconstruction technique depends on several factors, including the size, location, and depth of the defect, the condition of the periosteum, the quality of the surrounding tissues, and the patient's therapeutic history, such as prior radiotherapy or infections**."**

## Materials and Methods

This is a retrospective study conducted over a 5-year period, from December 2019 to December 2024, within the Department of Plastic, Reconstructive, and Aesthetic Surgery at IBN SINA University Hospital in Rabat, Morocco. It includes 30 cases managed for scalp defects. Coverage of these defects was achieved using various techniques, ranging from split-thickness skin grafts to free flap reconstruction.

- Ten cases with defects not exceeding 5 cm in size and with preserved periosteum were treated with split-thickness skin grafts.
- Three cases with defects measuring between 6 and 8 cm in width, also with preserved periosteum, were managed using local rotation flaps.
- One case involving a vertex defect was reconstructed using an Orticochea flap.
- Thirteen cases with defects ranging from 7 to 15 cm in width were treated with transposition flaps combined with skin grafting of the donor site.
- One case with an occipital defect was managed using a trapezius muscle flap.
- Two patients with large defects exposing the outer table of the skull underwent reconstruction with a latissimus dorsi free flap.

## RESULTS

The mean age of the patients was 45.5 years. The etiologies of the scalp defects were primarily tumor-related in 20 cases, including basal cell carcinoma and squamous cell carcinoma, and post-traumatic in 10 cases.

Among the patients treated with skin grafts or local flaps, no complications were observed, and the outcomes were favorable.

In the patient treated with a trapezius muscle flap, distal flap necrosis was noted and managed with fatty dressings and secondary intention healing.

Of the two cases managed with free flaps, one experienced total flap necrosis. With a 5-year follow-up, two patients developed radiodermatitis at the skin graft site, while no cases of tumor recurrence were reported.

**Figure 1: Rotation flap**

**Figure 2: Result after 2 years**

**Figure 3: PDS post-traumatique**

**Figure 4: Transposition flap + skin graft from the donor site**

## DISCUSSION

The scalp is a complex anatomical structure composed of five distinct layers, commonly remembered by the English acronym **"SCALP"**:

1. **S – Skin**: The outermost thick layer, richly vascularized and containing hair follicles, sebaceous glands, and sweat glands.
2. **C – Connective Tissue**: A dense fibrous layer containing blood vessels and nerves, firmly adherent to both the skin and the epicranial muscle.
3. **A – Aponeurosis (Galea Aponeurotica)**: A fibrous sheet stretched between the frontal and occipital muscles, playing a key role in scalp mobility.
4. **L – Loose Areolar Tissue**: A gliding plane located between the galea and the pericranium, allowing mobility of the scalp. It also represents a potential space for the spread of infections or hematomas.
5. **P – Pericranium**: The periosteal layer firmly attached to the outer table of the skull, crucial for skin graft adherence.

**Vascular Supply**

The scalp has a rich and bilateral vascular network supplied by five pairs of main arteries, originating from the external and internal carotid systems:

- Superficial temporal artery
- Occipital artery
- Posterior auricular artery
- Supraorbital artery
- Supratrochlear artery

This abundant perfusion supports the vitality of pedicled flaps but also contributes to significant bleeding risk during scalp surgery.

**Innervation**

Sensory innervation is provided by branches of the following nerves:

- **Trigeminal nerve (cranial nerve V)**: supraorbital, supratrochlear, zygomaticotemporal, and auriculotemporal nerves.
- **Cervical nerves (C2–C3)**: greater and lesser occipital nerves, and the great auricular nerve.

Scalp reconstruction presents a unique surgical challenge due to the anatomical complexity, limited tissue mobility, and the need to preserve both function and aesthetic appearance. A wide array of reconstructive options exists, ranging from simple skin grafts to free tissue transfer, each with its own set of indications and outcomes. This discussion aims to analyze the results of our series in light of existing literature, to highlight the strengths and limitations of the techniques employed, and to explore the factors influencing surgical decision-making and prognosis.

**Primary Closure**

Primary closure is the simplest and least invasive method. It is generally reserved for small defects (typically less than 2 cm in diameter) located in areas with good skin laxity. Due to the limited extensibility of the scalp—particularly in the vertex region—this technique has limited applicability. Excessive tension can compromise the vascular supply at the wound edges, potentially leading to partial necrosis or wound dehiscence. The technique can be optimized by performing a subgaleal dissection to increase tissue mobility.

**Skin Grafting**

Skin grafts, whether split-thickness or full-thickness, are generally used as adjuncts to other techniques or as a temporary solution when the periosteum is intact. On exposed bone, grafts will not take unless a flap or a dermal substitute is interposed. The main drawback is the absence of hair follicles, limiting their use in cosmetically sensitive areas. Additionally, the aesthetic outcome is often inferior, with visible scarring and color mismatch.

- **Secondary Intention Healing**

In specific situations—such as in frail patients, those with contraindications to general anesthesia, or with limited defects—secondary intention healing may be considered. This relies on the natural processes of granulation and progressive re-epithelialization, sometimes aided by advanced dressings or negative pressure wound therapy (VAC therapy). Although time-consuming and incapable of achieving full tissue restoration (*restitutio ad integrum*), it can be valuable in palliative settings or as a temporary measure.

- **Tissue Expansion**

Tissue expansion involves the placement of a tissue expander beneath healthy scalp adjacent to the defect. The expander is gradually inflated with saline over several weeks, promoting the formation of new scalp tissue with texture, color, and hair characteristics identical to the surrounding area. This technique is particularly indicated for reconstructions requiring high aesthetic integration, such as in cases of extensive scarring alopecia or post-tumoral defects. However, it carries risks including expander exposure, infection, pain, or mechanical failure.

- **Local Flaps**

Local flaps are among the most commonly used techniques for scalp reconstruction, particularly in cases of small to moderate-sized defects. They allow coverage with adjacent, well-vascularized tissue while preserving the aesthetic characteristics of the scalp (color, texture, and hair-bearing quality).

**Main types:**

- **Rotation flap**: Involves creating an arc from adjacent healthy scalp tissue to rotate over the defect. This technique often requires wide subgaleal undermining to reduce tension. It is especially useful for posterior or parietal lesions.
- **Advancement flap**: Based on linear mobilization of skin towards the defect. Often used in pairs (H-flaps) to distribute tension symmetrically.
- **Transposition flap**: Involves angular movement of a flap with a pivoting pedicle. This is particularly suitable for avoiding distortion of natural scalp lines, especially in the temporal or frontal regions.

**Advantages:**

- Excellent aesthetic results using native hair-bearing skin
- Technically straightforward, without the need for microsurgery
- High success rate due to the segmental vascular supply of the scalp (superficial temporal, occipital, and posterior auricular arteries).

**Limitations:**

- Limited tissue mobility, especially in elderly or irradiated patients
- Risk of necrosis in cases of excessive tension or marginal perfusion
- Requires extensive dissection, potentially associated with significant blood loss

**Regional Flaps**

Regional flaps utilize anatomical structures adjacent to the scalp, typically fasciocutaneous or musculocutaneous, based on a vascular pedicle that does not require microvascular anastomosis.

**Examples:**

- **Temporoparietal fasciocutaneous flap**: Supplied by the superficial temporal artery, this flap is thin, pliable, and can be rotated toward frontal or parietal areas. It is often used for complex reconstructions or as a base for grafts or implants.
- **Occipital flap**: Based on the occipital artery, suitable for covering large posterior defects.
- **Temporalis muscle flap**: Primarily used in oncologic reconstruction; this well-vascularized muscular flap may be combined with skin grafting.

**Indications:**

- Medium to large defects
- When local flaps are insufficient or contraindicated
- Tissue replacement in cases of necrosis or prior radiation damage

**Free Microvascular Flaps**

When the defect exceeds the capacity of local or regional flaps, or the recipient bed is poor (e.g., exposed bone, devitalized periosteum, irradiated tissue), reconstruction with a free flap is required. This involves microsurgical anastomosis of the flap's vessels to those of the scalp or neck.

**Commonly used free flaps:**

- **Radial forearm flap**: Thin, pliable, and easy to harvest with a long pedicle. Ideal for contouring irregular or bony surfaces.
- **Scapular flap**: Provides good volume and thick skin texture, useful for defects with associated volume loss.
- **Latissimus dorsi flap**: A musculocutaneous flap well-suited for large defects or oncologic resections. It can be harvested with or without skin (musculofascial variant).
- **Anterolateral thigh (ALT) flap**: Highly versatile, with the option to include multiple tissue types (fat, fascia, muscle). Especially valuable for extensive defects.

**Advantages:**

- Capable of reconstructing massive defects
- Well-vascularized tissues suited to hostile environments (bare bone, prior radiation)
- Wide selection based on reconstruction needs (volume, flexibility, pedicle length)

**Disadvantages:**

- Surgical complexity, requiring an experienced microsurgical team
- Risk of flap thrombosis or failure
- Donor site morbidity (variable depending on the flap)
- Intensive postoperative monitoring

## CONCLUSION

Scalp reconstruction requires meticulous planning that integrates functional and aesthetic considerations alongside the patient's clinical context. From simple primary closure to complex free flap reconstruction, each technique offers specific advantages, indications, and limitations. The current trend favors individualized, often multimodal, reconstructive strategies tailored to the anatomical characteristics and expectations of each patient.

## REFERENCES

1. Seery, G. E. (2002). Surgical anatomy of the scalp. *Dermatologic surgery*, *28*(7), 581-587.
2. Lafaurie, P. (2001). Chirurgie des pertes de substance du cuir chevelu. EMC.
3. Hoffmann, J. F. (2001). Management of scalp defects. *Otolaryngologic Clinics of North America*, *34*(3), 571-582.
4. Manders, E. K., Graham III, W. P., Schenden, M. J., & Davis, T. S. (1984). Skin expansion to eliminate large scalp defects. *Annals of plastic surgery*, *12*(4), 305-312.