DIRECT SCIENCE OPEN JOURNAL
Direct Scince Open Journal
ISSN 3086-1837
vol. 1, no. 1
2025

SCALP NECROSIS AFTER HAIR TRANSPLANTATION

ARNALDO ALMENDROS MELLO [1] and CARLOS JOSÉ BRITO RAMIREZ [1]

[1] *Centro Universitário do Norte de São Paulo (UNORTE), São José do Rio Preto, Brasil.*
almendrosdr@terra.com.br; r.britocaj@gmail.com

Case Report

Received: 01 May 2025 | Accepted: 01 Jun 2025 | Published: 01 Nov 2025

Abstract. Scalp necrosis after hair transplantation is a rare but clinically relevant complication that can compromise aesthetic results and require additional interventions. This study aimed to analyze the clinical course of a patient who presented post-hair transplant necrosis, investigate the factors associated with its occurrence, the therapeutic strategies employed, and the observed outcomes. To this end, a qualitative approach was adopted, based on the analysis of a case study combined with a literature review on hair transplant complications. The studies indicated that necrosis can be influenced by biological factors within the patient. These findings may be related to biological factors inherent to the patient, or influenced by the technique used during the surgical procedure or in the postoperative period, reinforcing the need for more effective preventive strategies. Conservative management, prioritizing healing by secondary intention, proved to be a safe approach, allowing for lesion recovery in approximately one month, with partial preservation of the hair follicles. These results demonstrate that, when properly managed, necrosis does not completely compromise graft viability, although it can impact follicular density in the affected region. In addition to contributing to a better understanding of post-hair transplant complications, this study highlights the importance of outpatient follow-up and technical care during surgery and postoperatively, and suggests new directions for future research. Additional studies exploring preventive strategies, comparisons between surgical techniques, and long-term assessments of graft viability could deepen our understanding of this complication and improve clinical protocols.

Keywords — Hair transplantation; Scalp necrosis; Surgical complications; Clinical management; Healing.

1 Introdução

Hair transplantation is a widely used procedure to restore hair density in patients with alopecia, providing significant aesthetic and psychosocial benefits [1, 2]. According to Schalch et al., androgenetic alopecia can profoundly impact self-esteem and quality of life, making hair transplantation an effective alternative for correcting baldness [3].

Over the past few decades, the evolution of hair transplantation techniques has driven significant advances in hair restoration. Procedures such as FUE (Follicular Unit Extraction) and FUT (Follicular Unit Transplantation) have enabled a more precise approach to follicular extraction and implantation, reducing surgical trauma and accelerating patient recovery. Studies indicate that these improvements have been fundamental in making hair transplantation more effective and accessible, providing more natural and long-lasting results [4]. Despite advances in surgical techniques and pre- and postoperative care, complications can still arise, with scalp necrosis being one of the most serious and challenging manifestations in the context of hair transplantation [1, 2]. Necrosis can occur due to multiple factors, such as compromised vascularization, inadequate surgical techniques, and insufficient postoperative care [5]. Recent studies indicate that the formation of thick crusts in the early phase of healing can interfere with tissue oxygenation, increasing the risk of necrosis [6]. Furthermore, the influence of graft ischemia time and the use of vasoconstrictor anesthetics have been widely debated in the literature as potential factors for surgical complications [2, 3, 7].

Studies demonstrate that improved clinical protocols can significantly minimize the risks of necrosis and other postoperative complications. Strategies such as prior assessment of scalp vascularization, appropriate choice of surgical technique, and the use of adjunctive medications have been increasingly recognized in the scientific literature as essential factors for a safe postoperative period [8].

With the evolution of hair transplant techniques, new approaches have been proposed to minimize these risks, including clinical management strategies and regenerative therapies aimed at improving vascularization and healing. Recent studies highlight the use of growth factors and platelet-rich plasma (PRP) as promising alternatives in post-transplant tissue regeneration [9, 10]. Furthermore, research on innovative solutions for graft preservation during surgery suggests that maintenance of follicular viability can be improved with specific storage techniques [11].

This study aims to analyze the clinical course of a patient who presented post-hair transplant necrosis, investigate the factors that contributed to its occurrence, the therapeutic approaches adopted, and the clinical outcomes observed. Additionally, we seek to discuss alternatives for managing necrosis, based on the existing literature and the patient's clinical response, providing support for improving surgical protocols and preventive strategies in hair transplantation.

2 Case Report

The translation of the manuscript from Portuguese to English was facilitated by Google Translate. The authors confirm that the tool was used exclusively for linguistic assistance, and the scientific content, data analysis, and interpretation are the sole responsibility of

the named authors.

This study is based on bibliographic research and the analysis of a clinical case through observation protocols and photographic documentation. The methodological approach adopted is qualitative, as it seeks to understand the factors involved in the occurrence of post-hair transplant scalp necrosis, correlating theoretical information and clinical evidence [2, 7].

To support the research, a literature review was conducted in scientific databases, prioritizing articles published between 2021 and 2025 on hair transplantation, scalp necrosis, and their management strategies. Furthermore, medical guidelines and systematic review studies that contribute to the understanding of the pathophysiological aspects of necrosis in aesthetic and reconstructive procedures were examined [1, 5]. Studies suggest that impaired vascularization of the recipient area can directly influence graft survival and post-surgical recovery [3, 9].

The case study was conducted using observation protocols, recording detailed patient information, including clinical history, clinical progression, treatment adopted, and response to various clinical management strategies. Images were also collected at different points in the postoperative period, allowing for an in-depth analysis of factors related to necrosis and the therapeutic strategies used [3]. According to Elzagh, clinical observation plays a fundamental role in monitoring the progression of necrosis, enabling therapeutic adjustments based on the patient's respons [6].

Furthermore, studies indicate that the use of innovative graft storage strategies can contribute to improved vascularization and reduced risk of necrosis during the postoperative period [9, 10]. According to Vale and Vilaça, individualized clinical protocols for patients at higher risk of complications may be essential to optimize surgical outcomes [12].

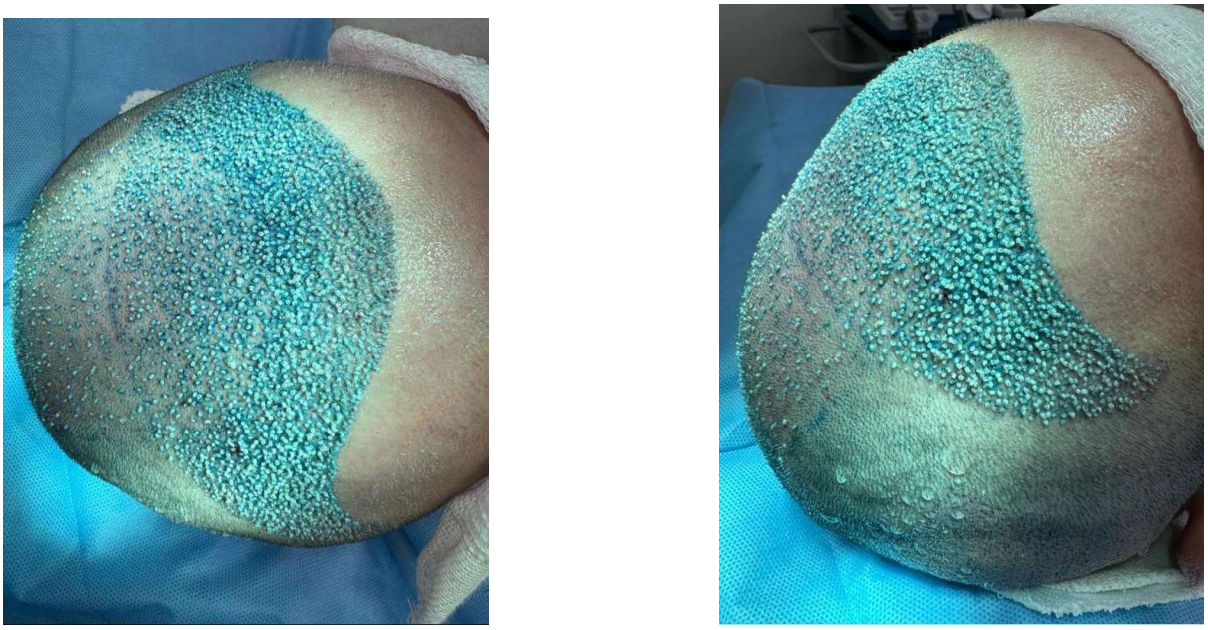
The patient, a 41-year-old man with a history of early-onset androgenetic alopecia, presented with grade V baldness according to the Norwood-Hamilton classification, shown in Figure 1. He had no associated comorbidities and began clinical treatment two months before surgery. Preoperative laboratory tests were normal, with no contraindications for the procedure.

Figure 1– (a) and (b) Initial preoperative scalp image

(a) **(b)**

Source: Authors (2025).

Figure 2– Day of surgery – Intraoperative record of the procedure performed



(a) **(b)**

Source: Authors (2025).

The hair transplant was performed on May 10, 2024, without any intraoperative complications (Figure 2). On the third postoperative day, the first scalp wash was performed, following the standard post-transplant care protocol, shown in Figure 3.

Figure 3– Third postoperative day – Scalp cleansing procedure following hair transplantation.

(a) **(b)**

Source: Authors (2025).

From the 20th day onward, a thick crust formed in the frontal region (Figure 4), prompting

a medical evaluation that diagnosed localized scalp necrosis. Therefore, systemic antibiotic treatment was immediately instituted, with amoxicillin and clavulanate (875 mg + 125 mg) prescribed every 12 hours for 10 days.

Figure 4– Twentieth postoperative day – Documentation of necrosis and initiation of antibiotic treatment.

(a) **(b)**

Source: Authors (2025).

On the 25th postoperative day, debridement of the necrotic area was performed, followed by weekly outpatient follow-up with local dressings and hygiene measures. It was decided not to use collagenase, allowing healing by secondary intention. One month after the necrosis management began (Figure 5), complete closure of the lesion was observed, with the presence of hair follicles at a lower density in the previously affected area compared to the rest of the transplanted area.

The clinical progress was monitored over the following months. Figure 6 shows the progression of results between 2- and 6-months post-treatment, demonstrating improvement in the affected area and follicular recovery. One year after the procedure, the patient was discharged, presenting a satisfactory aesthetic result, with no expression of interest in new interventions in the previously affected area.

Figure 5– One month after treatment initiation – Wound closure and tissue recovery.

Source: Authors (2025).

Figure 6– Treatment evolution – (a) Two months post-treatment. (b) Six months post-treatment.

(a)

(b)

Source: Authors (2025).

3 Discussion

Scalp necrosis after hair transplantation is a rare, yet relevant, complication that can significantly compromise the aesthetic results of the procedure and demand additional interventions for recovery (Cintra, Cristóvão, and Silva, 2022; Schalch, et al., 2024). Studies by Garg and Garg (2021) and Chen et al. (2021) have already indicated that factors such as compromised vascularization, inadequate surgical technique, and individual predisposition can increase the risks of this occurrence. In the analyzed case, the manifestation of necrosis was observed on the 20th postoperative day, leading to immediate treatment with antibiotic therapy and directed clinical management.

The findings of this study suggest that the occurrence of necrosis may be associated with three main factors:

Patient biological factors:

- History of advanced androgenetic alopecia, which may have contributed to reduced blood supply in the recipient area [1].
- Compromised local vascularization, a factor that may have influenced healing and graft survival [9].
- Individual healing responses, potentially impacted by genetic predisposition and inflammatory processes [10].

Technical factors of the surgical procedure:

- Density and depth of the implanted grafts, which may have compromised blood circulation in the scalp [7].
- Use of local anesthetics with vasoconstrictors, which may have temporarily interfered with blood flow in the transplanted area [6].
- Graft ischemia time, potentially influencing follicular viability post-implantation [2].
- Choice of transplant technique (FUE or FUT), which can directly impact vascularization and postoperative healing [4].

Postoperative and recovery factors:

- Formation of thick crusts in the frontal region, hindering adequate oxygenation of the scalp [3].
- Time until medical intervention, where early diagnosis is fundamental to prevent the progression of necrosis.
- Influence of external factors, such as sun exposure, mechanical pressure on the scalp, and inadequate hygiene.
- Continuous outpatient follow-up, allowing for early therapeutic adjustments according to the patient's response and ensuring optimized recovery [8].

The literature highlights the importance of necrosis prevention through control of risk factors. According to Elzagh, et al. (2024), adequate scalp preparation before transplantation and postoperative care are crucial for ensuring an uneventful recovery. In the present study, the choice of conservative treatment, avoiding the use of collagenase and prioritizing healing by secondary intention, proved effective, resulting in complete lesion closure in approximately one month. This finding corroborates the treatment guidelines for post-surgical necrosis described by Schalch, et al. (2024).

The patient's clinical response demonstrated that, despite the necrosis, there was partial preservation of hair follicles, allowing for a satisfactory aesthetic result after six months of follow-up. However, it was observed that follicular density in the affected area remained lower than the rest of the transplanted scalp, suggesting an impact of the lesion on graft survival (Zhou et al., 2023).

Another relevant aspect was the influence of weekly outpatient follow-up on the case outcome. Studies such as Cintra, Cristóvão, and Silva (2022) point out that rigorous monitoring allows for early therapeutic adjustments, reducing the risks of secondary infection and optimizing healing. In the analyzed study, this approach was essential for effective recovery, avoiding further surgical interventions.

This study contributes to the understanding of post-hair transplant complications, reinforcing the need for constant monitoring of scalp vascularization and personalized therapeutic approaches for cases of necrosis (Cintra, Cristóvão, and Silva, 2022; Schalch, et al., 2024). The patient's evolution suggests that conservative management can be effective, minimizing aesthetic and clinical impacts. **Suggestions for Future Research:**

- Investigation of more effective preventive strategies, such as the use of growth factors and regenerative therapies [10, 11].
- Comparative studies between different surgical techniques, analyzing their influence on the rate of necrosis and follicular survival [1].
- Long-term follow-up studies, evaluating the late impacts of necrosis on aesthetic results and graft viability [9].

4 Conclusion

This study investigated the occurrence of scalp necrosis after hair transplantation, analyzing the factors involved, the therapeutic approaches adopted, and the clinical outcomes. The results indicated that the manifestation of necrosis may have been influenced by patient biological factors, technical aspects of the surgery, and postoperative care, reinforcing the need for more effective preventive strategies.

Conservative management, without the use of collagenase and prioritizing healing by secondary intention, proved effective, allowing the lesion to close in approximately one month. Furthermore, the partial preservation of hair follicles suggests that, when adequately managed, necrosis does not fully compromise graft viability, although it did impact follicular density in the affected area.

The main contribution of this study lies in the detailed analysis of factors that may predispose patients to post-hair transplant necrosis, providing support for improving clinical protocols and optimizing therapeutic approaches. Furthermore, the findings reinforce the importance of continuous postoperative monitoring, evidenced by the positive impact of outpatient follow-up on the patient's clinical response.

With the evolution of hair transplantation techniques, the choice of the appropriate surgical technique has played an essential role in minimizing risks and ensuring the success of the procedure. The study demonstrated that advanced strategies can be incorporated to enhance surgical protocols and prevent complications. Thus, the findings of this research contribute to the discussion on the relationship between the technique used and the

development of necrosis, helping to define parameters that can optimize surgical outcomes.

However, some methodological limitations must be considered. As this is a single case study, the findings cannot be generalized to the entire population of patients undergoing hair transplantation. Furthermore, the absence of specific pre-operative vascularization tests represents a gap in the evaluation of predisposing factors for necrosis. **Suggestions for Future Research:**

- Investigate more effective preventive approaches, such as the use of growth factors and regenerative therapies [10, 11].
- Compare different surgical techniques, analyzing their impacts on the rate of necrosis and follicular survival [1].
- Conduct long-term follow-up studies, evaluating the late impacts of necrosis on aesthetic results and graft viability [9].

This study contributes to the advancement of knowledge about post-hair transplant complications, aiding in the improvement of clinical conduct, the refinement of surgical techniques, and the minimization of risks in future interventions.

References

[1] Jimenez F, Vogel JE, Avram MR. Complications in Hair Transplantation Surgery. Dermatologic Surgery. 2021;47(6):754-61.

[2] Cintra R, Cristóvão M, Silva F. Factors influencing scalp vascularization in hair restoration surgery. Brazilian Journal of Plastic Surgery. 2022;37:115-22.

[3] Schalch L, et al. Postoperative management and complications in hair transplantation. Aesthetic Surgery Review. 2024;19(1):33-41.

[4] Zhao L. Comparative outcomes between FUE and FUT techniques in modern hair transplantation. Journal of Cosmetic Dermatology. 2023;22(4):554-62.

[5] Chen L, et al. Vascular Compromise and Tissue Necrosis in Scalp Surgery: Prevention and Treatment. Aesthetic Plastic Surgery. 2021;45(8):3210-9.

[6] Elzagh M, et al. Postoperative necrosis mechanisms in scalp grafting: A clinical review. International Journal of Dermatologic Surgery. 2024;18(3):210-8.

[7] Garg AK, Garg S. Complications of Hair Transplantation: Prevention and Management. Journal of Cutaneous and Aesthetic Surgery. 2020;13(2):110-6.

[8] Feitoza L, et al. Clinical protocols for postoperative wound management. Brazilian Journal of Clinical Surgery. 2007;14(4):45-52.

[9] Pumford J, et al. Regenerative strategies in post-transplant tissue healing. Aesthetic Surgery Journal. 2024;44(1):55-64.

[10] Othman A, Glat PM. Platelet-rich plasma in scalp wound healing. Plastic and Reconstructive Surgery. 2023;152(2):243-51.

[11] Zhou Y, et al. Innovative storage and preservation methods for hair graft viability. International Journal of Aesthetic Medicine. 2023;12(2):98-106.

[12] Vale C, Vilaça D. Individualized clinical protocols for high-risk patients in aesthetic surgery. Revista Brasileira de Cirurgia Estética. 2022;8(1):77-84.