A Case Report and Literature Review

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*Corresponding Author: Ethar Thaer Mustafa
Email: ethar.t.mustafa@aliraqia.edu.iq

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Unilateral Scalp Necrosis, An Unusual Complication of Hair Transplantation: A Case Report and Literature Review

Mohamed Mohsen Farhan[1], Ethar Thaer Mustafa [*2], Samar Ahmed Jasim[3]

1 Institute of Laser for Postgraduate Studies, University of Baghdad, Baghdad, Iraq.
2 Department of Medicine, College of Medicine, Al-Iraqiya University, Baghdad, Iraq
3 Department of Dermatology, Al-Kindy College of Medicine, University of Baghdad, Baghdad, Iraq

Abstract

Hair transplantation is a permanent solution for hereditary baldness. However, scalp necrosis remains a very rare complication, but it is nonetheless a troublesome problem, affecting less than 1% of cases worldwide. Its causes are varied, including poor blood vessel function, graft density, and patient-related risk factors.

Case Presentation: We present the case of a 44-year-old Iraqi man, a heavy smoker (20 packs of cigarettes per year), who underwent a hair transplant to treat frontal temporal baldness. The patient returned to the clinic on the fourteenth post-operative day. He noticed changes in scalp color that began on day four and gradually worsened over the next ten days. Despite his attempts at self-care, the condition continued to deteriorate. On day fourteen, he developed black and yellow scales confined to the left frontal side of his scalp, clearly defined at the midline.

Management and Outcomes: The diagnosis was made clinically, supported by dermatoscopy. We began treatment with systemic antibiotics and daily topical wound care, and advised the patient to quit smoking. Over 60 days, the wound healed spontaneously, leaving a 3x2 cm atrophic scar. Notably, a year later, the patient successfully underwent a second hair transplant.
In conclusion, the significance of this case lies in its being one of the few documented cases in Iraq that highlights the role of certain risk factors in scalp necrosis, such as excessive smoking, epinephrine-loaded local anesthetics, and sensitivity of the mid-scalp as a high-risk area. Conservative treatment proved effective, supporting the idea that early diagnosis of abnormal skin changes and treatment of modifiable risk factors are just as important as the precision of the surgery itself.

Keywords: Hair Transplantation, Scalp Necrosis, Scarring Alopecia, Male Pattern Hair Loss.

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Introduction

Hair donates to the general silhouette of the facial outline, and its variable physical features (length, color, and arrangement) are thoroughly knotted with body image, self-concept, and psychosocial image. male pattern hair loss is a quite common and stressful problem for which many treatment modalities have been employed, one of these is hair transplantation which was first successfully performed in the 1950s (1). This procedure have come along way ever since with hair transplantation (HT) becoming a minimally invasive surgery in which follicular units (FU) are transferred from a donor area without alopecia to a recipient area with reduced hair density. while Complications being infrequent are still present, such as Poor wound healing, scarring (atrophic, widened, hypertrophic), hypopigmentation, necrosis, and Chronic pain (2). However, scalp necrosis is extremely rare, occurring in less than 1% of cases worldwide (3).

Necrosis can occur due to multiple factors, such as compromised vascularization, inadequate surgical techniques, and insufficient postoperative care (4). The scalp is a unique anatomical structure characterized by its high vascularity with a rich display of anastomoses that cover the complete blood supply to the scalp (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) in addition the use of the vasoconstrictor adrenalin in high concentrations in anesthesia have been debated as a potential cause for tissue ischemia (7). Herein, we reviewed cases with scalp necrosis following hair transplantation, and present a case report for this complication in an Iraqi patient.

Case report:

History: A 44-year-old male patient, attended the dermatological outpatient clinic of Al-Kindy Teaching Hospital in Baghdad-Iraq in April 2025, he is a heavy chronic smoker (20 pack-years) with no significant past medical, drug and surgical history. complains of hair loss and thinning due to androgenetic alopecia that he noticed since his early 20s especially in the frontotemporal region of the scalp. For which he underwent a hair transplant procedure with a follicular unit extraction (FUE) technique under local tumescent anesthesia. The patient condition first started post-operative day 4. He first noticed color changes, and the lesion progressively worsened over the following 10 days in the recipient area which was accompanied by moderate pain and discomfort. The skin turned gradually to a slightly hard layer associated with soft and boggy sensation on palpation. The state of the skin then continued to worsen during this period which he managed by himself locally with only over the counter topical medications that he summarizes as topical antibiotic ointment and disinfectant spray, and as the lesion did not improve, he sought medical attention on the 14th day after his procedure.

Examination: A middle-aged man presented with a reticulate black eschar surrounded by yellowish crustations on the scalp at the 14th day after a hair transplant procedure (FUE). The lesions were confined to the frontal recipient area of the scalp with unilateral distribution and clear-cut midline demarcation. There was fluctuance and mild tenderness on palpation (figure-1) another aspect of his medical exam came back negative as he shows no other skin lesions, there was no lymphadenopathy, no fever and was generally healthy.

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Figure 1: Clinical images of the necrotic area before (A) and after (B) debridement showing the lesions confined to the frontal recipient area of the scalp.

Diagnosis: The diagnosis relied mainly on the clear and straight forward history coupled with thorough clinical examination and aided by dermoscopic exam (figure-2) which shows many of the features of skin damage like Whitish-Blue Patches, Black Dots (Necrotic Areas), Hemorrhagic Crusts and Necrotic Borders that displays Eroded zones where the epidermis has sloughed off.

There was no need for any other investigations as the patient was generally healthy with no other complains or signs apart from his scalp lesion. the diagnosis of local tissue necrosis was made after exclusion of other differential diagnosis like herpes zoster, post radiation ulcers, folliculitis, ulcerated skin tumors, giant cell arteritis, and pyoderma gangrenosum (8,9).

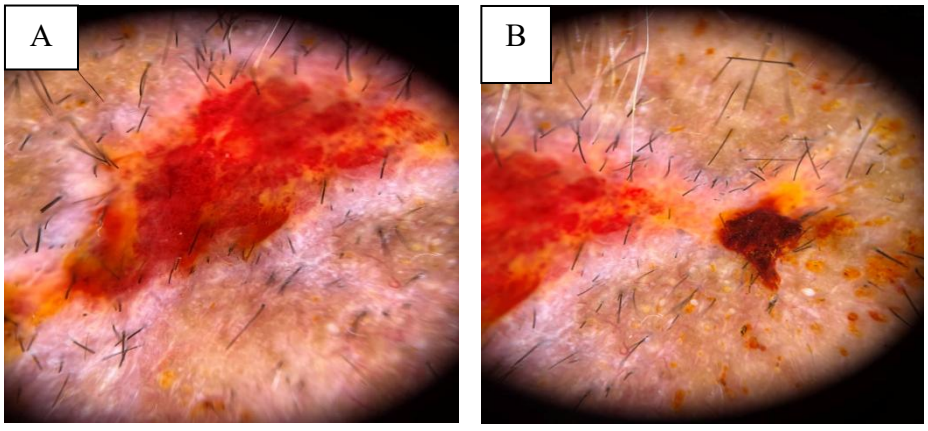

Figure 2: Dermoscopic images (A, B) which shows many of the features of skin damage like Whitish-Blue Patches, Black Dots (Necrotic Areas) and Hemorrhagic Crusts.

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Treatment: The management relied mainly on preventing secondary bacterial infection and promoting the best possible environment for effective wound healing. The patient was advised to stop or cutdown on smoking and promote a healthy life style, medical intervention started immediately which after excluding any history of drug allergies, included a prophylactic systemic antibiotic Cefpodoxime (brand name Cefodox) in a dose of 400mg twice daily for 14 days along with topical wound care and dressing with daily application of topical Cavidagel® (a sterile amorphous hydrogel with alginate used to treat necrotic wounds) and MEBO® ointment (a traditional Chinese medicine preparation), pain management consisted of acetaminophen 1g as needed for pain relief. the wound was left to heal by secondary intention and the patient was instructed to be followed weekly to monitor his healing closely and adjust treatment if needed.

Outcome: the patient achieved complete wound healing after 60 days of follow-up (figure-3) and was left with an atrophic hypopigmented 3*2 cm scar devoid of hair follicles. The patient was advised to wait for at least 12-18 months before undergoing a second HT procedure to allow the scalp skin to fully heal and gives the previous transplanted hair enough time to grow and fully mature so the surgeon can accurately assess the result and the number of follicular units required for his second trial. One year after his first visit the patient underwent a second HT surgery (figure-4) and now he is back for closeup monitoring and care of both his donor and recipient sites.

Figure 3*:* Image shows complete wound healing after 60 days of follow-up, and was left with an atrophic hypopigmented 3*2 cm scar devoid of hair follicles.

Figure 4: One year after the first visit, the patient underwent a second HT surgery, the outline of the previous necrotic scar was still somewhat visible through the newly transplanted follicles.

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Literature Review Methodology

This study conducted a chronological review of the medical literature to identify all reported cases and studies concerning scalp necrosis following hair transplantation. A systematic and comprehensive search was performed across the PubMed/MEDLINE, Scopus, and Google Scholar databases. The review included all original studies, case series, and individual case reports addressing scalp necrosis in the recipient area after hair transplantation; letters to the editor, conference abstracts, and non-English publications (unless an English translation was available) were excluded. Finally, the selected cases were arranged chronologically, and their summaries were presented in Table 1.

Table 1: Summary of Studies and Reported Cases on Scalp Necrosis Following Hair Transplantation

No.	Author-study	Year	Country of Study	No. of cases	Main Clinical findings	Publication Platform
1	Horta R et al. (10)	2026	Portugal	1 case	Progressive pain and necrotic eschar appeared on postoperative day 5 completely healed after debridement.	PubMed
2	Ali Al-Mamoori (11)	2026	Iraq	1 case	Early-onset necrosis with *Pseudomonas aeruginosa* infection, Dark discoloration on day 2 that progressed to extensive necrosis with yellow crusting by day 10.	PubMed
3	Fatih Ceran (12)	2024	Turkey	18 cases	All patients developed scarring and graft failure	PubMed
4	Chen J et al. (13)	2024	China	4 cases	3 cases healed within 2–3 weeks with timely treatment, 1 case had complete graft loss due to delayed initial management	PubMed
5	Gómez et al. (14)	2021	Spain	52 cases	The present study being the largest, including 52 patients.	PubMed
6	Zaheer Abbas (15)	2021	Pakistan	88 high-risk patients	Projected a management algorithm, topical nitroglycerin effectively prevented necrosis	PubMed
7	Feily A et al. (16)	2017	Iran	3 cases	Feily's method successfully prevented scalp necrosis in all 3 high-risk patients	PubMed
8	Yildiz H et al. (17)	2015	Turkey	1 case	Necrosis appeared on postoperative day 1; HBOT effectively limited the extent of necrosis	PubMed
9	Amir Feily (18)	2015	Iran	Multiple cases	The central frontal area is supplied by terminal arteries, making it an ischemic danger zone	PubMed
10	Marco N. Barusco (11)	2014	USA	1 case	necrosis may occur anywhere in the recipient area, and the central area is the most vulnerable region.	PubMed
11	Naci Karaçal (20)	2012	Turkey	1 case	Donor-site necrosis case, Resulted in cicatricial alopecia on the left occipital side	PubMed

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Discussion:

Hair transplantation remains a fairly common and accepted solution for a serious and permanent condition known as androgenic alopecia, and like any surgical procedure, it is not without complications, including scalp ischemia and the resulting necrosis.

Though it's very rare, it's still an important and serious possible scenario that must be anticipated and kept in mind to be dealt with promptly and effectively.

Published studies (Table 1) highlight several important aspects related to the causes and risk factors of scalp necrosis. Regarding gender, most reported cases were in male patients, as in our case, which is understandable since this procedure is primarily requested and performed by male patients. Currently, 87.3% of hair transplant patients are men and 12.7% are women. Most hair transplant procedures are intended to treat male pattern baldness (androgenic alopecia) (21).

Regarding our patient's general health and lifestyle, he has been a heavy smoker for many years. It is widely accepted among researchers that certain risky lifestyle habits, most notably smoking, increase the likelihood of tissue ischemia and subsequent scalp necrosis associated with hair transplantation, as in the case reported by Dr. Marco N. Barusco of Port Orange (19), where the patient was a 57-year-old man with a smoking history of over 20 years. The same applies to the studies by Seran et al. and Gomez et al., both of whom reported that patients who developed scalp necrosis associated with hair transplantation were smokers in 66.7% and 15.4% of cases, respectively. This indicates a significant personal risk factor that should be considered when consulting with hair transplant candidates (12, 14).

Nicotine's mechanism of action in causing tissue ischemia involves significant vasoconstriction, while carbon monoxide deprives tissues of oxygen. These combined effects restrict the vital blood supply necessary for scalp healing, potentially leading to permanent tissue death.

Our patient was 44 years old at the time of the incident. If age is a contributing factor in the development of scalp necrosis, we can refer to other documented cases, such as the four cases described by Chen Jie, Koo Qiu, Guo Wei, and others, whose ages ranged from 18 to 23, 30, and 45 years (13). While Marco N. Barusco reported a case of scalp necrosis in a 57-year-old man (19), this demonstrates that different age groups are affected by scalp necrosis, and it is reasonable to speculate that no age group is immune to this complication.

In our case, the patient had no history of diabetes or hypertension, and the rest of his medical history was not significant. The same cannot be said for 9.6% of people in a research letter by A. Gómez-Zubiaur (14), whereas none of the four cases in Jian Chen MD, PhD had a medical history (i.e., hypertension, smoking, diabetes) associated with circulatory disorder or infection (13).

In our case for the FUE procedure the choice of local anesthesia was tumescent anesthesia thus, epinephrine may play a role in the development of scalp necrosis (20). It has been observed that the use of high concentration epinephrine for tumescence coupled with high volume of tumescent solution and dense-packing in the central core of the anterior and mid scalp may

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overwhelm the available blood supply to the area, causing ischemia and necrosis, since our patient also reported the use of such type

anesthesia its most likely it has played a role in the development of his condition. In this case, avoiding the use of epinephrine or lowering the concentration to 1/2000000 or less might be a good solution to decrease the risk of vascular perfusion compromise (22).

Finally, as with any medical procedure or surgical intervention complications are always a possibility and should be expected at any phase in the therapeutic journey. Our patient has noticed some unusual changes like abnormal color change and sensation of post-operative pain and discomfort. However, he didn't seek medical attention until 10 days after the onset of his symptoms (14 days post op), where he was treated promptly and effectively by conservative debridement of the peripheral wound edges and a series of clearances to completely remove the whole eschar, a fresh granulation tissue was left exposed to heal by secondary intention. Moreover, timely administration of antibiotics is essential to prevent secondary bacterial infection and improve prognosis.

For his second attempt, we advised the patient to stop smoking at least one month before and one month after the operation and maintain regular follow-up visits.

Limitations Of the Study:

Some limitations must be admitted, such as the lack of wound culture and sensitivity, and the fact that this is a single case study. The findings cannot be generalized to the entire population of patients undergoing hair transplantation and we recommend future researchers to conduct long-term follow-up studies, evaluating the effect of necrosis on the aesthetic outcome and graft survival.

Conclusion:

In this case report and literature review we aim to contribute to the existing data about a quite rare but potentially distressing complication for a common procedure that's performed on a daily basis all around the world and in our case in Iraq, where we present one of a very few cases in Iraqi medical literature, to draw attention for this complication and to advise the professionals executing such procedures to keep in mind the potential factors that may play a part, whether they were related to the patient or the technique itself.

Ethical Approval and Consent to Participate:

The study received ethical approval from Al-Kindy Medical College, University of Baghdad (Document No. 3185, dated April 29, 2025). Written informed consent was obtained from the patient, and confidentiality with secure handling of patient information and identity was maintained throughout all study time.

Conflict of Interest: None.

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Author contributions: All authors contributed to the preparation, writing, and revision of this article and approved the final version of the manuscript.

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