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REVIEW

Alopecia Secondary to Hyaluronic Acid Injection: A Case Report and Literature Review

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Background: Hyaluronic acid injections, commonly used for anti-aging purposes, carry potential risks, including transient or permanent alopecia, a complication not yet fully characterized. This adverse effect can result from various mechanisms, such as pressure, ischemia, inflammation, and necrosis.

Objective: This study aimed to present a case report of a patient treated with Concentrated Growth Factor combined with microneedling and minoxidil for alopecia following hyaluronic acid injection in the left temporal scalp and to systematically review literature from January 2000 to December 2024 on alopecia secondary to hyaluronic acid injections.

Methods: A 23-year-old woman developed a 5×6.5 cm alopecic patch on the left temporal scalp just four days after receiving 5 mL of Restylane hyaluronic acid filler in the frontal area. Despite initial treatment with 1500 units of hyaluronidase, alopecia progressed. A multimodal therapy was then initiated, including Concentrated Growth Factor injections, microneedling, and topical 5% minoxidil, delivered over three sessions at 1–2-week intervals. A systematic literature search (PubMed/Web of Science/Embase, 2000–2024) identified 13 relevant articles reporting on 19 cases of hyaluronic acid-induced alopecia for analysis.

Results: In the case report, the patient experienced full hair regrowth after treatment with Concentrated Growth Factor, microneedling, and minoxidil. Additionally, thirteen full-text articles involving 19 patients with hyaluronic acid-induced alopecia were analyzed. Data collected included filler type, injection site, complication site, onset of alopecia, associated symptoms, diagnostic tests, proposed mechanisms, treatment approaches, and outcomes. Various treatments were employed across studies, with variable success rates.

Conclusion: Prompt diagnosis and early intervention are crucial in preventing irreversible hair loss after HA injections. Knowledge of scalp anatomy and injectable materials is essential. This case suggests that combining Concentrated Growth Factor, microneedling, and minoxidil may offer a promising therapeutic strategy for HA-induced alopecia.

Keywords: alopecia, cosmetic procedures, fillers, dermal fillers, hyaluronic acid, hair loss

Introduction

Over the past two decades, hyaluronic acid (HA) filler injections have become a widely used procedure in aesthetic medicine, employed for facial volume restoration, wrinkle correction, skin rejuvenation, and non-surgical facelifting.[1,2] HA is a naturally occurring, high-molecular-weight glycosaminoglycan composed of repeating disaccharide units of D-glucuronic acid and N-acetyl-D-glucosamine.[3] It is abundantly present in the extracellular matrix of connective tissues, particularly in the skin, eyes, synovial fluid, and soft connective tissues, underscoring its crucial physiological roles.[4] One of its most notable properties is its ability to bind and retain water—up to 1000 times its own weight—thereby contributing to tissue hydration, structural integrity, and volumizing effects.[2] Although HA occurs naturally in the body and plays a key role in maintaining skin health and moisture, it is commonly modified or synthesized for use in cosmetic and dermatological applications.[5] These formulations are designed for various routes of administration, including intradermal, subcutaneous, intra-articular, topical, and ocular delivery. When used as a dermal filler, HA provides immediate volume and helps reduce the appearance of wrinkles by restoring lost structural support.[2] As the

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material gradually degrades over time, water replaces the gel matrix, allowing for prolonged volumetric effect through a process known as isovolumetric degradation. The duration of action generally ranges from 4 to 6 months, although this may vary depending on the specific product, injection site, and technique used.[5]

Despite its widespread use and general safety profile, HA injections are associated with both cutaneous and systemic adverse effects.[6] Complications such as allergic reactions, hypersensitivity, edema, infections, and even vascular occlusion leading to vision loss have been reported.[7,8] Among these, secondary alopecia following HA filler injection is a rare but increasingly recognized complication, yet its exact pathophysiological mechanisms remain poorly understood.

In this case report and literature review, we present a case of a patient with HA-induced alopecia on the left temporal scalp who achieved complete hair regrowth after four months of treatment with Concentrated Growth Factor (CGF) combined with microneedling (MN) and minoxidil, and we provide a comprehensive analysis of alopecia secondary to HA, including detailed data on filler type, injection site, complication location, onset of alopecia, associated symptoms, diagnostic evaluations, potential pathophysiological mechanisms, treatment approaches, and outcomes. Our primary aim is to broaden the therapeutic options for such patients and highlight that alopecia following HA injections is an underreported complication. Clinicians should remain vigilant, recognize its clinical manifestations, and be prepared with effective prevention and management strategies.

Case Report

A 23-year-old woman underwent facial augmentation performed by a registered nurse, during which 5 mL of HA filler (Restylane, Medicis, Scottsdale, AZ, USA) was injected into the left frontal region. The procedure was uneventful at the time of injection; however, 4 days later, she developed localized erythema and pain in the same area. The patient visited a clinic after experiencing persistent pain for three days and received three sessions of hyaluronidase (HAase) treatment (total 1500 units), which alleviated the symptoms. On day 15 post-HA injection, she noticed an area of alopecia with superficial crusts on the left frontal scalp, which progressively worsened. She was subsequently referred to our hospital for further management. On initial examination, the affected region measured approximately 4×5 cm, with well-defined borders and complete absence of hair shafts. Dermoscopic examination revealed characteristic signs of active alopecia, including black dots, broken hairs, reduced hair density, scaling, and erythematous patches (Figure 1a and b). There were no signs of pustules or significant exudate. A provisional diagnosis of HA-induced alopecia was made based on the clinical presentation and temporal correlation with the injection. Treatment was initiated with topical application of recombinant bovine basic fibroblast growth factor (bFGF) gel to the affected area, aiming to promote tissue regeneration. By day 21, the condition had progressed to a well-demarcated alopecia patch measuring 5×6.5 cm (Figure 1c), with no spontaneous regrowth observed. The hair pull test yielded negative results, suggesting that the disease activity might be resolving or entering a quiescent phase.

Treatment Protocol for Alopecia

Given the lack of response to initial conservative therapy and the desire to explore regenerative options, a multimodal therapeutic strategy combining Concentrated Growth Factor (CGF), microneedling (MN), and 5% minoxidil was implemented. This approach was selected based on its potential to stimulate hair follicle regeneration through multiple mechanisms, including growth factor delivery, dermal remodeling, and enhanced drug penetration. CGF was prepared using differential centrifugation. Briefly, 9 mL of fresh blood was collected in vacutainer tubes containing EDTA-K2 as an anticoagulant (K.S MEDICAL; Zhejiang, China) under aseptic conditions. The blood sample was centrifuged using a specific protocol:[9] 30 seconds of acceleration, followed by 2 minutes at 2700 rpm, 4 minutes at 2400 rpm, 4 minutes at 2700 rpm, 3 minutes at 3000 rpm, and 36 seconds of deceleration and stop. This process separated the blood into three distinct layers (Figure 1d). The upper platelet-poor plasma (PPP) and the lower red blood cell layer were discarded, while the middle buffy coat layer, totaling 2–3 mL, was collected as CGF.

Before the therapeutic intervention, the alopecia area was meticulously prepared aseptically using normal saline and iodophor solution, followed by local anesthetic injections administered circumferentially. CGF was then injected into the alopecia-affected scalp at a dosage of 0.1–0.2 mL/cm² and a depth of 2 mm. Subsequently, MN was performed using

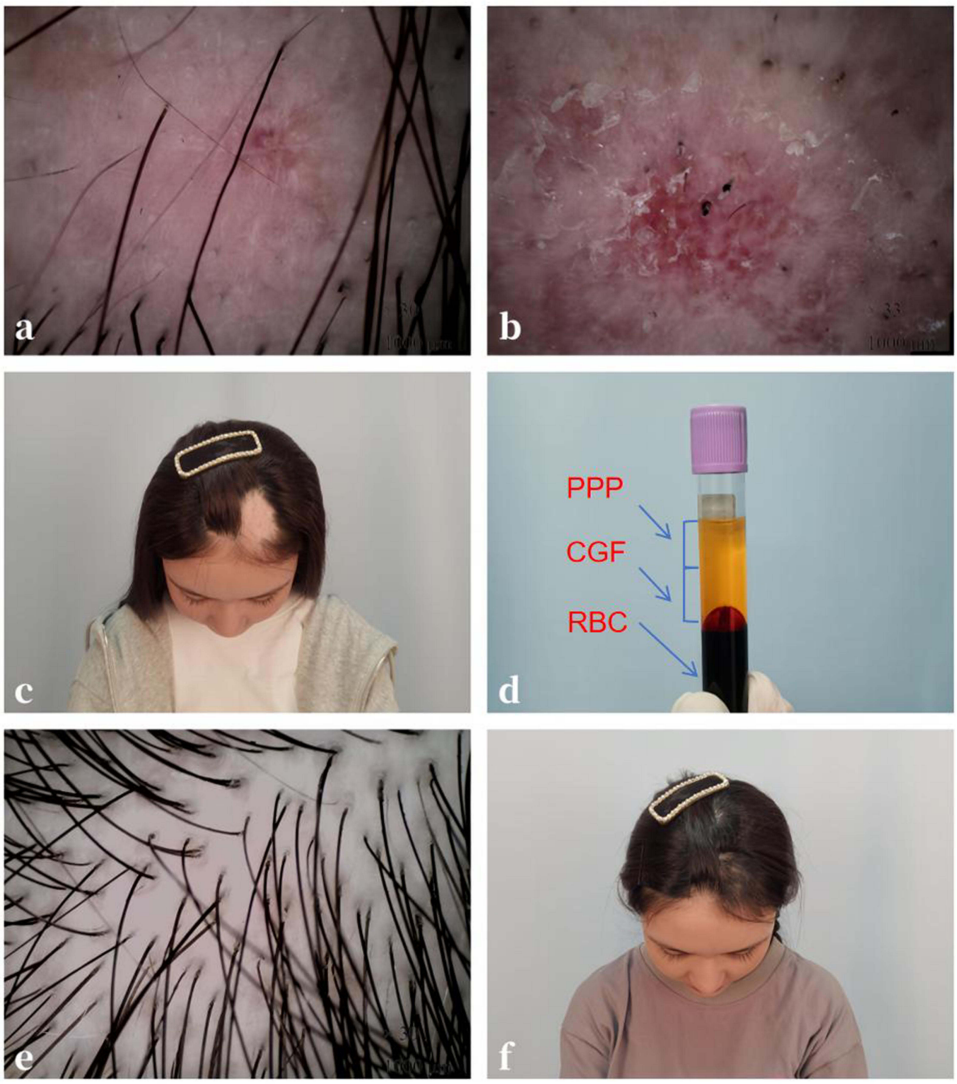

Figure 1 A 23-year old female showing alopecia secondary to hyaluronic acid injection. (**a** and **b**) Dermoscopic pictures at baseline: black dots, broken hairs, reduced hair density, scaling and erythematous patches. (**c**) A well-demarcated alopecia patch measuring 5×6.5 cm after the hair loss had stabilized. (**d**) CGF. Three blood fractions were obtained after centrifugation with anticoagulant: the upper layer represented by PPP; the middle layer or buffy coat represented by CGF; and the lower red blood cell (RBC) layer. (**e**) Dermoscopic picture at 3-month follow-up after the last session: absence of signs indicative of HA-related alopecia, and complete hair regrowth. (**f**) Follow- up for 3 months after the last session.

a dermaroller device equipped with 540 needles of 1.5 mm length. The device was rolled diagonally, vertically, and horizontally across the treated area, repeating the process four to five times along each axis to ensure thorough coverage. Pinpoint bleeding, indicative of adequate dermal stimulation, was observed as the endpoint. Immediately following MN, 5% minoxidil (Mandi, Zhejiang Wansheng Mandi Pharmaceutical Co., Ltd., China) was applied topically to the scalp and gently massaged into the micro-punctures created by the MN procedure. This step aimed to enhance transdermal absorption of minoxidil, thereby potentiating its vasodilatory and hair growth-promoting effects. The patient underwent a total of three treatment sessions, spaced 1 to 2 weeks apart, to ensure cumulative therapeutic exposure and optimize follicular stimulation. No adverse events or complications were observed throughout the treatment course. At the four-month follow-up, complete hair regrowth was evident both clinically and photographically (Figure 1e and f), with full restoration of hair density and texture. The progression and treatment timeline of the case are summarized in Figure 2.

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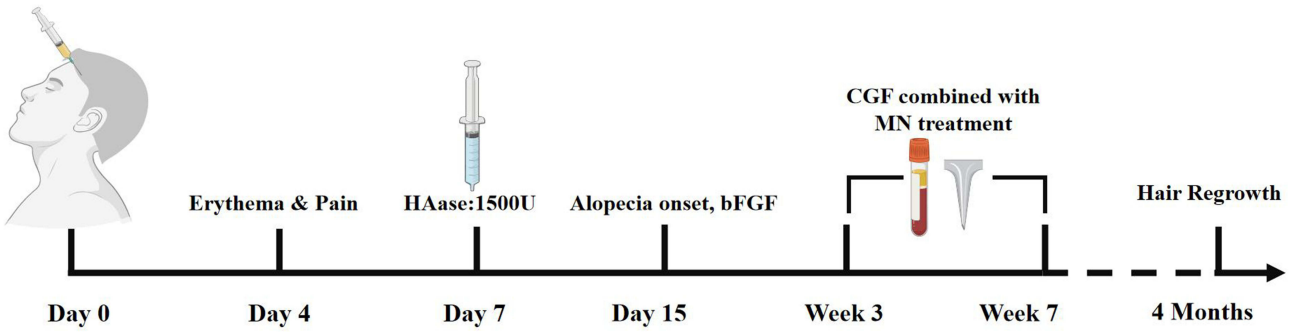

Figure 2 Therapeutic timeline showing: Day 0: 5 mL HA injection; Day 4: Erythema & pain; Day 7: HAase 1500U; Day 15: Alopecia onset, bFGF; Weeks 3–7: CGF+MN sessions; 4 Months: Complete regrowth.

Literature Review

A comprehensive literature search spanning the years 2000 to 2024 was conducted across PubMed, Web of Science, and Embase to identify cases of alopecia secondary to HA injection. The search utilized relevant keywords, including "hyaluronic acid", "injectable dermal fillers", "fillers", and "cosmetic procedures", combined with "alopecia", "hair loss", and "filler-induced alopecia" using the Boolean operator "AND". Duplicates, non-English articles, and studies unrelated to the topic were excluded. Prospective and retrospective studies, clinical trials, case reports, and case series involving human subjects were included if they provided detailed information on the types of products used, injection sites, and locations of hair loss. Studies lacking sufficient detail were excluded from the review. Flowchart describing the systematic study selection process is shown in Figure 3.

Results

A total of 13 reports involving 19 patients (18 females, 1 male) with alopecia following HA injections were identified. Data extracted from these cases included the type of products used, injection sites, complication locations, onset of alopecia, associated symptoms, diagnostic imaging findings, proposed mechanisms of alopecia, treatment approaches, and outcomes, as summarized in Table 1. Alopecia typically developed 1 week to 4 weeks following cosmetic injection procedures. The majority of injections were administered in the temple region (11/19 cases), followed by posterior temple (5/19). Alopecia consistently occurred adjacent to the injection site, with the temporoparietal scalp (6/19), temple scalp (3/19) and parietal scalp (2/19) most frequently affected. Diagnostic tools such as trichoscopy,[10,11] dermatoscopy,[12] ultrasound,[13,14] and histopathology[10,12,15–18] played a critical role in confirming the diagnosis. Proposed mechanisms for alopecia included extravascular compression, intravascular HA embolism, and inflammatory injury.

Therapeutic interventions for HA-induced alopecia were multifaceted, with HAase serving as the cornerstone of acute management. HAase was administered in 16 cases (84.2%),[10–14,16,17,19–22] with doses ranging from 50 to 69,000 units to mitigate ischemic damage. Adjunctive therapies included: topical minoxidil,[10,11,16,17,20,21] intralesional triamcinolone acetonide,[10,11,15,17,18] platelet-rich plasma (PRP),[19,21] basic fibroblast growth factor (bFGF),[16,19] hyperbaric oxygen therapy[19] and botulinum toxin A (BTXA).[19] In our case, Concentrated Growth Factor (CGF) with microneedling (MN) and minoxidil achieved complete regrowth by synergistically targeting ischemia, upregulating hair-growth genes, and enhancing drug delivery. Most cases reported partial or complete resolution of alopecia following treatment.

Discussion

HA is widely employed as a dermal filler to address age-related wrinkles and folds. Its natural biodegradability and rapid degradation via exogenous HAase make it a safer option compared to other fillers.[18] Paradoxically, while HA or compounds containing HA are increasingly utilized in hair growth formulations due to its ability to modulate dermal papilla cells, promote angiogenesis, and exert antioxidant and anti-inflammatory effects.[23,24] This study highlights its potential to induce alopecia when injected inappropriately. An increasing number of cases have reported alopecia following HA administration, particularly associated with temporal area volumization (Table 1). Although less common than transient edema, cutaneous erythema,

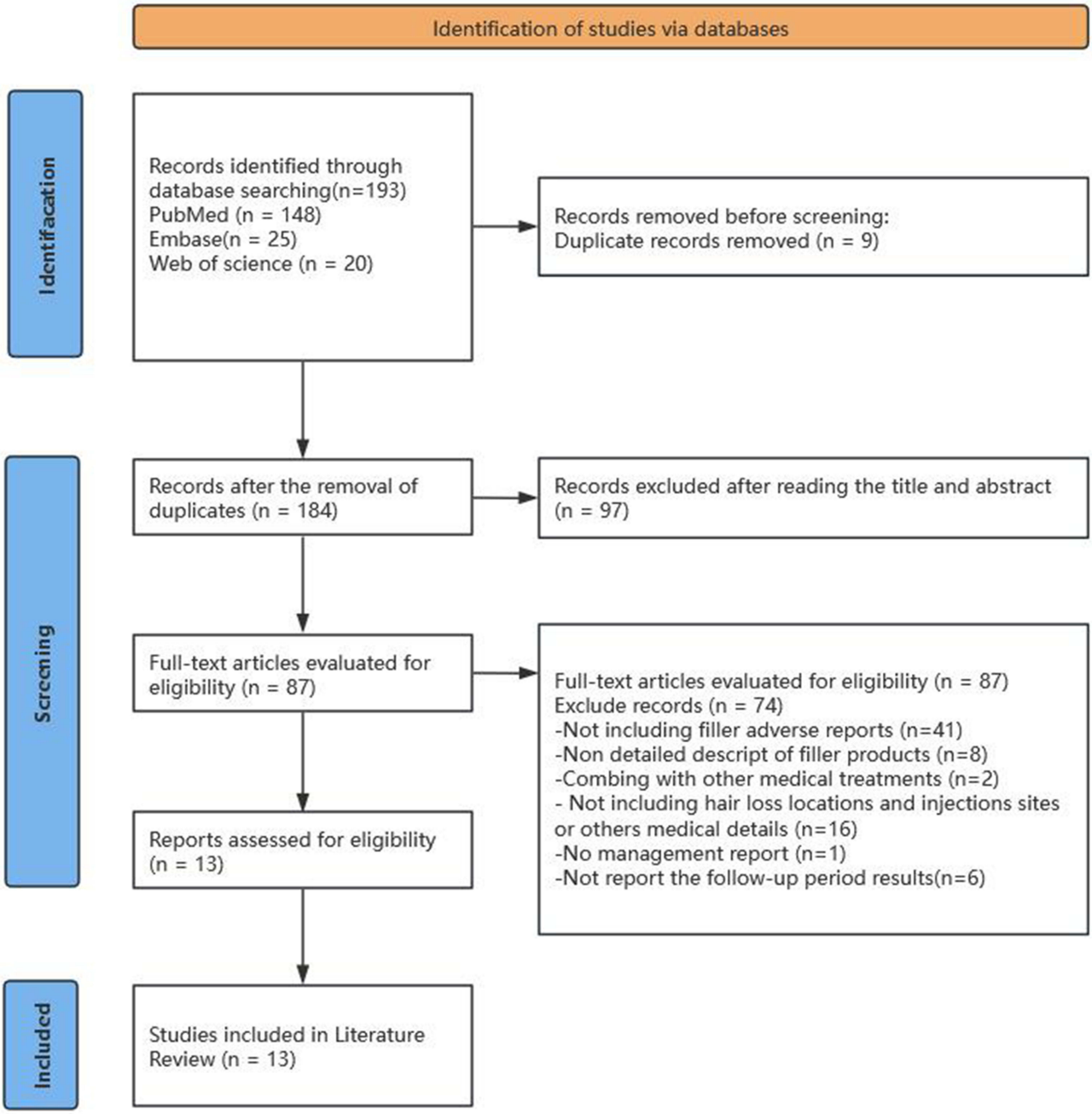

Figure 3 Flowchart describing the systematic study selection process.

immunologic responses, infections, or granulomatous inflammation, HA-induced alopecia remains a clinically significant complication.

The dual role of HA in hair biology warrants attention: topical or low-dose intradermal HA may promote hair growth by improving perifollicular vascularization and reducing oxidative stress,[24] whereas high-volume injections—especially in vascular-rich areas—can trigger ischemia and follicle damage. The mechanisms underlying HA-induced alopecia include vascular occlusion due to excessive filler volume (type 2 pressure-induced alopecia), intravascular obstruction from HA emboli,[25] and inflammatory or foreign body reactions.[18] The injection volume is a critical risk factor, with site-specific variations influencing the likelihood of complications.[18] HA's hygroscopic nature can also lead to increased

Table 1 Cases of Hyaluronic Acid Injections Leading to Alopecia

Author (Year)	Gender/age(y)	Procedure	Clinical Manifestation	Onset of Alopecia	Site of Alopecia	Diagnostic Imaging	Histological Analysis	Proposed Mechanism of Alopecia	Management	Result
Gan SD et al[8] (2013, US)	Female/58	6 mL HA on each temple	Burning pain within 30 minutes of the procedure.	15d	Right temple	NS	Near-total anagen shift Focal trichomalacia Dermal mucin pools Sparse perivascular inflammatory infiltrate	High volume filling Vascular tamponade Intraluminal occlusion	Within 30 minutes: ice pack application and antiinflammatory herbal cream. D15-36: intralesional triamcinolone (5 mg/mL) twice	3 months: 50% of hair regrowth + scarring alopecia
Yang Q et al[9] (2017, China)	Female/27	6.5 mL HA on each temple	Immediately after injection, swelling and burning pain over left temporoparietal region.	15d	Left temporoparietal scalp	Doppler ultrasound showing low blood perfusion.	Intradermal foreign material pools Inflammatory cell infiltrates Granuloma formation Decreased anagen-phase hair follicle density	Extravascular compression Intravascular HA embolism Inflammatory injury	D0-3: Ice pack application + dexamethasone. D9: HAase (600 units). D22-42: bFGF gel + minoxidil	D209: hair regrowth after + scarring alopecia
Park GH et al[10] (2019, Korea)	Female/58	HA on temples (volume NS)	NS	1wk	Right temple	NS	Disappearing hair matrix with pigment cast and its epithelial replacement Basophilic foreign bodies in dermal vessels	Extravascular compression Intravascular HA embolism	Concurrent treatment for 5 months: HAase, topical minoxidil, intralesional triamcinolone (5 mg/mL) twice	5 months: nearly complete hair regrowth + no scarring
Asz-Sigall D et al[3] (2019, US)	Female/30	HA along the superciliary arch (volume NS)	48 hours later, swelling of the forehead, patchy erythema, and severe pain.	1wk	Right frontoparietal scalp	Trichoscopy revealing nonscarring alopecia with yellow dots, black dots, broken hairs, and irregular vascular proliferation.	Anagen shift Concentric thickening of perifollicular collagen fibers Intravascular and intradermal HA deposits	Extravascular compression Intravascular HA embolism	48 hours: Oral amoxicillin and clavulanic acid. 1wk: intralesional triamcinolone (10 mg/mL). 2wk: HAase (50 units) and oral acetylsalicylic acid (100 mg). 3wk: topical minoxidil	2 months: hair regrowth + no scarring

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Park MJ et al[11] (2020, Korea)	Female/59	3mL HA on the forehead	Erythema, tenderness, and swelling on frontal to mid-scalp 2 to 3 days after the injection.	1mo	Frontal and mid-scalp	NS	Perifollicular irregular, amorphous material deposition Mild inflammatory cell infiltration Increased telogen hairs	Extravascular compression Inflammation Hair-cycle change	1 month: Intralesional triamcinolone (5 mg/mL)	6 months: complete hair growth + no scarring
Van den Elzen H et al[6] (2022, Netherlands)	Female/54	0.75mL HA on the right lateral cheekbone about 2–3 cm medial from the tragus	Several hours later, a dull pain in the right temporal area.	18d	Right temporoparietal scalp	Duplex-ultrasound showing a widened superior temporal artery above its bifurcation with the transverse facial artery and a hypoechoic pocket near the zygomatic bone, suggestive of HA filler.	NS	Extravascular compression Edema following filler injection	D1: Oral ibuprofen D18 and D21: HAase	9 months: complete hair growth + no scarring
Guo Y et al[18] (2022, China)	Female/32	2.0mL HA on right temple	NS	10d	Right frontotemporal scalp	NS	NS	Vascular occlusion Inflammation	D0: HAase D3: HAase (3000 units), antibiotics, vasodilator therapy, hyperbaric oxygen therapy. D10: bFGF gel. D89 and D121: PRP, BTXA. D148: PRP	D176: partial hair regrowth + scarring alopecia
Li C et al[19] (2023, China)	Female/50	HA on left temple (volume NS)	Several hours later, mild swelling and red bruise appeared on left forehead, temple region and periocular area, accompanied by painful and numb feeling. Afterwards, aggravated rash and pain, large area of map-like red and purple bruise and excessive swelling, occurred on the same area.	2wk	Upper forehead area	NS	NS	Vascular embolization	D3: HAase, oral antibiotics, applied Qingpeng ointment. 2wk: topical minoxidil	2 months: hair regrowth

(*Continued*)

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Table 1 (Continued).

Author (Year)	Gender/age(y)	Procedure	Clinical Manifestation	Onset of Alopecia	Site of Alopecia	Diagnostic Imaging	Histological Analysis	Proposed Mechanism of Alopecia	Management	Result
Zheng C et al[7] (2023, China)	Females/28	2mL HA on left temple	NS	6d	Left temporoparietal scalp	CDFI showing weak magnitude of regional scalp blood flow.	NS	Vascular embolization	D2: HAase (1500 units). D2-4: glucocorticoid pulse therapy, anti-allergy D2-90: neurotrophic treatment	3 to 4 months: hair density nearly reached the normal level
	Females/31	2mL HA on each temple	NS	1–2wk	Left temporoparietal scalp	NS	NS		D2: HAase (1500 units)	6 months: hair regrowth
	Females/31	4mL HA on right temple	NS	1–2wk	Right temporoparietal scalp	NS	NS		D4: HAase (1500 units)	6 months: hair regrowth
Landau M et al[20] (2023, Israel)	Female/61	1mL HA on each posterior temple	3 h after injection, scalp pain.	10d	Central scalp	NS	NS	Vascular occlusion	36 hours: HAase (7500 units). D10: Biweekly PRP sessions	3 months: hair regrowth started
	Female/44	0.5mL HA on each posterior temple	Scalp pain on day 2. Livedoid rash on forehead and scalp on day 4.	9d	Left temporoparietal scalp	CT Angiography revealing absence of visualization of the left frontal branch of STA.	NS		D4: HAase (69,000 units). D9: PRP sessions, topical and oral minoxidil, topical finasteride	4 months: hair regrowth started. 12 months: almost full regrowth except for a small alopecic patch.
	Female/41	1mL HA on each posterior temple	Central scalp pain 4 h after Injection.	14d	Central scalp	NS	NS		D0-3: Painkillers	3 months: hair regrowth started. 6 months: still small bald patch
	Female/36	1mL HA on each posterior temple	NS	15d	Left parietal scalp	NS	NS		D4: HAase	6 weeks: hair regrowth started
	Male/52	1.2 mL HA on each posterior temple	Pain and bruising in right parietal area after few hours.	14d	Right parietal scalp	NS	NS		HA extraction, HAase (300 units)	6 months: alopecia lasted
Pearce J et al[5] (2023, UK)	Female/37	HA on each temple (volume NS)	Within several hours, pain, swelling and a mottled reticulate rash involving the right temple, frontotemporoparietal scalp and forehead.	NS	Frontotemporoparietal scalp	Dermoscopy showing black dots, broken hairs, white dots and short vellus hairs.	Reduced follicle number Necrotic adipocytes and surrounding histiocytes Fibrotic 'onion skin' scar tissue	Vascular occlusion	D0-2: HAase, oral amoxicillin. 1 month: Oral prednisolone, clarithromycin, hydroxychloroquine, topical clobetasol propionate	10 months: hair regrowth + scarring alopecia

Almutairi R et al[21] (2024, Kuwait)	Female/48	1mL HA on each temple	Acute onset of severe pain in the left temporal area around the injection site 2 hours later.	10d	Left temporal area	NS	NS	Vascular compromise	D10: HAase (600 units) and gaspirin tablets	6 months: complete hair growth
Albargawi S et al[4] (2024, Saudi Arabia)	Female/21	7mL HA on each temple, tear trough, and eyebrow glabella	Painful lesions on the left temporal, tear trough, forehead, and eyebrows 4 days after the injection.	1mo	Left frontal and temporal scalp	Trichoscopy showing follicular dropout and white dots, consistent with ischemic hair loss.	NS	Intravascular occlusion	D4: HAase (1500 units). 4wk: Intralesional corticosteroids, topical minoxidil. 1 month: CO_2 laser therapy	Complete hair regrowth nearly 1y +no scarring
Our case (2025, China)	Female/23	5 mL HA on left frontal region	4 days later, erythema and pain in the left frontal region	15d	Left frontal scalp	Dermoscopy showing black dots, broken hairs, reduced hair density, scaling and erythematous patches.	NS	High volume filling Vascular tamponade	D7: HAase (1500 units). D15: bFGF. 3–7wk: CGF, MN sessions, minoxidil	4 months: complete hair regrowth

Abbreviations: HA, Hyaluronic acid; NS, not specified; HAase, Hyaluronidase; bFGF, basic fibroblast growth factor; PRP, platelet-rich plasma; BTXA, botulinum toxin A; CDFI, color doppler flow imaging; CT, computed tomography; CO_2, carbon dioxide; CGF, Concentrated Growth Factor; MN, microneedling.

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hydrostatic pressure in the interstitial space[26] causing ischemia and hypoxia. These conditions disrupt hair follicle metabolism, prematurely terminating the anagen phase and resulting in hair loss.

Currently, no standardized protocols exist for managing HA-induced alopecia; however, early intervention is critical to restore blood perfusion, reduce tissue ischemia and hypoxia, and reverse localized hair loss. Clinical evidence indicates that timely administration of HAase is an effective emergency measure to address compromised blood perfusion caused by HA fillers. The optimal window for HAase administration is within the first 48 hours post-HA treatment, as this period is crucial for preventing ischemic damage to skin tissues.[26,27] While some patients may be reluctant to reverse the aesthetic effects of the filler prematurely,[28] even delayed HAase injection can alleviate pain and improve skin ischemia, underscoring its therapeutic value. Although direct injection of HAase at the site of vascular occlusion is challenging due to its low probability, the broad diffusion properties of HAase enable its therapeutic effects even when administered into the ischemic area rather than directly into the occluded vessel. Ultrasound-guided HAase injection is recommended for its precision in localizing the filler.[14,29] Beyond HAase,[10–14,16,17,19–22] adjunctive therapies such as intradermal triamcinolone acetonide,[10,11,15,17,18] hyperbaric oxygen therapy,[19] minoxidil,[10,11,16,17,20] platelet-rich plasma (PRP),[19,21] and botulinum toxin A (BTXA)[19] can further support reperfusion efforts.

In our case, the patient received a high-volume injection of 5 mL HA in the left frontal region. The combination of the substantial filler volume and HA's hygroscopic nature likely exerted pressure on local blood vessels, leading to type 2 pressure-induced alopecia. Early application of hyaluronidase effectively alleviated skin ischemia by degrading the HA filler. To address HA-induced alopecia, a multimodal approach incorporating CGF, MN, and minoxidil was implemented. CGF represents the latest generation of platelet products, containing a high concentration of growth factors and CD34-positive stem cells, which play key roles in wound healing and tissue regeneration. CGF has been shown to promote hair growth in androgenic alopecia.[30] Additionally, CGF is a potent anti-inflammatory agent that can suppress cytokine release, thus limiting local tissue inflammation. Given that alopecia induced by HA may be accompanied by skin necrosis and inflammatory response, the anti-inflammatory effects of CGF are likely to be highly beneficial in managing this condition. MN has been observed to induce the expression of several hair growth pathway mediators, such as Vascular Endothelial Growth Factor (VEGF), β-catenin, Wnt3a, and Wnt10b,[31] which play essential roles in regulating the hair cycle, hair shaft production, and follicle development. When minoxidil is delivered through MN-assisted transdermal pathways, it experiences enhanced permeation and absorption into the skin. This not only ensures a deeper and more efficient delivery to the targeted hair follicular units but also potentially increases the drug's bioavailability at the site of action, thereby amplifying its therapeutic effect on hair growth stimulation. This comprehensive strategy not only addresses the ischemic and inflammatory mechanisms underlying HA-induced alopecia but also facilitates effective hair regrowth and scalp recovery.

Dermoscopy serves as a valuable tool not only for distinguishing HA-induced alopecia from other hair loss conditions but also as a noninvasive method for comprehensive monitoring and longitudinal assessment of therapeutic responses in patients with HA injection-related alopecia. Dermoscopic evaluation in such cases typically reveals characteristic features of non-cicatricial alopecia, including yellow and black dots, fractured hair shafts, and abnormal vascular patterns such as vessel dilation, cutaneous erythema, and pigment accumulation.[10] In our case, initial dermoscopic findings included black dots, broken hairs, and irregular vascular proliferation. By the 4-month follow-up, these features had completely resolved, aligning with the patient's clinical improvement and validating the efficacy of the combined therapy. These dermoscopic changes highlight their potential as favorable prognostic indicators for treatment outcomes in HA-induced alopecia. Furthermore, histopathological analysis often shows reduced anagen hair follicle density, vascular ectasia, perifollicular lymphocytic infiltration, and basophilic foreign material within vascular structures, consistent with HA deposition. These findings underscore the diagnostic and therapeutic utility of dermoscopy and histopathological analysis in managing HA-induced alopecia.

Although various treatment options exist for HA-induced alopecia, prevention remains the most effective strategy. To minimize the risk of alopecia following cosmetic injections, a thorough assessment of the patient's scalp health and hair loss history is essential. This preliminary evaluation helps identify potential risk factors prior to the procedure. Practitioners must possess a deep understanding of the anatomical structures and vascular systems in the treatment area,[32] recognize specific "high-risk zones", and be proficient in managing complications. These principles are

fundamental to ensuring safety and achieving optimal outcomes in aesthetic injections.[33–35] To reduce the risk of intravascular injection, pre-injection aspiration is recommended to verify that the needle is not positioned within a blood vessel. However, the reliability of aspiration varies between 33% and 63%, influenced by factors such as needle gauge, retraction time, and needle length.[36–38] Adjusting aspiration techniques based on filler rheology can enhance reliability. The use of blunt-tipped cannulas (25G or larger) is advisable, as they are less likely to penetrate vessels.[32,39] The force applied during injection and the patient's age can also impact the likelihood of vessel penetration. Caution is warranted when using products containing local anesthetics or epinephrine, as these agents may mask signs of vascular occlusion.[33]

A low-pressure, slow injection technique is recommended to ensure precise filler placement at the correct depth and tissue plane.[8,39,40] Using the minimal volume required to achieve the desired outcome helps prevent overfilling and vessel compression.[39] If additional product is necessary, repeating the treatment within 7–14 days is a safer approach.[32,40,41] The choice of injectable materials significantly influences treatment outcomes. Higher-density fillers, characterized by greater G' values, pose an increased risk of vascular occlusion due to elevated external pressure on vessels.[42] For less experienced practitioners, reversible HA fillers are preferable, as they can be managed with HAase in cases of vascular occlusion.[39]

Conclusion

HA injection procedures are now widely utilized not only by physicians but also by nonmedical personnel. Although adverse reactions are relatively rare, secondary alopecia must be acknowledged as a potential complication, particularly in anatomically sensitive areas such as the scalp, forehead, and temporal regions. Clinicians should maintain a high level of vigilance regarding this complication following aesthetic dermal injections, promptly recognize its clinical manifestations, and have appropriate preventive and therapeutic strategies in place. The case presented in this study suggests that a combination of CGF, MN, and topical minoxidil may be an effective treatment option for HA-induced alopecia, warranting further investigation in larger studies.

Data Sharing Statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

Ethics Statement

This study does not involve statements of ethics. Institutional approval was not required for the publication of this case report.

Consent

Written informed consent, including consent for the use of photographs, was obtained from the patient for scientific publication.

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Disclosure

The authors declare no conflicts of interest.

References

1. Fagien S, Bertucci V, von Grote E, Mashburn JH. Rheologic and physicochemical properties used to differentiate injectable hyaluronic acid filler products. *Plast Reconstr Surg*. 2019;143(4):707e–720e. doi:10.1097/PRS.0000000000005429

2. Bukhari SNA, Roswandi NL, Waqas M, et al. Hyaluronic acid, a promising skin rejuvenating biomedicine: a review of recent updates and pre-clinical and clinical investigations on cosmetic and nutricosmetic effects. *Int J Biol Macromol*. 2018;120(Pt B):1682–1695. doi:10.1016/j.ijbiomac.2018.09.188
3. Buckley C, Murphy EJ, Montgomery TR, Major I. Hyaluronic acid: a review of the drug delivery capabilities of this naturally occurring polysaccharide. *Polymers*. 2022;14(17):3442. doi:10.3390/polym14173442
4. Eberle Heitzmann M, Thumm D, Baudouin C. A review of the efficacy, safety and tolerability of Lacrycon((R)) eye drops for the treatment of dry eye syndrome. *J Fr Ophtalmol*. 2019;42(6):642–654. doi:10.1016/j.jfo.2018.08.008
5. Pulumati A, Algarin Y, Jaalouk D, Latta S, Nouri K. Fillers impacting follicles: the emerging complication of filler-induced alopecia. *Int J Dermatol*. 2024;63(9):1131–1139. doi:10.1111/ijd.17169
6. Lowe NJ, Maxwell CA, Lowe P, Duick MG, Shah K. Hyaluronic acid skin fillers: adverse reactions and skin testing. *J Am Acad Dermatol*. 2001;45(6):930–933. doi:10.1067/mjd.2001.117381
7. Lafaille P, Benedetto A. Fillers: contraindications, side effects and precautions. *J Cutan Aesthet Surg*. 2010;3(1):16–19. doi:10.4103/0974-2077.63222
8. Ozturk CN, Li Y, Tung R, Parker L, Piliang MP, Zins JE. Complications following injection of soft-tissue fillers. *Aesthet Surg J*. 2013;33(6):862–877. doi:10.1177/1090820X13493638
9. Qiao J, An N. Effect of concentrated growth factors on function and Wnt3a expression of human periodontal ligament cells in vitro. *Platelets*. 2017;28(3):281–286. doi:10.1080/09537104.2016.1213381
10. Asz-Sigall D, Inigo-Gomez K, Ortega-Springall MF, Vega-Memije ME, Arenas R, Tosti A. Alopecia secondary to hyaluronic acid embolization: trichoscopic findings. *Skin Appendage Disord*. 2019;5(6):396–400. doi:10.1159/000502262
11. Albargawi S, Nagshabandi KN, Shadid A. Dermal filler-induced alopecia: a case report and literature review. *J Cosmet Dermatol*. 2025;24(2):e16684. doi:10.1111/jocd.16684
12. Pearce J, Al-Wahab Y, Brent G, Natkunarajah J. A case of scarring and nonscarring alopecia secondary to vascular occlusion with dermal filler. *Clin Exp Dermatol*. 2023;48(9):1040–1043. doi:10.1093/ced/llad152
13. van den Elzen H, Schelke L, Velthuis P. Temporary hair loss after injection of hyaluronic acid filler. *J Cosmet Dermatol*. 2022;21(2):625–626. doi:10.1111/jocd.14453
14. Zheng C, Fu Q, Zhou GW, et al. Efficacy of percutaneous superficial temporal arterial hyaluronidase injection for hyaluronic acid filler-induced necrosis of frontotemporal skin and/or the ipsilateral scalp with subsequent alopecia. *Aesthet Surg J*. 2023;43(2):NP77–NP83. doi:10.1093/asj/sjac270
15. Gan SD, Itkin A, Wolpowitz D. Hyaluronic acid-induced alopecia: a novel complication. *Dermatol Surg*. 2013;39(11):1724–1725. doi:10.1111/dsu.12333
16. Yang Q, Qiu L, Yi C, et al. Reversible alopecia with localized scalp necrosis after accidental embolization of the parietal artery with hyaluronic acid. *Aesthetic Plast Surg*. 2017;41(3):695–699. doi:10.1007/s00266-017-0841-z
17. Park GH, Kim WI, Yang MY, et al. Filler-induced alopecia. *J Dermatol*. 2019;46(11):e392–e393. doi:10.1111/1346-8138.14936
18. Park MJ, Hong SP, Kim MH, Park BC. Temporary hair loss with an increase of telogen hairs after filler migration into the scalp. *Dermatol Surg*. 2020;46(8):1129–1131. doi:10.1097/DSS.0000000000002023
19. Guo Y, Wei W, Zhang A, et al. The combination of platelet-rich plasma with botulinum toxin A in the treatment of hyaluronic acid embolic cutaneous necrosis and alopecia. *Dermatol Ther*. 2022;35(6):e15442. doi:10.1111/dth.15442
20. Li C, Zhang W. Vascular compromise and alopecia after hyaluronic acid filler injection in temple region. *J Craniofac Surg*. 2023;34(2):e128–e129. doi:10.1097/SCS.0000000000008865
21. Landau M, Lopez-Gehrke I, Villarica-Hayano W, Suwanchinda A, Galadari H. Nonscarring alopecia after temporal lifting technique with dermal fillers. *JAAD Case Rep*. 2023;37:30–34. doi:10.1016/j.jdcr.2023.04.029
22. Almutairi R, Usmani S, Mubarak S, Aldaraji W. Treacherous territory: temple fillers and tissue necrosis. *Skin Health Dis*. 2024;4(5):e392. doi:10.1002/ski2.392
23. Zerbinati N, Sommatis S, Maccario C, et al. In vitro hair growth promoting effect of a noncrosslinked hyaluronic acid in human dermal papilla cells. *Biomed Res Int*. 2021;2021:5598110. doi:10.1155/2021/5598110
24. Siquier-Dameto G, Boisnic S, Verdu E. Revitalizing effect on the scalp after injection with a mechanically stabilized hyaluronic acid complex in subjects with androgenetic alopecia. *J Clin Med*. 2024;13(22):6878. doi:10.3390/jcm13226878
25. DeLorenzi C. Complications of injectable fillers, part I. *Aesthet Surg J*. 2013;33(4):561–575. doi:10.1177/1090820X13484492
26. Kassir R, Kolluru A, Kassir M. Extensive necrosis after injection of hyaluronic acid filler: case report and review of the literature. *J Cosmet Dermatol*. 2011;10(3):224–231. doi:10.1111/j.1473-2165.2011.00562.x
27. Kim DW, Yoon ES, Ji YH, Park SH, Lee BI, Dhong ES. Vascular complications of hyaluronic acid fillers and the role of hyaluronidase in management. *J Plast Reconstr Aesthet Surg*. 2011;64(12):1590–1595. doi:10.1016/j.bjps.2011.07.013
28. Goodman GJ, Roberts S, Callan P. Experience and management of intravascular injection with facial fillers: results of a multinational survey of experienced injectors. *Aesthetic Plast Surg*. 2016;40(4):549–555. doi:10.1007/s00266-016-0658-1
29. Schelke LW, Decates TS, Velthuis PJ. Ultrasound to improve the safety of hyaluronic acid filler treatments. *J Cosmet Dermatol*. 2018;17(6):1019–1024. doi:10.1111/jocd.12726
30. Zhao F, Hao L, Jin X. Clinical observation and evaluation of CGF in the treatment of androgenic alopecia. *J Cosmet Dermatol*. 2022;21(11):5723–5729. doi:10.1111/jocd.15109
31. Kim YS, Jeong KH, Kim JE, Woo YJ, Kim BJ, Kang H. Repeated microneedle stimulation induces enhanced hair growth in a murine model. *Ann Dermatol*. 2016;28(5):586–592. doi:10.5021/ad.2016.28.5.586
32. DeLorenzi C. Complications of injectable fillers, part 2: vascular complications. *Aesthet Surg J*. 2014;34(4):584–600. doi:10.1177/1090820X14525035
33. Brennan C. Avoiding the "danger zones" when injecting dermal fillers and volume enhancers. *Plast Surg Nurs*. 2014;34(3):108–111; quiz112–3. doi:10.1097/PSN.0000000000000053
34. Cohen JL. Understanding, avoiding, and managing dermal filler complications. *Dermatol Surg*. 2008;34 Suppl 1:S92–S99. doi:10.1111/j.1524-4725.2008.34249.x

35. Cohen JL, Brown MR. Anatomic considerations for soft tissue augmentation of the face. *J Drugs Dermatol*. 2009;8(1):13–16.
36. Casabona G. Blood aspiration test for cosmetic fillers to prevent accidental intravascular injection in the face. *Dermatol Surg*. 2015;41(7):841–847. doi:10.1097/DSS.0000000000000395
37. Van Loghem JA, Fouche JJ, Thuis J. Sensitivity of aspiration as a safety test before injection of soft tissue fillers. *J Cosmet Dermatol*. 2018;17(1):39–46. doi:10.1111/jocd.12437
38. Torbeck RL, Schwarcz R, Hazan E, Wang JV, Farberg AS, Khorasani H. In vitro evaluation of preinjection aspiration for hyaluronic fillers as a safety checkpoint. *Dermatol Surg*. 2019;45(7):954–958. doi:10.1097/DSS.0000000000001767
39. Souza Felix Bravo B, Klotz De Almeida Balassiano L, Roos Mariano Da Rocha C, et al. Delayed-type necrosis after soft-tissue augmentation with hyaluronic acid. *J Clin Aesthet Dermatol*. 2015;8(12):42–47.
40. Sclafani AP, Fagien S. Treatment of injectable soft tissue filler complications. *Dermatol Surg*. 2009;35 Suppl 2:1672–1680. doi:10.1111/j.1524-4725.2009.01346.x
41. Glaich AS, Cohen JL, Goldberg LH. Injection necrosis of the glabella: protocol for prevention and treatment after use of dermal fillers. *Dermatol Surg*. 2006;32(2):276–281. doi:10.1111/j.1524-4725.2006.32052.x
42. King M, Walker L, Convery C, Davies E. Management of a vascular occlusion associated with cosmetic injections. *J Clin Aesthet Dermatol*. 2020;13(1):E53–E58.