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Case and Review

Needling as a Potential and Novel Treatment for Skin Ischemia following Filler-Induced Vascular Occlusion: A Case Series

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Keywords
Filler injection · Vascular occlusion · Ischemia · Needling · Treatment

Abstract
Introduction: The most severe complication of filler injection is ischemia due to vascular occlusion, causing skin necrosis, scarring, blindness, and even stroke. Among the available treatments, needling therapy has been used in some clinical practices but has been rarely studied and discussed. ***Case Presentations:*** Four recent skin ischemia cases with subsequent needling procedure were observed retrospectively and pertinent literature was analyzed. The objective was to evaluate the efficacy and safety of needling procedure for filler-induced skin ischemia, which is unresponsive to standard therapies. ***Conclusion:*** All of the 4 cases recovered from skin ischemia without side effects by receiving needling procedure. The available data demonstrate some potential mechanisms of needling, such as embolus releasing, ischemia reperfusion and revascularization. Although there is a lack of conclusive evidence for improving the hypoperfusion area by needling treatment, the current cases observation and theoretical analysis as well as our cases provide evidence supporting its potential as an efficacious, simple, and secure treatment for vascular complications.

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Introduction

In recent years, dermal fillers have been extensively utilized for facial esthetic procedures. Not only hyaluronic acid (HA) is widely recognized for its effectiveness, various non-HA soft tissue fillers such as polycaprolactone, polymethylmethacrylate, poly-L-lactic acid, calcium hydroxyapatite, and others have also become attractive options due to their high patient satisfaction and long-lasting effects. Although filler injections are generally considered to be safe, numerous complications have been reported to date. Vascular occlusion is one of the most serious adverse events to fillers, even a minuscule dose has the potential to result in blindness, stroke, and even death [1]. And skin ischemia is one of the early onset presentation resulting from intravascular occlusion and/or extravascular compression. Typical treatments include hyaluronidase [2], systemic antibiotics, steroids, aspirin, low molecular weight heparin, prostaglandin, along with physical therapies such as massage, heat treatment [3], and hyperbaric oxygen therapy (HBOT) [4]. Although consensus and guidelines exist, the actual treatment is still difficult, and the therapeutic efficiency and value of these approaches remain controversial. Besides, the increase in filler varieties brings more unknown risks. Although studies have indicated that some synthetic polymer materials may have a lower risk of vascular occlusion than highly hydrophilic and viscous HA [5, 6], HA has an effective hyaluronidase (HYAL). Moreover, its higher risk of vascular occlusion might be due to its highest usage frequency. Additionally, a growing number of products are composite [7], possibly containing more than two materials. Hence, the actual situation is complex, presenting more challenges for occlusion treatment. Now, more rapid and efficacious methods remain under continuous research and discussion [8]. Needling therapy is rarely mentioned in the treatment of post-injection vascular occlusion. In fact, it has already been used in some clinical practices. Moreover, similar treatments like acupuncture and dry needling have substantial experimental data proving their effectiveness for other diseases. We intend to initially observe its efficacy and safety in alleviating the ischemia due to vascular occlusion after filler injection.

Methods

Herein, we introduce 4 cases in which skin ischemia that occurred subsequent to dermal filler injection was managed successfully by needling procedure. The first step is HYAL injection (1,500 units or more) into the ischemic tissue and the branch areas of presumed occlusion blood vessels (if necessary), then 22 G needle insert would be utilized (shown in Fig. 1). The needle puncture spacing is maintained at 5 mm intervals, with an initial insertion depth of 5–7 mm. If the puncture point drains dark red blood, it indicates the release of stagnant blood, additionally, if there is a reduction in local pain, it indicates the alleviation of tissue pressure. Conversely, if these conditions are not met, the needling could continue using a needle of increased density, depth and thicker tube diameter until rebleeding occurs (within finite limits). Finally, the patients' treatment satisfaction will be counted. In addition, a review of relevant published literature was conducted to analyze the principle and possible mechanism of needling process.

Cases Presentation

Case 1

A 31-year-old woman received bilateral nasolabial folds filling injection with collagen at a cosmetic clinic. During the injection, she experienced severe pain in the left nasal alar, followed by immediate pale and cyanotic changes, no visual effects. She was immediately

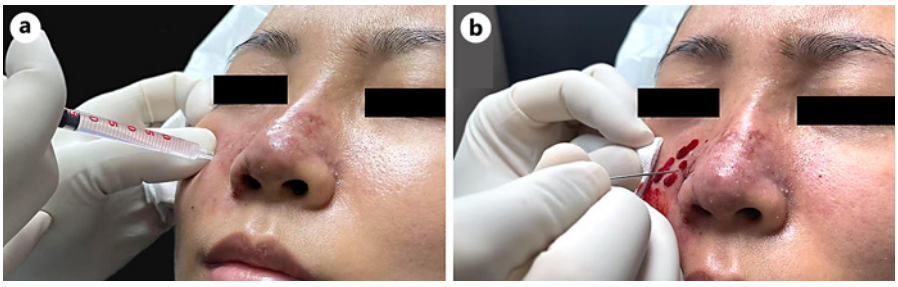

Fig. 1. Revascularization therapy with HYAL injection (**a**) and needling (**b**), the treatment is regarded as effective if there is an outflow of blood and alleviation of pain.

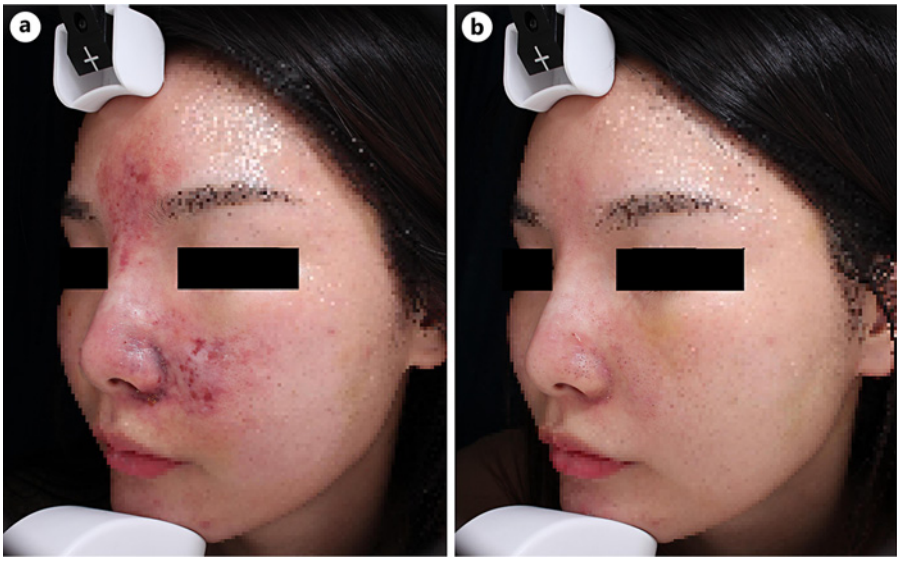

Fig. 2. The left nasal alar darkened and cyanotic changes appeared in the left nasolabial fold and glabella (**a**). By the sixth day after needling, the lesion had significantly improved, with no skin necrosis or scarring, only some hyperpigmentation left (**b**).

administered a total of 1,500 units of HYAL injection and subsequently received HBOT for three consecutive days but her condition did not improve. Pustules and blackened skin appeared (shown in Fig. 2a), particularly in the left alar nasal groove. We continued twice needling therapy on the third and fourth day after occlusion, the treatment areas targeted the facial artery, its nasal branch, and the interglabellar anastomotic branch, without the use of HYAL or any other supplementary therapies. By the sixth day after the needling, the patient had almost fully recovered, with no occurrence of skin necrosis or scarring (Fig. 2b).

Case 2

A 36-year-old woman had a nasal dorsum filling with polycaprolactone at a cosmetic clinic. Color change on the nose and right face were observed during the injection. Despite 2 days of high-dose HYAL, aspirin, and HBOT, the condition worsened with pain, pustules, swelling and even necrosis (shown in Fig. 3a). We applied needling for three consecutive days, accompanied by local hot compress. Then her symptoms improved notably during treatment (shown in Fig. 3b). At 1-month follow-up, she fully recovered with no scarring or pigmentation change (shown in Fig. 3c).

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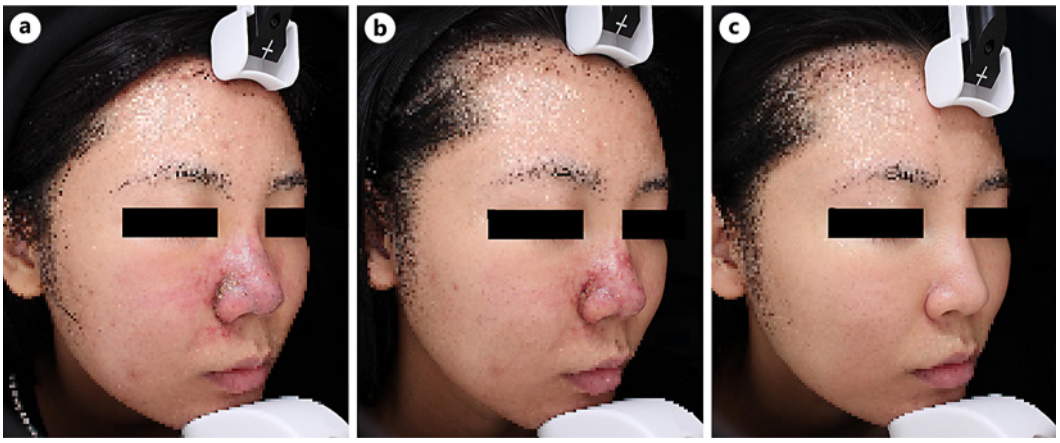

Fig. 3. Although the patient received high-dose HYAL, oral aspirin and HBOT, erythema, pustules, swelling, and even necrosis occurred in the nasal and right face regions (**a**). The day after the first needling, erythema and swelling improved markedly (**b**). At 1-month follow-up, the patient had fully recovered, with no skin necrosis or scarring (**c**).

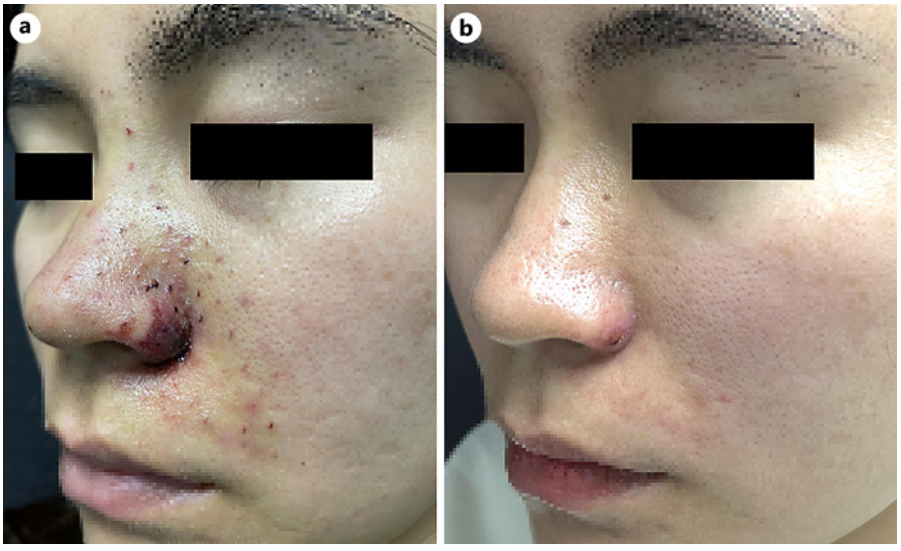

Fig. 4. Skin darkening was observed on her left nasal ala, and the needling was applied along the vascular distribution area (**a**). On the fifth day after treatment, the skin color recovered without necrosis and scar (**b**).

Case 3

A 34-year-old woman underwent a bilateral nasolabial folds filling with a mixture of poly-L-lactic acid and HA. During injection, her nose turned pale with pain. Then she got 1,500 units of HYAL in 3 h and applied hot compresses for 3 days after. However, a progressive darkening and a decline in temperature on her left nasal ala were still observed. On the fourth day, we re-administered HYAL (1,500 units) injections at the lesion site and simultaneously conducted a needling procedure along the vascular distribution area (shown in Fig. 4a). By the fifth day after treatment, she had almost fully recovered, with no occurrence of skin necrosis (shown in Fig. 4b).

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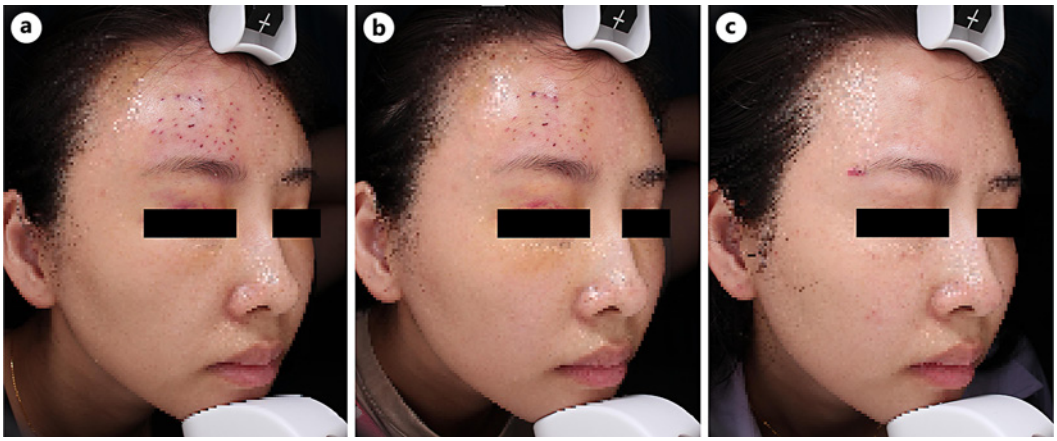

Fig. 5. Conditions on the day of needling treatment (**a**), on the third day after treatment, topical swelling and erythema improved (**b**), 10 days after the treatment, the lesions had achieved near-complete recovery (**c**).

Case 4

A 34-year-old woman received frontal augmentation with mixed materials (unknown), but the right frontal skin developed pain and pallor during the injection. Despite immediate topical administration of high-dose HYAL injection, no significant improvement was noted. Subsequently, she accepted once needling treatment at the second day after embolization without HBOT or oral medications. Ten days after the treatment, her lesions had nearly completely recovered (shown in Fig. 5).

Result

Four cases with different degrees of embolism were all recovered after needling procedure, without excessive dependence on HBOT, HYAL, or antithrombotic drugs, no secondary manifestations of skin necrosis and scar during follow-up visit. Patients' satisfaction with the therapeutic effect, measured by a five-point Likert scale, was at the "satisfied" or "very satisfied" level (shown in Table 1).

Discussion

The needling therapy we used mainly includes two key steps: needle insertion and bloodletting. On the one hand, there are already some treatment methods based on needle insertion without any pharmacological substance, like acupuncture (ACU) and dry needling (DN). DN involves the insertion of a solid filament needle through the skin and into the underlying muscles. The key difference from ACU is that DN is based on western anatomical and physiological concepts rather than traditional Chinese medicine which is based on specific points on the body. Various clinical effects in common diseases have been credited to them, involves chronic pain, muscle tension, insufficiency in blood circulation, and other systemic physiologic disorder [9–11]. Particularly, various studies have shown that ACU and DN can potentially enhance muscle blood flow and oxygenation [12–14]. Not only the changes in muscles, Sandberg et al. report needle insertion into the anterior tibial muscle of healthy female subjects enhanced both skin and muscle blood flow [15]. Multiple

Table 1. Patients information form

Patients	Age	Sex	Filler	Skin involved	Vessels involved	Needling area	Times of needling	Concomitant therapy	Patient satisfaction
Patient 1	31	F	Collagen	Left NLF and glabella	STRA, AA, LNA	NLF, nose, and glabella	2	None	Satisfied
Patient 2	34	F	PCL	Nose	DNA, LNA	NLF, nose, and glabella	3	Heat treatment	Very satisfied
Patient 3	36	F	PLLA, HA	Left nasal wing	FA, LNA	NLF, nose, and glabella	1	HYAL	Very satisfied
Patient 4	33	F	Mixed	Forehead	SOA, STA (fb)	Forehead	1	None	Very satisfied

F, female; PCL, polycaprolactone; PLLA, poly-L-lactic acid; HA, hyaluronic acid; HYAL, hyaluronidase; NLF, nasolabial fold; STRA, supratrochlear artery; AA, angular artery; FA, facial artery; LNA, lateral nasal artery; SOA, supraorbital artery; STA(fb), superficial temporal artery frontal branch.

mechanisms have been proposed to account for these procedures. Among them, the most likely one is the release of vasoactive substances like calcitonin gene-related peptide (CGRP) and substance P (SP), results in the dilation of small vessels and an augmentation of blood flow [16–18]. Besides, there are also some experiments or cases have stated the effectiveness of it in treating scar tissue and hold the view that the needle's rotation stimulates fibroblast activity, promoting collagen release and tissue restoration [19–21]. On the other hand, bloodletting is an ancient therapy which has been practiced at least 3,000 years [22, 23]. Numerous theories and practices have already confirmed the efficacy of bloodletting treatment in a variety of diseases, such as acute soft tissue injury [24] and nervous injury [25]. Some case reports have described the successful treatment of patients with retinal artery occlusion through the massage and bloodletting of the occluded artery [26, 27]. Similar to bloodletting therapy is hirudo medicinalis which has been used in medicine for millennia. In recent years, leeches have been successfully used to treat venous congestion in flaps and vascular compromise caused by replantation [28]. Besides removing stasis blood through sucking process, hirudin in leeches' saliva is a powerful inhibitor of thrombin. Case reports exist about successfully treating post-fillers injection occlusion unresponsive to standard measures with leeches [29, 30]. Tsai et al. [31] reported that the needling procedure guided by laser speckle contrast imaging could successfully treated skin tissue ischemia due to vascular occlusion after HA filler injections, and they believe laser speckle contrast imaging is suitable for assessing microvascular hemodynamics. Also, by puncturing affected blood vessels area, needling can improve blood circulation and help filler extravasation. In our 4 cases of patients with different filler-induced skin ischemia, they did not respond well to standard methods such as HYAL and HBOT. Therefore, by combining the methods reported in the literature and the experience of other physicians, we adopted needling procedure at area of blood supply based on vascular anatomy and achieved good results. The aim was to perform direct pierce on the involved area, drain a large amount of stagnant blood and remove residual substances, consequently re-establishing the blood flow. In addition, needle insertion may help recovery and reduces scar formation.

Our study, for the first time, has conducted a detailed and comprehensive analysis of the mechanism of occlusion after filler injection treated by needling procedure. The main limitations of our study are small sample size and lack of laboratory data, and the degree of occlusion in these patients was not fully clarified. While we initially explored using

ultrasonography to evaluate embolism severity and filler distribution, this method proved inadequate because localized skin ischemia is predominantly caused by small branch vessel occlusion, where ultrasound cannot reliably visualize microcirculation. Given that even trace amounts of filler (<0.1 mL) can cause vascular occlusion [1], combined with limitation of ultrasonography in identifying skin ischemia [32], we opted not to incorporate routine ultrasound assessment of ischemic areas in our clinical practice. Besides, our treatment used a hollow needle, whereas the ACU/DN and bloodletting procedures typically utilize solid needles. Consequently, there is a lack of laboratory evidence concerning whether the needling process holds the combined effectiveness of ACU and DN. Lastly, the needling procedure in our cases is only applicable to vascular occlusions in skin tissues covering a limited area. Regarding deep blood vessels, like those in the eyes or brain, there is a lack of sufficient practical examples. Herein, we further validated needling efficacy by presenting cases and analyzing the possible underlying mechanisms. In conclusion, all of our patients recovered and had a favorable prognosis. Although the needling treatment has achieved good results in our cases and is cost-effective, convenient, and quick, we do not recommend overrating it. Without proper examinations and assessments of the occlusion, blind use is unwise. However, when traditional treatments fail, it can be a viable option for doctors with imaging guidance or well vascular anatomy knowledge. The authors are looking forward to more controlled trials and deep research on needling treatment mechanisms in the future. The CARE Checklist has been completed by the authors for this case report, attached as online supplementary material (for all online suppl. material, see https://doi.org/10.1159/000547162).

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Statement of Ethics

Ethical approval is not required for this study; our institution allows no application of ethical approval for reporting single cases or series of cases. Written informed consent was obtained from patients for publication of the details of their medical case and accompanying images (pixelated).

Conflict of Interest Statement

The authors declare that there is no conflict of interest associated with this manuscript.

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Author Contributions

J.W. collated patients' information and wrote the draft manuscript; B.Y. and X.J. guided the design and data analysis of this manuscript. Z.Z. and J.W. revised the content structure of the manuscript, Y.Z. and Z.W. summarized the content of esthetic materials. All authors were involved in revising the manuscript critically for important intellectual content and for final approval of the version to be published.

Data Availability Statement

X.J. takes responsibility for the integrity of the data. The original contributions presented in this study are included in the article. Further inquiries can be directed to the corresponding author.

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