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CASE REPORT

Immediate Autologous Granular Fat Grafting with Modified Techniques for Chronic Prosthetic Rhinoplasty Infection: A Single-Case Experience

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Abstract: Managing chronic infection after prosthetic rhinoplasty is clinically challenging. Traditional staged treatment involves prolonged waiting periods, often leading to nasal dorsum collapse, soft tissue contracture, and increased difficulty of secondary surgeries. Immediate autologous fat grafting after infected implant removal has been reported, but technical limitations such as unstandardized debridement and aggressive fat processing remain. We report a case of a 48-year-old female patient with chronic infection one year after ePTFE prosthetic rhinoplasty, unresponsive to a 2-week course of oral amoxicillin-clavulanate potassium. A single-stage procedure was performed, including complete prosthesis and capsule removal, restricted cavity debridement, and immediate transplantation of minimally processed autologous granular fat (simple gauze filtration without washing/centrifugation) into the original cavity. During one-year follow-up, no signs of infection recurrence were observed, and the nasal dorsum contour remained stable and natural without collapse or deformity. The patient reported satisfaction with the aesthetic outcome and declined further implant-based surgery. This single-case experience suggests that single-stage debridement combined with immediate autologous granular fat grafting may be feasible for carefully selected patients with chronic, localized, low-virulence prosthetic rhinoplasty infection. The modified techniques described (restricted debridement, minimal fat processing, elastic tape fixation) warrant further investigation in larger studies.

Keywords: rhinoplasty, chronic implant infection, autologous fat grafting, restricted debridement

Introduction

Chronic infection following prosthetic rhinoplasty is a complex and challenging complication in cosmetic surgery.[1–3] Despite continuous advancements in surgical techniques and implant materials,[4–6] infection remains an unavoidable risk associated with allogeneic material implantation.[7,8] A large-scale retrospective study of 2630 East Asian rhinoplasty cases over 16 years reported an overall infection rate of 0.84%. Revision rhinoplasty carried a 19-fold higher risk than primary surgery (3.63% vs 0.19%), and female patients had a 3.6-fold greater susceptibility.[9]

The pathogenic bacteria responsible for post-rhinoplasty infections (commonly occurring at the nasal tip) vary depending on the implant material. Alloplastic materials in rhinoplasty carry distinct complication profiles: silicone implants are associated with capsular contracture (35%) and displacement (30%); Gore-Tex with contour deformities (53%) and infection (24%); and Medpor with severe contracture (85%) and mucosal protrusion.[10] Once infection progresses to a chronic state (persisting >4 weeks, accompanied by sinus tract formation, and positive cultures),

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management becomes particularly challenging. The traditional standard treatment emphasizes complete implant removal, systemic antibiotics, and a mandatory waiting period of at least 6 months before considering secondary reconstruction. This approach has inherent limitations: soft tissue contracture, scar hyperplasia, and contour collapse develop during the waiting period, making subsequent revision surgeries difficult and imposing significant psychological distress.

To address these limitations, several studies have explored immediate reconstruction after infected implant removal. One case series of 8 patients reported successful single-stage implant removal combined with autologous diced cartilage fascia grafting, with no recurrent infection and 75% excellent aesthetic outcomes at a mean follow-up of 84.4 months.[11] More relevant to the present work, immediate autologous fat grafting after removal of infected or extruding silicone implants has been described: block lobular fat grafting from the suprapubic region effectively obliterated dead space and prevented skin retraction, though approximately 50% fat absorption occurred within 6 months, requiring subsequent definitive repair.[12] These prior reports confirm the feasibility of single-stage strategies but leave room for technical refinement, particularly in fat processing and cavity management.

In this context, we modified our technique with three key refinements: restricted cavity debridement (confined to the original prosthesis cavity), minimal fat processing (filtration without centrifugation or washing), and elastic tape fixation (instead of rigid splints). We applied this modified protocol to a patient with chronic *Citrobacter koseri* infection (identified via intraoperative culture), achieving favorable outcomes. The present case report aims to describe these technical modifications and contextualize them within existing reconstructive options after infected implant removal.

Case Report

A 48-year-old female patient presented to our cosmetic surgery outpatient department on March 13, 2024, with swelling at the nasal root and serous secretion from a sinus tract, with a history lasting 3 months. She had undergone dorsal rhinoplasty with expanded polytetrafluoroethylene (ePTFE) implants over a year prior, with initial postoperative recovery and satisfactory morphology. Three months ago, the nasal root began to exhibit unexplained swelling and pain, accompanied by a protruding sensation at the nasal tip and intermittent serous discharge from the right nasal cavity. A two-week course of oral amoxicillin-clavulanate potassium at another hospital had failed to resolve her symptoms. The patient denied experiencing trauma, fever, chills, or other systemic symptoms. Her medical history was unremarkable for hypertension, diabetes, or other systemic diseases; no drug allergies; and no smoking or alcohol habits.

Physical examination revealed significant swelling at the root of the nose, with no skin ulceration or necrosis. Palpation revealed mild tenderness, and a floating sensation of the implant was detected, indicating damage to the prosthesis-tissue interface (Figure 1). A small sinus tract was visible at the right nasal vault, with light pressure causing the discharge of pale red serous fluid. The bilateral nasal mucosa exhibited congestion and edema, but no mucosal defects or prosthesis exposure was noted. Nasal airflow was not significantly impaired.

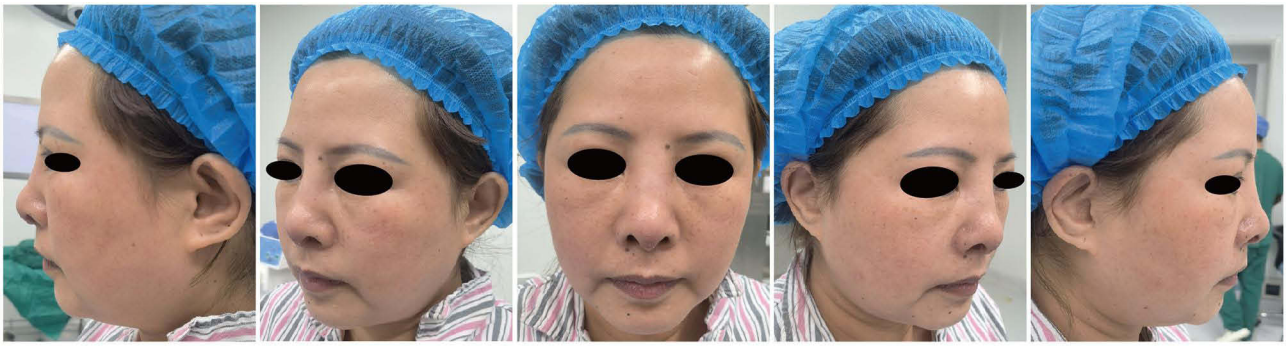

Figure 1 Preoperative clinical photographs. Views (from left to right): left lateral, left 45° oblique, frontal, right 45° oblique, and right lateral. Diffuse swelling is evident over the nasal dorsum and radix, with an irregular dorsal contour.

Diagnostic Workup and Preoperative Planning

Preoperative laboratory tests revealed no clear signs of infection (white blood cell count, 6.78×10^9/L; neutrophil count, 4.68×10^9/L; and lymphocyte count, 1.67×10^9/L). Liver and kidney function, coagulation profile, infectious disease screening, electrocardiogram, and chest X-ray revealed no significant abnormalities. Based on the clinical manifestations and examination results, the patient was preliminarily diagnosed with chronic prosthesis-related infection after rhinoplasty. This met the definition of chronic infection (symptoms >4 weeks) and showed localized infection without systemic spread, intact soft tissue coverage, and no extensive necrosis.

Given these features, we formulated a personalized surgical treatment plan: nasal prosthesis removal combined with autologous granular fat grafting. This approach removes the infected implant and restores nasal contour in one surgery, avoiding the traditional staged procedures such as interim deformity, soft tissue contracture, increased secondary surgery difficulty, and psychological burden. Unlike previous reports that often use centrifugation or washing, our modified technique keeps fat manipulation minimal to better preserve viable cellular components—a potential advantage in managing residual biofilm or low-grade infection.

Before surgery, we thoroughly discussed the rationale, surgical steps, expected outcomes, and potential risks (infection recurrence, fat absorption, contour irregularities, etc.) with the patient. After full understanding, she provided written informed consent. Our hospital's ethics committee waived formal approval for this single case report (no experimental intervention or extra patient identifiers), and all procedures followed the Declaration of Helsinki.

Surgical Technique: Biological Debridement and Reconstruction

Anesthesia and Incision

Surgery was performed under general anesthesia with endotracheal intubation. No local anesthetics with vasoconstrictors were injected into the nasal area to avoid interfering with intraoperative skin blood flow observation and postoperative fat survival. After anesthesia induction, the surgical area was disinfected routinely and draped. A "W"-shaped incision line was made at the lower third of the nasal columella, followed by subcutaneous dissection of the columellar and nasal tip flaps to expose the implant capsule.

Implant Removal and Wound Cavity Preparation

Once the implant cavity was entered, the implant was carefully dissected and removed intact. Exudate and capsule tissue samples were collected for bacterial culture and histopathology. The cavity then underwent rigorous and systematic irrigation: sequential rinsing with 3% hydrogen peroxide, povidone-iodine, diluted povidone-iodine, and warm normal saline (≥50 mL) to significantly reduce the bacterial load. A key modification in our protocol is the targeted use of hydrogen peroxide with a strict contact time (≤30 seconds) followed by generous saline rinse. This disrupts biofilms and targets anaerobes more effectively than conventional debridement, while minimizing tissue irritation to protect the fat graft. Residual inflammatory granulation tissue was then curetted, followed by another rinse with diluted iodophor and normal saline. Finally, the cavity was irrigated with a solution of 0.9% saline (20 mL) + gentamicin (80,000 U) + dexamethasone (5 mg) for 5 minutes (aspirated completely afterward) for local adjunctive anti-infective and anti-inflammatory effects.

Histopathology of the excised tissue (0.8×0.5×0.3 cm) showed inflammatory granulation tissue composed of fibroblasts, acute and chronic inflammatory cells, and capillaries (Figure 2). Bacterial culture of the exudate grew *Citrobacter koseri*, sensitive to cefuroxime and levofloxacin—findings that directly guided our postoperative antibiotic choice.

Fat Harvesting and Processing

In the same operation, a roughly 10 cm × 15 cm area on the inner left thigh was infiltrated with 2% lidocaine. A 3 mm incision was made near the groin, and 160 mL of tumescent solution (500 mL 0.9% saline, 0.5 mg epinephrine, and 100 mg 2% lidocaine) was injected into the superficial layer of the muscular fascia. A 10 mL syringe was used to aspirate fat from the anterior and inner thighs under −400 mmHg negative pressure, resulting in 40 mL of fat mixture.

Unlike conventional centrifugation or washing, we processed the fat simply by filtering it through two layers of sterile gauze andto remove liquid and fibrous tissue (>1 mm), then gently squeezing out residual fluid. After confirming

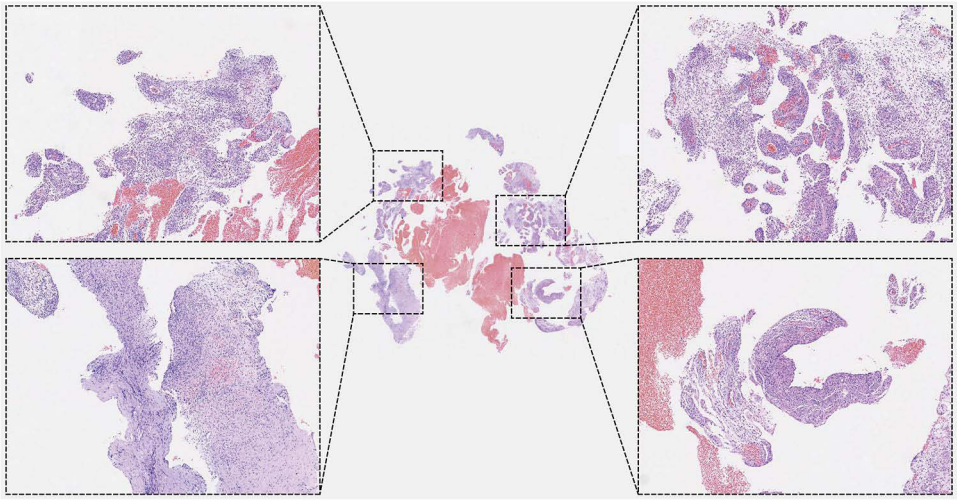

Figure 2 Histopathological examination of infected dorsal nasal tissue. (H&E staining, ×10). The specimen comprising proliferating fibroblasts, newly formed capillaries, and dense inflammatory cells infiltration.

a smooth contour at the donor site, the incision was closed with 5–0 nylon sutures, and the area was bandaged with elastic bandages.

Fat Transplantation and Incision Closure

Using a 1 mL syringe connected to an 18G fat grafting needle, the processed particulate fat was reimplanted into the prepared dorsal nasal cavity through the original columellar incision. Injection continued until slight overflow from the incision to ensure dead space elimination, with a total volume of approximately 2.5 mL (Figure 3). All procedures stayed

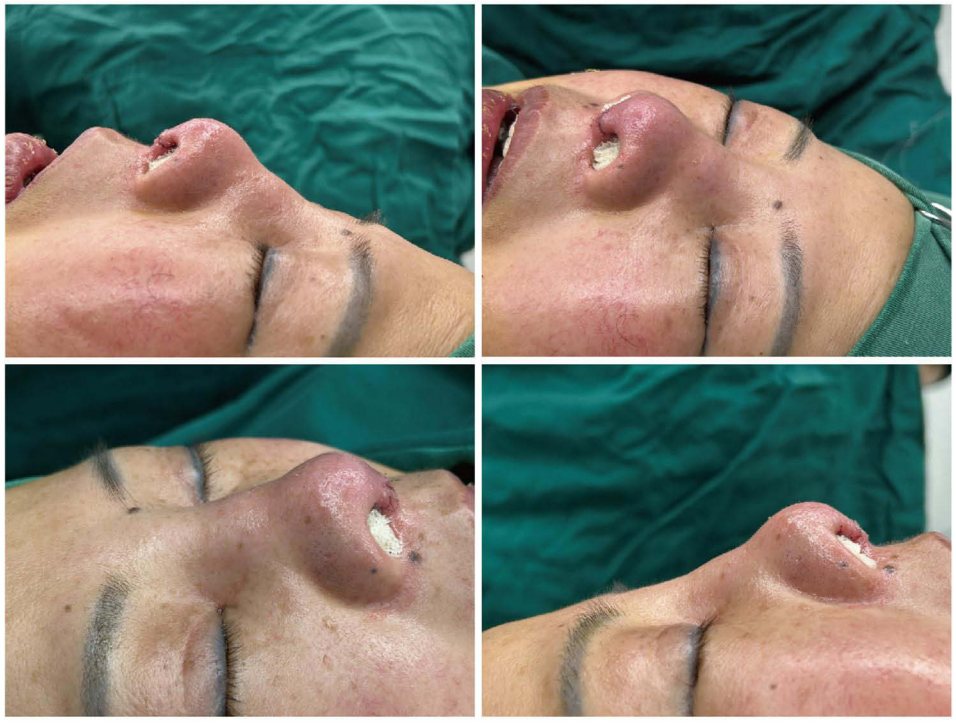

Figure 3 Immediate postoperative clinical photographs. Left lateral, left 45° oblique, right 45° oblique, and right lateral views show the initial restoration and stabilization of the nasal dorsal contour following granular fat grafting.

strictly within the original prosthesis cavity to avoid risks such as graft dispersion due to excessive dissection and postoperative widening of the nasal dorsum. The columellar incision was meticulously aligned and closed with 7–0 nylon sutures. Another refinement in our technique is using elastic medical tape rather than rigid splints for external fixation. The tape provides moderate, adaptive compression that accommodates postoperative swelling, avoiding excessive pressure on the graft and fragile nasal skin—thus reducing the risk of microcirculatory compromise and promoting fat survival.

Treatment Outcome and Follow-Up

Postoperatively, the patient received a 5-day course of intravenous antibiotic therapy (cefuroxime 1.5 g twice daily plus levofloxacin 0.2 g twice daily, selected based on intraoperative culture and sensitivity). Sutures and nasal tape were removed on postoperative day 9, with primary healing and no local signs of acute inflammation, such as redness, swelling, or exudate.

Follow-ups were conducted at 1 month, 3 months, and 1 year post-surgery (Figure 4). At the 1-month follow-up, postoperative edema had largely subsided, and the nasal contour had initially stabilized. By 3 months, the edema had completely resolved, with a soft texture and natural appearance on palpation. At 1 year, the nasal dorsum contour remained stable with smooth lines, and the grafted area exhibited a texture consistent with surrounding tissues, with no significant fat absorption or secondary contour changes. Throughout follow-up, common deformities associated with traditional implant removal surgery, such as nasal dorsum collapse or soft tissue contracture, were not observed.

The patient expressed satisfaction with the final aesthetic outcome and explicitly declined further implant placement surgery. At the last follow-up, no complications, such as recurrent infection, fat liquefaction necrosis, or hematoma, had occurred.

Discussion

This case presents a modified single-stage strategy for chronic prosthetic rhinoplasty infection, addressing limitations of prior immediate fat grafting protocols. The use of fat injection strategies to improve rhinoplasty by correcting small dorsal irregularities has been previously studied.[13] Although immediate autologous fat grafting after infected implant removal has been reported,[12] the present technique introduces three targeted refinements: 1) restricted cavity debridement. Debridement was confined to the original prosthesis cavity without enlargement, avoiding fat displacement and nasal widening. This preserves local blood supply while ensuring infection control. 2) minimal fat processing. Fat was only filtered with gauze (no washing/centrifugation). 3) Elastic tape fixation. Rigid splints were replaced with elastic tape to reduce compression-induced microcirculation impairment.

The success of this protocol is attributed primarily to thorough surgical debridement and precise mechanical reconstructions. Physical debridement and dead space obliteration are the primary drivers of infection control. Complete removal of the infected prosthesis and capsule, sequential lavage, and curettage of all inflammatory granulation tissue form the physical foundation. The importance of culturing the explanted prosthesis itself, rather than relying on wound secretions, has been highlighted in a recent study: bacterial detection rates are significantly higher from prosthetic cultures, especially in patients pretreated with antibiotics.[14] In our case, intraoperative exudate culture identified *Citrobacter koseri*, which guided targeted antibiotic therapy. Subsequent autologous fat implantation follows the principle of "filling without leaving residual space," providing immediate structural support, eliminating dead space, and avoiding allogeneic materials.

Pathogen-specific considerations further inform patient selection and management. *Staphylococcus aureus* is the predominant pathogen in infections associated with most materials, except for hyaluronic acid and expanded polytetrafluoroethylene.[15] *Pseudomonas aeruginosa* readily forms biofilms around implants, rendering antibiotics ineffective; early implant removal and radical debridement are mandatory to prevent catastrophic tissue damage.[16] Our patient's infection was caused by *Citrobacter koseri*, a less virulent organism, which may partly explain the favorable outcome without aggressive debridement. Additionally, Actinomyces has been identified as an underappreciated cause of postoperative rhinoplasty infections, requiring dedicated anaerobic culture and prolonged penicillin therapy.[17] Although not relevant to our case, this highlights the importance of comprehensive microbiological workup. For patients with

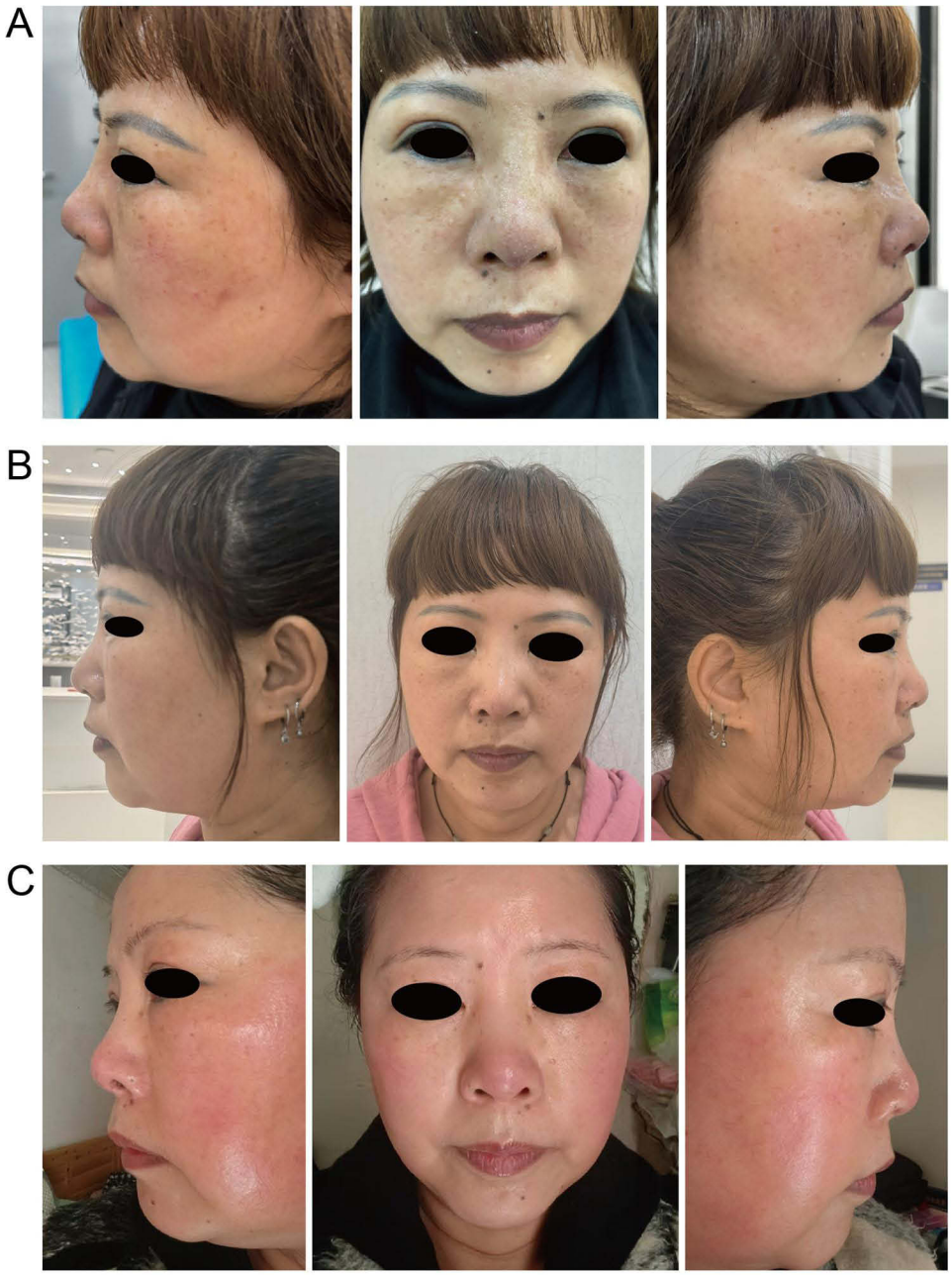

Figure 4 Postoperative follow-up clinical photographs. (**A**) 1 month: Left lateral, frontal, and right lateral views show resolved edema and initial contour stabilization. (**B**) 3 months: Corresponding views demonstrate a natural and smooth dorsal contour with complete edema resolution. (**C**) 1 year: Views confirm the long-term maintenance of a stable, symmetrical dorsal contour without signs of collapse, recurrence, or significant fat resorption.

severe nasal contracture after implant removal, alternative strategies such as preoperative autologous shuffling lipo-aspirated fat combined with manual mechanical stretching have been shown to improve nasal length and tip projection before revision rhinoplasty.[18] In our case, immediate fat grafting at the time of implant removal obviated the need for such staged pretreatment.

Regarding the microenvironment for fat graft survival, chronic infection-induced granulation tissue beds may offer a favorable environment. Such beds have been reported to have higher vascular density than normal tissues, which may enhance graft retention—though this remains a hypothesis requiring further validation. As for the potential role of adipose-derived stem cells (ADSCs): Autologous fat contains stromal vascular fraction (SVF) and ADSCs, which are believed to have proangiogenic and immunomodulatory properties.[19–22] Some literature suggests ADSCs may

upregulate antimicrobial peptides (including cathelin-related antimicrobial peptide, mouse beta-defensin 3) in epidermal tissues[23] or reduce immune cells apoptosis and enhancing their ability to clear *Staphylococcus aureus*.[24] However, in the context of this single case, these mechanisms are largely speculative. We present them cautiously, acknowledging that no direct laboratory data support their contribution in our patient. The minimal processing protocol preserves these components, but whether they actively contributed to infection control or fat survival remains unknown. The specific contributions of the biological mechanisms in this case still require further in-depth laboratory studies.

The 5-day intravenous antibiotic course (cefuroxime + levofloxacin) was selected based on intraoperative culture and sensitivity. Short-course antibiotics (≤7 days) have been shown to achieve infection control equivalent to long-term regimens while preserving fat viability. *Citrobacter koseri* was sensitive to both agents, supporting the efficacy of this short-course approach. Additionally, the management strategy of local antibiotic-hormone solution irrigation is designed to further control local infection and inflammatory responses, creating a more favorable local environment for the initial survival of the graft.

This technique is a targeted salvage strategy for carefully selected patients with: 1) chronic (>4 weeks), localized, low-virulence infection; 2) intact soft tissue envelope (no skin necrosis or implant exposure); 3) no uncontrolled systemic conditions (diabetes, immunosuppression). It is not applicable to acute infections or high-virulence pathogens (eg., *Pseudomonas aeruginosa*). As an alternative to traditional staged treatment, our approach prioritizes patient-centered outcomes (avoiding multiple surgeries, preserving contour) and may inform management of chronic infections in other implant-based procedures.

Finally, several limitations must be acknowledged: the single-case design, lack of a control group, and absence of validated outcome scales (eg., Standardized Cosmesis and Health Nasal Outcomes Survey (SCHNOS)[25,26] or Rhinoplasty Outcome Evaluation (ROE)).[27] Future research should explore comparative effectiveness of different fat processing techniques (eg., SVF-assisted fat grafting,[28,29] nanofat[30,31]) and incorporate comprehensive pathogen profiling, including anaerobic and biofilm-specific cultures, to better understand the role of specific organisms in treatment outcomes. Given the limited evidence, conclusions regarding effectiveness remain preliminary and require validation through larger comparative studies.

Conclusion

This single-case experience suggests that modified single-stage debridement combined with immediate autologous granular fat grafting may be a feasible option for carefully selected patients with chronic, localized, low-virulence prosthetic rhinoplasty infection. The technical refinements (restricted debridement, minimal fat processing, and elastic tape fixation) address limitations of prior protocols, achieving simultaneous infection control and contour preservation. Success depends on rigorous patient selection and standardized surgical steps. Broader application requires validation through larger comparative studies. The biological properties of fat may play a synergistic role, but this remains speculative and requires further investigations.

Data Sharing Statement

The datasets generated and analyzed during the current study are available upon request from the corresponding author Hai Zhao (E-mail: boys038@163.com).

Consent for Publication

We have confirmed with the patients that the details of any images, videos, recordings, etc can be published, and patients informed consent for publication of their case details and images was obtained in written form. Institutional approval was not required to publish the case details.

Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically

reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

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Disclosure

The authors report no conflicts of interest in this work.

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