SHORT COMMUNICATION

# Primary Cutaneous Nocardiosis after Dermal Filler Injection: A Case Report and Review of Cosmetic-procedure-associated Nocardiosis

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*Nocardia* species are filamentous, aerobic, gram-positive and weakly acid-fast bacteria classified under the order *Actinomycetales*. They are commonly found in soil, decaying organic matter, water and air. Nocardiosis results from either direct inoculation or inhalation and affects both immunocompromised and, less commonly, immunocompetent individuals worldwide (1, 2). Primary cutaneous nocardiosis can manifest in 4 clinical forms: superficial skin infection, lymphocutaneous infection, mycetoma and disseminated infection involving the skin. *Nocardia nova* has been associated with all these forms of nocardiosis (3, 4); however, *Nocardia brasiliensis* is responsible for 80% of primary cutaneous nocardiosis cases. Other clinical presentations of nocardiosis include lung involvement and disseminated systemic disease (5). Herein, we report the first documented case of primary cutaneous nocardiosis caused by *N. nova* following dermal filler injection.

## CASE PRESENTATION

A 27-year-old woman with no underlying diseases presented with multiple persistent erythematous nodules on the jawline for 11 months. One month before the onset of the nodules, she had undergone her first hyaluronic acid filler injections to the upper, mid and lower face, with particular emphasis on the jawline. Botulinum toxin and mesotherapy were administered during the same session (**Fig. 1**). The nodules were firm in consistency, without ulceration, sinus tracts or discharge. Hyaluronidase was subsequently injected, and the patient was prescribed multiple sessions of antibiotics, including intravenous ceftriaxone, oral amoxicillin, amoxicillin/clavulanic acid and ciprofloxacin, with no clinical improvement.

Upon referral to our hospital, delayed-onset nodules characterized as cold abscesses were observed. The nodules were soft, tender and fluctuant, without ulceration, sinus tract formation or spontaneous discharge at initial onset. At referral, mild discharge was observed from one lesion. At referral, the leading diagnosis was an atypical post-procedural infection, particularly rapidly growing mycobacterial infection, given the delayed persistent nodules after cosmetic injection and the poor response to conventional antibiotics. Nodulocystic acne was considered less likely because the lesions were localized to the injection sites and persisted despite prior antibiotic therapy. Other differential diagnosis included infectious causes, such as bacterial and fungal infections, as well as noninfectious causes, including foreign body granuloma with tissue necrosis and sterile abscess secondary to hyaluronic acid filler. Empirical therapy was initiated with clarithromycin to target RGM, in combination with lymecycline to address acne-associated bacteria and avoid monotherapy, given the patient's concurrent acne vulgaris.

Subsequent investigations were performed. Acid-fast staining of the pus smear yielded negative results. Culture on Löwenstein–Jensen medium for Actinomyces and mycobacteria from the nodule on the right jawline identified the causative organism as *N. nova* (**Fig. 2**). PCR assay of these isolates was negative. *In vitro* antibiotic susceptibility testing demonstrated sensitivity to trimethoprim-sulfamethoxazole, amikacin, ceftriaxone, clarithromycin, imipenem and linezolid, with resistance

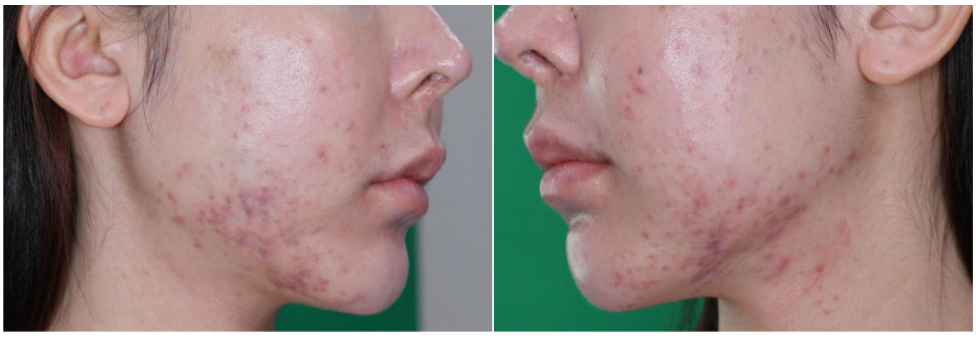

**Fig. 1. Multiple persistent erythematous nodules on both jawlines.**

**Fig. 2. The pus culture grown on Lowenstein–Jensen medium confirmed the organism as *N. nova*.**

to amoxicillin-clavulanate, ciprofloxacin, doxycycline and tobramycin. Based on susceptibility testing, TMP-SMX was selected as the backbone therapy in accordance with the Infectious Diseases Society of America (IDSA) guidelines with a planned duration of 3 months (6), while lymecycline was continued as adjunctive therapy for concomitant acne vulgaris. The patient's condition subsequently achieved complete clinical resolution.

## DISCUSSION

Reports of cutaneous nocardiosis following cosmetic procedures, although uncommon, are being recognized with increasing frequency. Previously documented cases have been linked to unlicensed cosmetic injections (7), mesotherapy (8) and intralesional treatments (9, 10), as summarized in **Table I**. Postprocedure nocardiosis has been predominantly associated with unlicensed, nonmedical settings, where breaches in infection control – including nonsterile or reused needles, contaminated injectables and absence of aseptic technique – represent the primary source of inoculation, as demonstrated by the cluster reported by Apostolou et al. (7). Such infections are therefore largely preventable. Notably, the present case occurred in a licensed clinic; however, a breach in sterilization of equipment or materials cannot be excluded. This underscores the importance of maintaining rigorous infection control protocols regardless of the clinical setting, and a high index of suspicion for atypical infections following any cosmetic injection procedure.

Dermal filler procedures involve the introduction of hyaluronic acid through the dermis and into the dermal, subcutaneous or preperiosteal plane using a sharp needle or cannula, thereby creating microtrauma pathways that may facilitate the direct inoculation of environmental organisms such as *Nocardia* spp. While filler-associated infectious complications are more frequently attributed to biofilm-forming bacteria ((e.g.) *Staphylococcus epidermidis, Cutibacterium acnes*) and atypical mycobacteria, nocardial infections may be underdiagnosed due to their rarity and subtle, indolent presentation. Many cases initially resemble sterile nodules, delayed inflammatory reactions or granulomatous foreign body responses, leading to prolonged empirical treatment with corticosteroids, hyaluronidase and antistaphylococcal antibiotics. This delay not only compromises clinical outcomes but may allow deeper extension of the infection.(11, 12).

A lack of improvement with standard management for filler-related complications – particularly when

**Table I. Reported injection/cosmetic-procedure-related nocardiosis**

| Study/year | Procedure and setting | Latency after procedure | *N* (cases) | Species | Host | Presentation | Management | Outcome | Country |
|---|---|---|---|---|---|---|---|---|---|
| Aydingöz IE et al., 2001 | Intraarticular corticosteroid injection | 1 Month | 1 | *Nocardia spp.* | Adult; immunocompetent | Nodules/ ulceration | TMP-SMX | Complete resolution with 6 weeks of therapy | Turkey |
| Yun et al., 2011 | Steroid injection (triamcinolone and dexamethasone) | 3 Months | 1 | *N. brasiliensis* | Adult; immunocompromised (gastric cancer) | Disseminated nocardiosis (intramuscular abscess, pneumonia and brain abscess) | Incisional and drainage for intramuscular abscess with combination of TMP-SMX | Clinical improvement | South Korea |
| Apostolou et al., 2012 | Unlicensed cosmetic injections performed by nonmedical providers | 8 Days to 3 months | 8 | *N. cyriacigeorgica* | Adult; immunocompetent | Painful nodules/ abscesses at injection sites | Surgical debridement and prolonged antibiotics (regimens based on susceptibility; typically TMP-SMX) | All improved, but prolonged courses are needed; significant morbidity from surgery and chronic infection | USA |
| Rodríguez-Gutiérrez G et al., 2014 | Mesotherapy with silica, artichoke oil and triiodoacetic acid | 1 Week | 1 | *N. brasiliensis* | Adult female; immunocompetent | Suppurative granulomatous plaque at mesotherapy site | TMP-SMX and dapsone | Complete resolution with 3 months of therapy | Mexico |
| Baek et al., 2019 | Intralesional triamcinolone injections | N/A | 2 | *Nocardia spp.* | Adult; immunocompetent | Erythematous edematous patches with tenderness | TMP-SMX | Complete resolution with 2–3 months of therapy | South Korea |
| Lenskaya V, et al., 2021 | Intralesional steroid injections | 9 Days | 1 | *N.nova* | Psoriasis with recent addition of Apremilast | Painful nodules | TMP-SMX | Clinical improvement | USA |

persistent erythema, indurated nodules, abscesses, or draining sinuses are present – should raise suspicion of *Nocardia*. Definitive diagnosis requires culture or molecular identification, with prolonged incubation of at least 14 days, and communication with the microbiology laboratory to avoid false-negative results. There are no standardized criteria for the diagnosis of nocardiosis. Although no formal diagnostic criteria exist for nocardiosis, the isolation of *Nocardia* from a sterile site is considered diagnostic, and extrapulmonary disease is generally easier to confirm. The diagnostic process is often delayed because *Nocardia* grows slowly (initial colonies may appear after 48–72 h but often require extended incubation) and may be difficult to detect on gram staining without molecular confirmation. Histopathology is typically non-specific, further contributing to the protracted time to diagnosis (6).

The selection of initial empiric antibiotics for the treatment of nocardiosis depends upon the severity and dissemination of the disease. Empirical therapy has traditionally encompassed the administration of one to three antibiotics, driven by the necessity to cover the wide spectrum of potential *Nocardia* species and their distinct susceptibility patterns, alongside the patient's clinical status. Patients with mild cases may commence treatment with a single antibiotic. In severe cases, it is customary to initiate treatment with 2 or 3 different antibiotics empirically, which can be adjusted once *Nocardia* susceptibility is determined (13, 14). Most *Nocardia* isolates exhibit susceptibility to antibiotics such as amikacin, imipenem, linezolid and trimethoprim-sulfamethoxazole (TMP-SMX), with TMP-SMX being the most extensively studied treatment option (15). For patients with nondisseminated cutaneous nocardiosis, the standard treatment duration is 3 months, whereas mycetoma requires a significantly longer treatment period (6).

Our patient was treated with trimethoprim-sulfamethoxazole and lymecycline for at least 3 months or until her lesions resolved. To the best of our knowledge, this is the first documented case of primary cutaneous nocardiosis following hyaluronic filler injection, underscoring the importance of considering *Nocardia* spp. in persistent postinjection nodules.

In conclusion, persistent nodular or abscess-forming complications after cosmetic injections should prompt an evaluation for atypical pathogens, including rapidly growing mycobacteria, *Nocardia* and other aerobic actinomycetes. Early microbiological confirmation is crucial because these presentations often mimic sterile inflammatory reactions. Species-level identification with susceptibility testing guides for optimal therapy, with trimethoprim–sulfamethoxazole as the first-line treatment and agents such as linezolid, amikacin or imipenem reserved for severe or resistant disease. The treatment duration is typically prolonged, often exceeding 12 months. For any postfiller lesion that is firm, draining or unresponsive to standard antibiotics, biopsy with appropriate stains and specific requests for *Nocardia*/NTM cultures is recommended, and corticosteroids should be avoided until the infection is excluded.

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

*The authors have no conflicts of interest to declare.*

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