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CASE REPORT
Cosmetic

Ultrasound-guided Treatment of Polycaprolactone Granuloma

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Summary: Foreign body granulomas associated with polycaprolactone (PCL) filler injections are rare, yet challenging to manage. Multiple management modalities have been described. Here, we present a literature review and describe a case of histologically confirmed PCL-related granuloma, treated using ultrasound-guided injections of triamcinolone, hyaluronidase, and 5-fluorouracil combined with oral prednisolone and doxycycline. *(Plast Reconstr Surg Glob Open 2024; 12:e5610; doi: 10.1097/GOX.0000000000005610; Published online 12 February 2024.)*

Polycaprolactone-based fillers are popular due to their collagen-stimulating properties, low complication rate, and high demand. However, filler-related foreign body granuloma, although uncommon, is a well-recognized pathology with diverse etiologies, supported by histological evidence.[1] To date, nine cases of PCL-related granuloma have been reported, using diverse management strategies with mixed outcomes.[2–5] (**See table 1, Supplemental Digital Content 1,** which displays a table that shows a summary of all reported PCL-related granuloma to date, including management and outcome. This extends the overview from Table 1 of Kalantari et al,[2] with the inclusion of data from three more recent publications.[3–5] **http://links.lww.com/PRSGO/D70**.) We present a case of PCL-related granuloma, highlighting the role of ultrasound in both the diagnosis and treatment.

CASE

A 46-year-old Fitzpatrick skin type II woman sought consultation 14 months after an uneventful chin and jawline augmentation with 2 mL polycaprolactone, presenting visible irregularities, hard nodules, and bluish discoloration, progressively increasing in size over 12 months (Fig. 1). The initial injection lacked an accessible protocol, including details on injection depth, technique, and type of cannula/needle. Her medical history included multiple sclerosis treated with intravenous steroid pulse therapy, rosacea erythemato-teleangiectatica, four Pfizer–BioNTech COVID-19 vaccinations, and one COVID-19 infection 5 months prior.

An episode of swelling and redness after hyaluronic acid filler injection in the infraorbital region was treated using hyaluronidase 3 years prior.

She previously received four intralesional steroid injections in the jawline and chin without significant clinical improvement. Clinical examination identified firm, non-painful, nonfluctuant nodules at the gonial angle, prejowl sulcus, and chin, accompanied by bluish skin discoloration (Fig. 1). No lymphadenopathy or fever was detected. Ultrasound examination using the L4-20T-RS 20 MHz linear probe (GE Healthcare, Venue Fit) was performed and detected multiple hypoechoic nodules of varying size with posterior acoustic shadowing, irregular borders, bright hyperechoic spots, and "mini comet tail" artifacts along the borders, indicative of polycaprolactone (Fig. 2).[6] These nodules were located in the subcutaneous fat and SMAS layer of the lower face. Color Doppler revealed perinodular hypervascularity. [**See Video 1 (online)**, which displays the initial ultrasound B-mode findings of the patient's chin and jawline, emphasizing the granuloma and polycaprolactone features. It transitions to color duplex mode to illustrate the hypervascularity of the reference nodule on the prejowl sulcus, identifying inflammatory granuloma characteristics, and concludes with a demonstration of precise ultrasound-guided infiltration.]

Histopathological examination of two biopsied lesions confirmed a subcutaneous granulomatous foreign body reaction, with nodular accumulations of histiocytic cells, multinucleated giant cells, and optically empty spaces, a response notably associated with polycaprolactone filler injections (Fig. 3).

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Fig. 1. A photograph of the patient on the day of presentation at the clinic. The areas of irregularities, palpable nodules, and skin-discoloration are marked.

A combined therapy was initiated, including a tapering oral prednisolone regimen for 1 month (50/25/12.5/5 mg/day, weekly for each dose, followed by a maintenance dose of 5 mg/day for another month) and 100 mg/day of doxycycline for 2 months. Alongside this, three monthly ultrasound-guided treatment sessions were conducted [**see Video 1 (online)**]. The first two sessions involved triamcinolone (0.1 mL of a 10 mg/mL ampoule), hyaluronidase (HYLASE Dessau 150 I. E. Vial, reconstituted in 0.7 mL of 0.9% Fresenius bacteriostatic sodium chloride, and 0.2 mL of 2% lidocaine HCl. B. Braun, resulting in a 1 mL solution. For the third session, 1.0 mL of 5-fluorouracil (5-FU medac 50 mg/mL, injection solution) was added, resulting in a 2.0 mL solution. An amount of 0.1–0.2 mL solution volume was injected under ultrasound guidance into each lesion, using a 27G 40-mm needle. Significant clinical and echographic improvement was observed. The last follow-up 7 months later revealed a decrease in visible irregularities and improved shape of the lower third of the face (Fig. 4). The nodules were no longer visible, but remained palpable. Ultrasound examination found a decrease in the amount and size of hypoechoic deposits with a reduction in posterior acoustic shadowing and improved tissue recognition. Residual product deposits were detectable, and vigilance regarding potential flare-ups is maintained with a plan of ultrasound-guided treatment in case of recurrence.

DISCUSSION

Foreign body granulomas result from various causes, involving granulomatous inflammation triggered by macrophage aggregation in response to large foreign bodies resistant to phagocytosis.[1] As documented by Kalantari et al in 2021[2] and subsequent literature,[3–5] nine cases of PCL injection-related granulomas have been reported, showcasing diverse diagnostic and treatment approaches, and underscoring the complexity of this condition (**See table 1, Supplemental Digital Content 1, http://links.lww.com/PRSGO/D70**).[2–5]

The importance of ultrasound in aesthetic medicine has been demonstrated in diagnosing and treating filler complications.[6,7] Given this patient's clinical presentation, characterized by progressive symptoms persisting for over 12 months and unresponsiveness to four prior intralesional steroid injections, we opted for treatment with oral medications and ultrasound-guided injections. The patient's medical history, including multiple sclerosis, rosacea, two COVID-19 vaccinations, and a COVID-19 infection during the course of the symptoms, and a previous adverse event related to hyaluronic acid filler injections, are possible factors for the granulomatous reaction. Additionally, there are other procedural and product-related factors known to potentially play a crucial role in this case.[1] This reflects the multifactorial nature of filler-related delayed adverse events and inflammatory nodules.

Oral treatment with a tapering oral prednisolone system and doxycycline provided an antiinflammatory component, helping to prepare the nodules for intralesional therapy and has been previously described.[8] Ultrasound-guided intralesional therapy was delivered

Fig. 2. Ultrasound image (B-mode) of the reference nodule located in the prejowl-sulcus. A hypoechoic nodule of irregular shape and ill-defined border, bright hyperechoic spots with posterior mini-comet-tail artifact on the border can be observed, typical for polycaprolactone.

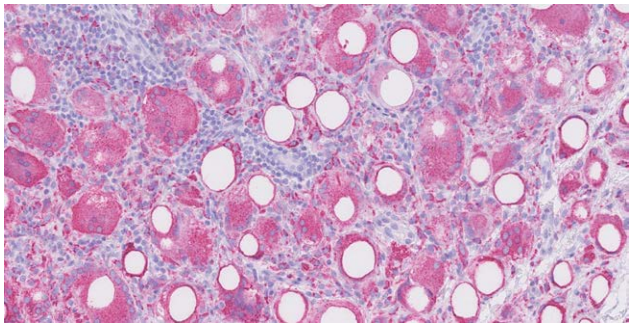

Fig. 3. Histopathology (40× CD68) confirming subcutaneous granulomatous foreign body reaction with the inclusion of numerous small cavities, as can be seen after injection of polycaprolactone filler.

Fig. 4. A photograph of the patient 6 months after the treatment. In the posttreatment image, irregularities and discoloration are absent, returning to the patient's usual facial appearance.

using triamcinolone as an antiinflammatory drug, hyaluronidase as a spreading agent to increase connective tissue permeability, and 2% lidocaine for pain control.

For the third session, 5-fluorouracil was added as an antimetabolite that suppresses fibroblast proliferation.[9] This triple combination for intralesional therapy has been described in the past for hypertrophic scars, keloids, postrhinoplasty fibrosis, foreign body granulomas, and postburn scarring.[9,10] We observed significant clinical improvement after the addition of 5-fluorouracil. The rationale behind combining these three agents is to decrease the dosage of each substance, minimizing individual adverse effects and creating a synergistic effect.

We are reporting a foreign body granuloma associated with polycaprolactone, confirmed by ultrasonographic and histopathological evidence, and managed by systemic and ultrasound-guided intralesional therapy. Further research will help delineate best clinical practices for treatment of these complications.

CONCLUSIONS

We present the case of a 46-year-old woman with a biopsy-proven PCL-related granuloma and the treatment using ultrasound-guided triamcinolone, hyaluronidase, and 5-fluorouracil injections with additional oral steroids and antibiotics. A comprehensive review of the patient's medical history is crucial before dermal filler procedures. Ultrasound serves as a valuable tool for diagnosing and managing complications, providing the benefits of direct visualization and guided treatment.

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DISCLOSURE

The authors have no financial interest to declare in relation to the content of this article.

PATIENT CONSENT

The patient provided written consent for the use of her image.

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