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Inflammatory complications of soft tissue fillers: A retrospective case series and narrative literature review

Yumuşak doku dolgularının inflamatuar komplikasyonları: Retrospektif bir olgu serisi ve anlatısal literatür derlemesi

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Inflammatory Complications of Soft Tissue Fillers
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ABTSTRACT

Complications of soft tissue fillers (STFs) are rare, but infections and foreign body reactions can be serious and difficult to manage. This retrospective case series and narrative literature review provides an overview of inflammatory complications associated with STFs and compares our clinical management approach with the available literature. Ten patients with inflammatory complications related to STFs were retrospectively evaluated. In addition, a narrative literature search was performed in PubMed using the following Boolean search terms: ((infection) OR (biofilm) OR (foreign body reaction)) AND ((soft tissue filler) OR (dermal filler)). The time interval between filler injection and the onset of inflammatory reaction ranged from 2 days to 84 months and most culture results were negative. When our results are evaluated together with the literature, antibiotic treatment appears to be more effective for acute infectious complications, whereas delayed complications may be less responsive because of biofilm formation. For late inflammatory nodules, nonsurgical treatments such as hyaluronidase, intralesional triamcinolone, and 5-fluorouracil may be applied; however, these treatments remain controversial and surgical excision may be required for persistent lesions.

KEYWORDS

Biofilm, foreign body reaction, infection, soft tissue filler

ÖZ

Yumuşak doku dolgu maddelerinin (STF) komplikasyonları nadirdir; ancak enfeksiyonlar ve yabancı cisim reaksiyonları ciddi olabilir ve tedavileri güçlük oluşturabilir. Bu retrospektif olgu serisi ve anlatısal literatür derlemesinde, STF'lerle ilişkili inflamatuvar komplikasyonlara genel bir bakış sunulması ve klinik tedavi yaklaşımımızın mevcut literatürle karşılaştırılması amaçlandı. STF'lerle ilişkili inflamatuvar komplikasyonları bulunan on hasta retrospektif olarak değerlendirildi. Ayrıca PubMed veri tabanında şu Boolean arama terimleri kullanılarak anlatısal bir literatür taraması gerçekleştirildi: ((enfeksiyon) veya (biyofilm) veya (yabancı cisim reaksiyonu)) ve ((yumuşak doku dolgusu) veya (dermal dolgu)). Dolgu enjeksiyonu ile inflamatuvar reaksiyonun başlangıcı arasındaki süre 2 gün ile 84 ay arasında değişmekteydi ve kültür sonuçlarının çoğu negatifti. Bulgular literatürle birlikte değerlendirildiğinde, antibiyotik tedavisinin akut enfeksiyöz komplikasyonlarda daha etkili olduğu, gecikmiş komplikasyonların ise biyofilm oluşumu nedeniyle tedaviye daha az yanıt verebileceği görüldü. Geç inflamatuvar nodüllerde hyalüronidaz, intralezyonel triamsinolon ve 5-florourasil gibi cerrahi dışı tedaviler uygulanabilir; ancak bu tedaviler tartışmalı olmaya devam etmektedir ve persistan lezyonlarda cerrahi eksizyon gerekebilir.

ANAHTAR KELİMELER

Biyofilm, enfeksiyon, yabancı cisim reaksiyonu, yumuşak doku dolgu maddesi

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Nonsurgical cosmetic procedures, including filler injections, offer a minimally invasive approach to achieving a youthful appearance. As the development of ideal filler materials remains an active area of research, various products have been introduced and refined over time (1). Fillers are expected to be readily available, nonimmunogenic, and composed of nontoxic and nonallergenic substances. They should also be easy to store and transport. Moreover, potential complications associated with their administration should be minimal and easily manageable (2).

Because they provide immediate and satisfactory results, soft tissue fillers (STFs) are among the most commonly used treatment options worldwide for augmenting depressed areas, particularly in the face, and restoring volume in various anatomical regions. While complications associated with these procedures are rare, some of them can be serious (3). Adverse effects may be more frequent in cases involving unbranded products, procedures performed in unauthorized facilities, and unauthorized practitioners (4). Although several filler classification systems have been proposed, the most widely accepted classification system is based on persistence and longevity. Temporary fillers dissolve and dissipate within 6 months, while permanent fillers last for more than 5 years (5).

Although filler injections are considered minimally invasive procedures, local or systemic complications may occur. Such complications may be related to the filler material itself, the injection site, or the injection technique (6). Regardless of their composition, fillers may induce a mild immune response. However, bacterial contamination may intensify this response and produce clinical findings that can be mistaken for an allergic reaction. Administering corticosteroids in this setting may worsen the condition, leading to nodule formation, fistula development, and drainage of pus or filler material (7). Autoimmune reactions and bacterial infections following filler administration are uncommon but may be difficult to manage, and prolonged inflammatory reactions at injection sites may result in tissue damage (8).

This study presents 10 patients who developed inflammatory complications after filler injection, provides an overview of these inflammatory complications, and compares our diagnostic and treatment approaches with those reported in the literature.

Case presentation

This study was designed as a retrospective case series combined with a narrative literature review. Our institutional database was retrospectively searched to identify patients who had developed inflammatory complications following STF administration. Clinical and demographic data were collected from medical records.

The study was conducted in accordance with the principles of the Declaration of Helsinki. Written informed consent was obtained from all patients for the use and publication of their clinical data and images.

A narrative literature review was also conducted to summarize the definitions, diagnosis, and management of inflammatory complications associated with STFs reported in articles published between 2010 and 2023. A PubMed search was performed using the following Boolean search terms: ((infection) OR (biofilm) OR (foreign body reaction)) AND ((soft tissue filler) OR (dermal filler)). The search was limited to review articles published in English and involving human patients. The initial search identified 72 articles. References cited in the selected articles were also reviewed to identify additional relevant reports. Studies using fat grafting as a filler and articles that focused primarily on complications such as necrosis, embolization, and allergic reactions were excluded. Ultimately, 16 review articles were included to provide an overview of the topic.

Results

Eight female patients and two male patients, with a mean age of 48.2 ± 9.9 years (range: 36–64 years), were treated in our clinic for inflammatory complications after filler injection between 2018 and 2023. All patients were hospitalized. The initial complaints of all patients except one were pain, swelling, and erythema. Five patients had received hyaluronic acid (HA) filler injections, four had received polyacrylamide hydrogel (PAH) injections, and one had received polymethyl methacrylate (PMMA) injections.

The time interval between filler injection and the onset of inflammatory reaction ranged from 2 days to 84 months. Culture specimens from two patients were positive for gram-positive bacteria (Staphylococcus aureus and coagulase-

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negative staphylococci). No specific pathogen was identified in the remaining cases.

Only one patient's symptoms resolved with antibiotic therapy and local wound care. Nine patients underwent invasive procedures such as incision and drainage, removal of the filler material, or debridement of devitalized tissue, depending on the severity and clinical presentation. In two cases, the early inflammatory findings initially regressed with antibiotic therapy; however, subsequent excision was required because of persistent nodule formation.

All patients were evaluated in the Department of Infectious Diseases. First-line treatment consisted of ciprofloxacin and clarithromycin, together with topical agents for local wound care (Table 1).

Following the final treatment, complete clinical resolution was achieved in all cases. All patients were followed for at least 12 months after the final intervention, and no recurrence of inflammatory findings was observed during the follow-up period.

Three representative cases are described below in detail to illustrate the clinical courses and treatment approaches.

Table.1. Clinical data of the patients and summary of the complications following filler injection

Patient	Age/Sex	Filler material	Injection site	Time interval	Culture results	Diagnosis	Treatment
1	53/M	HA	Frontal	3 months	Negative	Late inflammatory nodule	A + E
2	52/F	PMMA	Pre-jowl, buccal region	48 months	Negative	Sterile abscess Late inflammatory nodule	A + I&D + E
3	36/F	PAH	Breast	48 months	Negative	Sterile abscess Late inflammatory nodule	A + E (surgical reduction)
4	51/F	HA	Malar	4 days	CNS	Early inflammatory nodule	A + late E
5	42/F	HA	Malar, tear trough	2 days	*S. aureus*	Septic abscess	A + I&D
6	36/F	PAH	Gluteal	9 months	Negative	Sterile abscess Late inflammatory nodule	A + E (surgical reduction)
7	43/F	HA	Chin	3 days	-	Cellulitis	A
8	43/M	PAH	Penis	15 months	Negative	Sterile abscess Late inflammatory nodule	A + E
9	64/F	PAH	Frontal	84 months	Negative	Late inflammatory nodule	A + E
10	62/F	HA	Malar, tear trough	2 days	Negative	Early inflammatory nodule	A + late E

F; female, M; male, HA; hyaluronic acid, PAH; polyacrylamide hydrogel, PMMA; polymethylmethacrylate, CNS; coagulase-negative staphylococci, A; antibiotic therapy, I&D; incision and drainage, E; excision

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Case 1

A 53-year-old male patient presented to the clinic with intermittent facial swelling and redness extending from the glabellar region to the forehead. According to the patient's history, he had received a filler injection of HA in the glabellar region for the treatment of rhytids 10 months before presentation. Three months after the injection, intermittent swelling, redness, and minimal pain developed at the injection site (Figure 1a).

Physical examination revealed a mobile, well-demarcated, painless mass measuring 1–1.5 cm in diameter in the glabellar region. The lesion was associated with skin irregularity and facial asymmetry. There was no discharge or crepitation. Firm, heterogeneous, granulomatous, and fibrotic tissue was observed during surgery. The abnormal tissue and filler material were excised, and samples were sent for microbiological and pathological examination.

The patient was discharged with oral antibiotic therapy and instructions for local wound care. Culture specimens were negative. Histopathological examination demonstrated granulomatous inflammation and a foreign body-type reaction.



Figure 1. Photographs of the three presented cases. (a) View of the subcutaneous mass in the glabellar region in Case 1. (b) Erythema and swelling in the pre-jowl and buccal region in Case 2. (c) Appearance of the opened breast pocket at the fourth year after application of polyacrylamide-containing filler material in Case 3.

Case 2

A 52-year-old female patient presented to our clinic with swelling, erythema, fever, and pain in the right pre-jowl and buccal region (Figure 1b). According to the patient's history, she had received PMMA filler injections in both pre-jowl areas 4 years before presentation. On initial examination, obvious asymmetry was noted on the right side, with spontaneous purulent discharge and pain upon mouth opening.

The patient was hospitalized. After 7 days of treatment with clarithromycin (500 mg twice daily) and ciprofloxacin (400 mg twice daily) and drainage, the inflammatory reaction subsided. The patient then underwent surgery to remove the filler. Culture samples were negative. Ten days after surgery, the patient was discharged without complications, with oral antibiotic therapy and instructions for local wound care. Histopathological examination revealed basophilic material surrounded by histiocytic cells and a foreign body reaction.

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Figure 1-b. Erythema and swelling in the pre-jowl and buccal region in Case 2.



Figure1-c. Appearance of the opened breast pocket at the fourth year after application of polyacrylamide-containing filler material in Case 3.

Case 3

A 36-year-old female patient presented to our clinic with breast hypoplasia and volume loss. According to the patient's history, she had received injections of a polyacrylamide-containing filler into her breasts 4 years before presentation. Because of recurrent breast volume loss over time, the patient requested augmentation mammoplasty. In contrast to the other cases, no erythema, swelling, fever, pain, or skin irregularity was observed. During implant pocket dissection, granulomatous, fibrotic, and irregularly circumscribed filler material was identified within the breast tissue (Figure 1c). Most of this material was removed. Subsequently, implants were placed in the subglandular plane. The patient was discharged with oral antibiotic therapy and instructions for local wound care.

Two years later, she presented with breast asymmetry and ptosis of the left breast. She underwent revision surgery for breast asymmetry. During revision pocket dissection, previously implanted filler material was found within the breast tissue. As much of the residual filler material as possible was carefully removed and the implants were repositioned. Culture specimens were negative. Histopathological examination revealed basophilic material surrounded by

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histiocytic cells, together with foreign body and granulomatous reactions.

Literature Review

Definitions and treatment recommendations for inflammatory complications of STFs vary across the literature. Therefore, the relevant terminology, diagnostic evaluation, and treatment approaches require clarification.

Inflammation is a nonspecific tissue response that may be triggered by microorganisms, foreign bodies, trauma, toxins, heat, or other causes. Infectious complications, in contrast, are caused by microorganisms such as bacteria, viruses, fungi, or parasites. Inflammatory complications associated with STFs may therefore result from either a foreign body response or an infectious process. This distinction is particularly important when determining the appropriate treatment strategy.

Inflammatory complications of STFs generally present in four principal clinical forms: herpetic lesions, folliculitis/erysipelas/cellulitis, abscesses, or inflammatory nodules, or a combination of these forms (Table 2). Management recommendations for inflammatory complications identified in the literature are summarized in Table 3.

Table 2. Summary of definitions of inflammatory complications related to STFs according to the reviewed literature.

Inflammatory complications		Signs and symptoms	Pathophysiology	Investigation
Herpetic infection		Vesicles Crusting Redness Swelling	Herpes simplex virus	Tzanck Viral culture
Folliculitis / Erysipelas / Cellulitis		Redness Pain Tender Swelling	Microorganism	Culture
Abscess	Septic abscess	Fluctuant Redness Pain	Microorganism (acute, chronic, or low-grade infection)	Culture Radiology
	Sterile abscess	Tender Swelling	Biofilm Delayed hypersensitivity	PCR FISH Histology Skin test Radiology
Inflammatory nodules*	Early inflammatory nodule	Mass Redness Pain	Microorganism (acute infection)	Culture Radiology
	Late inflammatory nodule	Tender Swelling	Microorganism (chronic or low-grade infection) Biofilm** Delayed hypersensitivity Foreign body reaction (foreign body granuloma)**	Culture PCR FISH Histology Skin test Radiology

*Noninflammatory nodules; filler itself, due to excessive filler use or poor technique.

**Biofilm-related nodules in the absence of active infection and filler-related foreign body granulomas are often observed with only mass formation.

STFs; soft tissue fillers; PCR; polymerase chain reaction; FISH: fluorescence in situ hybridization.

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Table 3. Summary of the literature on the management of inflammatory complications related to STFs.

Study	Topic	Management recommendations and notes
Ono et al. (30)	Complications of PAH	• No signs of inflammation and encapsulated PAH: NA • Fluctuant infectious nodule: A + I&D • Inflammation and fibrous capsule present: E (if PAH has been injected in multiple layers, surgical reduction of granuloma can help to suppress inflammation)
Dayan et al. (17)	STFs and biofilm	• First choice: H + A (avoid all forms of S and NSAIDs) • If persistent: 5-FU (15 to 40 mg repeatedly every 4 weeks); LL; I&D and irrigation with A; E
Cox et al. (24)	Complications of STFs	• Inflammatory/infectious nodule: A (tetracycline + a macrolide) + I&D (if fluctuant) • Granuloma: S (prednisone in doses of up to 60 mg/day); 5-FU + S; E (for well-circumscribed nodular granulomas)
Schütz et al. (23)	Infected facial fillers	• Early inflammatory/infectious nodules: A (tetracycline or a macrolide for 4–6 weeks) + I&D (if fluctuant) • Late inflammatory nodules/granulomas: A (tetracycline + a macrolide); A + T (if there is no response to antibiotics for 7–10 days, T is added)
Dumitraşcu et al. (18)	HA infections related to biofilm	• A (ciprofloxacin, amoxicillin, or clarithromycin for up to 6 weeks); H; 5-FU (steroids should be avoided due to activation of biofilm infections)
DeLorenzi et al. (25)	Complications of STFs	• Infection: A + I&D (if there is an abscess); H (after infection control; not to be used in the primary phase due to the risk of spreading the infection) • Nodule related to biofilm: H for HA; E for permanent fillers • Granuloma: T (starting with 0.1 mL of 10 mg/mL, up to 20 mg/mL and 40 mg/mL with repeated injections until effective); 5-FU
Ledon et al. (26)	Inflammatory nodules following STFs	• Collagen-induced inflammatory nodule: S; E • H-induced inflammatory nodule: A; I&D; T; S; E • H with acrylic hydrogel-induced inflammatory nodule: A; T; 5-FU • PLLA-induced inflammatory nodule: E (resistant to many therapies) (PLLA often causes inflammatory nodules due to secondary foreign body reaction) • Calcium hydroxyapatite-induced inflammatory nodule: T; LL; E
Hexsel et al. (29)	Complications of injectable silicone	• Early infection: A + I&D • Late infection: A + I&D; E • Granuloma: A; T; allopurinol; isotretinoin; imiquimod; E • Herpetic infection: AV (two doses of 2 g of valaciclovir for 1 day; alternatively, prophylactic treatment with valaciclovir for 3–5 days may be started prior to injection)
Kulichova et al. (19)	Safety and tolerability of facial fillers	• Bacterial infection: topical, oral, or intravenous A (cephalexin, dicloxacillin, or nafcillin); I&D (if there is an abscess); H (after infection control) • Granuloma: H; a combination of intralesional T + 5-FU + lidocaine (0.5 mL of 5-FU at 50 mg/mL, 2% xylocaine with adrenaline at 1:100000, and 0.3 mL of T at 10 mg/mL; before injecting intralesional steroid injections, infection needs to be excluded); E
Chiang et al. (27)	Complications of STFs	• Early inflammatory/infectious nodules: A (should not be massaged) + I&D (if fluctuant)

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Ibrahim et al. (20)	STF nodules related to biofilms	• Late inflammatory nodules: A + E + T or S (following A, if infection is excluded and surgical excision is not practical) + H • Initial therapy: H + dual A (a quinolone and a macrolide for at least 2 weeks) • Subsequent therapy for resistant nodules: T; 5-FU • Final option: E • Herpetic infection: AV o Patients with a history of severe cold sores (more than 3 episodes): valaciclovir at 1 g/24 h 1 day before and 3 days after injection o Patients with active herpes: injections should be delayed
Urdiales-Gálvez et al. (16)	Complications of STFs	• Acute infection: A (amoxicillin-clavulanic acid at 4 g/24 h for 15 days or ciprofloxacin at 500–750 mg for 2–4 weeks) o Typical organisms such as *S. aureus* or *S. pyogenes* • Delayed-onset chronic infection: A (clarithromycin at 500 mg/twice daily in combination with ethambutol/rifampicin) + I&D (if fluctuant) o Atypical organisms such as mycobacteria or *E. coli* • Inflammatory nodule: H for HA (not to be used in the presence of an active infection); intralesional T + 5-FU (0.1 mL of triamcinolone at 40 mg/mL and 0.9 mL of 5-FU at 50 mg/mL injected at regular intervals: weekly × 2, once every 2 weeks × 2, then monthly); PRP; A (500 mg clarithromycin + 400 mg moxifloxacin twice daily for 10 days, or 500–750 mg ciprofloxacin twice daily for 2–4 weeks, or 100 mg minocycline once daily for 6 months); E • Granuloma: H (150 U/mL); T; S; 5-FU; E
Singh et al. (21)	Nonvascular complications of STFs	• Folliculitis: A (topical cream) • Erysipelas: A (never massage) o Typical microorganisms such as *S. aureus* or *S. pyogenes* o If late onset, consider atypical mycobacterial infection • Cellulitis and abscess: A; I&D (if fluctuant) o Erythema, swelling, and tenderness, early: typical microorganism / amoxycillin + clavulanic acid o No pain or fever initially, infection occurs after a few days, culture is sterile: atypical microorganism / a macrolide and a quinolone • Granuloma: H; T; A; S; 5-FU • Complications related to biofilm: A (a quinolone + a macrolide); H (allows better access of the antibiotic to the bacteria); S; 5-FU (up to 0.5 mL of 50 mg/mL concentration); T
Wang et al. (31)	Herpes reactivation after HA injection	• Herpes simplex virus infection: AV (acyclovir at 400 mg three times per day for 10 days or valacyclovir hydrochloride at 1 g twice per day for 7 days)
Galadari et al. (28)	Complications of STFs	• Recurrent herpes labialis: AV at least 3 days before the procedure • Abscesses and cellulitis: A • Suspected biofilms: A; T + 5-FU
Davies et al. (32)	Bacterial infections following nonsurgical cosmetic procedures	• Cellulitis: A (flucloxacillin at 500 mg orally for 7–14 days) • Abscess: A (flucloxacillin at 500 mg orally + metronidazole at 400 mg orally for 10–14 days); NA (if smaller than 1 cm); I&D (if large)

PAH; polyacrylamide hydrogel, STFs; soft tissue fillers, NA; needle aspiration, NSAID; nonsteroidal anti-inflammatory drug, A; antibiotic therapy, AV; antiviral therapy, I&D; incision and drainage, E; excision, HA; hyaluronic acid, H: hyaluronidase, 5-FU;

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intralesional 5-fluorouracil, T; intralesional triamcinolone, S; steroid, PLLA; poly-L-lactic acid, LL: laser lysis; PRP: platelet-rich plasma.

Discussion

The use of STFs for rejuvenation has gained immense popularity worldwide, becoming one of the most commonly performed nonsurgical aesthetic procedures after neuromodulator injections. Their ease of administration and rapid visible effects have contributed to their widespread adoption (9). STFs can be categorized into three main types: temporary, semipermanent, and permanent fillers (5).

Regardless of the type of filler material, the injected substance triggers an immune response in the surrounding connective tissue that may persist even after the material dissolves (10,11). Complications are uncommon and vary according to filler type, injection, and anatomical site (12). Reported complication rates particularly vary according to filler composition, having been estimated as 0.08% for HA fillers, 10% for acrylates, and approximately 50% for polylactic acid (13). However, the use of unlicensed products and the involvement of unauthorized practitioners who lack proper knowledge of facial anatomy may increase the incidence and severity of complications.

Even in experienced hands, complications can lead to undesirable outcomes. Early recognition and appropriate management of these complications are essential to minimize tissue damage and long-term morbidity (14,15).

Inflammatory complications can be categorized according to their timing as immediate, occurring within the first day; early, occurring within 1–30 days; or late, occurring more than 30 days after filler injection (16). In our series, four of the five patients who had received HA fillers developed early inflammatory complications, whereas all patients treated with PAH or PMMA presented with late complications.

Complications associated with permanent or long-lasting fillers were generally more severe and more frequently required surgical removal. These findings are consistent with the literature, which suggests that early complications are more commonly associated with acute bacterial contamination, whereas late reactions may result from biofilm formation, a foreign body reaction, or a combination of these mechanisms (16–23).

Early inflammatory complications are commonly associated with microbial contamination and should be differentiated from allergic or noninfectious inflammatory reactions. In contrast, the diagnosis and management of late inflammatory complications remain challenging because biofilm-related infection and foreign body reaction may have overlapping clinical presentations. Culture negativity does not exclude biofilm-related complications and fluorescence in situ hybridization and polymerase chain reaction may also be used (16–21). Recent studies have shown that biofilm formation on the surface of the filler can trigger the inflammatory response and initiate a foreign body reaction (22). Thus, although histology is the definitive diagnostic method for filler-related foreign body granuloma, histological findings with foreign body reaction may be observed in the presence of biofilm (23).

Clinical differentiation should therefore be based on the timing of symptom onset, filler type, local and systemic findings, microbiological results, and histopathological examination. Early-onset erythema, tenderness, fever, purulent discharge, and abscess formation should raise suspicion of active infection. In contrast, slowly developing, firm, and relatively painless nodules without signs of acute inflammation may be more suggestive of a foreign body reaction. Nevertheless, biofilm-related nodules may also occur without overt signs of active infection. In our series, cultures were positive in only two cases, whereas the remaining culture specimens were negative. In the three detailed culture-negative cases, histopathological examination demonstrated granulomatous inflammation or foreign body-type reactions. These findings emphasize that negative conventional cultures cannot reliably exclude a biofilm-related process and that microbiological and histopathological findings should be interpreted together with the clinical presentation.

Treatment should be individualized according to the timing and severity of the reaction, the presence of active infection, and the type and persistence of the filler material. In patients with suspected acute infection, microbiological sampling and empirical antibiotic therapy should be initiated, and incision and drainage should be performed when a fluctuant abscess is present. A quinolone such as ciprofloxacin

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combined with a macrolide such as clarithromycin has been recommended as an empirical treatment option, particularly in cases of suspected biofilm-related infections (16–18,20,21). However, bacteria embedded within a biofilm may demonstrate reduced susceptibility to antimicrobial treatment, and antibiotic therapy alone may therefore be insufficient (16–21,24,25).

In addition to antibiotics and surgery, treatment modalities include hyaluronidase, triamcinolone, 5-fluorouracil, and oral corticosteroids (16–18,20,21,23–28). Some authors suggest that hyaluronidase may be used during the initial phase of treatment to disrupt the extracellular matrix of the biofilm and facilitate antibiotic penetration, whereas others emphasize that it should not be administered during active infection because of the potential risk of spreading the infectious process (20,25).

Intralesional triamcinolone and 5-fluorouracil injections are generally recommended for antibiotic-refractory delayed nodules (16,20,21,29). However, some authors recommend avoiding corticosteroids and nonsteroidal anti-inflammatory drugs because immunosuppression may activate or aggravate an underlying biofilm-related infection (18,25). Therefore, intralesional corticosteroids and 5-fluorouracil should preferably be considered only after active infection has been reasonably excluded or adequately controlled.

Surgical intervention should be considered for patients with persistent or recurrent inflammatory nodules, fluctuant or recurrent abscesses, fistula formation, tissue compromise, failure of medical treatment, non-biodegradable filler material, or diagnostic uncertainty requiring histopathological evaluation. In our series, two patients with early inflammatory complications ultimately required excision because of persistent nodules. Moreover, all patients treated with PAH or PMMA underwent surgical intervention. These observations support a lower threshold for surgical removal in cases of persistent complications involving permanent or long-lasting fillers. Although complete removal of permanent filler material may be technically difficult, excision or debridement may reduce the inflammatory burden, permit microbiological and histopathological assessment, and provide definitive clinical resolution.

Conclusion

Inflammatory complications of soft tissue fillers are uncommon but may be difficult to diagnose and manage. Clinical assessment should consider the timing of symptom onset, filler type, microbiological findings, and histopathological features to distinguish active infection, biofilm-related reactions, and foreign body responses. Treatment should be individualized; medical management may be sufficient in selected acute cases, whereas surgical excision or debridement should be considered for persistent or recurrent lesions, treatment-resistant complications, and reactions associated with permanent or non-biodegradable fillers.

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Informed Consent:
Written informed consent was obtained from all patients for the use and publication of their clinical data and images.

Authorship Contributions:
All authors contributed to the conception and design of the study, data acquisition and interpretation, drafting and critical revision of the manuscript, and approved the final version.

Conflicts of interest and source of funding
The authors declare that there are no conflicts of interest and no sources of funding related to this study.

Ethical approval
The study was approved by the Dokuz Eylül University Ethics Committee with Decision No. 2025/34-16.

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