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## Immediate Post-Operative Folliculitis: A Foreign Body Reaction, Not an Infection

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### ABSTRACT

Immediate post-operative folliculitis (IPF) refers to the development of inflammatory lesions such as pustules or papules around the transplanted hair follicles shortly after a hair transplant procedure, typically within the first 1–7 days. This condition can arise due to one of two primary mechanisms: 1) foreign body reaction or 2) surgical trauma. This is generally self-limiting in nature and does not involve bacterial infection. Proper differentiation from infective folliculitis, which typically occurs later, is critical for appropriate management.

**Keywords:** immediate post-operative folliculitis, foreign body reaction, surgical trauma

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### INTRODUCTION

Folliculitis is defined as inflammation of the superficial or deep portion of the hair follicle.<sup>1</sup> Immediate post-operative folliculitis (IPF) typically presents within the first few days following hair transplantation and is characterized by erythema, papules, and pustules surrounding the transplanted follicular units (FUs). The prevalence of IPF in the recipient site reported in literature varies widely from 1.1% to 20%. On the other hand, with proper care, IPF in the donor area is uncommon after follicular unit excision.

Though not life-threatening, IPF is an important complication to address due to its impact on patient satisfaction, downtime, and concern for graft survival. As these lesions were traditionally believed to be infectious in nature, prophylactic antibiotics have been advocated as a preventive measure. (See Figure 1.)

FIGURE 1. *Left:* Immediate post-operative folliculitis is characterized by erythema, papules, and pustules surrounding the transplanted follicular units. *Right:* Patient with folliculitis 5 days after hair transplant; the folliculitis did not resolve with the use of oral antibiotics.



## PROPHYLACTIC ANTIBIOTICS

There is no universally standardized protocol for the routine use of oral prophylactic antibiotics in hair transplant surgery, as practices vary among clinics and regions. First-generation cephalosporins, such as cephalexin 500mg, are often used due to their broad-spectrum coverage against gram-positive bacteria, including *Staphylococcus aureus*, a common cause of surgical site infections.<sup>2</sup> Nevertheless, cephalexin has limited action against other common pathogens implicated in infective folliculitis, such as gram-negative bacteria. Alternatively, amoxicillin-clavulanate 500-875mg has been prescribed as an alternative for its extended gram-positive and anaerobic coverage.

Prophylactic antibiotics are usually administered 30-60 minutes before the procedure to achieve adequate tissue concentrations during surgery. Some physicians extend the use of oral antibiotics postoperatively for 3-5 days to cover the immediate healing phase, particularly in patients with diabetes or poor scalp hygiene, who are at higher risk for infection.

While this protocol aims to reduce the risk of surgical site infections and infective folliculitis, its routine application in hair transplantation contributes to the global rise of multi-drug-resistant bacteria,<sup>3</sup> and carry risks of hypersensitivity reactions including life-threatening anaphylaxis. Approximately 10% of patients with a history of penicillin allergy demonstrate cross-reactivity with first-generation cephalosporins.<sup>4</sup> Community-based studies report that the rate of anaphylaxis is between 0.0001% and 0.1% following the use of cephalosporins, with mortality rates as high as 1% in severe cases of anaphylaxis.

With this in mind, it is important to critically evaluate whether the prophylactic use of antibiotics is truly indicated or necessary.

## CLASSIFICATION OF FOLLICULITIS

Hair transplant-related folliculitis can be classified into three categories based on its etiology:<sup>5</sup>

1. **Foreign body folliculitis:** Foreign body folliculitis typically arises within the first week postoperatively due to a sterile inflammatory reaction to grafts or hair fragments. Erythematous papules or pustules are localized to grafted areas. Systemic symptoms are absent, and the course is self-limiting, resolving after removal of the offending hair fragment.<sup>6</sup>
2. **Infective folliculitis:** Infective folliculitis results from the proliferation of bacteria that colonize hair follicles, including *Staphylococcus aureus*, *Pseudomonas aeruginosa* and gram-negative organisms such as *Enterobacter*.<sup>7</sup> Local risk factors include poor hygiene, infrequent scalp washing, scratching, environmental exposure to dust and dirt, excessive moisture and sweating, and the use of contaminated headwear.<sup>8</sup> Pre-operative hair shaving has been reported to result in a 3% increase in surgical site infections.<sup>9,10</sup>

Certain medical conditions such as diabetes, seborrheic dermatitis, and the use of immunosuppressive medications increase the risk of infection by compromising the immune system, delaying wound healing, and creating a favorable environment for bacterial growth.

Erythematous pustules or nodules, often with purulent discharge, usually appear after 72 hours postoperatively and can persist beyond 7 days if not properly treated. Fever and regional lymphadenopathy are apparent in severe cases. The diagnosis should be confirmed through gram staining and culture of pustule contents. A lack of bacterial growth supports the diagnosis of a foreign body reaction, while positive cultures indicate an infectious etiology. Targeted antibiotics should only be initiated based on culture results to avoid unnecessary antibiotic use.

3. **Traumatic folliculitis:** Traumatic folliculitis results from mechanical irritation or friction during or after the procedure, and more importantly from inadvertent damage to sebaceous glands surrounding the follicles during incision-making.

Key differences in clinical signs between foreign body folliculitis and infectious folliculitis are summarized in Table 1. Based on these clinical observations, immediate folliculitis is more likely to result from a foreign body reaction or traumatic causes rather than an infectious process.

TABLE 1: Key Differences in Clinical Signs Between Foreign Body Folliculitis and Infectious Folliculitis

FEATURE	FOREIGN BODY REACTION	INFECTION
<b>Onset</b>	Within 24-72 hours post-transplant	Often delayed beyond 72 hours
<b>Pain</b>	Mild to moderate	Moderate to severe
<b>Erythema</b>	Localized to graft areas	Diffuse or spreading
<b>Pustule Content</b>	Sterile (clear or slightly cloudy fluid)	Purulent, with bacterial presence on culture
<b>Systemic Symptoms</b>	Absent	May include fever and malaise
<b>Response to Treatment</b>	Resolves spontaneously or with anti-inflammatory measures	Requires targeted antimicrobial therapy

## THE DISRUPTION OF SEBACEOUS GLANDS

The disruption of sebaceous glands is hypothesized to contribute to folliculitis in specific contexts, including hair transplantation.<sup>11</sup> While direct reports explicitly linking sebaceous gland disruption to post-operative folliculitis are relatively limited, the following evidence supports its potential role.

### *Sebaceous Gland Disruption as a Trigger*

Sebaceous glands are intimately connected to hair follicles. If disrupted during incision or graft implantation, they can release sebaceous material into the dermis, which may be perceived by the immune system as a foreign substance, triggering an inflammatory response in the immediate post-operative period.

### *Evidence from Dermatology Literature*

Follicular occlusion disorders such as acne vulgaris, where sebaceous gland activity is altered or excessive, are well-known to cause inflammation and folliculitis. Although these

conditions are not directly caused by surgical trauma, they highlight the inflammatory potential of sebaceous gland disruption. Disruption of sebaceous glands has been associated with follicular trauma in other dermatologic procedures, leading to localized inflammatory reactions.

### **Hair Transplantation Context**

During hair transplant procedures, the incisions made in the recipient area may inadvertently damage sebaceous glands surrounding the follicles. This damage can contribute to the development of immediate post-operative folliculitis, either as a result of direct trauma (traumatic folliculitis) or through the release of sebaceous material that acts as an irritant.

The risk may be higher in cases involving dense graft placement (dense packing) or in individuals with coarse hair, as the close proximity of incisions or the use of wider bore needles can increase the likelihood of sebaceous gland disruption.<sup>11</sup>

Although there is no direct clinical study that isolates sebaceous gland disruption as the sole cause of post-operative folliculitis, the following works provide indirect evidence and relevant discussions:

- Bernstein RM, Rassman WR: Discussed postoperative folliculitis and hypothesized potential triggers, including surgical manipulation and inflammatory responses.<sup>12</sup>
- Gollnick H, Zouboulis CC (1998): Highlighted the role of sebaceous gland activity in inflammatory conditions involving hair follicles.<sup>13</sup>
- Tosti A, et al.: Addressed inflammation around follicles after dermatological interventions, noting that sebaceous gland damage may contribute to localized reactions.<sup>14</sup>

While the evidence remains indirect, disruption of sebaceous glands during hair transplant surgery can reasonably be considered as a potential contributing factor to post-operative folliculitis, warranting further investigation in future studies.

### **PREVENTION AND TREATMENT**

Proper recognition that the underlying pathophysiology of IPF is a sterile inflammatory process is essential to providing appropriate interventions. Since 2014, our clinic has replaced prophylactic antibiotics with low-dose oral steroids for patients undergoing hair transplantation. A 3-day course of prednisolone (5mg twice daily) has proven to mitigate inflammation, improve patient comfort, and significantly reduce the incidence of IPF to 0.7%. This protocol has become our standard practice. Needless to say, a high standard of hygiene and regular hair washing are essential to reducing the risk of secondary infective folliculitis.

### **RECOMMENDATIONS FOR CLINICAL PRACTICE**

1. **Accurate diagnosis:** Differentiate between foreign body and infective folliculitis based on clinical presentation and culture results.
2. **Avoid routine prophylaxis:** Reserve antibiotics for cases with clear signs of infection.
3. **Use steroids for prevention:** Implement low-dose oral steroids to reduce the incidence of foreign body folliculitis. In healthy adults, a daily dose of 5-10mg oral prednisolone used fewer than 7 days needs no tapering

and is generally well-tolerated and unlikely to cause significant systemic side effects. However, the specific dose and duration should always be tailored in patients with comorbidities such as diabetes, hypertension, or a history of gastrointestinal ulcers.

4. **Patient education:** Emphasize the importance of good hygiene, including scalp washing and avoiding scratching.
5. **Monitor high-risk patients:** Pay close attention to patients with coarse hair, dense packing, or a history of folliculitis. You may need to modify your surgical technique to avoid using large bore needles or implanters for dense packing.

### **CONCLUSION**

Immediate post-operative folliculitis is often a sterile foreign body reaction rather than an infectious process. Disruption of the sebaceous glands during the procedure may play an important role. Low-dose steroids in our experience have been effective in reducing its incidence, while the routine use of prophylactic antibiotics is discouraged due to limited efficacy and significant risks, including hypersensitivity and antibiotic resistance. Secondary infective folliculitis, while less common, requires targeted treatment based on culture results. Adopting evidence-based practices can minimize patient harm and improve outcomes in hair transplantation.

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