

## Necrotizing Fasciitis of the Forearm in a 20-Week Pregnant Woman: Case Report and Literature Review

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## 1. Summary

Necrotizing fasciitis (NF) is a rare skin and soft tissue infection that progresses rapidly to necrosis and can be life-threatening. The incidence varies by geographic region but is generally low, with a mortality rate ranging between 11-22%. Early diagnosis and treatment are crucial for survival, particularly in patients with underlying conditions such as immune suppression, diabetes, obesity, trauma, recent surgical procedures, or renal pathology. However, the relationship between pregnancy and NF has not been extensively studied. The case presented involves a 37-year-old, 20-week pregnant woman, who presented to the emergency department with septic shock and left forearm compartment syndrome. She reported no recent trauma or obvious source of contamination. The patient was immediately admitted and taken to the operating room. During admission she underwent three surgeries, consisting of staged debridement, fasciectomy, vacuum therapy and skin grafting. The patient was carefully monitored in the intensive care unit and multiple obstetrical consultations were performed to monitor the fetus. The patient was discharged with a fully integrated graft and with the donor area undergoing epithelialization.

This case highlights the importance of early diagnosis and treatment of NF, particularly in high-risk patients, and the need for further research into the relationship between pregnancy and NF.

## 2. Introduction

The “necrotizing fasciitis” term was first used in 1952 by B. Wilson [1] to describe an infection of the fascial layers. The actual term defines a potentially life-threatening skin and soft tissue infection

(incidence between 0,1 and 1 per 100 000 people per year[2]), rapidly progressive towards necrosis (mortality rates ranging from 20% to 30%-up to 73% [3]), requiring early diagnosis and urgent treatment. The infection is caused by a variety of bacteria, but the most common causative agent is Group A Streptococcus (GAS), also known as Streptococcus pyogenes. Other bacterial agents that can cause necrotizing fasciitis include Staphylococcus aureus, Clostridium species, and other streptococcal species [4]. Patients with concurrent diagnosis such as immune suppression, diabetes, obesity, trauma, or renal pathology have a higher risk to develop this disease. Related to pregnancy, it is well known that it increases the risk of developing severe maternal infections (pneumonia, sepsis, malaria, hepatitis) [5], but the direct link between pregnancy and necrotizing fasciitis is yet to be documented [6]

## 3. Case Presentation

A 37-year-old 20-week pregnant woman presented to the ER in June 2022 with high intensity pain and oedema of the left forearm and hand that debuted 12 hours before presentation. She had no history of recent upper limb trauma or obvious contamination source. The pain level increased progressively with general malaise and hemodynamical instability. From patient medical history we mention upper respiratory infection 2 weeks before, C-section in 2021 and oxacillin allergy.

Local clinical examination on presentation revealed: warm left forearm and hand with important rash and edema, with increasing pain level on active and passive mobilization of the upper limb, imperceptible radial and ulnar pulse, CRT >4s, multiple antebra-

chial ecchymoses (Figure 1). BP was 130/80 mmHg, HR was 117 bpm and temperature of 36,8o C.

Ultrasound examination showed no signs of venous thrombosis in the upper limb; suspicion of subcutaneous and intrafascial liquefaction along the affected area. Arterial flow was present up to distal arteries.

The plastic surgery team established clinical forearm compartment syndrome. The patient was admitted immediately and taken to the OR.

In general anesthesia, large decompression incisions were made from the carpal tunnel to the cubital fossa and on the dorsal aspect of the hand and forearm. During dissection it was observed from the proximal third of the forearm serous, gray fluid externalized (Figure 2). Fluid and fascia samples were collected for microbiological and histopathological examination, respectively. Decompression fasciotomies were performed on the volar aspect of the forearm along with fasciectomy.

After rigorous debridement of macroscopically altered tissue and hemostasis, the forearm regains its normal color and the capillary pulse was present in each finger. Subsequently, abundant lavage with betadine, physiological serum and wound dressing with paraffin gauze and sterile compresses were practiced. The patient was referred to the ICU for specific treatment and surveillance.

Because of the expansion of necrosis further debridement was needed. Excisions of the skin, subcutaneous tissue, and fascia from the forearm extending to the cubital fossa, were practiced. Antebrachial neurovascular pedicles were explored and no pathological changes were observed. We started Vacuum therapy at 80 mmHg pressure, achieving granulation tissue in 4 days. Subsequently, the defect was covered with autologous skin graft harvested from the left thigh.

During this period, the patient was carefully monitored in the ICU, followed antibiotic treatment. Positive intraoperative secretion of *Streptococcus pyogenes*, for which an allergology consultation was requested and treatment with penicillin G was administered - without incident- and obstetrical consultations were performed.

The evolution of the patient in ICU was favorable with normalization of biological samples and general condition, allowing patient transfer to the plastic surgery department on postoperative day 13. After three days the patient was discharged with fully integrated graft at the forearm level, the donor area with undergoing epithelialization, she was hemodynamically and respiratory stable and with normal blood samples (Figure 3).

The plastic surgery team regularly followed the patient until the complete epithelialization in an outpatient regime.

At 38 weeks the patient spontaneously gave birth to a healthy baby girl without any other complications or incidents (Figure 4).

The patient in the postpartum period presented for a follow-up examination at 8 months post-surgery, with favorable local and general progress, scars under local treatment with silicone and without functional limitations.

For a proper management of this complex case, a multi-modal team of doctors specialized in: Plastic surgery, gynecology, ICU, laboratory medicine, allergology and pathological anatomy were involved.



**Figure 1:** Swelling of the entire left forearm with multiple ecchymoses on the volar surface (in the ER department)



**Figure 2:** The grey fluid drainage after the decompression incisions



**Figure 3:** A week after discharge: fully integrated skin graft



**Figure 4:** 8 months after surgeries: fully recovered functionality.

#### 4. Discussion

We presented and published this clinical case for teaching purposes: an interesting and difficult case to manage. After research in specialized databases, we found only one similar case of necrotizing forearm fasciitis in a pregnant woman [7]. In the specialized literature, multiple other studies can be identified that primarily focus on necrotizing fasciitis in pregnant women; however, in the majority of cases, the patients were in the postpartum period, following the termination of a pregnancy or other genital area interventions, making the point of entry easily identifiable [14-16].

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Additionally, the preferred areas for this pathology in pregnant women or puerperal women are the abdomen, perianal area, or lower extremities [17,18].

Early diagnosis and treatment are essential. Compartment syndrome and necrotizing fasciitis more commonly occur in polymicrobial forms (type I) [8], in this particular case monomicrobial infection with *Streptococcus pyogenes* (type II) was confirmed.

Group A *Streptococcus* (*Streptococcus pyogenes*) (GAS) is a rare but potentially fatal infection. GAS is the most common cause of necrotizing fasciitis, accounting for approximately 70-80% of cases. Other bacterial agents that can cause this condition include *Staphylococcus aureus*, *Clostridium* species, and other streptococcal species, but GAS is by far the most prevalent [9]. Even when antibiotics cure the most severe infections, the overall case fatality rate (CFR) for invasive infections caused by *S. pyogenes* is 15% to 20%, and if septic shock develops, the mortality rate is 40% to 60%. For obstetricians, GAS has a unique place in medical history because it was associated with puerperal fever in the mid-19th century, when up to 15% of all women giving birth in centralized hospitals died from this disease. Although invasive GAS infection is now rare in developed countries, it still causes approximately 40% of sepsis deaths in patients with postpartum endometritis, necrotizing fasciitis, and toxic shock syndrome infections [10].

The need of staged surgeries were proof of the progressive character of this infection and are not unusual. Extended carcinological excisions (up to the level of the macroscopic undamaged tissues) were needed to control and limit the the infection, thus respecting the protocol of treatment of this pathology.

The evolution of this pathology in patients with concomitant diseases that produce immunosuppression, is described. In this case, pregnancy was the main and only cause of immunosuppression and no history of local trauma has been identified. A pregnant woman's immune system undergoes several changes to allow tolerance of the father's fetal antigens. Cell-mediated downregulation of immunity occurs and maternal lymphocytes show reduced proliferative responses to soluble antigens and allogeneic lymphocytes [11,19].

Surgical treatment alone may not be enough [12] and indicating targeted and suitable antibiotic treatment for the patient in a short time is a challenge: we had to take into account the risks to which it is possible or not to subject the pregnancy (teratogenicity, delayed growth, miscarriage, etc.), possible drug allergies of the patient and the sensitivity or resistance of the pathogen to a certain substance.

Penicillin is considered first line treatment for *Streptococcus pyogenes* group A of beta-hemolytic streptococcus [13]. Consequently, in the case presented, the antibiogram confirmed sensitivity for penicillin. Taking in consideration a negative allergy test and the fact that penicillin can be safely used in pregnant patients, the treatment was initiated.

## 5. Conclusion

In summary, the successful management of the 37-year-old pregnant woman with forearm compartment syndrome highlights the effectiveness of a collaborative, multidisciplinary medical team. Swift diagnosis, urgent surgical intervention, and meticulous post-operative care, involving specialists in plastic surgery, gynecology, ICU, laboratory medicine, allergology, and pathological anatomy, led to a favorable outcome. The patient, who gave birth to a healthy baby girl, experienced a smooth postoperative recovery with no functional limitations, emphasizing the importance of a comprehensive and coordinated approach in complex medical cases.

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