

Early Diagnosis and Surgical Management of Cervical Necrotizing Fasciitis Caused By *Pseudomonas Aeruginosa*: A Case Report

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Abstract

Introduction: Necrotizing Fasciitis also known as flesh eating disease, is a rare, dangerous, and life threatening infection that causes extensive necrosis of muscle, fascia, subcutaneous, dermis, and epidermis tissue along fascial planes with or without overlying cellulitis.

Case Report: We report a case of Necrotizing Fasciitis in a 37 year old woman who presented with swelling and neck pain for 7 days. Wound cultured showed *Pseudomonas Aeruginosa*. *Pseudomonas aeruginosa* as the culprit in Necrotizing Fasciitis of the neck region is rare and potentially fatal. Odontogenic infections are one of the reasons why this bacteria exists. Under general anesthesia, the patient underwent necrotomy debridement and tooth extraction. To date, the patient has undergone a second necrotomy debridement and closed with anterolateral thigh (ALT) free flap. The study highlights the importance of early intervention to improve outcomes.

Conclusion: Treatment for this patient was necrotomy debridement and ATL free flap closure. Early detection, necrotomy debridement, and broad-spectrum antibiotic can reduce mortality and morbidity in Necrotizing Fasciitis.

Keyword: Necrotizing Fasciitis, Necrotomy Debridement, *Pseudomonas Aeruginosa*

Introduction

Necrotizing fasciitis is a rare and potentially fatal infection involving the subcutaneous tissue and fascia. Necrotizing fasciitis is often known as a flesh-eating disease. At onset, necrotizing fasciitis is difficult to differentiate from cellulitis and other superficial infections of the skin. Studies show that 15-34% of patients with necrotizing fasciitis have an accurate diagnosis. Early detection and aggressive surgical treatment can reduce mortality and morbidity.^{1,2}

Necrotizing fasciitis is classified according to its microbiology (polymicrobial or monomicrobial), anatomy, and depth of infection. Polymicrobial necrotizing fasciitis mostly occurs in immunocompromised individuals. Monomicrobial necrotizing fasciitis is less common and affects healthy individuals who often have a history of (usually minor) trauma. Patients with necrotizing fasciitis may present with symptoms of sepsis, systemic toxicity, or evidence of skin inflammation, with pain

disproportionate to the degree of inflammation. In addition, this condition is also present in conditions that are less serious. The hyperacute case presents with sepsis and rapidly progresses to multiorgan failure, while the subacute case remains insidious, with purulent soft tissue infection. This condition is rare with minimal specific signs, causing frequent misdiagnosis. If Necrotizing fasciitis is suspected, histology of tissue specimens is required. Laboratory and radiological tests can be useful in deciding which patients require surgical consultation. Once Necrotizing fasciitis is diagnosed, the next steps include wound debridement, excision of necrotic tissue, and covering with broad spectrum antibiotics i.e. intravenous antibiotics.^{3,4}

Most cases start with trauma to the skin surface (eg, from a penetrating injury or even acupuncture needles), followed by the presence of bacteria. The infection starts in the deep tissue, and the epidermis may not be affected at first. Clinical signs begin to appear as the infective organism spreads through the tissues along the deep fascia. The bacteria multiply rapidly in tissues, although the fibrous attachment between the subcutaneous tissue and fascia limits spread to areas such as the hands, feet, and scalp. Lack of fibrous attachments to the trunk and limbs, however, can lead to widespread infection and tissue damage. The infection also spreads to the venous and lymphatic channels, causing edema. Spread of bacteria results in thrombosis of blood

vessels in the dermal papillae, resulting in ischemia and gangrene of the subcutaneous fat and dermis. If the fascia becomes infected, muscle infection causing myositis occurs. Gas producing organisms such as *Clostridium* species can give rise to subcutaneous gas which is called gas gangrene.⁴

Patients usually present with symptoms of pain, swelling, and fever. Tenderness, erythema, and fever are early clinical signs of necrotizing fasciitis. Wang et al. reported local swelling in 92 patients (80%), fever in 87 patients (76%) and pain in 84 patients (73%).¹ Necrotizing Fasciitis is associated with a high mortality rate of 12.1-41.6% in each case and amputation between 4.1-27.8% of each case.²

Case Report

A 37 years old female patient came with complaints of swelling in the left lower jaw for 1 week. The patient complained of the appearance of swelling in the lower left then extending under the chin (figure 1, 2). The patient feels fever and weak. The patient voice has changed in the form of hoarseness and neck stiffness. The lesion was found to be reddish in color with a size of 10 x 8 x 3 cm, warm temperature, localized, fluctuating, and painful on palpation, and no necrotic tissue was found. The patient's oral hygiene was poor, had some gangrene pulpes of teeth and remaining roots were found (figure 3).



Figure 1: Patients profile



Figure 2: Extra Oral Figure 3: Intra Oral

The patient performs a complete blood count, *Prothrombin Time (PT)*, *Activated Partial Thromboplastic Time (APTT)*, Blood Gas Analysis, lactate, and bilirubin (table 1). AP Lateral Soft Tissue neck X-ray results with the

conclusion of Necrotizing fasciitis in bilateral submandibular, submental, and anterior region. Intraoral examination found gangrene pulps of teeth 34,36,37 and radices of teeth 35,38 (figure 7).

Table 1: Lab examination

Type	Result	Unit	Normal value
Hemoglobin	7.2	g/dl	12.3 -15.3
Leukosit	28.82	10^3	4.4 – 11.3
Eritrosit	3.59	million/ul	4.5 – 5.1
SGOT (AST)	69	u/L	15 -37
SGPT (ALT)	129	u/L	0 - 55
Albumin	2.70	g/dL	3.5 – 5/2
pCO ₂	29.6	mmHg	35.0 – 45.0
pO ₂	67.9	mmHg	80 – 105
HCO ₃	19.7	mmHg	22 – 26
tCO ₂	20.6	mmHg	23.05 – 27.35



Figure 4: AP Lateral Soft Tissue neck X-ray

The patient is paired with an infusion and a catheter with an initial urine of 300 cc with a urine target for the first 6 hours of 180 cc. Examination of bacterial culture and antibiotic

resistance was performed (figure 5) and given the drug Ceftriaxone, Metronidazole, Ibuprofen, Omeprazole and was referred to Thoracic and Cardiovascular Surgery Dept. and Anesthesia

Dept. The patient was hospitalized and scheduled for necrotomy debridement surgery and

extraction of the causative tooth with assistance from Thoracic and Cardiovascular Surgeon.



Figure 5: Culture swab

In the first operation, necrotic and slough tissue was found in the anterior colli dextra and left with a size of 8x5x1 cm, 50 cc of pus was found, no track to the mediastinum was found, necrotomy

debridement was performed to the limit of vital tissue and tooth extraction caused (figure 6,7). This patient was treated for an open wound and given the antibiotic Meropenem.



Figure 6: 1st surgery

Figure 7: Odontogram

On Post Op Day (POD) 4 after the first operation it was seen that there was still a lot of slough

tissue and a second necrotomy debridement was performed under general anesthesia. (figure 8).

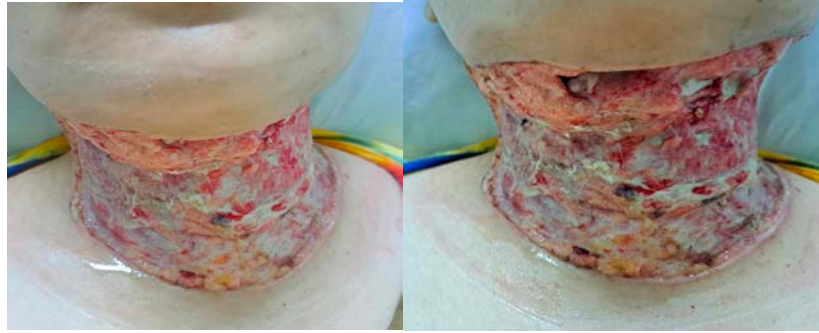


Figure 8: Post Op Day 4

On day 5 after the first necrotomy debridement, a second necrotomy debridement was performed under general anesthesia (figure 9). Bacterial

culture results found *Pseudomonas aeruginosa*. On the 10th day after surgery, the network showed a good response (figure 10).

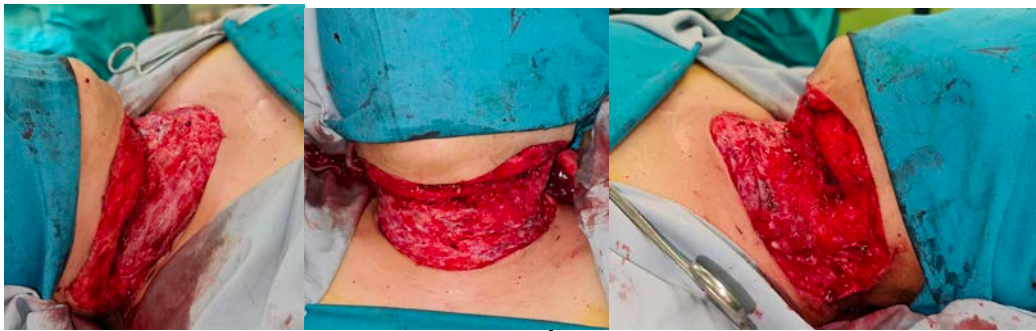


Figure 9: 2nd surgery



Figure 10: 10th day after surgery

On day 21, a Full Thickness Skin Graft (FTSG) operation was performed by Plastic surgeon (Figure 11).



Figure 11: 3rd surgery

Discussion

Necrotizing fasciitis is an infectious disease that has a rapid progression and involves the fascia and subcutaneous tissue. This disease is rare but is a life-threatening infection. This disease can affect all parts of the body and often occurs in the lower extremities.¹ This disease rarely occurs around the head and neck and when it occurs it is usually caused by an odontogenic infection.⁵ Predisposing conditions for this disease include diabetes mellitus, cirrhosis of the liver, alcoholics, hypertension, and chronic renal insufficiency, and malignancy. Early detection and early treatment with adequate antibiotics with or without surgical intervention is very important because of the high mortality.¹

Necrotizing fasciitis falls into two groups. The first group is polymicrobial infections which are usually caused by non-Streptococcus a. groups, other aerobic and anaerobic microorganisms. The second group is infections caused by Streptococcus pyogenes itself or with Staphylococcus. Research by Wang et al. identified microorganisms in 115 cases. A single organism was found in 7 patients (61%) and multiple pathogens were isolated in 20 patients (17%). The most frequent gram-positive bacteria were group Streptococcus a, followed by methicilin-resistant Staphylococcus Aureus (MRSA) and methizilin-sensitive Staphylococcus aureus (MSSA). Pseudomonas aeruginosa bacteria was found in 5 cases out of 115 cases. From the results of bacterial culture in this case, it was found that Pseudomonas aeruginosa was the cause of necrotizing fasciitis in this patient. Pseudomonas aeruginosa is a very rare pathogen that causes necrotizing fasciitis.¹

Pseudomonas aeruginosa is a gram-negative bacterium that causes conditions such as folliculitis, erysipelas, green nail syndrome, ectima gangrenosum, and sepsis. In immunosuppressed patients, Pseudomonas aeruginosa is an opportunistic pathogen and often causes septicemia, abscesses, and wound infections. Pseudomonas aeruginosa is frequently

found in moist environments and in the human intestinal flora. These microorganisms can cause nosocomial skin infections and environmental influences through direct inoculation, hematogenous spread, or intestinal translocation.⁶

Cellulitis that does not respond to antibiotic therapy raises suspicion of necrotizing fasciitis, especially in patients with co-morbidities. The presence of bullae filled with serous fluid is an important diagnostic sign. As the infection progresses, the skin becomes increasingly erythematous, painful, and swollen with indistinct margins.¹ Necrotizing fasciitis affects not only the extremities, but also the head and neck, perineum and scrotum. Mao et al. reported that the survival rate in patients with thoracic extension was only 60% when compared with the survival rate in patients without thoracic extension.¹ Possible complications of necrotizing fasciitis include airway obstruction, arterial occlusion, jugular vein thrombosis, mediastinitis, and pleural and pericardial effusions.⁵

The importance of debridement of wounds and ulcers with necrotic tissue, regardless of the status of infection, cannot be overstated and should not be underestimated. Debridement of most wounds is considered standard in wound management. This provides the benefits of removing necrotic tissue and bacteria and senescent cells, as well as stimulating growth factor activity. Debridement with sharp instruments has been shown to reset the wound re-epithelialization phase by providing the primary trauma seen in the hemostatic phase of wound healing. Angiogenesis has also been shown to be stimulated by debridement with sharp instruments. The method of debridement must be tailored to the particular appearance of the wound, taking into account factors such as co-morbidities, other low-risk options, and patient comfort and wishes.⁷

Skin grafts are the gold standard for covering large areas of defects when there is a defect with intact muscle tissue. The advantage of skin grafts when compared to local flaps is that they can be done more quickly, besides that the morbidity of

the donor area is smaller and can be implemented repeatedly. However, skin grafts have functional and aesthetic deficiencies such as wound contractures and dissimilar colors to skin grafts. FTSG has progressed and compensated for these deficiencies. When subdermal fat tissue is removed and skin harvesting is performed with a thickness of 0.6 mm or more, contractures are significantly reduced and aesthetic guarantees are obtained. Faults in the texture of the skin around the graft can make the scars at the edges of the graft visible and produce an unnatural result. FTSG can be a treatment option when there are superficial defects on the face. When making an incision in the skin, the operator must consider the Relaxed Skin Tension Line (RSTL). When the FTSG was performed, the RSTL matching of the facial area showed improvement in the scars. Despite the limited evaluation method, the RSTL-matched FTSG exhibits a natural appearance due to better assimilation with facial animation. Superficial facial defect closure with FTSG, matching the graft's RSTL to the surrounding RSTL can result in minimal scarring and better facial esthetics.³

The nature of this disease makes early and aggressive treatment and surgical care with intensive support is vital⁸. Early detection is important because it can slow the course of the disease towards SIRS (systemic inflammatory response syndrome) and even death. Early and aggressive debridement necrotomies have been shown to significantly reduce mortality. Wong et al. showed that delays in debridement of less than 24 hours can increase mortality.⁹ Toro et al. reported six cases of necrotizing fasciitis in the neck area caused by odontogenic infection and originated from mixed flora such as *Prevotella*, *Peptostreptococcus*, and coagulase negative *Staphylococcus*. Toro et al. Give broad-spectrum antibiotics where the bacteria are sensitive to these antibiotics.⁸ Surgical exploration and debridement of necrotic tissue is the standard of care when a diagnosis of necrotizing fasciitis is made.¹⁰

Conclusion

Necrotizing fasciitis is a rare disease but can cause death. Early diagnosis and treatment with necrotomy debridement, broad-spectrum empirical antibiotic treatment, and a multidisciplinary team approach are critical to successful treatment. Early surgical and medical intervention results in a good prognosis for the patient.

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