



Potentially Fatal Necrotising Fasciitis of the Head and Neck:

A Case Report and Review of the Literature

ABSTRACT

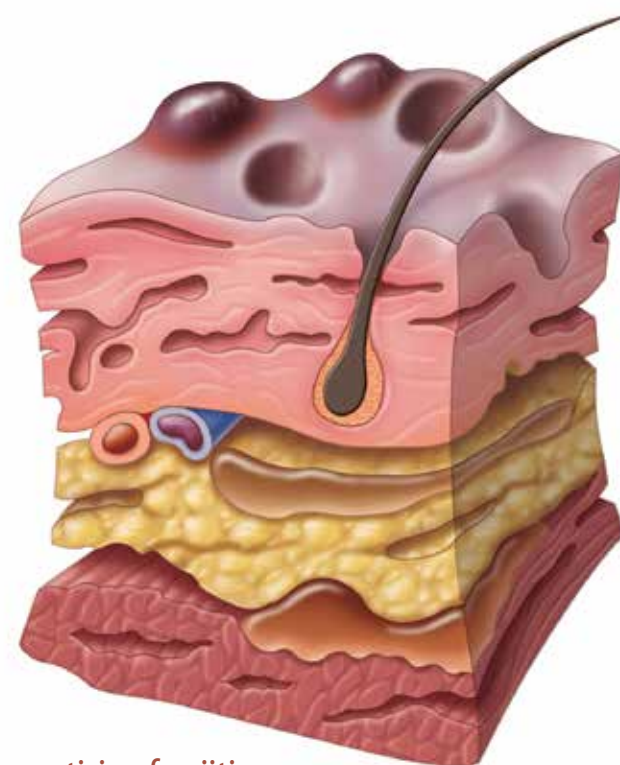
A case of necrotising fasciitis of the neck originating from odontogenic infection is presented. Clinical features including pathogenesis and treatment are discussed along with a review of the literature.

KEYWORDS: necrotising fasciitis, flesh eating bacterial disease, synergistic necrotising cellulitis, killer bug disease, fasciitis necrotans, surgical débridement, hyperbaric oxygen therapy, multi-organ failure, toxic shock syndrome, Disseminated Intravascular Coagulopathy (DIC), Laboratory Risk Indicator for Necrotising Fasciitis (LRINEC).



? Pre-test CME Quiz

Necrotising fasciitis is a rare, potentially fatal, rapidly progressive infection of the soft tissue which spreads along the fascial planes causing tissue necrosis and gas in the superficial fascia. It was recorded in France in 1783 and first described in 1848. In 1918 the cause was identified as bacterial, and, in 1952 the disease was named as “necrotising fasciitis” by Dr. B. Wilson. It is also known as flesh eating bacterial disease, killer bug disease, synergistic necrotising cellulitis, and fasciitis necrotans. It is the fastest spreading disease known to man with a progression rate of up to 3 cm per hour.



necrotising fasciitis

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Incidence

The overall reported annual incidence of necrotising fasciitis (NF) of the head and neck is 2–3 cases per year in the US.^{1–3} Legbo *et al.* reported 56 cases of NF in four years.⁴ However, reported incidence of necrotising cervical fasciitis is quite low. Vaid and colleagues reported only 68 cases of necrotising cervical fasciitis in world literature before 2002,⁵ and Helmy *et al.* reported only eight cases over a period of 53 months.⁶

Case Presentation

A 62-year-old diabetic male patient, was admitted to Allain Hospital in the United Arab Emirates, with painful swallowing dysphagia and hoarseness following a right upper tooth infection. He also had hoarseness and occasional stridor.

The patient was advised to have a lateral radiograph of the soft tissue of the neck (Figure 4) followed by a computed tomography (CT) scan of the neck (Figure 5 and Figure 6). Examination showed tenderness and crepitus on the right side of the neck. Fiberoptic laryngoscopy showed a swollen right vocal cord and right aryepiglottic fold. Dental opinion confirmed right upper first molar infection and a possible abscess.

This patient received combination of intravenous (IV) ceftriaxone, clindamycin, metronidazole, and dexamethasone for 24 hours. There was mild improvement in

Figure 1: Necrotising fasciitis of head and neck.



the patient's condition so the dexamethasone was reduced and IV antibiotics were continued. The patient's follow-up CT scan of the neck showed an increase in air shadow, and surgical débridement was done through the intra-oral and pharyngeal route.

Unfortunately, the patient developed a duodenal perforation and needed an emergency laparotomy to seal the perforation. The

Figure 2: Necrotising fasciitis after surgical debridement and wound care.



Key Point

Necrotising fasciitis is a rare but potentially fatal soft tissue infection.

patient was put on a ventilator for more than three weeks, and later had to undergo an emergency tracheotomy. Despite these efforts, the patient's condition continued to deteriorate, resulting in multi-organ failure and mediastinitis, and the patient expired.

Discussion

NF is an uncommon surgical emergency. NF is an aggressive bacterial infection of the soft tissue and fascia and needs early and aggressive surgical, medical, and supportive treatment to avoid the devastating possible complications such as airway obstruction, pneumonia, pulmonary abscess, jugular vein thrombosis, mediastinitis, and septic shock which is associated with high mortality. It is more common in the extremities but rare in the head and neck region because of the high vascularity in this area. Other synonyms of necrotising fasciitis are hospital gangrene, suppurative fasciitis, flesh eating disease, killer bug disease, Meleney's ulcer, and necrotising erysipelas. It is known as Fournier's disease when genitalia are also involved.

One of the early references of necrotising fasciitis was recorded in 1871 when Joseph Jones studied the disease during the American Civil War. In 1920, Frank Meleney reported 20 patients necrotising fasciitis caused by haemolytic streptococcus. In 1952 Dr. B. Wilson coined the term "necrotis-

Figure 3: The same patient after completion of treatment.



ing fasciitis" which is still used to describe this condition.

The disease is generally caused by polymicrobial or mixed aerobic anaerobic infection. Immunocompromised patients with diabetes mellitus, cancer, alcoholism, vas-

Figure 4: Lateral radiograph of the soft tissue in the neck showing air shadow in the soft tissue.



Key Point

Necrotising fasciitis of head and neck is rare compared to in the lower extremities, is a rapidly progressing disease where the focus of infection is dental or pharyngeal in origin.

Figure 5: Axial scan of neck showing air shadow on the right side.



cular insufficiencies, organ transplants, human immunodeficiency virus (HIV), or neutropenia are more prone to getting this disease. Celebrities face the same risk of getting necrotising fasciitis as those who are not so famous Of note, Lucien Bouchard (former premier of Quebec, Canada), Melvin Franklin (bass singer, The Temptations), Eric Allin Cornell (Nobel Prize for physics 2001), J.P. Balkenende (former premier of the Netherlands), and Alexander Martin (physics professor of MIT) are some of the people who have contracted NF.

The disease is generally caused by polymicrobial or mixed aerobic-anaerobic infections. The spread of organisms along the fascial planes is facilitated by enzymes and toxins released during bacterial multiplication and subsequently results in vascular thrombosis, ischemia, and tissue necrosis. Local anaesthe-

sia occurred due to damage to the superficial nerves. If not controlled, it can result in septicemia and shock.

Most of the odontogenic and oropharyngeal lesions are relieved with proper antibiotics and anti-inflammatory drugs. But, in rare cases, especially in patients who are in poor health or immunocompromised, this may spread through deep neck spaces and hence produce life-threatening cervicofacial necrotising fasciitis.

Pathophysiology

As noted in Wikipedia: “Flesh eating bacteria’ is a misnomer as bacteria don’t actually ‘eat’ the tissue. They cause the destruction of skin and muscle by releasing toxins (virulence factors), which include streptococcal pyrogenic exotoxins. *S. pyogenes* produces an exotoxin known as superantigen. This toxin is capable of activating T-cells non-specifically, which causes the overproduction of cytokines and severe

Table 1: Types of Necrotising Fasciitis

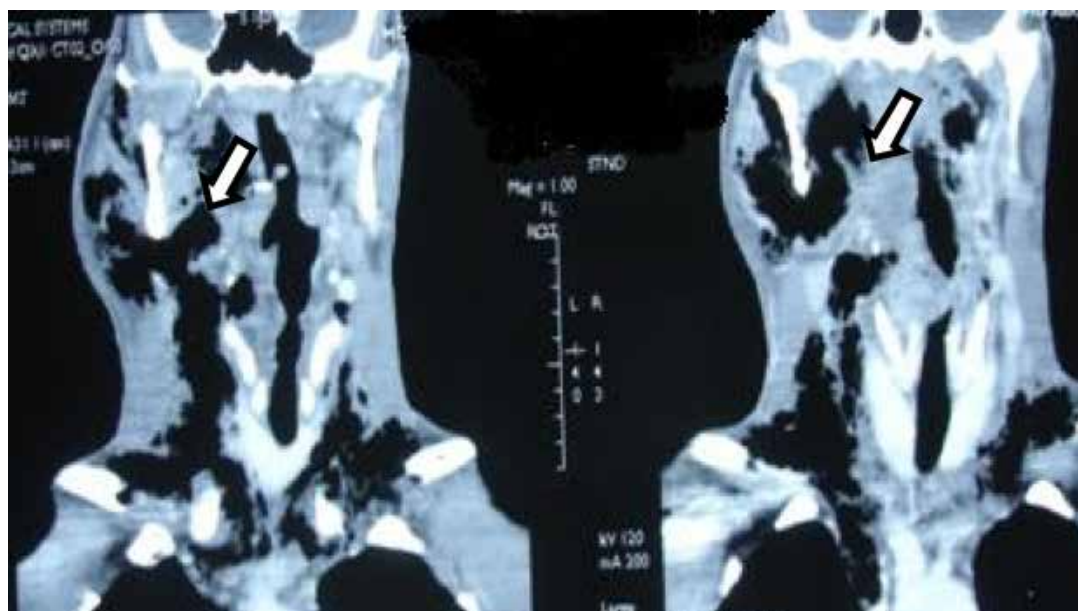
- I – Polymicrobial
- II – Group A streptococcus/ staphylococcus
- III – Clostridial myonecrosis
- IV – Fournier’s gangrene
- V – Lemierre’s syndrome



Key Points

Early diagnosis of necrotising is utmost importance.

Figure 6: Computed tomography scan of the coronal plane showing air shadow in the right side of neck.



illness (toxic shock syndrome). This can lead into septicemia and multi-organ failure.⁷

The types of necrotising fasciitis are listed below in Table 1.

Clinical Features

Patient's with NF are often immune compromised, with diabetes or malignancy, or renal or hepatic failure or anaemia, or are HIV infected. The infection often begins at the site of trauma and may be severe as a result of surgery or it can also be non-apparent. The patient usually complains of excessive pain, and, with progression of the disease, often within hours the tissue becomes swollen. Diarrhea and vomiting may be associated common symptoms. Furthermore, the patients with NF may have fever and look ill. Mortality rate is quite high at 73% if not treated. Without surgery and medical treatment such as antibiotics,

the infection will rapidly progress and will eventually lead to death. If the spread of infection is in the larynx, the patient may present with hoarseness and breathing difficulty, and if in the pharynx is involved the patient may develop dysphagia. If the patient does not respond to treatment they may end up with complications.

Diagnosis

Proper clinical history and examination could lead to a diagnosis. Sometimes the site of entry of infection is not apparent. Patients are generally ill looking, febrile, and have swelling on neck with skin erythema and rapidly increasing emphysema of subcutaneous tissue.

Criteria adopted by the authors for the diagnosis of cervical necrotising fasciitis are outlined below.

1. Clinical evidence of severe, rapidly progressive infection (Figure 1) +/- immunosuppression.
2. Radiological evidence of subcutaneous air (Figures 5, 6, and 7).
3. Evidence of oral, oropharyngeal, laryngeal, and neck infection.
4. Evidence of necrosis on surgical exploration with sampling of deep tissue is the most accurate of diagnosis.

Investigations

Hemoglobin may be low if the patient is anemic. Blood count will



Key Points

Quickly spreading erythema and extreme pain in the affected area serve as red flags.

show increase in white blood cells. Blood sugar may be raised as the patient may be an uncontrolled diabetic. If there is renal or hepatic failure, the kidney or hepatic function may be deranged.

The Laboratory Risk Indicator for Necrotising Fasciitis (LRINEC) (Table 2) is used to determine the risk of necrotising fasciitis. A score greater than 6 indicates that necrotising fasciitis is suspected.

The LRINEC score is an impressive diagnostic tool⁸ to distinguish necrotising fasciitis from other severe soft tissue infections, but it is not useful for early recognition of necrotising fasciitis.¹⁵

CT scan of the neck (Figures 5, 6, and 7) with contrast may show presence of gas under the soft tissue of the neck and if the larynx is involved it may note swelling of the vocal cords CT scan of the neck could show parapharyngeal abscess as a source of infection (Figures 8 and 9). If there is history of dental infection¹⁴ (Figure 10), an orthopantomogram (Figure 11) can show the focus of infection.

Treatment

Early medical treatment is often presumptive, antibiotics should be started as soon as the condition is suspected. Initial treatment often includes a combination of IV antibiotics like synthetic penicillin or cephalosporin (ceftriaxone or ceftazidime), clindamycin (for

Figure 7: Axial scan of neck showing large air shadow in the right side of neck compressing the airways.



Table 2: Laboratory Risk Indicator for Necrotising Fasciitis

C-reactive protein	>150 = 4 points
White Blood Cell count	<15 ⁶ per mm ³ = 0 points
	15–25 ⁶ per mm ³ = 1 point
	>25 ⁶ per mm ³ = 2 points
Hemoglobin (g/dL)	>13.5 = 0 points
	11–13.5 = 1 point
	<11 = 2 points
Sodium (mmol/L)	<135 = 2 points
Creatinine (µmol/L)	>141 = 2 points
Glucose (mmol/L)	>10 = 1 point



Key Points

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anerobes resistant to penicillin) or vancomycin and metronidazole. Cultures are taken to determine appropriate antibiotic coverage and antibiotics may be changed when cultures are obtained.

Wound Care

Wound care involves débridement of wound, keeping it open for regular irrigation with H₂O₂ to eradicate local anerobes and with chlorhexidine in alcohol to eliminate other microbes for secondary healing (Figure 2), and it can then be repaired with a graft if does not heal completely. Dunn *et al.* and Preuss *et al.* used maggots to clean the necrotic wounds in head and neck necrotising fasciitis.^{12,13} Legbo used fresh honey to clean and dress the wounds in necrotising fascitiis.⁴ Kamulegeya¹⁴ used 0.3% hydrogen peroxide to clean the wound while Edwards *et al.*¹⁰ used 0.5% povidone iodine solution for irrigating the necrotic wound. The authors also used fresh hydrogen peroxide daily in the necrotic wound after through surgical débridement and followed with irrigation of the wound with normal saline and povidone iodine 0.5%.

In the medical centre hyperbaric oxygen can be administered 2.5 to 2.0 atmosphere for 90 minutes twice a day following surgical débridement. Immunoglobulins are also given in immune-compromised patients. Critical care sup-

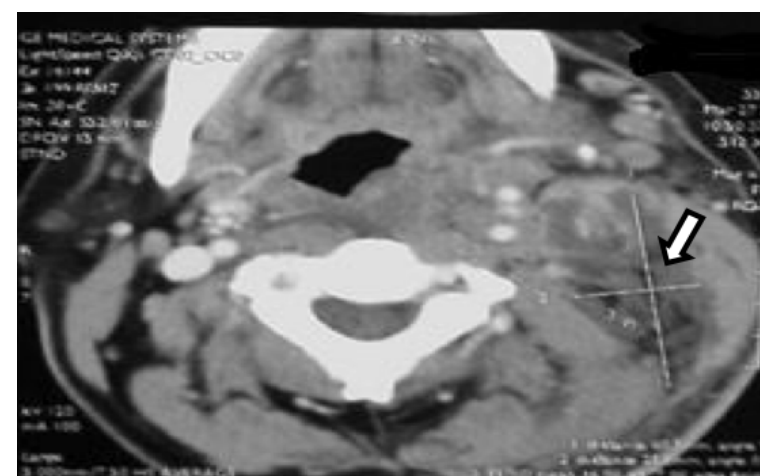
Figure 8: Coronal neck computed tomography scan showing left parapharyngeal abscess.



port should be provided for the patients with hemodynamic and ventilator instability.

Even after early surgical exploration and débridement of necrotic tissue is done, sometimes the patient will need repeated explorations and débridement. Through transverse incision the wound should be explored till the necrotic tissues are removed completely and normal tissue plane is seen.^{6,8} Also, air in the neck can be drained

Figure 9: Axial scan of neck showing left parapharyngeal abscess.



through a CT-guided catheter 11 (Figure 12).

Complications

Necrotising fasciitis can lead to mediastinitis.¹⁰ Airway obstruction, pleural effusion, pericardial effusion, empyema, arterial erosion, thrombocytopenia, coagulopathy, multi-organ failure, jugular vein thrombophlebitis,⁹ and septicemic shock.

Conclusion

Necrotising cervical fasciitis is a rare but serious soft tissue infection, with significant morbidity and mortality. Generally it is caused by group A beta-hemolytic streptococci (bacteria), but may also be caused by anerobic bacteria (*Peptostreptococcus*, *Bacteroides*). NF is common in immune-compromised patients with diabetes mellitus, cancer, alcoholism, vascular insufficiencies, organ transplants, HIV, or neutropenia. NF may also occur as a complication of a variety of surgical procedures. This infection results in extensive soft tissue destruction (necrosis) of skin, subcutaneous tissue, and muscle. Often surgical intervention (débridement) in combination with antibiotic therapy is required. Mortality rate is high particularly if treatment is delayed. Infection is often the result of a skin abrasion or puncture that becomes secondarily infected with streptococcal bacteria. In the neck, NF can often

Figure 10: Lower left first premolar tooth abscess.



Figure 11: Orthopantomogram showing left lower first premolar abscess.

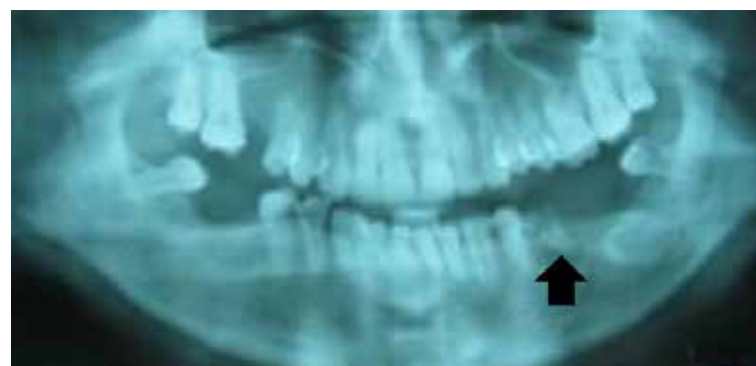


Figure 12: Computed tomography-guided drainage of right neck emphysema.





SUMMARY OF KEY POINTS

Necrotising fasciitis is a rare but potentially fatal soft tissue infection.

Necrotising fasciitis of head and neck is rare compared to in the lower extremities, is a rapidly progressing disease where the focus of infection is dental or pharyngeal in origin.

Early diagnosis of necrotising is of utmost importance.

Quickly spreading erythema and extreme pain in the affected area serve as red flags (Figure 1).



Post-test CME Quiz

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follow complicated dental infection. Familiarity with NF may facilitate earlier diagnosis and initiation of appropriate therapy.

Necrotising fasciitis is uncommon and can be difficult to diagnose. It causes progressive morbidity until the infectious process is diagnosed and properly treated. Prompt diagnosis and early aggressive treatment could result in good outcome (Figure 3).

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Dr Pradeep Shenoy takes full responsibility for the integrity of the content of paper.

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CLINICAL PEARLS

With current intensive multimodality regimen, the mortality could be reduced if treatment is started early and aggressively although 70% suffered sequelae.

With multi-system organ failure, mortality is very high.

Failure in diagnosis and treatment could lead to 100% mortality.

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