

Cervical Necrotizing Fasciitis: Case Series and Review of Literature

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Abstract

Introduction: Cervical necrotizing fasciitis is a fatal and rapid multi-bacteria infection causing extensive necrosis of the subcutaneous tissues and fascial planes with resultant skin gangrene and associated systemic manifestation. The aim of the present study is to report four cases of cervical necrotizing fasciitis highlighting their source.

Method: The case notes of the patients were retrieved and reviewed, literature search was done using Medline, journals available and various texts.

Results: Most often the cause of Cervical necrotizing fasciitis is of dental origin. The diagnosis depends mainly on clinical features and a high index of suspicion because the clinical features may be innocuous at the early stage.

Conclusion: Despite aggressive management with liberal wound debridement, intravenous antibiotics, and nutritional support, the mortality was still high due to late presentation.

Key words: Necrotizing fasciitis, late presentation, Nutritional support, wound debridement, tooth extraction.

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Introduction

Cervical necrotizing fasciitis is a fulminant life-threatening and polymicrobial infection causing extensive necrosis of the subcutaneous tissues and fascial planes with resultant skin gangrene and associated systemic manifestation.¹ Necrotizing fasciitis in general frequently occurs in the extremities, perineum and abdomen.^{2,3} This disease has been more commonly reported in the developed world.^{4,5} A few cases however have been reported in the East and Western Nigeria^{6,7} thus indicating that the disease is not rare in the country.

Predisposing factors includes diabetes mellitus, malignancy, radiotherapy, burns, malnutrition, peripheral

vascular disease and alcoholism. Soft tissue infections following trauma, tonsillitis, dental infections, insect bites can result in necrotizing fasciitis.^{8,9} The infection spreads along the superficial fascia planes of the neck and can easily track down into the mediastinum. It usually spares the overlying skin initially, but eventually the skin becomes erythematous and necrotic as a result of thrombosed feeding microvessels.

The infecting organisms are usually mixtures of aerobes and anaerobes. Common causative organisms are beta haemolytic streptococcus (group A) and staphylococcus species.¹⁰ It is the aim of this communication to report four cases of cervical necrotizing fasciitis highlighting the clinical features as seen in our centre.

Case report 1

A 49-year old carpenter was referred to the emergency unit of our teaching hospital from a peripheral hospital with history of left tooth ache and tooth extraction of 24 weeks and 1week duration respectively. He developed a left jaw swelling 2 days post extraction which later progressed to involve the whole neck, suprasternal region and the anterior chest wall. Subsequently, he noticed an offensive discharge from the neck and the chest wall. Despite commencement of antibiotic therapy at the peripheral hospital the wound rapidly increased in size. There was associated weight loss, fever and loss of appetite. There no history suggestive of immunosuppression or other predisposing factors.

Examination revealed a toxic looking patient, febrile (39° C), moderately pale and dehydrated. The pulse rate was 100/minute while the other vital signs were normal. There were fluctuant areas with necrotic tissues involving the overlying skin extending from the ramus of the left mandible to the mid sternal region of the chest, some of which were discharging pus. The Oral cavity revealed very poor orodental hygiene, halitosis,

multiple dental caries with absent left premolar and first and second mandibular molar tooth. Ear, nose and throat examination did not reveal any other significant findings while plain X-rays of the cervical region, mandible and chest did not reveal any pathology. Computerized tomographic scan of the cervical region was requested for but not done due to non-availability of one in our centre. Retroviral screening was non reactive. The wound swab culture grew *Staphylococcus aureus*, *Proteus species* and *Klebsiella species*.

A diagnosis of necrotizing cervical fasciitis secondary to dental infection was made. The patient was placed on intravenous ciprofloxacin, metronidazole, intravenous fluids, and tetanus toxoid. He had an aggressive wound debridement as well as commenced on daily dressing with Eusol and good nutrition. He responded well to the instituted treatment. The wound granulated well and he subsequently had split thickness grafting and was discharged home 4 weeks later.

Case report 2

Y.A is 25 year old female who was referred to the ENT clinic via the surgical outpatient of ECWA Evangel Hospital, Jos. She presented with discharge from a swelling on the left side of the neck of four days duration. There was associated fever, easy fatigability, weakness of the body and difficulty in breathing and pain on turning the neck. She had presented a month earlier with a two weeks history of progressive neck swelling without fever or headache. There was no antecedent history of tooth extraction, trauma or predisposing conditions like diabetic, malnutrition or immunosuppression. She presented to a prayer house for succor and to apply local medications to the spot all the while.

On presentation to the ENT Unit she was found to be ill looking, pale, dyspnoeic and febrile with a temperature of 39 °C. The pulse rate was 104 beats per minute and of small volume. The blood pressure was 120/60 mmHg. She had a uniform neck swelling extending from the left lower jaw to the root of the neck on the left with a large ulcer measuring about 6cm by 7cm in diameter with necrotic tissues at the floor and all round the edge. There was visible pulsation from great vessels passing through the centre of its floor.

The packed cell volume was 16%; the white blood cell count was 11,000/cm³ with relative neutrophilia of 59%; lymphocytes of 38% and eosinophils of 3%. The erythrocyte sedimentation rate (ESR) was 11mm/Hr. The retroviral screening was non reactive. A diagnosis cervical necrotizing fasciitis was made. She was admitted

commenced on intravenous Ceftriaxone 1g, 12 hourly, Metronidazole 500 mg, 8 hourly and Gentamycin 80 mg, 8 hourly for 72 hours in addition to intravenous fluids and nutritional support. She was required to be transfused two units of blood while awaiting wound debridement.

The financial support to meet these treatments was not available. She continued to deteriorate with the temperature chart showing "swinging" pyrexia, tachycardic (pulse rate of 160 beats per minute) and a low blood pressure of less than 80/50mmHg. A diagnosis of septicemic shock secondary to cervical necrotizing fasciitis was made. She continued to deteriorate and was transferred to the intensive care unit (ICU) on the 4th day and was giving supplemental oxygen (100%) via intranasal catheter. Her condition worsened and she gave up on the 7th day of admission.

Case report 3

W.S was a 68 year old retired male secondary school teacher who presented to the emergency Unit of the Jos University Teaching Hospital following referral from a peripheral hospital with a 3 weeks history of ulcers on the anterior and lateral neck, upper chest, and lower submandibular region following a tooth extraction. There was history of associated low grade fever, mild gum and lower jaw swelling for which the patient applied series of herbal concoctions/remedies. This was followed by skin excoriation on the jaw, neck and upper chest. There was no history of predisposing conditions like diabetes or immunosuppression. The other systems were essentially normal.

Examination revealed an elderly man, mildly pale, afebrile, anicteric and well hydrated.

The neck showed ulceration of skin and muscles in various stages of spread extending from the mandible superior and lateral to the anterior border of sternocleidomastoid muscle down to both supraclavicular fossae and unto the anterior chest wall just above the nipple almost symmetrical in level.

The pulse rate was 124 beats per minute with a blood pressure of 90/60 mmHg. The other systems were essentially normal.

The urea and electrolyte showed chloride of 117 mmol/L, HCO₃⁻ of 16 mmol/L, urea of 16.6 mmol/L, the sodium and potassium were 140 and 4.5 mmol/L respectively. **The pack cell volume was 23 percent.** A wound swabbed of the lesion was sent for microscopy, culture and sensitivity. Chest X-ray was also requested for.

An assessment of cervical necrotizing fasciitis secondary to tooth extraction was made. Admitted, patient was commenced on intravenous Ceftriaxone 1g daily and Metronidazole 500mg 8 hourly all for 5 days and intravenous fluids (5% Dextrose Saline). Daily dressing with Eusol and hydrogen peroxide was also started. Two days later, he was noticed to be making scanty urine. The temperature was 36.2 °C, pulse rate 110 beats per minute, blood pressure 130/90 mmHg and a respiratory rate of 22 cycles per minute. His intravenous fluid was increased to 1L 8hourly. The 24hour urinary output continued to fall and was 200 mls by the next day. An assessment of septicemia with acute renal failure in a patient with cervical necrotizing fasciitis was made. The patient continued to deteriorate and expired on the fourth day of admission while being worked up for dialysis.

Case report 4

B.J was a 42 year old known diabetic patient of 10- years duration who presented to the out patient department of ECWA-Evangel with a 3-weeks history of anterior neck swelling. She had in addition pain over the neck skin with dysphagia and fever of a day's duration. There was an initial increase in pain and size of a localized black spot over the skin of the neck in the last three days. There was no history of trauma or any other predisposing factor. This was followed by discharge of pus and bleeding from the skin of the neck.

General examination revealed a patient in painful distress. She was dehydrated with tender submandibular, upper and middle jugular cervical lymphadenopathy. The neck revealed a cystic fluctuant anterior neck mass measuring 6cm by 7cm with an ulcer measuring 2cm by 1 cm over the central portion. There was a pocket of pus beneath the subcutaneous tissue extending inferiorly up to the clavicle. The rest of head and neck region were normal. The pulse rate and blood pressure were 82 beats per minutes and 120/80 mmHg respectively. The fasting blood sugar was 452mg/dl. The pack cell volume was 41% while the white blood cell count was 5400/cm² with neutrophils and lymphocytes differentials of 66% and 34% respectively while the retroviral screening was non reactive. The cervical x-ray revealed increased soft tissue shadow anteriorly.

The patient was commenced on intravenous insulin 10 international units (i.u) morning and evening and later increased to up to a maximum of 25i.u and 10i.u until a normal glycaemic control of 154 mg/dl was achieved. She also had intravenous saline 1 litre 8 hourly; incision and drainage and serial debridement. In addition, she was placed on intravenous ciprofloxacin 200 mg 12 hourly and

metronidazole 500 mg 8 hourly for five days, after which she was started on oral ciprofloxacin 400 mg 12 hourly and metronidazole 400 mg 8 hourly for another five days. The wound is still granulating while waiting for skin grafting.



Fig. 1 shows case report no.3



Discussion

Necrotizing fasciitis is an aggressive and potentially fatal infection without clearly defined local boundaries or limit. There are two groups of necrotizing fasciitis in the head and neck region. The first group affects the scalp and the eyelid. Trauma is the commonest course of this followed next by infections. The second group is that involving the face and neck with dental infection being the commonest cause, followed by trauma, peritonsillar and pharyngeal abscesses and osteoradionecrosis. In the study by Klabacha et al sixty-five (65%) of them developed chest wall and mediasternal extension with a mortality of 27%.¹¹ All the cases in this present study belong to the second group that involves the face and neck. Two (2) cases were of odontogenic origin, while cervical furuncle and diabetes mellitus each were the predisposing factors in the remaining cases. Two (2) of them had chest wall extension. Retroviral screening was negative in all our patients and the fasting and random blood sugar tests were within normal limits in three of the patients. In previously healthy individuals (13 - 31%) Group A beta haemolytic streptococci is the infective agent and spreads with speed to produce massive tissue infection.

The most common bacteria that cause Cervical necrotizing fasciitis is group A beta haemolytic streptococcus (GABHS) or Streptococcus pyogenes and Staphylococcus aureus alone or in combination with other organisms. All our cases grew Staphylococcus aureus, Proteus species and Klebsiella species. We do not have the facility to grow anaerobic organisms.

Streptococcus species produce streptococcal pyrogenic exotoxin and streptococcal supra-antigen and other toxic components like protein M₁ and M₃. The streptococcal pyrogenic exotoxin and streptococcal supra-antigen leads to production of cytokines which in turn lead to excessive production of lymphocytes with cascades of reactions resulting in vascular thrombosis, tissue necrosis, the necrotic tissues compress the nerves to cause cutaneous nerve anaesthesia. There is pooling of fluid into the third space with resultant hypotension, hypoproteinaemia and malnutrition. There is subcutaneous fat necrosis with consequent saponification having reacted with calcium. The protein M₁ and M₃ help the streptococcus to bind to the tissues and also reduce neutrophils phagocytic function.

The staphylococcus species produce endotoxin which is toxic to the tissues. The facultative anaerobic organisms utilize the oxygen leading to proliferation of more anaerobic organisms; this in turn results in production of gases such as hydrogen, hydrogen sulfide, methane and carbon dioxide. The only insoluble gas amongst them is carbon dioxide which diffuses into the subcutaneous tissue causing subcutaneous emphysema. The decreased oxygen tension affects polymorphonuclear functions. Bacteroides fragilis interferes with interferon activity leading to decreased polymorphonuclear phagocytic functions. The rapid multiplication of polymicrobial organisms results in toxemia resulting in haemolysis, jaundice and anemia with systemic manifestations.¹²⁻¹⁵ Two of our cases presented with systemic manifestations.

The clinical features are those of tense, shiny smooth skin without sharp demarcation noticed two to four days after insult. This is soon followed by dusky discoloration, poorly defined edge, localized skin necrosis and secondary cutaneous gangrene. There is then sudden onset of pain, increased skin swelling, the skin becomes warm and erythematous. There was a wide peripheral zone of erythema around a dusky zone with central necrosis and ulceration. Skin anaesthesia may be present and soft tissue crepitation due to damage to cutaneous nerve and subcutaneous gas diffusion. Low grade fever, anaemia, jaundice and dehydration may ensue.^{16,17} Our cases all

presented with frank ulceration and the last two cases had subcutaneous gases whereas the first and last cases had none. The early features were not seen because they presented very late. Three cases presented with initial high fever (39°C) while only one came had a low grade fever (36.2°C).

The investigations required are full blood count which may show low packed cell volume and elevated white blood cells. The pack cell volume of the second patient was very low with high white blood cell count.

Soft tissue neck x-ray may reveal subcutaneous gases and retropharyngeal widening. The Chest X-ray may show evidence of mediasternal widening and pleural effusion. The chest X-ray in the fourth case was normal. Computerized tomographic (CT) scan is the most important and shows air in areas inaccessible to palpation, extent of spread of infection, vascular thrombosis and erosions and Mediasternitis. Magnetic resonant imaging (MRI) can show extent of the disease but may be nonspecific. Currently there is rapid streptococcal diagnostic kit and polymerase chain reaction for streptococcal pyrogenic exotoxin gene (SPE-B).¹⁸⁻²⁰ Mandibular X-ray was normal in the first case; the other two did not take their X-rays while the fourth had x-ray soft tissue neck with evidence of involvement of the cervical soft tissues. Due to cost in centers where CT and MRI facilities are available, the distance from our center and the severity of the patients' illness CT scan and MRI could not be done though requested. There was none of these facilities in our center at this time.

The most important steps in the management of Cervical Necrotizing Fasciitis are early diagnosis, institution of broad spectrum antibiotic, restoration of metabolic derangement and surgical debridement of the necrotic tissues. Early diagnosis and institution of antibiotics have been known to reduce the mortality if commenced within 24 hours compared to when antibiotics are introduced later than twenty four (24) hours.^{21,22} All our four cases presented very late; the earliest being a week and the longest four weeks later. The mortality was high, two out of four of them died.

The drug of choice for most streptococcus species and clostridia is penicillin but where there is resistance to penicillin by anaerobes clindamycin is used; metronidazole is also a very good drug for anaerobes. In our case we combined ciprofloxacin with metronidazole for the first case and ceftriazone with metronidazole for the second, third and fourth case respectively.¹⁶ The dehydration was corrected using crystalloid that is,

normal saline and ringer's lactate intravenously in addition to good nutritional support.

The complications of cervical necrotizing fasciitis are chest wall necrosis, Mediasternitis, pleural effusion, pericardial effusion, empyema, airway obstruction, arterial erosion, jugular vein thrombophlebitis, septic shock, lung abscess and carotid artery thrombosis and multiple organ failure.²³⁻²⁶ The second case in our series died of septic shock whereas the third died of acute renal failure.

In conclusion, Cervical Necrotizing Fasciitis is increasing becoming very common in our environment. Mortality from this disease is high, early presentation and early recognition of the disease process and prompt institution of broad-spectrum intravenous antibiotics treatment, aggressive surgical debridement, wound care, and supportive measures remain the best goal in treating these patients.

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