

Necrotizing Fasciitis Case Series: Improved Outcomes with Early Diagnosis and Effective Surgical Interventions in Low Resource Settings

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Abstract

Necrotizing fasciitis (NF) is a severe, rare, potentially lethal and fulminant soft tissue infection. It is marked by necrosis of the superficial fascia, neutrophil infiltration of the deep dermis and fascia, thrombosis of the cutaneous microcirculation, and the presence of the infecting organism in the necrotic tissue.

The infection progresses rapidly with systemic signs of toxicity and septic shock may ensue; hence, the mortality rate is high (median mortality 32.2%). Prognosis becomes poorer in the presence of co-morbidities, such as diabetes mellitus, immunosuppression, chronic alcohol disease, and in poor resource settings.

Early and aggressive meticulous surgical debridement constitutes the mainstay of treatment along with broad spectrum antibiotics and fluid resuscitation. Postoperative management of the surgical wound is also important for the patient's survival, along with proper nutrition.

Objective: To determine improved outcomes with early diagnosis and cost effective surgical interventions for patients necrotizing fasciitis at Bwindi community hospital, Uganda.

Design: These are case series of 6 patients who presented with fulminant necrotising fasciitis admitted to the hospital through the emergency wing.

Materials and methods: Six patients presented with fulminant necrotizing fasciitis admitted at Bwindi community Hospital between August 2015 and June 2017, were analysed, and appropriate effective surgical management based on these patients is suggested.

Results: These patients were all admitted after a minimum of 3.8 days from the on onset of the infection. The average timing of debridement through fish fillet incisions was 14 and 4 hours from the time of admission and diagnosis respectively. The average number of re-debridements were six. There was 83.3% survival after treatment, with 16.6% mortality. Vacuum dressings were used for one paediatric case. 50% of the wounds healed by secondary intention, 16.6% by secondary closure and 16.6% done full thickness skin grafting. Placement of the testicles in subcutaneous pockets in the thigh was done for one patient. In 100% were of the patients dressing with honey gauze was used for the alternate day bed side dressing.

Conclusion: The diagnosis of necrotising fasciitis is a challenge, however early meticulous surgical debridement, supported by fluid resuscitation and broad spectrum antibiotic clinical administration is key to survival of these patients.

Keywords: Necrotizing fasciitis, Surgical debridement, Skin grafting, Fish fillet skin incisions, Poor resource setting, Uganda.

subcutaneous layer. Necrotizing fasciitis moves along the fascial plane [1,2].

Background

Necrotizing fasciitis is a rapidly progressive inflammatory infection of the fascia, with secondary necrosis of the subcutaneous tissues. The speed of spread is directly proportional to the thickness of the

Necrotizing fasciitis has also been referred to as hemolytic streptococcal gangrene, hospital gangrene, suppurative fasciitis, and synergistic necrotizing cellulitis. Fournier gangrene is a form of necrotizing fasciitis that is localized to the scrotum and perineal area [3].

The degree of suspicion should be high since the clinical presentation is variable and prompt intervention is critical. The lay press has referred to organisms that cause NF as “flesh-eating bacteria” [4].

The causative bacteria may be aerobic, anaerobic, or mixed flora [5].

Surgical intervention by debridement, necrosectomy, and fasciotomy is life-saving and must be performed as early as possible, since a delay in treatment beyond 12 hours in fulminant forms of NF can prove fatal [3,4]. Surgical debridement should be repeated during the next 24 h or later, depending on the clinical course of the necrotizing infection and vital functions [1]. Many studies have pointed out that timing and the extent of the first debridement are the most important risk factors in terms of increased mortality rate. A study by Mock et al. showed that the relative risk of death was 7.5 times greater in cases of restricted primary debridement [6].

Objectives

To present cost early effective surgical interventions and outcomes in low resource settings for patients with necrotizing fasciitis.

Design

This was a retrospective study of patients who presented with necrotizing fasciitis.

Materials and Methods

Between August 2015 and June 2017, we operated on six patients with fulminant forms of necrotizing fasciitis, admitted in the hospital. Surgical debridement was performed within 4 hours of arrival at the hospital after initial resuscitation for patients with early diagnosis, and they were followed up with multiple serial debridement's, until formation of granulation tissue. The in-depth cases with the surgical options and outcomes are presented.

Case one

An infant with abdominal crepitus

A 9 month old female infant admitted with left sided abdominal swelling for 3 days that had started from the left groin spreading to the anterior abdominal wall and back, associated with high grade fevers. There was no history of trauma. Normal micturition, with reduced appetite.

Review of other systems was quite unremarkable.



At 10 days of treatment



At 17 days of treatment

Examination

Febrile, Temperature- 39.9°C, tachycardia Pulse rate, 162 bpm, Respiratory rate- 40 bpm, SPO2-97%. Weight 7kgs.

Local exam- had hyperemic, wide subcutaneous swelling on the anterolateral aspect of the abdomen extending to the back, well demarcated with marked dimpling, and marked tenderness to touch and crepitus.

Rest of physical exam was unremarkable.

Investigation reports

CBC- **leukocytosis** total white cell count **17.2** x 10⁹ /l

Neutrophilia **12.67** x 10⁹/l

Hb 8.4g/dl – moderate anemia

Platelets **429** x 10⁹/l

HIV-negative

Gram stain- gram positive Cocci.

Abdominal u/s –significant for inguinal lymphadenopathy, with marked loss of tissue planes on the abdominal wall.

Diagnosis

Was initially managed as cellulitis with intravenous antibiotics (Cloxacillin, gentamycin, metronidazole) and rectal paracetamol. After 24 hours of antibiotics, the swelling had progressed into a fluctuant mass, aspiration had purulent yellowish aspirate, sent for gram staining.

Management

She was scheduled for Incision, drainage and debridement; intra operatively made multiple fish fillet incisions, drained about 700mls of pus, found extensive necrosis of the subcutaneous tissue and massive debris up to the muscle layer, but the muscle layers were not affected.

Extensive debridement and irrigation with normal saline, was done with packing with Normal saline wet gauze.

Follow up

She was started on vacuum dressing with intermittent suction every 4 hours for the next 4 days and transfused with packed red blood cells. Treatment was switched to intravenous Ampicillin and metronidazole. She had serial debridement every 48 hours, for the next one week. With eventual formation of granulation tissues by day 6. Eventual secondary closure was done 24days later after wound contraction.

Gram positive Cocci were seen on gram stain, she was started on oral clindamycin 150mg three times a day for 2 weeks.

Conclusion

The patient was previously labelled as cellulitis, but the pain was out of proportion with no improvement in symptomatology despite intravenous antibiotics, and this should be used as a supportive clue to diagnosis and should raise high index of suspicion of necrotizing fasciitis. Vacuum dressing with intermittent suction quickened the process of granulation tissue formation.

Case Two

A middle aged HIV positive male, with right sided disproportionate abdominal pain, not responding to narcotic analgesics

A 32 year old, HIV positive male admitted with right sided abdominal pain, marked in the right lower quadrant, and left groin. This had started 4 days prior to admission. The last CD4 count was 200, had been started on antiretroviral drugs and septrin, with poor adherence and compliance. There was history of fever, low but to moderate grade, with no clear history of trauma. Had mild dysuria, no cough, no difficulty in breathing.

Examination

Sick looking and severe pain, pain rating scale 9/10, despite the pethidine injections.

Temperature – 38 °C, pulse rate 100beats per minute, respiratory rate 30 b/ minute, SPO2 97 %. BP 100/65mmHg.

Abdominal exam

Normal fullness, with hyperemia and dimpling on the right lower quadrant extending to the groin, with marked tenderness on touch and clear demarcation. No area of fluctuancy

Investigations

CBC- leukocytosis 16×10^9 ,

Neutrophilia at 92 %

HB- 7.0g/dl

HIV positive

Gram stain- mixed Gram positive Cocci with rods.

Abdominal ultra sound, edema of the anterior abdominal wall, abdominal organs normal

Diagnosis

Anterior abdominal wall cellulitis with necrotizing fasciitis because of the disproportionate pain.

Treatment

He was started on intravenous ceftriaxone and metronidazole and planned for debridement.

Intra operatively, mild pus approximately 10 cc was found, but with extensive necrosis of the subcutaneous fat and fascia extending to the costal margin superiorly, groin area inferiorly, iliac crest laterally and linea Alba medially. Multiple fish fillet skin incisions were made, and extensive debridement done. Samples for gram staining taken off. Irrigation with hydrogen peroxide and normal saline done. Packed wound dressing was done, with Povidone iodine gauze.

Follow up

He was transfused with 4 units of whole blood over a period of one week. Daily debridement and dressing with honey gauze was done for one week, then alternate day dressing for the next 6 weeks. He was also started on high dose oral clindamycin 600 mg hourly for 4 weeks. He was re initiated on the antiretroviral drugs, and there was eventual granulation tissue formation wound contraction and healing by secondary intention.

Conclusion

Necrotizing fasciitis can be mimicked as cellulitis and especially in the immune compromised. Disproportionate pain is one key clue to diagnosis. Extensive debridement through fish fillet incisions improves access to the wound and the ease for dressing. Honey gauze dressing is an affordable and available alternative for dressing

in such septic wounds.

Case 3

A middle aged lady, known type 1 diabetes patient with a painful swelling on the back

21-year-old female, presented to the out patients department with history of painful swelling on the back for 4 days that had started discharging pus a day prior to admission. She had associated occasional drenching night sweats, and progressive weight loss and low grade fevers.

She was previously diagnosed with type 1 DM about 2 years prior to the onset of symptoms and started on insulin(Mixtard) however defaulted about 2 months following advice from a local priest. She had polyuria, polydipsia and polyphagia. She had been given some local herbal medicines through therapeutic marks on the back.



Week 5 on treatment



Week 7 on treatment



5 days after full thickness skin grafting and secondary closure in week 9



Examination

General exam was significant for severe wasting, perspiration, and a fever of 37.9 °C. BP-90/60mmHg, Pulse rate 120 beats / min, RR- 32b/minute. She was in severe pain, pain rating scale 7/10.

Back exam- had multiple paramedian therapeutic scars, with tenderness and a discharging sinus in the thoracolumbar regions. no Gibbus or any other deformities.

Investigations

CBC was significant for Leukocytosis 13.19×10^9 ($5.0-10 \times 10^9/l$), Neutrophilia 10.4×10^9 ($2.5-7.5 \times 10^9$), Hb-7.8 g/dl (12.0-16.0g/dl), Plt $375 \times 10^9/l$ ($150-400 \times 10^9/l$)
 FBS-19.6 mmol/l,
 B/S- no MPs,
 Gram stain on pus Aspirate - Gram Positive Cocci in clusters +++, intracellular PUS Cells +++
 ZN on pus-negative for AFBs
 Spine X-ray Normal.

Diagnosis

Necrotizing fasciitis of the back, in a diabetic patient, with poor drug compliance.

Treatment

The patient was initiated on intravenous fluids normal saline,

Insulin (Actrapid and Mixtard as per institutional guidelines) and intravenous antibiotics (Ampicillin and metronidazole) and analgesics with codeine and paracetamol, and prepared for fasciotomy and debridement.

Multiple fish fillet incisions were made on the back, found extensive necrotic debris and copious pus extending to the paravertebral muscles. Debridement was done, washed with hydrogen peroxide and copious N/S and dressing with honey gauze.

Follow up

She was started on clindamycin 600mg 8hly for 6 weeks. Patient developed anemia (Hb-5.5 g/dl) post operatively and was transfused with 3 units of whole blood.

Over the next two weeks, the patient underwent 12 debridement's and dressing with honey gauze on alternate days and ultimately had full thickness graft for the large fasciotomy wounds and secondary closure for the other wounds in the 9th week in hospital and was discharged.

Conclusion

In the setting of immunosuppression, necrotizing fasciitis can be life threatening, prompt recognition and early surgical intervention is key to survival. For wounds that fail to undergo early contraction, full thickness grafting is employed for coverage and reduction of dressing pain.

Case 4

An elderly man with a ripped off scrotum

68 year old man admitted with history of needle aspiration for a right scrotal hydrocele that progressed into pain and reddening. This was followed by a massive scrotal swelling, with extensive pain. 1 day before admission he started discharging little pus. He had associated fever and general body weakness. Developed cough but no difficulty in breathing. He was a chronic alcoholic for over 30 years.

Examination

Elderly man sick looking, temperature 37.8 °C, pulse 93 b/min, RR 26 b/min, spo2- 92%, in foul smell.

Had few coarse crepitation's right lung basal arrears, Locally. Copious thick foul smelling Pus discharge from the scrotum, with a lot of necrotic tissue, and inguinal lymphadenopathy.

Had urine leakage through the wound, on attempting micturition.

Investigations

CBC- Leukocytosis 17×10^9
 Neutrophilia 82%
 Hb 9.8g/dl
 Abdominal ultrasound- thickened bladder wall, with an enlarged prostate volume 70cc, kidneys appear normal.

Renal function tests

Urea 50mg/dl
 Creatinine 1.4mg/dl
 Potassium 4.3mg/dl
 Sodium 141mg/dl
 Glucose fasting 130 mg/dl
 Gram stain- Gram positive Cocci, unable to do culture and sensitivity.

Diagnosis

Fournier's gangrene, with urethral cutaneous fistula.

Treatment

He was started on intravenous fluid therapy with normal saline, started on intravenous ceftriaxone with metronidazole, and then prepared for debridement.

Intraoperative we found massive debris and necrotic tissue of the scrotum, eaten away tunica vaginalis, and a fistula of the bulbar urethra.

Did extensive debridement, irrigation and washing with hydrogen peroxide and normal saline, with exposure of the testis thus we did placement of the testicles in subcutaneous pockets in the thigh. Inserted a supra pubic catheter for urinary diversion.

Follow up

He had 8 serial debridements and dressing with hydrogen peroxide and honey gauze over 16 days. Then alternate day dressing with honey gauze. Three weeks on treatment, there was some granulation tissue formation. He was awaiting prostatectomy to address the bladder outlet obstruction pathology and eventual scrotal reconstruction, but requested referral to another unit.

Conclusion

Fournier's gangrene is a life threatening condition, often resulting from minor trauma to the scrotum, and early recognition with aggressive management is key to survival. Subcutaneous pockets in the thighs for the testis are a temporary but simple measure for exposed testis. Chronic alcoholism coupled with old age worsens the risk...

Case 5

An elderly man admitted with a foul smelling left lower limb

A 70 year old admitted through emergency with history of pus discharge from the left foot, with swelling of the left leg for two days. He reported history of trauma by a stick 4 days prior to the onset while he was in his garden. He had associated fever, high grade with difficulty in breathing. He had reduced appetite with general body weakness.

He had no polyuria, no polydipsia and no polyphagia. No history of other chronic diseases. Like diabetes

Examination

Very sick looking man, dehydrated, febrile temperature 39°C, BP 85/50mmhg, RR 30b/min, PR 100b/min, small volume pulse.

Locally

Septic left foot wound, foul smelling, discharging pus in the first web space, extensive swelling and necrosis of the left leg. Left thigh muscles and skin normal
R/s chest clear on auscultation

Investigations

CBC
Leukocytosis- 240×10^9
Neutrophilia of 81%
Hb- 6.3g/dl
Renal function
Urea- 64mg/dl

Creatinine- 2mg/dl

X-ray of the limb- no evidence of osteomyelitis

Random blood sugar 140mg/dl

Diagnosis

Extensive necrotizing fasciitis left lower limb.

Treatment

Fluid resuscitation for the patient with 2 liters of normal saline, started on Intravenous antibiotics (ceftriaxone and clindamycin), and inserted a Foley's urethral catheter to monitor urine output and prepared for debridement.

Intra operative found extensive necrosis of the skin and subcutaneous tissues, up to the muscles. The whole lower leg and foot involved. Did debridement of the necrotic tissue and lavage with hydrogen peroxide and normal saline and transfusion with 2 units of blood? Patient declined consent for amputation.

Follow up

Patient continued on the intravenous antibiotics, however 24 hours post-operative, he developed severe difficulty breathing, chest X-ray showed diffuse pulmonary infiltrates, went into septic shock unresponsive to fluid therapy, and vasopressors and died.

Conclusion

Necrotizing fasciitis from neglected trauma had profound effect on life with mortality. Sometimes amputation could be the definite solution.

Case 6

A child with a painful neck mass

A 1.5 year old girl admitted to the pediatric ward with history of a neck swelling, progressively increasing in size, associated with moderate grade fever and difficulty in swallowing. She had been on treatment for tonsillitis with some minimal improvement. There was no clear history of trauma. 2 days in admission, the swelling kept increasing with worsening pain. Had been started on ampicillin and metronidazole for treatment as cellulitis.

Examination

Sick looking child, febrile temp- 38°C, PR- 110 b/min, RR 38b/min
Locally; anterior neck mass, with erythema and dimpling of skin. It was of mixed consistency, mild fluctuancy and hard areas, very tender on palpation. Aspiration, very mild thick pus.

Investigations

CBC- leukocytosis 15×10^9
Neutrophilia- 87%
HB- 11.0g/dl
Neck Ultra sound- soft tissue edema, with unclear tissue planes

Diagnosis- Necrotizing Fasciitis of the neck

Treatment

She was prepared for emergency debridement, intra operatively, found extensive necrotic tissue in the neck; we did extensive debridement through fish fillet incisions, irrigated wound with normal saline. And packed with honey gauze.

Follow up

She had three more debridements at 24, 72 and 120 hours with honey gauze dressing. She was kept on IV ampicillin and metronidazole and added clindamycin.

She was discharged home after one week and continued with OPD dressing. 4 weeks later the wounds contracted and healed by secondary intention.

Discussion

Necrotizing fasciitis (NF) was described in the 5th century BC by Hippocrates [7]. It has had numerous appellations, including hospital gangrene, phage Dena gangrenous, progressive bacterial synergistic gangrene, and Fournier's gangrene [8].

The process is marked by necrosis of the superficial fascia, neutrophil infiltration of the deep dermis and fascia, thrombosis of the cutaneous microcirculation, and the presence of the infecting organism in the necrotic tissue [8-10].

These infections most often occur on the extremities, abdomen, and in the perineum, but can occur anywhere on the body [10]. In our case series, the sites were abdomen, back, limb, scrotum and neck.

There are numerous risk factors, but the immunocompromised are particularly susceptible. Some of these conditions include diabetes mellitus, cancer, HIV, peripheral vascular diseases, renal or liver impairment, chronic corticosteroid use, chronic skin ulcers, recent surgery, and obesity [10,11]. Two of the cases had immunosuppression; one is diabetes and one HIV.

NF usually starts at a site of trauma, often in apparent, which may be a minor puncture wound, blunt trauma, or a surgical scar [10].

It is also important to note that NF does occur in healthy persons as much as 30% of the time [12].

Three basic microbial sub-types have been described. Type 1 infections are poly-microbial in nature and, occurring in 55%–75% of NF [13]. Type 2 infections are mono-microbial and are caused by (GAS) Group A *Streptococcus* [14]. Type 3 infections are also mono-microbial and are attributed to *Clostridium* species [14, 15].

Paediatric cases have been reported from resource-poor nations where poor hygiene is prevalent. The male-to-female ratio is 2-3:1. We had two paediatric cases in our series.

Diagnosis of necrotizing fasciitis can be difficult and requires a high degree of suspicion. In many cases of necrotizing fasciitis, antecedent trauma or surgery can be identified. Surprisingly, the initial lesion is often trivial, such as an insect bite, minor abrasion, boil, or injection site.

In a study by Wong et al., the typical clinical presentation of patients with NF was elucidated. Additionally, pain out of proportion to clinical findings was the most common initial symptom [8]. All our patients had pain out of proportion as a key feature.

The basic principles of early diagnosis, prompt and broad antimicrobial therapy with penicillin G, an aminoglycoside and as well clindamycin, and aggressive, serial, surgical debridement

remain the pillars of therapy aimed at reducing morbidity and death [16-18]. Indeed these are the only factors that we, the clinicians, can modify to optimize outcome [19-21]. All our patients had emergency surgery within 4 hours of diagnosis.

Surgical debridement should never be delayed in the hope of restoring hemodynamic stability before anesthesia induction, because correction of the septic state will not occur until all of the infected and necrotic tissues have been removed.

Surgical debridement is usually extensive and involves significant blood loss. Therefore, part of the pre-operative workup should include type and cross match for red blood cells. All our patients had typing and cross match and 83.3% had transfusion of red blood cells.

Repeated examinations with debridement of the wound (usually within 24–36h), and aggressive nutritional support also improve survival [22,23]. Under no circumstance should the wounds be closed at the time of surgical debridement, but rather packed for open drainage and re-exploration. In our case series we had an average of 6 repeat debridement's for our patients.

Despite intervention, necrotizing fasciitis has a mortality rate from 6 to 76%, with a review of 696 patients showing a rate of 34% [22-24]. In our case series, we had a mortality of 16.6%.

Once surgical debridement is no longer required, wound care can be performed at the bedside. Meticulous wound care is all that is required even with the most difficult wounds. When the wound is clean, use of a vacuum wound dressing is an option to facilitate wound granulation [25].

For the majority of the wounds, closure is achieved with simple split thickness skin grafts. It is not necessary to wait for granulation tissue to fill the entire wound bed for split thickness skin grafts, because the grafts will take as long as there is a clean and vascularized bed that is free from infection. One of our patients had full skin grafting for skin closure [26].

For Perineal wounds that involve the scrotum, the best cosmetic result can be achieved by delayed primary closure of the wound, if it is small. If the wound is too large for primary closure, it should not be allowed to heal by secondary intention because this will lead to contracture deformity of the scrotum. Several scrotal reconstruction methods have been described, including musculocutaneous flap and fasciocutaneous flaps from the thigh and the abdomen [25-27].

A simple and widely used method is placement of the testicles in subcutaneous pockets in the thigh. It is functionally acceptable, but cosmetically sub-optimal [27]. In our case series the patient with Fournier's gangrene had placement of his testis in the thigh subcutaneous pocket.

Conclusion

Necrotising fasciitis is a lethal tissue infection, however early meticulous surgical debridement, supported by fluid resuscitation and broad spectrum antibiotic administration is key to survival of these patients.

Recommendations

We recommend;

1. Early meticulous debridement at least within 4 hours of diagnosis of NF, as we had a survival of 83.3%
2. Vacuum dressing with intermittent suction every 4 hours quickens granulation tissue formation.
3. Honey gauze dressing for the bedside dressing is a safe and effective method, for wound care, when there is no longer need for debridement.
4. Fish fillet incisions for debridement improve access to the wound during surgery and for progressive dressing.

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