

ocular movements were full but painful. Rapid afferent pupillary defect was present, however, fundus examination showed no abnormality. Colour vision was normal. Fields could not be performed. A diagnosis of retrobulbar neuritis was made and the patient was given a course of 1 g methylprednisolone intravenously for 3 days and oral prednisolone 60 mg for the next eleven days. The doses were subsequently tapered and then stopped after 6 weeks. Eight weeks after treatment his systemic and ocular condition improved. The patient had visual acuity of 6/6 and 6/12 in right and left eyes respectively, however his contrast sensitivity score (by Cambridge low contrast sensitivity charts) was 70 and 110 for left and right eyes respectively compared with a total score of 290 for a normal person in his age group. Moreover, visual evoked potential showed low amplitude and increased latency confirming the diagnosis of retrobulbar neuritis on the left side. The patient recovered fully on neurological grounds without any sensory or motor deficit.

Discussion

In developing countries such as India the Semple vaccine is commonly used because it is easy to produce and is inexpensive. However, one of the serious drawbacks associated with its use is occurrence of neurological complications. Neurological complications have been reported even with the purified vaccines such as human diploid cell vaccine^{7,8}.

Only three cases of optic neuritis after anti-rabies inoculation have been reported⁴⁻⁶. Two cases presented as bilateral papillitis^{4,5}, while one as retrobulbar neuritis⁶. Our patient presented as retrobulbar neuritis. The incubation period in all three cases was about three weeks, while in our case it was nine days. All the three cases recovered within 3 weeks, while our patient took 8 weeks, the most probable reason being the severity of the disease. Blurring of vision was the initial complaint in all cases. Comark *et al.*⁴ followed their patient up to 1 year, while in our case follow-up was 18 months; in the other two cases follow-up was 3 weeks.

Although the exact pathogenesis of retrobulbar neuritis following rabies is not known, we speculate that the allergic or immunological reactions seem to be the probable aetiology. Our patient presented with post-vaccination retrobulbar neuritis and it seems justified to regard his disease as initiated by Semple rabies vaccine. Steroids have been recommended for the treatment of post-vaccination neurological complications³. Our patient had complete visual recovery in right eye, probably due to immediate initiation of therapy and asymmetrical involvement. Moreover, severe affection of the left eye was also prevented. However, this complication may be under-reported and we suggest that it should be suspected in all such cases. If post-vaccination retrobulbar neuritis is diagnosed, immediate initiation of steroids can prevent severe visual damage.

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Necrotizing fasciitis

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SUMMARY Necrotizing fasciitis (NF) is a rare but rapidly progressive and potentially fatal disease condition. It is characterized by progressive inflammation and extensive necrosis of the subcutaneous tissue and fascia, sparing the underlying tissue. It is a poly-bacterial infection and is associated with profound systemic toxicity, considerable morbidity and a high mortality rate. The outcome is influenced by early recognition and radical surgical debridement. We present a report of six cases of NF who presented to our surgical service within the past 5 years.

Patients and materials

The records of six patients diagnosed with necrotizing fasciitis (NF) and treated in the Department of Surgery, University College Hospital (UCH) Ibadan, Nigeria between January 1998 and December 2001 were reviewed and analysed. Information included demographic data, site of disease, initiating or predisposing factors, laboratory data, surgical management, supportive therapy, clinical course and outcome. Full clinical and laboratory data for two patients were not available for detailed analysis.

Clinical features

The clinical information on the six patients is summarized in Table 1. Four of the patients were women aged 18 years and above, the two remaining were boys less than 12 years old. Predisposing factors identified were intramuscular injection and minor trauma. The duration of the symptoms ranged between 3 and 14 days. The lower extremities were involved either singly or bilaterally in four patients and, in two of those, the lesion extended to

Table 1 Clinical information on six patients with necrotizing fasciitis

| Patient | Age/sex (years) | Occupation | Predisposing factors | Site | Bacteriology |
|---------|-----------------|------------------|-------------------------------|--|---|
| 1 | 30/F | Food seller | None | Both thighs and buttocks | <i>Pseudomonas aeruginosa</i> |
| 2 | 45/F | Food seller | Intramuscular injection | Anterior abdominal wall and buttocks | <i>P. aeruginosa</i> , <i>Escherichia coli</i> , <i>Klebsiella</i> spp., <i>Staphylococcus aureus</i> |
| 3 | 62/F | Housewife/trader | Traumatic laceration from RTA | Right leg | <i>P. aeruginosa</i> , <i>S. aureus</i> |
| 4 | 18/F | Street hawker | Minor abrasion (RTA) | Right thigh and calf | <i>P. aeruginosa</i> , <i>Klebsiella</i> spp., <i>E. coli</i> |
| 5 | 11/M | Schoolboy | Trauma | Right thigh, anterior abdominal wall and flank | — |
| 6 | 3 months/M | — | — | Neck | — |

RTA=Road traffic accident

involve the lower abdomen and the buttocks. The youngest patient was a 3-month-old infant who presented with NF of the anterior aspect of the neck and septicaemia. None of the patients had any pre-morbid chronic disease such as diabetes, cancer or HIV infection.

The diagnosis of NF was delayed in the first two patients, one of whom died. However, the experience gained and the high index of suspicion occasioned by them, ensured that diagnosis was prompt in subsequent patients and their prognosis was therefore better. All had widespread subcutaneous and fascia necrosis. Other features in varying degrees included skin changes, cellulitis, subcutaneous crepitus and septicaemic shock.

Bacteriology

The disease was of poly-microbial nature in our series except in the first patient, the most commonly isolated pathogen being *Pseudomonas aeruginosa*. Other organisms cultured from the wounds included *Escherichia coli*, *Klebsiella* spp. and *Staphylococcus aureus*. The multi-microbial aetiology of NF has been reported in many previous studies. Based on clinical suspicion and previous literature reports, the first two patients were initially commenced on intravenous penicillins. However, wound culture reports and antibiotic sensitivity patterns necessitated replacing penicillins with a 4-quinolone and making ciprofloxacin the first choice in subsequent patients. All the patients received metronidazole to cover for anaerobes, even though none was isolated.

Management

The mainstay of management was surgical debridement of all necrotic skin, subcutaneous tissue and fascia. After the initial resuscitation, the patients had incision of the surface wounds in the Accident and Emergency Department. The finding of a spreading necrosis of the subcutaneous tissue and fascia, which was usually out of proportion to the small cellulitic, dull (and sometimes blistering) skin changes, necessitated a more extensive debridement under general anaesthetic within the next 24 hours. Copious foul smelling purulent discharge from the subcutaneous tissue was drained and a radical debridement of the necrosed fat, fascia and overlying skin was done (Figure 1). The underlying muscles were characteristically not involved.

The undermined, subcutaneous plane was washed with hydrogen peroxide, copiously irrigated with saline and then packed loosely with dressing soaked in honey. A daily hypertonic saline bath in bathtub was effected in most of the patients. Apart from minor wound reviews

and debridement under light sedation and analgesia, the number of major debridements under general anaesthetic ranged from 1 to 3. Initially the plastic surgeons estimated that there might not be enough skin to harvest from a patient to cover the skin defects without a mesher, however, when infection had been controlled and the extensive wounds had contracted significantly, two of the patients had split thickness skin graft of the residual defects (Figure 1). General supportive measures were given to promote wound healing, give nutritional support and enhance survival. Three patients received whole blood transfusion, two of whom had 6 units and 8 units, respectively. Nutritional support was in the form of enteral (oral) and parenteral supplementation (Table 2).

Morbidity and mortality

The duration of hospitalization ranged from 30 days to 130 days, the median hospital stay being 90 days. The shortest duration was in the first patient with NF of both thighs and the gluteal regions. She died from septicaemia and hepato-renal failure. The second patient had extensive necrosis of both glutea, the flanks and about two-thirds of the anterior abdominal wall secondary to a single

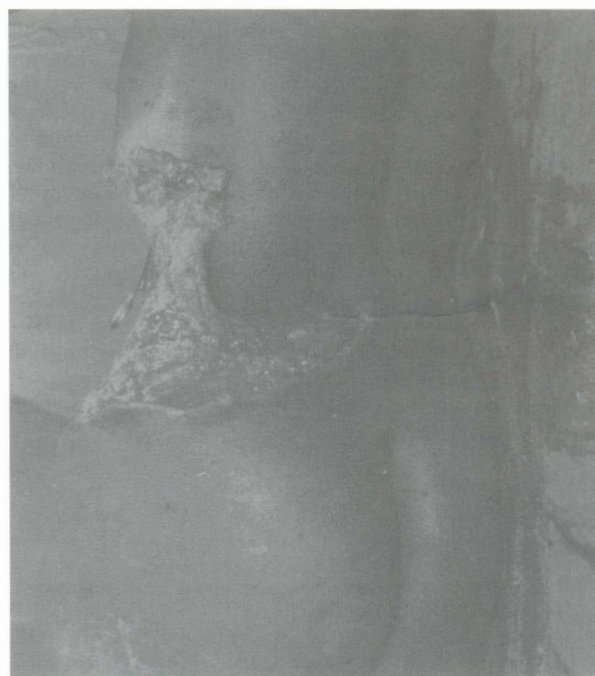
**Fig. 1** Necrotizing fasciitis at debridement

Table 2 The management and outcome for six patients with necrotizing fasciitis

| Patient | No. of major debridements | Major complications | Hospital stay (days) | Outcome |
|---------|---------------------------|--|----------------------|-------------------------------|
| 1 | 1 | (1) Septicaemia (2) Hepato-renal failure | 30 | Died |
| 2 | 3 | (1) Septicaemia (2) Lower abdominal protrusion | 105 | Recovered |
| 3 | 2 | Necrotic extensor tendons | 64 | Discharged temporarily |
| 4 | 1 | (1) Septicaemia (2) Arthrofibrosis of right knee and ankle joints | 130 | Recovered |
| 5 | 2 | Septicaemia | 90 | Discharged to sister hospital |
| 6 | 3 | Septicaemia | 90 | Discharged to sister hospital |

intramuscular injection. She developed protrusion of the lower abdomen consequent upon the loss of fascia support of the anterior abdominal wall. The third and fourth patients developed necrosis of exposed extensor tendons of the foot and arthrofibrosis of the knee and ankle joints, respectively. The two youngest patients could not have their granulating wounds skin grafted due to disruption of services at the UCH and were referred out to sister hospitals.

Discussion

Necrotizing fasciitis, as it is known today, had been described under various nomenclature such as 'hospital gangrene'¹, 'haemolytic streptococcal gangrene'² and 'progressive bacterial synergistic gangrene'³ before the current terminology was coined by Wilson in 1952 to describe a rapidly progressive inflammation and necrosis of subcutaneous tissue down to the superficial fascia⁴. It is a diffuse infection of the soft tissue⁵ that is often polymicrobial in origin in contrast to the earlier held view that it was caused solely by the haemolytic streptococcus². It is a rare clinical entity, which often runs a rapid fulminant course that is similar to and sometimes confused with clostridial myonecrosis. Recent reviews reported a yearly incidence of two to three cases in most series^{3,6,7}. At the UCH, Ibadan, Nigeria, six documented cases were seen over a 5-year period in the general surgical service up to the end of 2001 giving a hospital incidence of about two cases per year.

It is now known that the disease is not a specific bacterial infection but a clinical entity that can be caused by a variety of synergistically acting organisms without any specific combination⁶⁻⁹. In our experience, Gram-negative bacilli were the predominant organisms with *Pseudomonas* spp. being the most common isolate in accordance with some reports in the literature⁶. Some reports, however, show that haemolytic streptococcus was still predominantly isolated amongst other organisms^{7,10,11}.

The disease may start spontaneously or may follow local infections such as perianal abscess, boil or minor wounds such as abrasions, punctures, lacerations and needle infections, as typified by our patients. It can complicate surgical procedures such as herniorrhaphy, dental extraction, caesarean operation and laparotomy. In addition, it may complicate pressure ulcerations. The disease is no respecter of age and affects a wide age group, although adults are more commonly affected^{2,6,8,10,11}. Any part of the body may be affected but more commonly it is found in the lower extremities, the lower abdomen and perineum. Underlying chronic diseases have been

identified as predisposing factors but the condition has been reported in healthy individuals.

Most cases of NF run a very fulminant course and are often associated with severe systemic inflammatory response. Whether it presents in the fulminant or less acute form, diagnosis is mainly clinical and the eventual morbidity and/or mortality, is positively influenced by early diagnosis. A history of painful soft tissue swelling with or without constitutional symptoms and the finding of spreading cellulitis with ecchymosis, bullae, dermal gangrene or crepitus should alert the clinician and call for emergency surgical exploration. Furthermore, when toxæmia and fever are present, they are usually out of proportion to the local signs¹². Laboratory investigations in support of the diagnosis include wound and blood culture, histology of wound specimen and full blood count. Plain radiograph may reveal subcutaneous swelling and/or gas and magnetic resonance imaging, where readily available, defines tissue planes and presence of microabscesses. Screening tests for diabetes mellitus, HIV infection and renal dysfunction are necessary in patients not previously so diagnosed.

The treatment of NF rests on early recognition, adequate resuscitation, high-dose antibiotics, urgent radical debridement and supportive care. The goal of surgery is to resect all necrotic soft tissue and fascia while preserving viable skin flaps. The incision should extend to expose normal fascia and the wound should be thoroughly irrigated and packed loosely with gauze. It should be reviewed within 24 hours and subsequently, as further necrosectomies may be necessary. When the infection has been controlled and the wound is clean and granulated, the residual open areas should be covered with split thickness skin graft which may be meshed in some cases. The initial choice of antibiotics should be broad spectrum based on the centre's previous sensitivity pattern. This should be modified when culture reports are obtained. Further management should be directed towards providing adequate nutrition either enterally or by intravenous hyperalimentation, controlling underlying diseases such as diabetes mellitus, treatment of complications and provision of organ support when indicated. The use of hyperbaric oxygen or heparin early in the disease has not been proven to impact significantly on the prognosis of NF.

NF is associated with high morbidity and a high mortality rate. A 17% mortality rate was recorded in our patients. It results in prolonged hospital stay and multiple surgical procedures with the attendant anaesthetic risks. It also places a lot of financial demands upon the family, especially where cost of healthcare is borne solely by those who do not have health insurance policies. In spite of

aggressive surgical management and use of appropriate antibiotics, most authors still quote a mortality rate of between 22%–40%. The combination of factors such as late presentation, old age and underlying immunosuppression tends to result in mortality. Death is due to sepsis, respiratory failure, renal failure or multiple organ failure.

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A little known complication in an obstructed right inguinal hernia: five patients with afferent limb strangulation

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SUMMARY Within a period of 6 months five cases of afferent limb strangulation in patients with an obstructed

right inguinal hernia were seen and treated in our institution and are described in this report. Recommendations to avoid pitfalls in the management of similar cases are reported.

Introduction

During a period of 31 months (December 1996 to May 1999) 95 patients with a strangulated inguinal hernia were operated on in our district hospital. The youngest patient was 9 months and the eldest 80 years: 81 males (85%) and 14 females (15%). Of these 95 cases, 65 (68%) were on the right side and 30 (32%) on the left. Of the 65 right-sided hernias 56 (86%) occurred in men and 9 (14%) in women. Bowel resection was necessary in 10 of these cases (10%) (seven times on the right side and three times on the left). In five (8%) of the 65 cases of right-sided strangulated hernia we met with the little known complication of afferent limb strangulation (ALS). Three of the cases were actually seen in their full form. Our review of two of the case histories suggests a diagnosis of ALS.

Case histories

Case 1

A 45 year-old driver with a right-sided inguinal hernia came to our institution with a strangulation of 7 hours' duration. Apart from all the symptoms of strangulation there were no signs of an acute abdomen. The patient was operated on by the duty medical officer (MO). The operative findings were: a non-sliding ischaemic but viable caecum appendix and terminal ileum. There was no reason to suspect any intraabdominal complication. No inspection of the intraabdominal small bowel was performed. After reduction of the contents of the sac, herniotomy and herniorrhaphy were carried out. Seventeen hours after operation it became clear that there was an abdominal complication. The patient was in pain, restless and had signs of an acute abdomen.

Laparotomy by the surgeon and MO revealed a necrotic caecum and ileum of 1.5m with a constricting ring proximal to the non-viable part of the ileum. The diagnosis made during this operation was that in addition to a strangulated hernia of the caecum, appendix and probably a small portion of the ileum there must have been an intraabdominal strangulation of the distal 1.5m ileum. After resection of the necrotic caecum and 1.5m of ileum, an ileocolonic anastomosis was constructed. The patient recovered without further complication. Literature referred to after this operation indicated that this must have been a case of ALS. Consequently all doctors in our institution were prepared for any future cases.

Case 2

A 22-year-old farmer with a right-sided inguinal hernia was operated on by the MO and surgeon because of an incarcerated hernia of 27 hours' duration and without clear acute abdominal signs. The contents of the sac were a necrotic but freely mobile caecum and ileum. Laparotomy was performed and an afferent limb strangulation of 1.5m ileum was found incarcerated behind the caecum. An ileocaecal resection was undertaken and an ileocolic anastomosis was carried out together with a herniotomy and herniorrhaphy. The patient recovered without complication. This was the first time that we had seen the