CASE REPORT

Missed acute appendicitis presenting as necrotising fasciitis of the thigh

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SUMMARY

Necrotising fasciitis is a rapidly progressive soft tissue infection that leads to diffuse tissue necrosis. It is associated with systemic toxicity and rapid deterioration resulting in high mortality. Rapid diagnosis and prompt treatment are essential to improve the outcome. We report the case of a 26-year-old woman who presented with severe thigh pain and swelling associated with irritability of a few hours' duration following 2 days history of right abdominal pain. Urgent MRI and CT scan showed features of necrotising fasciitis in the thigh spreading from an inflamed appendix. Emergency surgery was performed which revealed perforated appendix with disseminated infection in the intraperitoneal and retroperitoneal spaces as well as the right thigh. The patient rapidly deteriorated with evidence of sepsis, shock and renal impairment. In spite of surgery and all supportive measures, she succumbed shortly postoperatively. Blood culture revealed *Staphylococcus aureus* and *Streptococci*, while tissue culture showed growth of *Escherichia coli* and proteus.

BACKGROUND

Necrotising fasciitis (NF) is an uncommon life-threatening soft tissue infection which is caused by virulent toxin-producing bacteria and associated with spreading necrosis of the fascia and the subcutaneous fat. It is a rapidly progressive condition which can cause septic shock and multiorgan failure if untreated. In general, the diagnosis is challenging due to its rarity and non-specific manifestations; therefore a high index of suspicion is needed. Once clinically suspected, NF should be considered as a surgical emergency. However, MRI can be useful in certain situations to diagnose this condition and differentiate it from other types of infection provided it is readily available and does not delay the surgical management. We present this case to demonstrate a very rare presentation and highlight the possibility of an occult intra-abdominal source of infection in patients presenting with NF in the lower limb. Furthermore, we are emphasising the importance of considering NF as a differential diagnosis in patients presenting with features of infection in a certain area particularly in the presence of severe pain, sudden deterioration or systemic toxicity which appear disproportional to the local findings.

CASE PRESENTATION

A 26-year-old woman with no history of medical illness presented to the emergency department with right thigh pain accompanied by altered consciousness and irritability of few hours' duration. The

pain was severe associated with inability to bear weight. This was preceded by pain in the right side of the abdomen 2 days prior to admission which was treated as renal colic in a local health centre. On admission, the patient appeared irritable, slightly confused and in distress due to pain. She had tachycardia 110 bpm with normal temperature and blood pressure. Physical examination also revealed soft abdomen with positive bowel sounds but tenderness was noted in the right iliac fossa. Local examination of the right lower limb revealed marked swelling and tenderness of the right thigh with redness and induration of the overlying skin.

Initial laboratory tests revealed white cell count of 5000 with 83.1% neutrophils, C reactive protein (CRP) of 290 mg/L, haemoglobin 10.3 g/dL, urea 16.2 mmol/L, serum creatinine 92.45 µmol/L, sodium 128 mmol/L, potassium 2.3 mmol/L, glucose 7.7 mmol/L, albumin 17 g/L and bicarbonate 14.7 mmol/L. Subsequently, abdominal ultrasound and lower limb Doppler studies were carried out to rule out a possible abdominal pathology or venous thrombosis as the cause of the patient's symptoms, which showed negative results. From these findings, the patient was suspected to have a localised lower limb infective process. Cellulitis, septic arthritis and NF were the main possibilities. Intravenous tazocin, vancomycin and metronidazole were, therefore, immediately started in addition to general supportive treatment. Urgent MRI was carried out for the pelvis and upper thigh to look for the type of infection. MRI revealed thickened superficial and deep fascia showing abnormal high signal on T2-weighted and low signal on T1-weighted images associated with small scattered fluid areas. There was involvement of the intermuscular fasciae in all muscle compartments (figure 1A). Postcontrast images showed heterogeneous enhancement pattern of the abnormal thickened fascial layers (figure 2A, B). In light of these imaging findings, a provisional diagnosis of NF was made. Surprisingly, MRI also showed fluid collections in the right iliacus and psoas muscles associated with stranding of the right paracolic fat raising the suspicion of an intra-abdominal inflammatory process (figure 1B). By that time, the patient's general condition had rapidly deteriorated with breathing difficulty and deranged renal function. An urgent CT scan for the abdomen and upper thigh was carried out just prior to surgery to detect a suspected intra-abdominal source of infection. CT revealed extensive fat stranding in the right lower abdomen as well as a calcified appendicolith, features that are consistent with acute appendicitis. The

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Figure 1 A 26-year-old woman with necrotising fasciitis of the thigh. (A) Thigh MRI, T2-weighted fat suppressed axial image showing hyperintense thickened superficial (white arrow) and deep (black arrow) fasciae with involvement of all the compartments in the thigh. Scattered fluid areas are also noted in the fascial layers. (B) Fast abdominal axial T2-weighted image showing fluid collections in the right iliacus (thick arrow) and psoas (thin long arrow) muscles.

inflammatory process appeared to spread throughout the intra-peritoneal and retroperitoneal spaces with scattered air pockets particularly involving the upper thigh (figure 3A, B). The abdominal wall in the right flank region showed mild fascial thickening and subcutaneous fat stranding indicating an inflammatory process. However, these changes were less prominent than those affecting the lower limb.

DIFFERENTIAL DIAGNOSIS

This condition should be differentiated from cellulitis, pyomyositis, septic arthritis of the hip and deep venous thrombosis. Spread from other intra-abdominal infective foci such as diverticulitis and perforated viscus, these are the other differential diagnoses. Furthermore, spondylodiskitis with psoas abscess can produce a similar presentation.

TREATMENT

The patient underwent emergency laparotomy and fasciotomy of the thigh. Surgery revealed perforated gangrenous appendix and caecum causing diffuse peritonitis with involvement of intraperitoneal and retroperitoneal spaces. Soft tissue debridement was carried out. Tissue and fluid samples were collected

for culture and sensitivity. The diagnosis was an acute appendicitis complicated by NF which was mainly affecting the thigh.

OUTCOME AND FOLLOW-UP

Despite the surgery, antibiotic treatment and all supportive measures, the patient deteriorated with desaturation and features of shock. Unfortunately, she expired 1 h postoperatively, about 18 h after hospital admission. Tissue culture revealed growth of *Escherichia coli* and proteus while blood culture grew methicillin-resistant *Staphylococcus aureus* and streptococci.

DISCUSSION

NF is defined as an infection of any of the layers in the soft tissue compartment which leads to rapidly progressive necrosis of the fascia and subcutaneous tissues. In addition to the predominant involvement of the superficial and deep fasciae, the skin, subcutaneous fat and muscle can also be affected. The risk of NF is higher in immunocompromised patients having diabetes, renal disease, liver disease and malignancies. However, it can affect young healthy adults and may complicate any wound, surgical procedure or septic focus. Most cases of NF are polymicrobial in nature with culture revealing mixture of aerobic and non-aerobic bacteria. Infection with single organism, usually *Streptococcus*, is reported in only 15% of cases. Any part of the body can be affected by this condition, but the extremities, trunk and perineum are most frequently involved.

Literature has shown several reported cases of NF complicating acute appendicitis or an appendectomy site; most were seen in the flank and the abdominal wall.¹⁻³

We present an extremely rare case in which NF complicating perforated appendicitis affected mainly the thigh with only mild non-specific inflammation in the abdominal wall.

To the best of our knowledge, there are only three previously reported cases in which NF complicating appendicitis predominantly involved the lower limb.⁴⁻⁶

Most patients with this condition initially present with non-specific symptoms followed by deterioration with septicæmia, confusion and shock. Some cases are very acute showing rapid deterioration; however, most of the patients follow a more insidious subacute course.

Early diagnosis of NF is often very difficult due to its rarity and non-specific clinical presentation. Consequently, a high

Figure 2 (A) T2-weighted axial MRI and (B) post contrast T1-weighted fat suppressed axial MRI at the same level. The abnormal high signal thickened fasciae seen on the T2-weighted image showing significant heterogeneous postcontrast enhancement on the T1-weighted fat suppressed image. The thin arrows indicate the enhancing fasciae while the thick arrows indicate small non-enhancing regions.

Figure 3 CT scan, axial images showing evidence of perforated acute appendicitis surrounded by extensive inflammatory process: (A) abdomen and (B) upper thigh. Fat stranding and free air are seen in the right side of the abdomen (black arrow). Thin long white arrow points to an appendicolith. Thickened deep fascia is seen in the thigh (thick white arrows) which contains air.

index of suspicion is needed to pick up cases early to ensure an early surgical intervention and hence improve the prognosis. Usually the early manifestations are local symptoms and signs of inflammation in the affected region such as swelling, pain, redness and tenderness occasionally accompanied by fever. However, this condition should be suspected when the severity of pain is disproportional to the local findings or the patient looks too ill for his local manifestations. Sudden deterioration or progression despite antibiotic treatment is another important clue to the diagnosis.

Late manifestations will develop if the condition is not properly treated. The patient will progress to sepsis and shock with tachycardia, hypotension and acute renal failure. Skin changes such as discolouration, crepitus, blistering, bullae and fluid discharge are also late features.

Like the clinical features, laboratory investigations are also non-specific. An important finding is a raised CRP early in the course of the disease. Other possible findings are increased white cell count, low sodium, raised creatinine, raised glucose and low haemoglobin levels. Based on these values, a Laboratory Risk Indicator for Necrotising Fasciitis score (LRINEC) was proposed by some authors to facilitate diagnosis and early detection of cases.⁷

NF is a potentially fatal condition which is associated with a high mortality rate ranging from 30% to 70%. Once suspected, early surgical exploration is the mainstay of diagnosis and treatment, and leads to a better chance of survival. Fasciotomy with extensive surgical debridement may be needed. Management also includes early administration of broad spectrum intravenous antibiotics and other supportive measures.⁸

In cases of suspected NF, imaging studies should not delay the definitive surgical management.⁹ However, if readily available, MRI can be very useful to diagnose this condition and differentiate it from other soft tissue infections such as cellulitis and myositis. Important differentiating MR findings are fascial thickening greater than 3 mm and abnormal hyperintense signal in the deep fascia (particularly intermuscular fascia) on fat-suppressed T2-weighted or short τ inversion recovery images with extensive involvement of the deep fascia and involvement of three or more compartments. Areas of fluid collections can also be noted. Contrast administration is not always helpful as mixed pattern of enhancement is seen in this condition. However, lack of contrast enhancement of the thickened fascia increases the likelihood of NF over cellulitis.^{9–12}

The most important CT finding in NF is soft tissue air associated with fluid collections within the deep fascia. However, this finding is not always seen. Another advantage of CT is its

ability to show any abdominal source of infection such as diverticulitis or appendicitis as seen in the current case.

Ultrasonography, in experienced hands, can show characteristic changes in NF such as fascial thickening and fluid collection in the fascial layers, and was found to be most useful in the paediatric age group.

Plain radiograph may show air in the affected parts; however, this feature is uncommon and difficult to appreciate.^{9–12}

Learning points

- ▶ Necrotising fasciitis (NF) can complicate intra-abdominal conditions such as acute appendicitis that might first present with extra-abdominal manifestations.
- ▶ A high index of suspicion is needed in NF since rapid diagnosis and prompt treatment are essential to improve the prognosis.
- ▶ MRI is a useful diagnostic tool that can differentiate NF from other types of infection.
- ▶ CT scan has the advantage of showing a possible intra-abdominal infective focus.
- ▶ Despite being useful, imaging studies should not delay the definitive surgical treatment.

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