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A RARE CASE OF EMPYEMA NECESSITANS DUE TO STREPTOCOCCUS ANGINOSUS WITH NECROTIZING FASCIITIS AND RETROPERITONEAL ABSCESSES

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ABSTRACT

Background: Necrotizing fasciitis (NF) is a rapidly progressive soft-tissue infection associated with high mortality even when recognized early. Empyema necessitans (EN) is an uncommon complication of pleural empyema in which purulent material extends beyond the thoracic cavity into surrounding soft tissues. Although classically linked to *Mycobacterium tuberculosis* and *Actinomyces*, EN due to *Streptococcus anginosus* is distinctly rare. In exceptional cases, extra thoracic spread of empyema can track along fascial planes and evolve into NF.

Case report: A 36-year-old previously healthy woman, recently treated for bilateral empyema, re-presented in severe respiratory distress and septic shock. She was found to have a foul-smelling open thigh wound, widespread soft-tissue involvement, and laboratory evidence of severe infection. Computed tomography (CT) imaging demonstrated bilateral multiloculated empyema with chest-wall extension consistent with EN, NF of the right thigh, multiple large retroperitoneal abscesses, and emphysematous cystitis (EC). She required intubation, vasopressor support, broad-spectrum antibiotics, and multiple surgical debridements. Pleural cultures grew *S. anginosus*. Retroperitoneal abscesses were managed conservatively, and multidisciplinary care led to steady clinical improvement. After approximately 5 weeks, her empyema had resolved, and her thigh wounds healed adequately, allowing discharge on oral antibiotics.

Conclusion: This case illustrates an exceptionally rare progression of *S. anginosus* empyema to EN with concurrent NF and widespread retroperitoneal involvement. Early recognition of atypical dissemination, aggressive surgical management, and coordinated multidisciplinary care are essential for survival in such complex presentations.

KEYWORDS

Necrotizing fasciitis, empyema necessitans, emphysematous cystitis, *Streptococcus anginosus*, immunocompetent host

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LEARNING POINTS

- *Streptococcus anginosus*, although a commensal organism, has strong abscess-forming potential and can cause disseminated, life-threatening infections even in immunocompetent adults.
- This case highlights the importance of optimal treatment of lung empyema. Partially treated lung empyema can lead to empyema necessitans, with pus tracking along fascial planes and causing multiple superficial and retroperitoneal abscesses.
- Early recognition, repeated surgical source control, and multidisciplinary collaboration are critical to survival in multifocal invasive infections.

INTRODUCTION

Empyema necessitans (EN) is a rare complication of pleural empyema in which purulent material dissects through the parietal pleura into the chest wall or adjacent soft tissues. Historically, EN was most frequently associated with *Mycobacterium tuberculosis* and, less commonly, with *Actinomyces* or fungal pathogens such as *Aspergillus*[1–3]. Although its incidence has declined due to modern antibiotics, and EN is uncommon in contemporary practice, with one thoracic surgery cohort reporting 9 cases over a 4-year period[4], it remains clinically important because of its capacity for severe local invasion, propagation along fascial planes, and systemic dissemination.

Once the infection extends beyond the thoracic cavity, spread typically occurs via contiguous extension along the fascial planes, although hematogenous dissemination is also possible. This tracking may predispose to necrotizing fasciitis (NF), a rapidly progressive soft-tissue infection with mortality exceeding 20% despite prompt management[5]. Dissemination can also involve the genitourinary system, resulting in emphysematous cystitis (EC), defined by intramural bladder gas. EC is uncommon and typically reported in elderly, diabetic, or immunosuppressed patients, though it may arise in other settings[6].

Streptococcus anginosus, part of the *Streptococcus milleri* group, is known for its potent abscess-forming capacity and ability to cause invasive thoracic, abdominal, retroperitoneal, and deep soft-tissue infections[7]. Incompletely treated empyema may facilitate hematogenous or contiguous spread, allowing infection to track along intercostal, paravertebral, or retroperitoneal planes. However, the simultaneous occurrence of EN, NF, widespread retroperitoneal abscesses, and EC in an immunocompetent adult is exceedingly rare.

We describe such an unusual and severe presentation in a previously healthy woman, illustrating the aggressive pathogenic potential of *S. anginosus* in the context of inadequately treated pleural empyema and emphasizing the need for prompt recognition and multidisciplinary management.

CASE DESCRIPTION

A 36-year-old previously healthy woman initially presented to another facility with bilateral empyema and pyelonephritis, requiring intensive care unit (ICU) management with oxygen supplementation and vasopressors. Bilateral chest drains were inserted; pleural cultures grew *Streptococcus* species. She received intravenous meropenem and clindamycin; meropenem was selected to provide broad-spectrum coverage in the setting of severe sepsis with potential polymicrobial infection, while clindamycin was added for its toxin-suppressing effects in suspected severe streptococcal infection. The patient demonstrated clinical improvement but subsequently left against medical advice with plans to return to her home country.

Several days later, she was found at an airport in severe respiratory distress and brought to our hospital. On arrival,

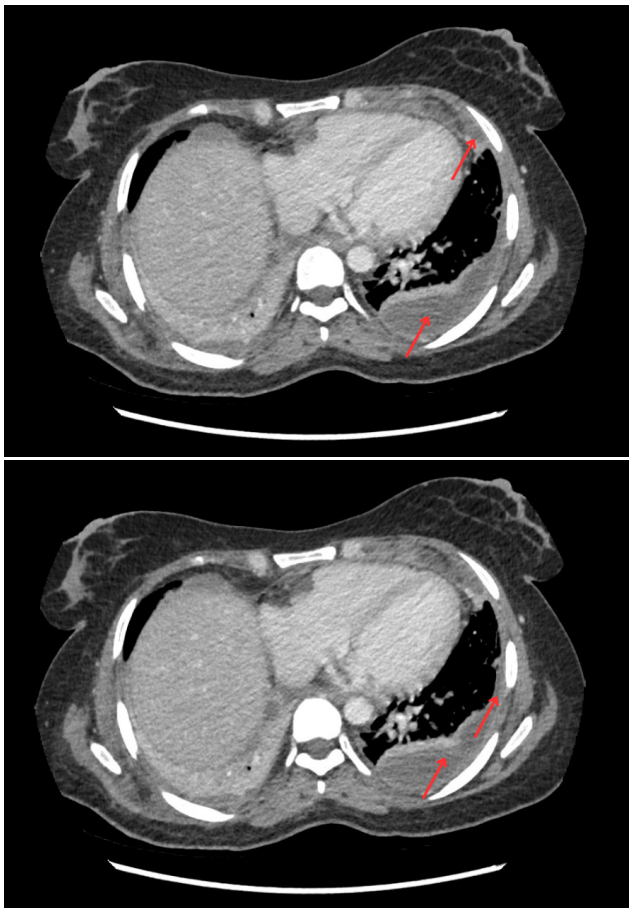


Figure 1. *Contrast-enhanced chest computed tomography scan showing widespread multiloculated pleural collections with chest-wall extension consistent with empyema necessitans (red arrows).*

Parameter	Initial presentation	Reference range	Deviation from reference range
Complete blood count			
White blood cell count ($\times 10^3$/µl)	10.5	3.6–11	Within range
Red blood cell count ($\times 10^6$/µl)	3.27	3.8–4.8	Low
Haemoglobin (g/dl)	9.2	12–15	Low
Haematocrit (%)	27.8	36–46	Low
Mean corpuscular volume (fl)	84.9	77–95	Within range
Mean corpuscular haemoglobin (pg)	28.2	27–32	Within range
Mean corpuscular haemoglobin concentration (g/dl)	33.3	31.5–34.5	Within range
Red cell distribution width (%)	14.8	11–15	Within range
Platelet count ($\times 10^3$/µl)	478	150–410	High
Mean platelet volume (fl)	7	7.5–11	Low
Neutrophil absolute ($\times 10^3$/µl)	8.8	2–7	High
Lymphocyte absolute ($\times 10^3$/µl)	1	1–3	Within range
Renal function tests			
Creatinine blood (mg/dl)	0.35	0.5–0.9	Low
Estimated glomerular filtration rate (ml/min/1.73 m^2)	140.9	>60	Within range
Liver function tests			
Alanine aminotransferase (U/l)	37	0–31	High
Total bilirubin (mg/dl)	0.65	0–1.2	Within range
Alkaline phosphatase (U/l)	220	35–104	High
Total protein (g/dl)	6.4	6.6–8.7	Low
Albumin (g/dl)	2.8	3.9–5	Low
Coagulation studies			
Prothrombin time (s)	13	9.7–11.8	High
INR	1.26	0.8–1.1	High
APTT (s)	41.7	25.1–37.7	High
Inflammatory markers			
C-reactive protein (mg/l)	281	<5	High
Erythrocyte sedimentation rate (mm/hr)	47	<13	High
Procalcitonin (ng/ml)	0.48	<0.05	High
Urea electrolytes			
Sodium (mmol/l)	138	136–145	Within range
Potassium (mmol/l)	3.8	3.4–4.5	Within range
Chloride (mmol/l)	101	98–108	Within range
Urea (mg/dl)	11	12–40	Low

Parameter	Initial presentation	Reference range	Deviation from reference range
Glycaemic parameters			
Random blood glucose (mg/dl)	139	70-140	Within range
HbA1c (%)	5.4	<5.7	Within range
Immunoglobulins			
IgG (g/l)	12.5	7–16	Within range
IgA (g/l)	1.85	0.7–4	Within range
IgM (g/l)	1.02	0.4–2.3	Within range
HIV-1/2 Antigen–Antibody	Non-reactive	Non-reactive	Within range
ABG metabolic panel			
PH	7.38	7.35–7.45	Within range
PcO_2 (mmHg)	50.1	35–45	High
PO_2 (mmHg)	49.5	83–108	Low
Bicarbonate (mmol/l)	29.9	22–28	High
ctHb (g/dl)	9.4	-	-
sO_2 (%)	81	95–99	Low
FO_2Hb (%)	79.9	95–98	Low
Potassium (mmol/l)	3.7	3.4–5	Within range
Sodium (mmol/l)	144	134–143	High
Ionized calcium (mmol/l)	1.19	1.15–1.29	Within range
Chloride (mmol/l)	103	97–108	Within range
Glucose (mg/dl)	119	60–100	High
Lactate (mmol/l)	0.9	0.5–16	Within range
Pleural fluid studies			
Microscopy and culture	*S. anginosus*	No growth expected in a healthy individual	Abnormal
Colour	Milky white	Colourless	Abnormal
Appearance (clarity)	Turbid	Clear	Abnormal
Total nucleated cell count	458,260	<1000	High
Differential count (neutrophils) (%)	95	<25	High
Differential count (lymphocytes) (%)	2	<75	Within range
Differential count (other cells) (%)	3	-	-
LDH (U/l)	30,702	-	-
TB PCR direct detection for fluid	Not detected	-	-

Table 1. Initial laboratory and pleural fluid findings on presentation.

Abbreviations: INR, international normalized ratio; APTT, activated partial thromboplastin time; HIV, human immunodeficiency virus; ABG, arterial blood gas; pCO_2, partial pressure of carbon dioxide; pO_2, partial pressure of oxygen; sO_2, oxygen saturation; FO_2Hb, fraction of oxygenated haemoglobin; ctHb, total haemoglobin concentration; LDH, lactate dehydrogenase; TB, tuberculosis; PCR, polymerase chain reaction.

she was febrile, tachycardic, tachypnoeic, and in septic shock. Examination revealed significant swelling of the right lower limb with an open, foul-smelling posterior thigh wound. Laboratory results demonstrated leucocytosis and markedly elevated inflammatory markers (*Table 1*). Diabetes screening with HbA1c was performed and yielded a normal result (5.4%). Transthoracic echocardiography showed preserved ejection fraction and no pericardial effusion.

Urgent CT chest revealed substantial bilateral multiloculated empyema with pleural thickening, lung collapse, and chest-wall extension consistent with EN *(Fig. 1)*. CT abdomen and pelvis showed multiple large multiloculated collections, including a right posterior pararenal abscess measuring approximately 8.5 × 6.2 cm and retroperitoneal collections extending into the quadratus lumborum muscle. Intramural bladder gas indicated EC, with adjacent thickened ileal loops *(Fig. 2)*. CT lower limbs demonstrated subcutaneous gas and deep fascial involvement of the right thigh, confirming NF *(Fig. 3)*.

The patient was intubated, commenced on vasopressors, and admitted to the surgical ICU. Broad-spectrum intravenous (IV) antibiotics were initiated. Emergency debridement of the right thigh demonstrated widespread necrosis of skin, subcutaneous tissue, and muscle. She remained intubated for 15 days and underwent four additional debridements with vacuum-assisted closure.

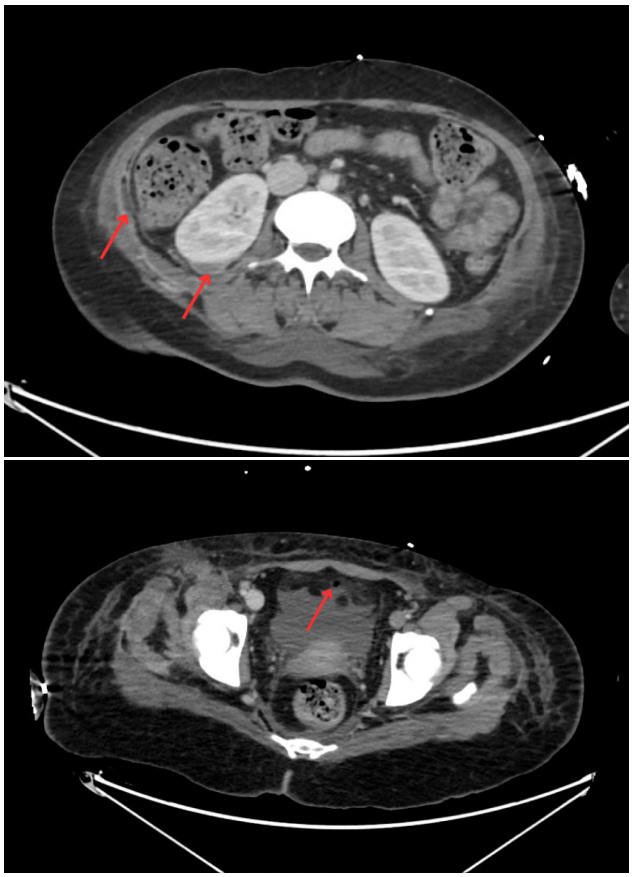


Figure 2. *Abdominal and pelvic computed tomography scan demonstrating multiloculated retroperitoneal and posterior pararenal abscesses (red arrows) and intramural bladder gas consistent with emphysematous cystitis.*

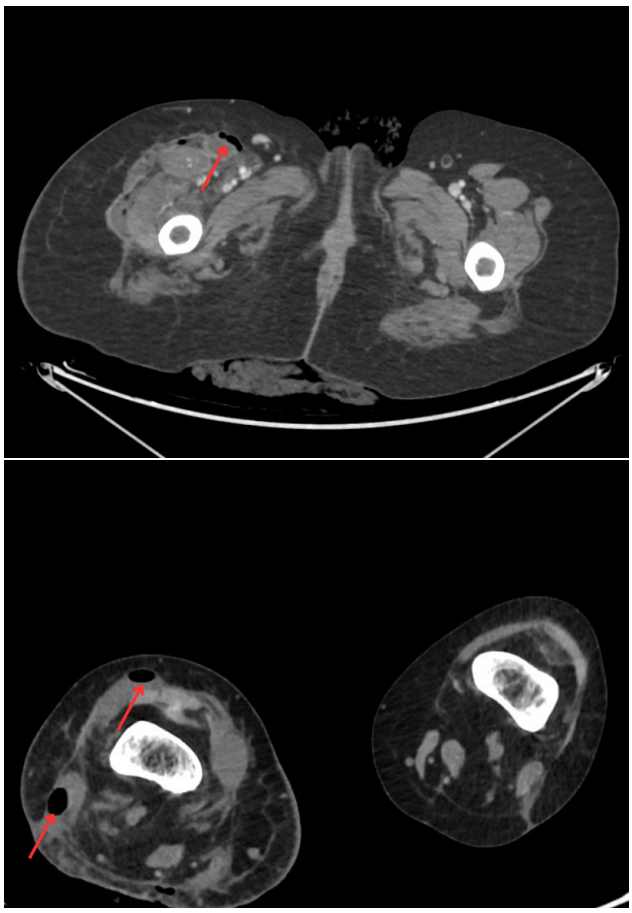


Figure 3. *Computed tomography scan of the right thigh showing extensive subcutaneous emphysema and deep fascial gas tracking along the musculature, consistent with necrotizing fasciitis (red arrows).*

After the final procedure, the wound showed healthy granulation tissue, and she was successfully extubated. She continued prolonged IV antibiotics throughout wound closure.

Persistent empyema required right-sided chest drainage. Pleural fluid cultures grew *S. anginosus*; acid-fast bacilli were negative. Though the drain was removed after one week, repeat CT scan demonstrated a new left-sided loculated empyema requiring contralateral drainage, which remained until radiological resolution.

Retroperitoneal abscess drainage was deemed unsafe by interventional radiology due to depth and location. Urology recommended bladder catheterization and continued antibiotics for EC. Multidisciplinary teams, including pulmonology, infectious diseases, cardiothoracic surgery, orthopaedics, and critical care, were involved. Cardiothoracic surgery deferred decortication given her improving trajectory.

Because of the unusually widespread disease, an immunological evaluation was performed. Quantitative immunoglobulins, human immunodeficiency virus testing, and tuberculosis studies were normal *(Table 1)*.

Following 5 weeks of intensive multidisciplinary care, imaging demonstrated resolution of empyema and satisfactory healing of the thigh wounds. The patient was

discharged in stable condition with a 3-week course of oral amoxicillin-clavulanate and scheduled infectious diseases, pulmonology, and orthopaedic follow-up.

DISCUSSION

This case illustrates an exceptionally rare presentation of EN due to *S. anginosus*, complicated by NF of the thigh and widespread retroperitoneal abscess formation. EN typically results when empyema erodes through the parietal pleura and extrudes into soft tissues[2]. While the chest wall is the most common site, pus may dissect to the vertebral column, mediastinum, groin, flank, or retroperitoneum[8]. In this patient, CT scan did not demonstrate a visible fistula between the thoracic empyema and retroperitoneal abscesses; magnetic resonance imaging (MRI) was not performed to further delineate fistulous tracts due to her significant clinical improvement, representing a diagnostic limitation in confirming the exact route of spread.

Although EN is classically associated with tuberculosis or fungal pathogens, *S. anginosus* is increasingly recognized as an emerging cause. A recent case was reported by Ayoola and Zejnullahu, where a patient with chronic obstructive pulmonary disease developed empyema necessitans from *Streptococcus intermedius*, which is a part of the *S. anginosus* group[9]. Moreover, Noguchi et al. demonstrated the association of *S. anginosus* with obligatory anaerobes in empyema[10], and this, coupled with the known virulence factors including hyaluronidases, contributes to its behavior[11]. Reis-Melo et al. reported pediatric EN caused by *S. anginosus*[12], and Sullivan et al. described a case following coronavirus disease 2019 infection in an immunocompetent adult[13]. Other unusual presentations include EN after chest drain insertion[14] and EN in immunocompromised patients after thoracostomy[15]. To our knowledge, very few cases have been reported of EN due to *S. anginosus* presenting with NF of the thigh requiring urgent debridement, accompanied by retroperitoneal and perinephric collections.

This case broadens the known spectrum of *S. anginosus* infections. Despite the absence of diabetes, immunosuppression, or other classic risk factors, the organism produced severe multifocal disease. This underscores the importance of vigilance in patients with chest-wall extension of empyema or multifocal abscesses, as early recognition may expedite intervention.

Management principles are reinforced by this case: survival in fulminant infections relies on early diagnosis, repeated aggressive surgical debridement, prolonged culture-guided IV antibiotics, and multidisciplinary coordination[5,14-15]. The patient's favourable recovery despite widespread disease highlights the efficacy of timely, coordinated intervention.

CONCLUSION

This case highlights the ability of *S. anginosus* to cause multifocal invasive disease even in immunocompetent adults. Proper management of empyema, including timely drainage, adequate IV antibiotics, and surgical decortication, when necessary, is essential to prevent complications such as EN and NF. Awareness of these rare presentations facilitates early recognition, aggressive surgical management, and coordinated multidisciplinary care, all of which are critical for survival. Long-term follow-up is recommended to monitor for potential recurrence or late complications, such as chronic osteomyelitis or soft-tissue dysfunction.

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