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Case Report

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Sepsis-Induced Purpura Fulminans in a Patient with Advanced Chronic Liver Disease: A Call for Timely Intervention

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ABSTRACT

Purpura fulminans is a severe thrombotic condition and hematologic emergency marked by disseminated intravascular coagulation and endovascular thrombosis. Timely recognition and treatment are crucial to reduce its high morbidity and mortality. This condition is linked to significant acquired deficiencies in protein C and dysfunction in the protein C-thrombomodulin pathway. Management involves treating the underlying infection, aggressive anticoagulation, and substantial transfusion support to correct deficiencies in natural anticoagulant proteins. We present a case of acute infectious Purpura fulminans with disseminated intravascular coagulation due to pneumonia in a middle-aged male with advanced chronic liver disease.

Keywords: Purpura Fulminans, Sepsis, Disseminated Intravascular Coagulation

INTRODUCTION

Purpura fulminans (PF) is a rare but life-threatening complication often triggered by sepsis, marked by rapid onset of disseminated intravascular coagulation (DIC) and extensive endovascular thrombosis (1-4). The condition is classified into three main forms: neonatal, idiopathic, and acute infectious (5). Neonatal PF is linked to genetic deficiencies of anticoagulants such as protein C, protein S, and antithrombin III, while idiopathic PF is believed to arise as an autoimmune response following an infectious illness. Acute infectious PF, the most prevalent form, occurs in severely septic patients and is associated with dysfunction in anticoagulation mechanisms, particularly involving protein C (5,6).

The pathophysiology of PF involves a hypercoagulable state resulting from severe bacterial infections that lead to DIC. This state is characterized by the depletion of natural anticoagulants such as protein C and antithrombin III, which can result in widespread thrombosis and multiorgan failure (7). The clinical presentation typically includes erythematous macules that evolve into indurated lesions with necrosis. Without prompt intervention, PF can lead to irreversible tissue damage and death from septic shock or multiple organ failure within 48 hours.
Herein, we describe a case of acute infectious PF due to pneumonia in a 57-year-old male with advanced chronic liver disease (ACLD).

CASE REPORT

A 57-year-old male with a ten-year history of type 2 diabetes and advanced chronic liver disease

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(Child-Pugh class B), along with a history of chronic alcohol use, presented with fever and productive cough lasting ten days, accompanied by reduced urine output over the previous three days. Upon admission, the patient was febrile, had a Glasgow Coma Scale (GCS) score of 13/15, blood pressure of 70/50 mmHg, pulse rate of 92 bpm, and exhibited bilateral coarse crepitations in the lungs. There was no free fluid detected in the abdomen. Urine output was critically low at 10 cc/hr for the preceding 12 hours.

The patient's blood pressure was stabilized through the administration of two inotropes alongside broad-spectrum intravenous antibiotics. He required intubation and was subsequently transferred to the ICU for ventilatory support and further management. The following day, he developed a purpuric rash on both lower limbs extending from toes to knees, with gangrene affecting the tips of four toes (Figure 1).

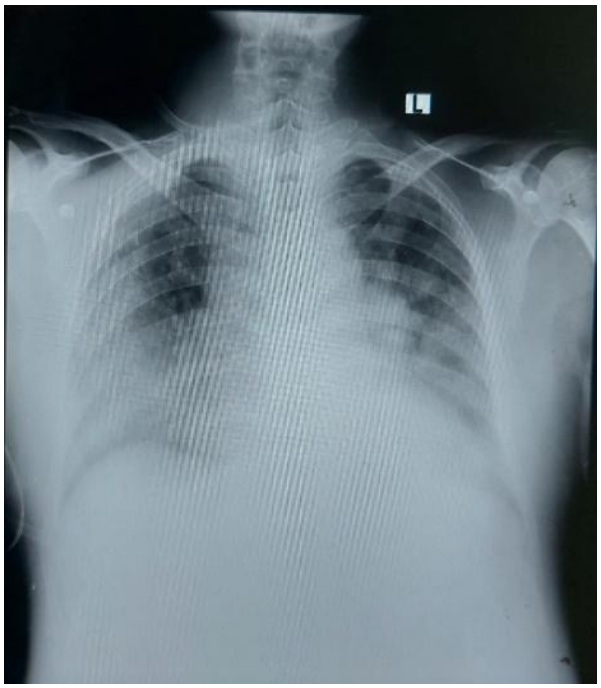

Figure 2: Chest radiograph with bilateral opacities in the middle and lower zones middle and lower zones

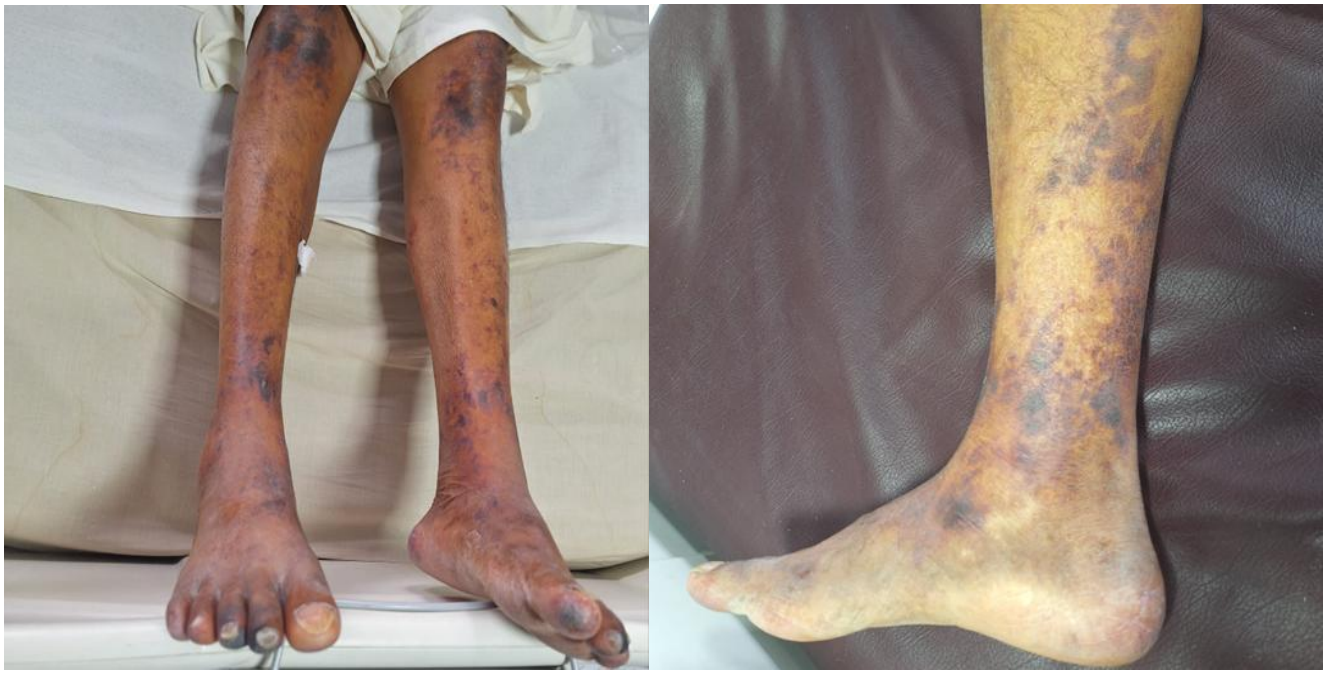

Figure 1: Purpuric rash of calves and feet with gangrene of toes

Laboratory tests indicated elevated white blood cell count (26.4 × 10^9/L), haemoglobin of 9.2 g/dL, and critically low platelet count (5 × 10^9/L). Serum creatinine was elevated at 619 mmol/L on admission. Chest radiographs revealed opacities in the middle and lower zones of both lung fields suggestive of pneumonia (Figure 2). Additional findings included elevated C-reactive protein (172 mg/dL), INR (1.83), APTT (33.2 seconds), D-dimer (>10,000 ng/mL), and LDH (493 U/L). Blood culture revealed a growth of Gram-negative bacilli, and there was a mixed growth in the endotracheal tube culture. The blood picture suggested an ongoing infection with microangiopathic haemolytic anaemia indicative of DIC and PF. The Laboratory Risk Indicator for Necrotizing Fasciitis (LRINEC)

score was 8 points, which suggested a high risk for necrotizing soft tissue infection.

The patient was managed for pneumonia complicated by sepsis-induced DIC, PF, and acute kidney injury (AKI), with broad-spectrum intravenous antibiotics, haemodialysis, and fresh frozen plasma infusions. Peripheral gangrene was treated with intravenous heparin infusions. Despite aggressive treatment efforts, the patient succumbed to his illness seven days post-admission.

DISCUSSION

PF is a rapidly progressing, life-threatening condition characterized by the sudden onset of erythematous macules that evolve into indurated, non-blanching lesions with thin, irregular, and expanding borders. Early in the course, these lesions may resemble a livedo pattern, with the skin appearing mottled. As the disease progresses, central necrosis develops, and haemorrhage into the necrotic dermis can result in the formation of bullae. Within 24 to 48 hours, these changes lead to irreversible full-thickness skin necrosis, and the affected skin is highly vulnerable to secondary infections (3)

Laboratory findings consistent with PF typically align with those seen in DIC: prolonged prothrombin time and partial thromboplastin time, elevated D-dimer levels, reduced fibrinogen and thrombocytopenia (7). Given its resemblance to necrotizing fasciitis, it is recommended that clinicians utilize the laboratory risk indicator for necrotizing fasciitis (LRINEC score) when suspicion for PF is low (8).

PF is typically a manifestation of severe sepsis, often beginning in the distal extremities and spreading proximally. In some cases, it may present as a widespread purpuric rash that affects the entire body. The condition is frequently complicated by DIC, AKI and organ dysfunction, especially heart and respiratory compromise.

A case reported by Alsharif et al highlights a rare presentation of PF involving the nose. The patient's clinical course was complicated by PF associated with DIC, AKI, acute heart failure, and respiratory compromise. Despite aggressive management, which included blood product transfusions, inotropes, ventilatory support, and haemodialysis, the patient ultimately passed away. This case exemplifies the severe, rapidly progressive nature of PF, especially when involving such rare anatomical locations and multiple organ systems. The case also underscores the importance of early detection and comprehensive supportive care in managing this critical condition (18).

Acute infectious PF is a severe and often life-threatening condition most associated with infections from encapsulated bacterial pathogens, such as *Neisseria meningitidis*, *Streptococcus pneumoniae*, and *Haemophilus influenzae*, particularly in immunocompromised individuals (11-13). Although extremely rare in immunocompetent individuals, there have been a few documented cases in the literature. Djurdjevic et al report a patient with schizophrenia who refused pneumococcal vaccination and developed pneumococcal bacteraemia complicated by PF. This case was effectively managed with broad-spectrum intravenous antibiotics, inotropic support, and haemodialysis for AKI, resulting in the patient's recovery (12). Similarly, Tew et al report a rare case of rapidly progressive PF in a patient with pneumococcal sinusitis (13).

The first case of PF secondary to Methicillin-resistant Staphylococcus aureus (MRSA) endocarditis was managed with protein C concentrate to address coagulopathy, while surgical valve replacement treated the underlying MRSA endocarditis, leading to a favourable outcome (14). A rare case was reported from Turkey, where PF developed following an endoscopic retrograde cholangiopancreatography (ERCP) procedure. Despite aggressive management with antibiotics, immunosuppressive therapy, protein C concentrate, and fresh frozen plasma, the patient succumbed on the 12th day of hospitalization (15).

A devastating case reported by Jialing Zhu et al describes a patient with ulcerative colitis who underwent subtotal colectomy for a perforated transverse colon who went on to develop PF. This led to bilateral forearm amputations, although the

patient's hemodynamic status improved with anticoagulation therapy and transfusions of fresh frozen plasma to stabilize protein C levels (16). A similar case reported by Salcin et al involves meningococcal PF presenting as acute hypoxic respiratory failure during the COVID-19 pandemic. The patient received broad-spectrum antibiotics, fresh frozen plasma, and cryoprecipitate, and eventually underwent bilateral amputations due to necrosis (17). Levenberg et al report a man who presented with a vasculitic rash following exposure to non-steroidal anti-inflammatory drugs. The patient developed PF involving the face and hands, which was managed with broad spectrum antibiotics, hydration, repeated plasma exchange with supplementation of fresh frozen plasma, and anticoagulation followed by pulse dosing of steroids, for which there was marked improvement (19).

Other pathogens associated with severe presentations of PF include *Capnocytophaga canimorsus*, *Staphylococcus aureus*, and fungi such as Fusarium spp., *Cryptococcus neoformans*, and Aspergillus spp. Viral pathogens such as West Nile virus and Varicella zoster virus have also been identified as triggers of this life-threatening condition (9-11)

While bleeding is widely acknowledged in advanced chronic liver disease (ACLD) as the predominant clinical manifestation due to reduced platelet function and count, impaired clotting factor production, and excessive fibrinolysis, the role of hypercoagulability in chronic liver disease remains underappreciated. However, emerging evidence suggests that a prothrombotic state may significantly contribute to various complications associated with the disease.

A prothrombotic state in advanced chronic liver disease is multifactorial in etiology, with coagulation factor imbalance, endothelial dysfunction, systemic inflammation, and impaired fibrinolysis playing a part. ACLD leads to impaired synthesis of both procoagulant factors (including fibrinogen, factor VIII, and von Willebrand factor) and anticoagulant factors (including protein C, protein S, and antithrombin). However, the decline in anticoagulant proteins is often more pronounced than that of procoagulant factors, shifting the hemostatic balance towards hypercoagulability (20).

Additionally, ACLD is linked to systemic inflammation, which increases the production of pro-inflammatory cytokines such as interleukin-6 (IL-6) and tumor necrosis factor-alpha (TNF-α) which contribute to thrombus formation. ACLD is also associated with elevated levels of plasminogen activator inhibitor-1 (PAI-1), a key regulator that inhibits fibrinolysis, leading to prolonged clot persistence. Compromised synthesis of tissue plasminogen activator (tPA) and plasminogen further impairs the body's ability to break down clots, reinforcing the hypercoagulable state seen in advanced liver disease (20). In ACLD immune dysfunction significantly increases susceptibility to severe infections. This compromised immune response and prothrombotic state in not only elevates the risk of purpura fulminans (PF) but may also obscure early symptoms, potentially delaying diagnosis and complicating effective management as described in our case.

These case reports highlight the importance of early recognition and aggressive management of PF, given its potential for rapid deterioration and the variety of infectious agents that can precipitate the condition. In brief, the management strategies for PF involve addressing the underlying infection aggressively with broad-spectrum antibiotics while implementing anticoagulation measures and providing transfusion support for correcting deficiencies in natural anticoagulant proteins.

Surgical input also plays a crucial role in the management of patients with PF. Treatment strategies depend on the severity of the disease and may range from conservative management with complex wound care to more aggressive interventions such as amputations to control rapidly spreading infections. Early surgical intervention such as fasciotomy may prevent need for amputation later (8). Additional treatment for managing acute septic PF, such as hyperbaric oxygen therapy, fresh frozen plasma, protein C concentrate, intravenous immunoglobulin and plasma exchange, have been explored. However, there are no definitive guidelines for their use due to a lack of sufficient data (9).

In conclusion, PF represents a rare but critical emergency that demands immediate recognition and intervention from multidisciplinary teams, including infectious disease specialists, haematologists, wound care experts, and surgical teams to optimise patient outcomes.

Author declaration

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REFERENCES

1. Adcock DM, Hicks MJ. Dermatopathology of skin necrosis associated with purpura fulminans. Semin Thromb Hemost [Internet]. 1990;16(4):283–92. http://dx.doi.org/10.1055/s-2007-1002681
2. Warkentin TE. Ischemic limb gangrene with pulses. N Engl J Med [Internet]. 2015;373(7):642–55. http://dx.doi.org/10.1056/nejmra1316259
3. Darmstadt GL. Acute infectious purpura fulminans: pathogenesis and medical management. Pediatr Dermatol [Internet]. 1998;15(3):169–83. http://dx.doi.org/10.1046/j.1525-1470.1998.1998015169.x
4. Chalmers E, Cooper P, Forman K, Grimley C, Khair K, Minford A, et al. Purpura fulminans: recognition, diagnosis and management. Arch Dis Child [Internet]. 2011;96(11):1066–71. http://dx.doi.org/10.1136/adc.2010.199919
5. Perera TB, Murphy-Lavoie HM. Purpura fulminans. In: StatPearls. Treasure Island (FL): StatPearls Publishing; 2024.
6. Irfan Kazi SG, Siddiqui E, Habib I, Tabassum S, Afzal B, Khan IQ. Neonatal Purpura Fulminans, a rare genetic disorder due to protein C deficiency: A case report. J Pak Med Assoc. 2018;68(3):463–5.
7. Colling ME, Bendapudi PK. Purpura fulminans: Mechanism and management of dysregulated hemostasis. Transfus Med Rev [Internet]. 2018;32(2):69–76. http://dx.doi.org/10.1016/j.tmrv.2017.10.001
8. Ranieri VM, Thompson BT, Barie PS, Dhainaut J-F, Douglas IS, Finfer S, et al. Drotrecogin Alfa (activated) in adults with septic shock. N Engl J Med [Internet]. 2012;366(22):2055–64. http://dx.doi.org/10.1056/nejmoa1202290
9. Teo HG, Wong JY, Ting TLL. Purpura Fulminans: A rare presentation ofStreptococcus Pneumoniaeinfection. BMJ Case Rep [Internet]. 2017;bcr-2017-221150. http://dx.doi.org/10.1136/bcr-2017-221150
10. Okuzono S, Ishimura M, Kanno S, Sonoda M, Kaku N, Motomura Y, et al. Streptococcus pyogenes-purpura fulminans as an invasive form of group A streptococcal infection. Ann Clin Microbiol Antimicrob [Internet]. 2018;17(1). http://dx.doi.org/10.1186/s12941-018-0282-9
11. Saraceni C, Schwed-Lustgarten D. Pneumococcal sepsis–induced Purpura fulminans in an asplenic adult patient without disseminated intravascular coagulation. Am J Med Sci [Internet]. 2013;346(6):514–6. http://dx.doi.org/10.1097/maj.0b013e31829e02d3
12. Djurdjevic N, Taweesedt PT, Paulson M, LaNou A, Radovanovic M, Patel JN, et al. Septic shock and Purpura fulminans due to streptococcus pneumoniae bacteremia in an unvaccinated immunocompetent adult: Case report and review. Am J Case Rep [Internet]. 2020;21. http://dx.doi.org/10.12659/ajcr.923266
13. Tew ZY, Johnson D, Louis G, Bhowmick K. Purpura fulminans in a hyposplenic patient arising from pneumococcal sinusitis. BMJ Case Rep [Internet]. 2023;16(7):e253043. http://dx.doi.org/10.1136/bcr-2022-253043
14. Kumar A, Shah NP, Menon V, Nissen SE. Purpura fulminans manifesting with Staphylococcus aureus endocarditis: a case report. Eur Heart J Case Rep [Internet]. 2019;3(2). http://dx.doi.org/10.1093/ehjcr/ytz077
15. Tosun T, Koçhan K, Kiremitçi S, Köker İH, Senturk H. Purpura fulminans: A rare condition that surprisingly develops after endoscopic retrograde cholangiopancreatography. J Clin Images Med Case Rep. 2023;4. http://dx.doi.org/10.52768/2766-7820/2265
16. Zhu J, Mukerji S, Anesthesiology ANDO. US, A case of bilateral forearm amputation resulting from purpura fulminans following subtotal colectomy for perforated ulcerative colitis ,OAT, Clin Case Studie Rep. Boston Medical Center. 2021;4:2–2.
17. Salcin S, Raybon-Rojas E, Mcdonald A. A Case of Meningococcal Purpura Fulminans Presenting as Acute Hypoxic Respiratory Failure During the COVID-19

Pandemic: A Case Report. In: TP58 TP058 INFECTIONS IN THE ICU: CASE REPORTS. 2021. p. A2946–A2946.

18. Alsharif SH, Al-Omair A, Andijani F. Uncommon location of Purpura fulminans: Case report and literature review. Case Rep Dermatol [Internet]. 2020;12(1):5–11. http://dx.doi.org/10.1159/000505476
19. Levenberg G, Bleier J, Leibowitz A, Salomon O, Misgav M, Agmon-Levin N, et al. NSAIDs linked to IgA-mediated hypersensitivity vasculitis and purpura fulminans-like eruption. Eur J Case Rep Intern Med [Internet]. 2023; http://dx.doi.org/10.12890/2023_004072
20. Verbeek TA, Stine JG, Saner FH, Bezinover D, Hypercoagulability in end-stage liver disease: review of epidemiology, etiology, and management. Transplantation Direct. 2018;4(11):e403. http://dx.doi.org/10.1097/TXD.0000000000000817