

Case article

Pan-resistant *Acinetobacter baumannii*–associated necrotising fasciitis in a patient with stroke, tachycardia-induced cardiomyopathy, and diabetes mellitus in a tertiary hospital of South India: a multidisciplinary challenge

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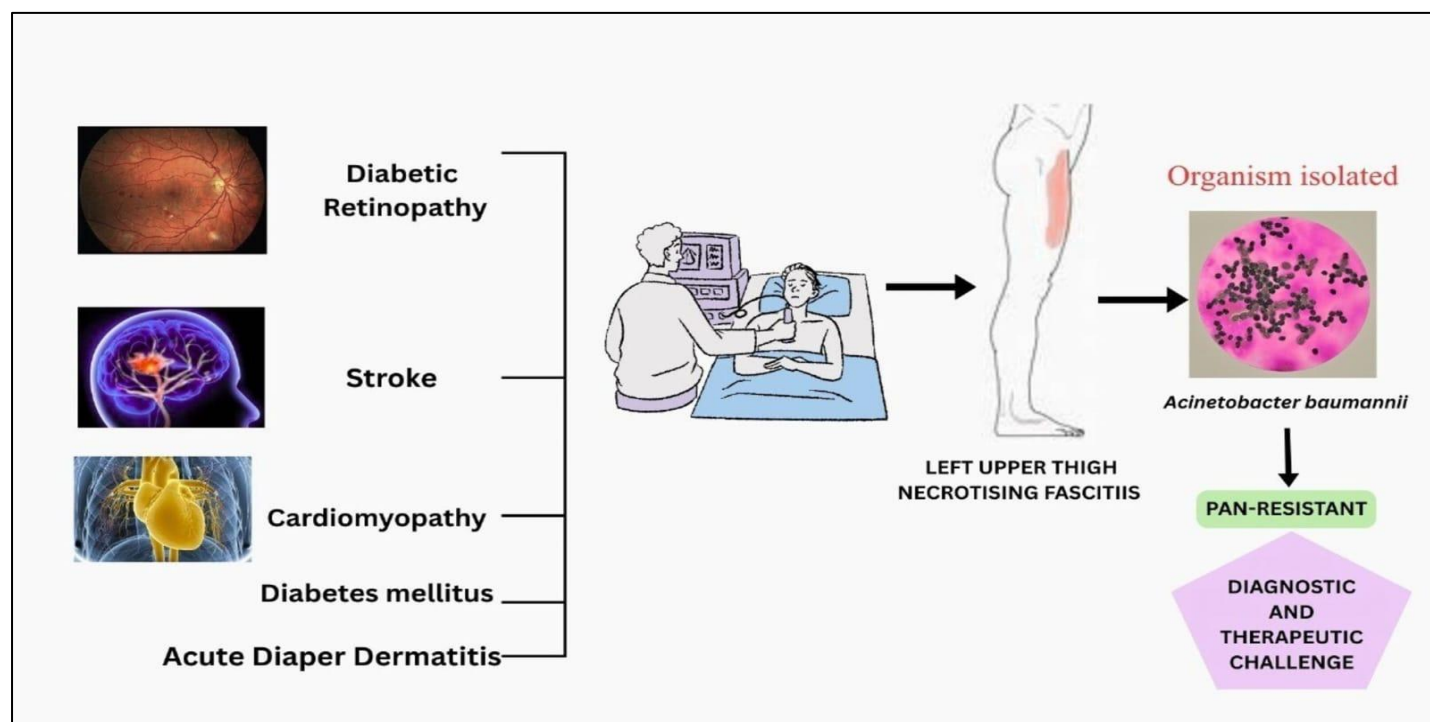
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ABSTRACT

Acinetobacter baumannii is a gram-negative, non-motile, oxidase-negative bacillus. This is one of the most significant nosocomial microorganisms involved in various conditions, including septicemia, endocarditis, osteomyelitis, and soft tissue infections. *Acinetobacter baumannii* with necrotising fasciitis is life-threatening and not well-documented. Necrotising fasciitis (NF) is a severe, rapidly progressing infection with high mortality, especially in immunocompromised patients. A 52-year-old female patient with a history of Type 2 DM presented with complaints of generalised tiredness and weakness for the past 5 days. She has been recently diagnosed with necrotising fasciitis on her left upper thigh by another hospital and has been on regular dressing. Since her condition didn't improve, she was admitted for wound debridement.



On investigations, the patient was also diagnosed with tachycardia-induced cardiomyopathy and subacute ischaemic stroke. An ophthalmologist's opinion was consulted for the patient's diabetic retinopathy. During the stay, she developed diaper dermatitis and ACD. Initially, the patient had hypokalemia (2.9 mmol/L); therefore, potassium correction was performed. Treatment consisting of antibiotics, analgesics, NSAIDs, cerebroactive agents, beta blockers, statins and multivitamin supplements was given. Though provided with a broad-spectrum antibiotic (Ciprofloxacin), the patient didn't get symptomatic relief. Thus, a culture sensitivity test was sent, which showcased *Acinetobacter baumannii* with pan-resistance. The patient was further managed and discharged after improvement. Managing NF becomes highly challenging when the causative organisms exhibit pan-resistance. This case highlights the diagnostic and therapeutic challenges of pan-resistant NF in a patient with diabetes, stroke, and cardiomyopathy.

Keywords: Antimicrobial resistance, Nosocomial infection, Critical care management, Soft tissue infection.

INTRODUCTION

Necrotising fasciitis is a rare but potentially fatal soft tissue infection that mainly affects the fascia and subcutaneous tissue and causes widespread tissue necrosis with a high mortality rate [1]. Because of its aggressiveness and capacity for quick tissue destruction, it is frequently referred to as a "flesh-eating disease". Early symptoms are often subtle and can be confused with deep vein thrombosis, gangrene, cellulitis, or a milder soft tissue infection, and diagnostic delays are common in this case [2].

Microbiology

Necrotising fasciitis can be of 4 different types: polymicrobial, monomicrobial, Gram-negative monomicrobial, and fungal-associated NF. Staphylococci and streptococci are the main organisms involved in most cases. On the other hand, *Acinetobacter baumannii* is a well-known nosocomial bacterium that is aerobic, gram-negative, and frequently resistant to several antibiotics. Hospital-associated infections, burns, ventilated patients, and post-operative wounds are all affected by *A. baumannii* outbreaks observed in countries like China, India, and the United States [3,4].

Case description

A 52-year-old woman with a history of type 2 diabetes and necrotising fasciitis was brought in complaining of ongoing discomfort and weakness in her left upper thigh ulcer, which limited her mobility. The patient was just diagnosed with necrotising fasciitis and has been receiving regular medication for type 2 diabetes for the past year with Tab. Metformin-500 mg and Tab. Glimepiride 0.5 mg. She was admitted to the hospital for the ulcer because of severe discomfort and is currently receiving dressings. Laboratory investigations, including complete blood count and blood glucose level, were taken.

On her admission, the patient's vital signs and lab results showed a low potassium level (2.9 mmol/L), elevated blood pressure (140/100 mmHg), and an increasing pulse rate (117/min). Treatment was started with potassium correction with Inj. KCl with NS, and the antibiotic ciprofloxacin 500 mg, metformin hydrochloride sustained-release, and glimepiride tablets 500 + 0.5 mg (OD) and metformin 500 mg (OD) were administered to the patient. As the patient complained of difficulty in raising her left limb, palpitation, and giddiness, the physician advised a CT scan of the brain, a thyroid function test, a CV

Doppler, a culture sensitivity report, the RFT, the ECHO, the ECG, and a hip-thigh X-ray. An ill-defined subacute haemorrhagic infarct was found on the right side of the CT image. ECHO showed LVEF - 45% and Free T4 (1.26). After consulting a cardiologist, she was diagnosed and treated for tachycardia-induced cardiomyopathy. To manage stroke, the patient was advised to take atorvastatin + aspirin (75/20 mg), piracetam and citicoline (800/500 mg) and multivitamin supplements.

After receiving a culture sensitivity report examined with the pus isolated from the ulcer site, the patient was resistant to all the antibiotics tested [Table 1]. On pharmacist intervention, the drug was changed to high-dose ampicillin-sulbactam in combination with polymyxin. The ulcer site discomfort had improved.

On consecutive days, the patient developed allergic dermatitis with erosions over the perianal area. With the advice of a dermatologist, zinc cream, mupirocin ointment, liquid paraffin, and halobetasol propionate ointment (0.05% w/w cream) were suggested.

She was brought in for an ophthalmologist's opinion regarding puffy eyes, and upon examination, her retina showed cotton wool patches. The doctor recommended certain adjustments to her diabetic treatment plan because the issue was caused by diabetic retinopathy. Metformin hydrochloride prolonged release and glimepiride tablets – 500/2 mg (B/F) OD, and vildagliptin and metformin hydrochloride – 50/500 mg OD were introduced as per recommendation. Inj. KCl was shifted to Syrup KCl and finally withdrawn when the target level of 5.0 mmol/L was reached.

Case discussion

Treating ulcer site pain and enhancing the patient's quality of life were the main priorities. Necrotising fasciitis is not a very common soft tissue infection identified in the hospital setting. The reason a patient can develop necrotising soft tissue ulceration is associated with several factors, including patient comorbidities. The primary location of the ulcer site, contamination, the existence of bacteria, and the kind of resistance are all factors in the treatment of this condition [3]. This also influences the choice of antibiotics secondary to the organism isolated.

In this case, for initial management, the introduction of intravenous antibiotics and surgical debridement was carried out. The patient was started on the broad-spectrum antibiotic ciprofloxacin 500 mg (BD) before receiving the culture sensitivity report. After identifying the pan-resistance to all the major classes of antibiotics, high doses of ampicillin were considered as a choice, especially in carbapenem-resistant *Acinetobacter baumannii*. During the prolonged stay of a patient in the hospital and multiple diagnoses, there are high chances of developing hospital-acquired infections and exposure to triggering factors.

The patient was treated for subacute ischaemic stroke with Tab. Aspirin and Atorvastatin -75/20 mg and Rerve Plus, Piracetam and Citicoline -500 mg. For tachycardia-induced myopathy, Tab. Bisoprolol fumarate 2.5 mg and Inj. KCl one ampule with 500 ml NS for electrolyte imbalance were included in the plan. Inj. KCl was later shifted to syrup KCl. Prolonged admission as bedridden increased the chances of developing diaper dermatitis over the perianal region. So, lateral application of zinc cream, T Bact ointment, liquid paraffin, and Halovate S ointment was prescribed.

Though the patient was very recently diagnosed with type 2 DM and is on regular treatment, in hospital settings, several hidden factors may contribute to an increase and uncontrolled blood sugar levels. Fluctuating blood glucose level is considered one of the important risk factors for diabetic retinopathy [4]. Repeated illness and consecutive diagnoses, increased chances for drug-drug interactions, adverse events, limited treatment options, communication breakdown between healthcare professionals, care transitions, and risk of complications are the major threats identified in this case.

Table 1: Culture Sensitivity Report of *Acinetobacter baumannii* for tested drugs

Antibiotics	Sensitive	Moderate	Resistance
Cefaperazone /Sulbactam	-	-	Y
Cefixime	-	-	Y
Gentamycin	-	-	Y
Amoxyclav	-	-	Y
Ampicillin	-	-	Y
Entrapenam	-	-	Y
Imipenem	-	-	Y
Meropenem	-	-	Y
Levofloxacin	-	-	Y
Piperacillin-Tazobactam	-	-	Y
Trimethoprim-Sulfamethoxazole	-	-	Y
Polymyxin B	-	-	Y
Cefepime	-	-	Y
Ciprofloxacin	-	-	Y

Pan resistance

When a bacterium or other microorganism is resistant to every antibiotic on the market, it is referred to as pan-resistance, where treatment becomes very difficult or impossible.

Despite the rarity of cases, *A. baumannii* is becoming a global human disease that exhibits resistance to a number of antibiotics and appears to acquire the resistant gene by horizontal gene transfer. Even though researchers have conducted numerous animal studies to investigate its virulence and pathogenicity, the issue remains unclear despite advancements in technology. Biofilm formation, beta-lactamases, efflux pumps, target mutations, and porin loss are some of the resistance mechanisms displayed by *A. baumannii* [5-8].

Table 2: Mechanism of action of antibiotics

Drug class	Resistance mechanism
Carbapenem (imipenem, meropenem, ertapenem)	Carbapenem-hydrolysing enzymes Efflux pumps Biofilm-mediated resistance
Colistin (polymyxin)	Genes regulate lipid a modification enzyme and reduce colistin affinity. Lipid a-deficient mutants.
Aminoglycosides	Enzymatic modification by aminoglycoside-modifying enzyme
Fluroquinolones	Mutations in the gyra and parc genes
Sulbactam	Overproduction of beta-lactamases and altered pbps
Tetracyclines	Overexpression of efflux pumps decreases the intercellular concentration of the drug.

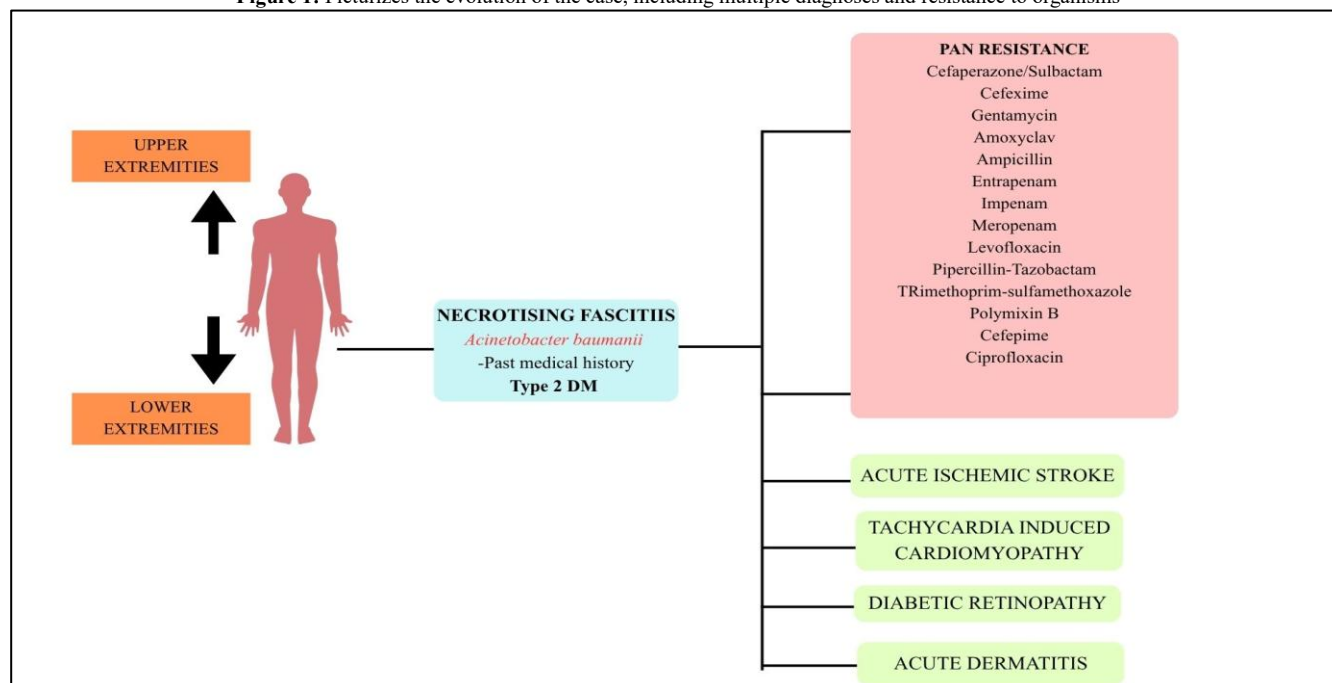
General approach to treatment

Initial treatment for any soft tissue infection involves ruling out the actual cause and causative organism of the condition and continuing with initial high-dose broad-spectrum antibiotics. Necrotising fasciitis can be ruled out with the LRINEC score, a plain X-ray, which says something about the extent of tissue infection, and a CT scan. The Laboratory Risk Indicator for Necrotising Fasciitis (LRINEC) was found to be a reliable tool in early detection and differentiation from other soft tissue infections with a high accuracy rate [9].

For critically ill patients with multiple drug resistance, medications such as carbapenem, tigecycline, colistin, and rifampicin are reserved. Hence, these drugs are reserved for use in medical emergencies when there are few therapeutic options, like respiratory specimens, soft tissue infections, and sepsis.

Combination therapy is recommended for carbapenem-resistant *A. baumannii* (CRAB) due to the significant global rate of antibiotic resistance [10]. Carbapenem plus Sulbactam-Durolactam is the recommended treatment for CRAB [11].

If this combination is unavailable, drugs such as Polymyxin B/Minocycline/Cefidrol/Colistin must be combined with a high dose of Ampicillin-sulbactam administered intravenously for multidrug-resistant or XDR infections, but still require close monitoring [12, 13]. There are chances for nephrotoxicity when polymyxin or colistin is administered as a monotherapy.

Figure 1: Picturizes the evolution of the case, including multiple diagnoses and resistance to organisms

CONCLUSION

Necrotising fasciitis with *Acinetobacter baumannii* is becoming a serious issue that requires timely diagnosis with the appropriate diagnostic tests. This case exposes true challenges, such as increased healthcare expenses, the need for additional treatments and interventions, carer stress, limited access to healthcare, and the need for cost-effective treatment options, infection control practices, awareness, and education that will help improve quality of life.

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