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ANTIBIOTIC RESISTANCE AND CLINICAL MANAGEMENT CHALLENGES IN A PATIENT WITH LOWER-LIMB NECROTIZING FASCIITIS AND CHRONIC KIDNEY DISEASE: A CASE REPORT

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ABSTRACT :

Necrotizing soft-tissue infections move fast and need quick recognition by doctors, swift surgery to control the source, and the right antimicrobial therapy. Choosing the antibiotics is especially difficult when antimicrobial resistance appears in a patient who already has renal dysfunction. We report the case of a female who came to the hospital with large swelling on the left lower leg, redness, tenderness, and many spots of skin affected after an initial bite that was reported. Her condition was worsened by kidney disease, obesity, and signs that suggested a systemic infection. Lab tests showed a white blood cell count with many neutrophils, Anemia, elevated blood urea, high serum creatinine, and metabolic problems that match severe renal dysfunction. The patient had wound debridement surgeries and a fasciotomy as part of the surgical care. A wound culture and sensitivity test showed resistance to every antibiotic that was tested, which made therapy very difficult. During treatment, the patient had a reaction to intravenous meropenem, so meropenem was stopped. The next steps in care involved keeping the wound clean, surgical debridement, and careful monitoring of kidney function and infection markers. A later pus culture showed no growth. This case shows how important it is to get microbiological samples and to do antimicrobial susceptibility tests in severe soft-tissue infections, especially when the usual therapy might not work because of antimicrobial resistance. It also shows how difficult it is to choose antibiotics when there is resistance, a drug allergy, and kidney impairment at the same time.

Keywords: Necrotizing fasciitis, antimicrobial resistance, antibiotic susceptibility testing, chronic kidney disease, wound culture, surgical debridement, antimicrobial stewardship.

INTRODUCTION

Necrotizing soft-tissue infections are severe, rapidly progressive infections involving the skin, subcutaneous tissue, fascia and, in advanced cases, deeper structures. They can progress rapidly to systemic toxicity, sepsis and multiorgan dysfunction. Early recognition, prompt surgical intervention, and effective antimicrobial therapy are central to management. The increasing prevalence of antimicrobial resistance complicates antimicrobial therapy in severe soft-tissue infections.⁽¹⁾ Empirical therapy may initially require broad antimicrobial coverage; however, once microbiological results become available, therapy should ideally be modified according to the susceptibility profile of the causative organism.⁽²⁾ This approach reduces unnecessary exposure to broad-spectrum antibiotics and supports antimicrobial stewardship. The present case is clinically important because the patient's management was complicated by three simultaneous factors: severe soft-tissue infection, reported resistance to all tested antibiotics, and renal impairment. In addition, an allergic reaction to meropenem was documented, further limiting antimicrobial options.

CASE PRESENTATION

A 60-year-old female patient was admitted to the hospital with a severe infection in the left lower limb. Clinical notes describe swelling that spreads from the leg to the foot, bright redness, many tense or broken blisters, pain in the local area, higher local temperature, and discoloration of the skin. Patient also had motor problems in the infected limb. History notes show that the patient first reported a bite days before coming to the hospital. Patient had kidney disease and was taking regular medications. Later clinical assessment recorded infection of the limb, specifically cellulitis and necrotizing fasciitis, worsening kidney disease, sepsis, and obesity at different times during the admission. Due to the extent of the soft-tissue infection patient had a fasciotomy and wound debridement. The patient later had debridement surgeries during the hospital stay. Operative record shows removal of damaged tissue and care of the infected lower limb. The patient's long stay required repeated checks, wound dressing changes, monitoring of kidney function, fluid balance,

and nutrition, and teamwork among surgeons and nephrologists.

Clinical Examination

On local examination, the affected lower limb showed:

- Diffuse swelling of the left lower limb
- Erythema extending over the lower limb
- Multiple tense blisters, some of which were ruptured
- Local increase in temperature
- Local tenderness
- Skin discoloration
- Wound requiring repeated dressing and debridement
- Abnormal sensory and motor findings in the affected limb

Laboratory Investigations

The laboratory findings were particularly important because they demonstrated both the severity of the infection and the patient's underlying renal dysfunction.

Table 1. Major laboratory findings during hospitalization

Investigation	Result documented	Clinical significance
Hemoglobin	11.3 g/dL	Mild anemia
Total leukocyte count	23,460 cells/mm ³	Marked leukocytosis
Neutrophils	82.6%	Neutrophil predominance, supporting acute bacterial/inflammatory process
Lymphocytes	8.3%	Relative reduction
Platelets	3.28 lakh/mm ³	Within documented laboratory range
Blood urea	142 mg/dL	Markedly elevated
Serum creatinine	3.9 mg/dL	Significant renal dysfunction
Uric acid	10.8 mg/dL	Elevated
Sodium	136 mmol/L	Within/near reference range
Potassium	5.0 mmol/L	Upper-normal/mildly elevated depending on laboratory range
Chloride	105 mmol/L	Within reference range
CRP	9.6 mg/dL	Elevated inflammatory marker
pO ₂	63.0 mmHg	Reduced oxygenation
pCO ₂	30.8 mmHg	Reduced
HCO ₃ ⁻	18.6 mmol/L	Reduced
pH	~7.3	Acidemia documented on ABG

The initial laboratory report showed a **WBC count of 23,460 cells/mm³ with 82.6% neutrophils**, indicating a pronounced inflammatory response. At the same stage, blood urea was **142 mg/dL** and serum creatinine was **3.9 mg/dL**, demonstrating substantial renal impairment. The arterial blood gas examination showed a **pO₂ of 63 mmHg, pCO₂ of 30.8 mmHg, and bicarbonate of 18.6 mmol/L**, with an acidic pH, indicating significant physiological disturbance during the acute illness.

The CRP was reported as **9.6 mg/dL**, supporting the presence of significant systemic inflammation.

Renal Function During the Hospital Course

Renal dysfunction was a major factor influencing antimicrobial management.

Renal Profile Parameter	Initial Abnormal Report	Subsequent Report	Later Follow-up Report
Blood Urea (mg/dL)	142	155	120
Serum Creatinine (mg/dL)	4.1	4.4	2.4
Uric Acid (mg/dL)	11.0	9.9	Not reported
Sodium (mmol/L)	136	138	138
Potassium (mmol/L)	4.6	4.3	4.7
Chloride (mmol/L)	110	113	113

Microbiological Investigation and Antibiotic Resistance

Wound Culture and Sensitivity

One of the most clinically significant findings in this case was wound culture and sensitivity assessment states Resistant to all tested antibiotics also adverse event was associated with antimicrobial treatment. Inj. Meropenem was stopped due to an allergic reaction. Following discontinuation of meropenem, piperacillin-tazobactam and tramadol were prescribed for symptomatic management.

Surgical Management

Because of the severity and progression of the lower-limb infection, surgical source control formed a major component of treatment.

The patient underwent:

1. Fasciotomy of the left lower limb
2. Wound debridement
3. Repeated wound debridement
4. Continued wound dressing and local wound care

The operative record describes debridement of devascularized tissue from the affected limb. Repeated surgical intervention was required during the hospital course, reflecting the nature of the infection and the need for continuing source control. This is important because antibiotics alone are inadequate when necrotic tissue or a drainable focus is present. In necrotizing soft-tissue infection, early surgical evaluation and removal of devitalized tissue are critical components of management.

Antibiotic-Related Clinical Challenges

This patient presented with a difficult antimicrobial decision-making scenario.

Challenge 1: Infection - The patient had a severe lower-limb infection with documentation of necrotizing fasciitis and sepsis, making prompt antimicrobial treatment necessary.

Challenge 2: Resistance - The wound culture documentation reported resistance to all tested antibiotics. This substantially narrowed the antimicrobial choices and demonstrated why susceptibility testing is important in severe infections.

Challenge 3: Dysfunction - The patient had markedly elevated serum creatinine and blood urea, requiring careful consideration of renal function when selecting and dosing antimicrobial agents.

Challenge 4: Antibiotic allergy - An allergic reaction to meropenem was documented, following which the drug was stopped.

Clinical Course and Outcome

The patient required prolonged inpatient management with repeated surgical debridement, wound care, renal monitoring and supportive treatment. Laboratory monitoring demonstrated persistent leucocytosis during the course, with a later WBC count of approximately 20,500 cells/mm³ and hemoglobin of approximately 9.1 g/dL, while renal parameters remained abnormal.

Subsequent renal investigations showed improvement in serum creatinine from approximately 4.4 mg/dL to 2.4 mg/dL, although urea remained elevated. The patient's management continued to involve wound dressing and surgical follow-up. The later microbiology report demonstrated no growth from the pus specimen.

DISCUSSION

This case shows how hard it can be to treat a soft-tissue infection when the bacteria are resistant to antibiotics and the patient has serious kidney problems. The first lab results showed a high white blood cell count and a lot of neutrophils, which means there is a strong body response to inflammation. The high CRP level also shows that the body is fighting something. At the time, the high urea and creatinine levels show that the kidneys are not working well. This is very important because some antibiotics need to be adjusted based on how the kidneys are working.⁽²⁾ The important thing was that the wound culture showed the bacteria were resistant to all the antibiotics tested. Even though the exact germ causing the infection was not listed in the part of the report, this shows a big problem in medicine: using antibiotics without knowing the exact germ may not work if the germ is very resistant. Antimicrobial susceptibility testing is very important because it helps doctors know which medicines still work against the germ that was found. The World Health Organization says that antimicrobial susceptibility testing and good lab tests are parts of making sure tests are used properly and keeping track of resistance.⁽³⁾

At the time, the results from the culture need to be looked at along with what is happening with the patient. Later, a new pus culture from this patient showed no growth even though there was a report of resistance. A negative culture does not always mean there is no infection. This can happen if the patient has already taken antibiotics or had surgery. This case also demonstrates the importance of source control. Repeated fasciotomy and wound debridement were required, along with the operative removal of necrotic tissue. In necrotizing soft-tissue infections, antimicrobial therapy should not be viewed as a substitute for appropriate surgical management.⁽³⁾ Another important issue is the reaction to meropenem. The combination of antimicrobial resistance and a drug allergy makes the therapeutic window much smaller. From a clinical pharmacy point of view this case shows the need for reassessment of antimicrobial therapy instead of just keeping empirical treatment. The patient's renal function changed during the hospital stay. That reinforces the importance of repeated renal monitoring and dose reassessment⁽⁴⁾

Clinical Pharmacy Perspective

- Antimicrobial stewardship
- Renal dose adjustment
- Drug allergy monitoring
- Monitoring therapeutic response
- Source control
- The repeated requirement for wound debridement highlights that pharmacological treatment must be integrated with surgical management in necrotizing infections.

CONCLUSION

This case shows how severe necrotizing soft-tissue infection can interact badly with resistance, renal dysfunction, and antibiotic allergy. The patient came to us with a lower-leg infection and many serious health problems. The blood tests revealed a rise in white cells, very high inflammatory markers, and severe kidney failure. We had to perform repeated debridement and fasciotomy to control the source of the infection. The wound culture was labeled "resistant to all tested antibiotics," which was the antimicrobial problem in this case. Then we found that the patient had an allergic reaction, which cut down the options even more. Later, a pus culture grew nothing, which shows why laboratory results must always be looked at with past antibiotic use, surgery and the overall clinical picture.

Overall, this case tells us that treating a soft-tissue infection needs early recognition, good specimen collection, antibiotic susceptibility testing, careful antibiotic choice, dose adjustment based on kidney function, allergy checks, and quick surgical source control. Diagnostic stewardship and antimicrobial stewardship become especially important when resistance limits the drugs we can use.

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