Case Report
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Calciphylaxis in a Hemodialysis Patient: A Rare and Fatal Complication

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ABSTRACT

Calciphylaxis, or calcific uremic arteriolopathy, is a rare and life-threatening condition primarily seen in patients with end-stage renal disease (ESRD) undergoing dialysis. It is characterized by vascular calcification, thrombosis of dermal arterioles, and subsequent tissue necrosis. We present a case of a 52-year-old female on maintenance hemodialysis who developed progressive skin lesions, later diagnosed as calciphylaxis. Despite early diagnosis and initiation of treatment, the patient succumbed to sepsis due to secondary wound infection. This case underscores the diagnostic challenges and high mortality associated with calciphylaxis in dialysis patients and highlights the need for early intervention and multidisciplinary management.

CASE PRESENTATION

A 52-year-old woman with a 5-year history of ESRD secondary to long-standing diabetic nephropathy presented to the nephrology department Lady Reading Hospital Peshawar with complaints of painful skin lesions on her thighs and lower abdomen. The lesions had started as tender nodules and progressed rapidly over 10 days to areas of indurated necrosis with ulceration and black eschar formation. She also reported low-grade fever and generalized malaise.

Her medical history included poorly controlled type 2 diabetes mellitus, hypertension, and secondary hyperparathyroidism. She had been on regular twice-weekly hemodialysis for the past five years and was taking calcium-based phosphate binders and vitamin D analogs. There was no history of recent trauma, new medications, or anticoagulation use such as warfarin.

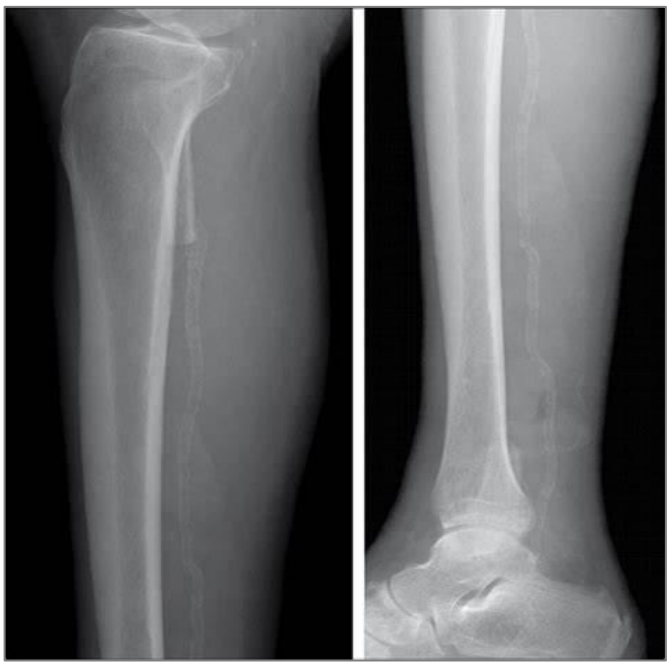
Clinical and Laboratory Findings

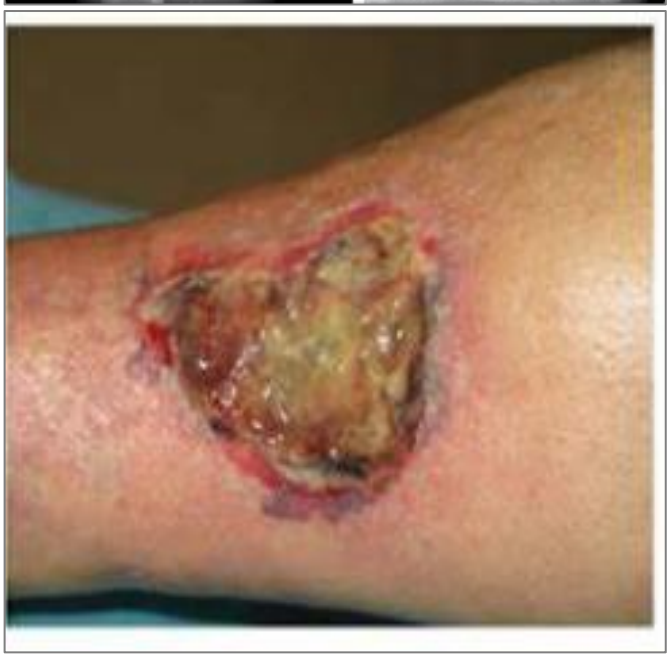
On examination, the patient appeared uncomfortable with extensive painful, violaceous, and necrotic skin lesions over both thighs and lower abdomen. The lesions were warm and tender, with black eschar indicating tissue necrosis. Vital signs showed a blood pressure of 150/90 mmHg, heart rate of 92 bpm, and temperature of 37.9°C.

Laboratory investigations revealed elevated serum calcium (10.8 mg/dL) and phosphate (6.5 mg/dL), markedly raised intact parathyroid hormone (iPTH) levels at 1250 pg/mL, elevated C-reactive protein (CRP), and hypoalbuminemia (2.8 g/dL). Her white blood cell count was 11,800/mm³, indicating an inflammatory response. Serum creatinine was 7.2 mg/dL, consistent with her baseline renal failure status.

Imaging & Histopathology

- **Skin biopsy** showed: dermal arteriolar calcification, intimal proliferation, thrombosis, and fat necrosis.
- **X-ray of the limbs:** linear calcifications along vessel walls confirming vascular calcification.





Laboratory Investigations

Parameter	Result	Reference Range
Serum Calcium	10.8 mg/dL	8.5–10.5
Serum Phosphate	6.5 mg/dL	2.5–4.5
iPTH	1250 pg/mL	10–65
CRP	56 mg/L	<5
WBC	11,800 /mm³	4,000–11,000
Creatinine	7.2 mg/dL	0.7–1.3
Albumin	2.8 g/dL	3.5–5.0

Management and Clinical Course

Management of the patient began with the immediate discontinuation of calcium-based phosphate binders to reduce the exogenous calcium load, which plays a pivotal role in vascular calcification. Sodium thiosulfate therapy was initiated at a dose of 25 grams intravenously three times a week after dialysis sessions. This agent has antioxidant and calcium-chelating properties, and is considered a mainstay in the treatment of calciphylaxis. For symptom control, opioid analgesics were administered to manage the severe pain associated with the necrotic skin lesions. Comprehensive wound care was provided, including regular cleaning, local antiseptic applications, and careful debridement of necrotic tissue to prevent infection and promote healing. Dialysis was continued using a low-calcium dialysate (1.25 mmol/L) to further minimize calcium burden. Given the markedly elevated parathyroid hormone (PTH) levels and persistent hyperphosphatemia, parathyroidectomy was considered as a potential intervention. However, the procedure was ultimately deferred due to the patient's unstable clinical status and the associated surgical risks.

Despite these interventions, the patient's condition deteriorated. While there was initial modest improvement in the wound appearance and pain control, she soon developed signs of systemic infection. Blood cultures confirmed a secondary infection, and broad-spectrum intravenous antibiotics were promptly initiated. Unfortunately, the infection progressed to sepsis, which led to multiorgan failure. Despite intensive supportive care, the patient succumbed to the illness approximately four weeks after her initial presentation.

DISCUSSION

Calciphylaxis is a devastating condition associated with a high mortality rate, ranging from 45% to 80%, primarily due to sepsis from infected skin lesions. It typically occurs in ESRD patients on dialysis, though non-uremic cases have also been reported. Pathogenesis involves a complex interplay of hyperphosphatemia, hypercalcemia, elevated PTH, inflammation, and vascular smooth muscle cell transdifferentiation leading to calcification and thrombosis of small vessels.

Numerous studies across the globe have explored the risk factors and management strategies of calciphylaxis. Nigwekar et al. in the United States conducted a retrospective study which found that sodium thiosulfate improved survival and reduced pain in dialysis patients with calciphylaxis, supporting its inclusion as a frontline therapy.[1] In Japan, Hayashi et al. identified that patients with high phosphate and PTH levels were more likely to develop calciphylaxis, highlighting the importance of early phosphate control.[2]

Weenig et al. emphasized that histopathological confirmation remains the diagnostic gold standard and demonstrated classic findings of vascular calcification and thrombotic occlusion in affected tissues.[3] Brandenburg et al. in Germany observed that parathyroidectomy improved survival in selected patients with severe secondary hyperparathyroidism.[4] In Austria, Zitt et al. demonstrated that using a low-calcium dialysate reduced calcium overload and helped slow disease progression.[5]

A more recent study by Povoa et al. from Portugal advocated for a multidisciplinary care model, emphasizing that coordinated care among nephrologists, dermatologists, surgeons, and infectious disease specialists improves outcomes.[6]

Despite these insights, calciphylaxis remains a challenging condition with limited treatment options. Preventive strategies such as tight control of mineral metabolism, early recognition of skin changes, and discontinuation of risk-enhancing medications like warfarin are critical.

CONCLUSION

Calciphylaxis is a rare but fatal complication seen primarily in dialysis patients. Early diagnosis, prompt discontinuation of calcium and phosphate load, and use of sodium thiosulfate are central to management. This case illustrates the typical clinical course and diagnostic complexities of calciphylaxis, as well as the need for multidisciplinary care. Given its high mortality, more research is needed to identify effective therapies.

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