Feasibility of laboratory monitoring from continuous kidney replacement therapy circuit in the absence of conventional blood sampling access: a case report

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Background of the problem

Continuous kidney replacement therapy (CKRT) requires regular blood monitoring—typically every 4–6 hours—to assess electrolytes, urea, and acid–base status, ensuring treatment adequacy and patient safety. This is usually performed via a central venous catheter (CVC) or intra-arterial (IA) line, which provide reliable access for blood sampling.

However, patients may have challenging vascular access or ultimately refuse central line insertions, making standard sampling methods unfeasible.
An alternative is sampling directly from the CKRT pre filter port. But this raises concerns over sample accuracy, potentially affected by:

- Access recirculation
- Dilution from replacement fluids

We present a case demonstrating the feasibility and accuracy of routine blood sampling from the CKRT pre-filter port, using a protocol to minimize these confounding factors.

Case Summary

A 46-year-old Chinese male was admitted to Singapore General Hospital from 29 January to 25 April 2025 for management of septic shock secondary to foot gangrene, complicated by fluid overload, hypotension, and dialysis non-compliance.

His weight increased from 115.8 kg to 127.8 kg during admission. He was transferred to the renal high dependency unit (HDU) from 17 March to 7 April 2025 for CKRT to enable slow, sustained fluid removal. At the time, he required noradrenaline at 0.08 mcg/kg/min and nasal oxygen (2 L/min), with clinical signs of marked edema and pulmonary congestion.

Due to refusal of CVC and IA line insertion, routine blood sampling was challenging. While on CKRT via a tunneled dialysis catheter, blood samples were obtained from the pre-filter port after temporarily pausing dialysate and replacement flows, enabling safe and reliable monitoring without conventional access.

Management/Treatment

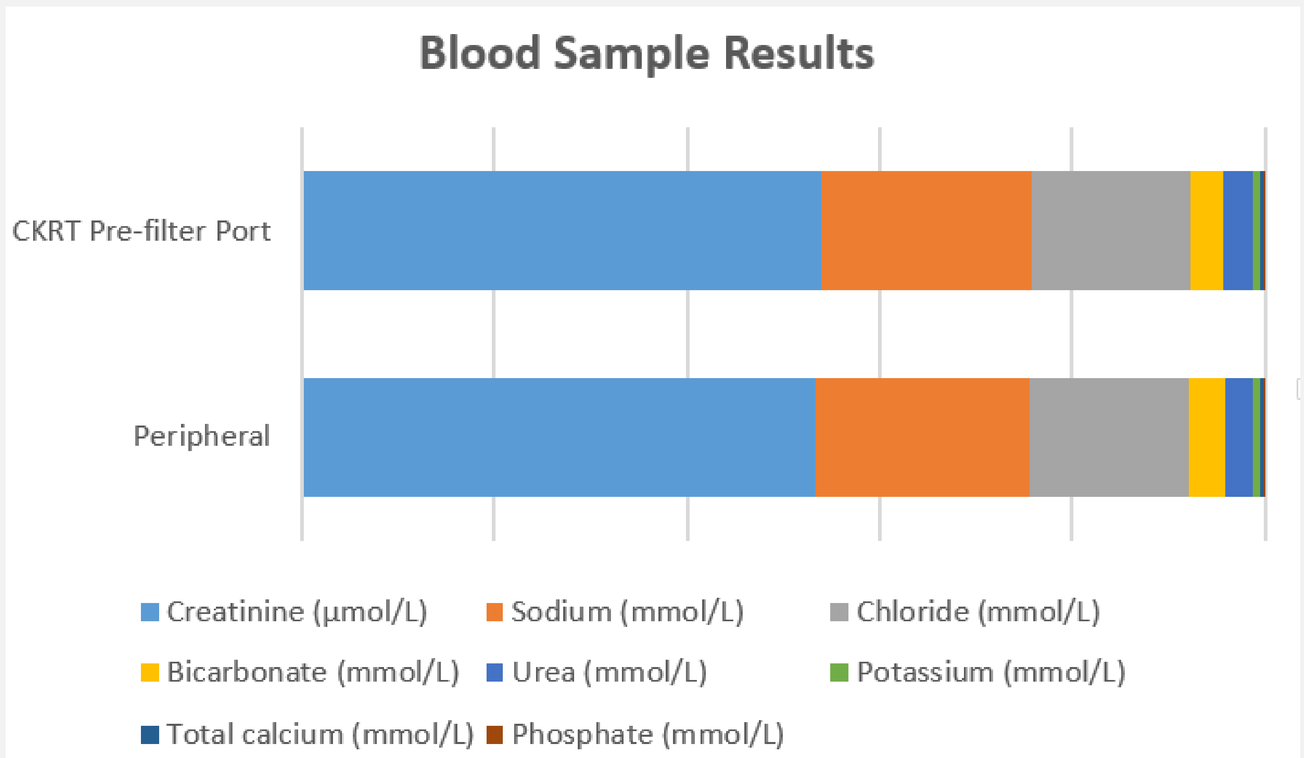
Initial attempts at intermittent hemodialysis were unsuccessful in achieving the required fluid removal. To facilitate large-volume fluid removal, the patient was initiated on CKRT via an existing right tunneled dialysis catheter, without anticoagulation due to bleeding risk.

Given the patient's refusal of central or intra-arterial (IA) lines, routine blood sampling was performed via the CKRT pre-filter port
Protocol:

- Pause dialysate, replacement, and ultrafiltration flows for 5 minutes prior to each blood draw
- Paired samples from pre-filter port and peripheral venipuncture were collected for comparison

This method enabled safe and effective monitoring during CKRT in the absence of conventional access.

Results



- ✓ Values were clinically comparable
- ✓ No complications observed during sampling

Conclusion

Pre-filter blood sampling during CKRT can be inaccurate due to access recirculation and fluid dilution.

In this case, pausing dialysate, replacement, and ultrafiltration flows for 5 minutes before sampling from the pre-filter port produced results comparable to venipuncture.

This method offers a safe and practical alternative when conventional access is unavailable, avoiding the need for additional lines or peripheral draws.

Limitations

- Single patient case report; findings may not be generalizable.
- May not be able to pause CKRT in unstable patients for sample collection.
- Potential for access recirculation still exists, especially at higher blood flow rates or with catheter dysfunction.
- Does not address applicability in patients on anticoagulation or with different CKRT settings.

Take Home Message

With the proposed blood sampling method, the CKRT pre-filer port serves as a reliable alternative for blood sampling in patients lacking central venous access

References
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