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Cause of Hemodialysis Blood Leak Alarm for Freshwater Near-Drowning Patient

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Hemolysis is a rare cause of hemodialysis blood leak alarms. We report a recent single-patient case with laboratory verification that demonstrates red blood cell destruction as potential etiology when sufficient hemoglobin crosses the high-flux dialyzer membrane.

In this case, a freshwater near-drowning, unresponsive adult male patient was placed on hemodialysis with a high-flux dialyzer. The dialysis machine, like all modern hemodialysis machines, was equipped with a blood leak alarm to protect patients from loss of blood and back-infusion of dialysate into the vascular circulation. Within five minutes of initiating treatment, the blood leak alarm sounded. The care team made multiple attempts to reinitiate hemodialysis with different machines, blood tubing lots, and various brands of high-flux dialyzers. In every attempt, the blood leak alarm was triggered shortly after dialysis re-initiation.

To explore the cause of the blood leak, the attending nephrologist ordered a blood draw to test for hemolysis: a condition that can occur in cases of significant freshwater inhalation. With this condition, water readily crosses into the vascular system through pulmonary alveoli and dilutes the plasma, leading to osmotic hemolysis.

The laboratory results from the blood sample demonstrated evidence of severe hemolysis. With this diagnosis in mind, the attending nephrologist ordered continuous venovenous hemofiltration, which offers a lower blood flow rate and lower clearance rate than that offered by the high-flux hemodialysis membrane. The therapy was initiated without incident or alarm and continued into the following day, when the patient ultimately expired from complications of the near drowning.

This case indicates the importance of considering hemolysis as a potential cause for blood leak alarms during hemodialysis. When hemolysis is suspected, it may be appropriate to use a continuous dialysis option or to perform hemodialysis using a low-flux dialyzer and with a lower ultrafiltration rate to reduce the rate of hemoglobin crossing the hemodialysis filter membrane.

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