

Haemofiltration as a treatment option in refractory life-threatening diabetic ketoacidosis

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Background:

Treating life-threatening diabetic ketoacidosis (DKA) with a pH of < 6.9 is extremely challenging and often refractory to treatment using standard fixed dose insulin DKA management protocols which may not work effectively at this low pH because of increased insulin resistance. I.V. bicarbonate (HCO₃) use in this situation can be considered it but remains controversial due to the risk of significant side effects as well as limited evidence in literature.^{1,2,3}

Here we attempt to describe a case of fulminant DKA without renal failure, where treatment with haemofiltration (HF) for severe metabolic acidosis was successful.

Case History:

A 23-year-old female with history of recurrent episodes of DKA and poor diabetes control secondary to non-compliance, presented to the emergency department via ambulance after being found collapsed and had successful cardiopulmonary resuscitation for pulseless electrical activity and was subsequently treated with standard DKA protocol.

Past Medical History:

She was previously on Lantus 23 units in the morning and Novorapid 10 units with each meal and she did not carb count. She was also on Pregabalin 50 mg BD, Citalopram 20 mg OD, Atorvastatin 20 mg OD and Lisinopril 2.5 mg OD. She had 22 DKA admissions in the last one year due to non-compliance. She had gastroparesis, peripheral neuropathy, diabetic nephropathy and retinopathy, depression.

Investigations on Admission:

pH 6.752, HCO₃ 1.3, lactate 3.1, base excess K30, blood glucose 45 mmol/l, blood ketones 6 mmol/l, creatinine 133 mmol, urea 10.8 mmol, and eGFR 43.

Treatment:

Despite maximal DKA treatment over three hours, including 5 litres of i.v. fluid, and maximum possible fixed rate i.v. insulin at 15 units/hour, she continued to be in severe metabolic acidosis with pH 6.772, HCO₃ 1.7, ketones 5, and blood glucose 40.1, without any improvement in her Glasgow coma scale of 8. She was already intubated and had central venous access. Options were discussed at length with critical care and endocrine teams regarding use of i.v. bicarbonate therapy vs haemofiltration. Because of the risks associated with bicarbonate therapy² and she was put on haemofiltration which resolved the metabolic acidosis completely within 12 hours. See table for details.

Time	pH	pCO ₂	pO ₂	HCO ₃	Lactate	Glucose	Ketones
1426	6.771	1.48	11.2	1.6	3.6	43.1	> 6
1534	6.752	1.23	26.25	1.3	3.1	42.2	> 6
1614	6.730	0.98	25.9	1.0	3.2	41.9	> 6
1715	6.772	1.79	13.2	1.7	3.7	40.1	> 6
12 hour post Haemofiltration	7.212	3.71	12.5	16.5	1.4	12.1	0.9

Table 1: Laboratory data of the patient pre and post haemofiltration (all SI units)

Conclusion:

Haemofiltration offers novel treatment option for patients with refractory diabetic ketoacidosis. We need more evidence to confirm usefulness of haemofiltration in such cases.

References:

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2. Chua HR, Schneider A, Bellomo R . **Bicarbonate in diabetic ketoacidosis - a systematic review.** *Ann Intensive Care.* 2011 Jul 6;1(1):23.
3. Duhon B, Attridge RL, Franco-Martinez AC, Maxwell PR, Hughes DW. **Intravenous sodium bicarbonate therapy in severely acidotic diabetic ketoacidosis.** *Ann Pharmacother.* 2013 Jul-Aug;47(7-8):970-5