

Early calcium disturbances in trauma: prehospital measurement by a UK Helicopter Emergency Medical Service

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Introduction

Ionised calcium (iCa) disturbance can occur due to calcium chelation from citrate-containing blood products, in response to traumatic injury, through administration of crystalloid fluids, or exogenous replacement of calcium as part of a transfusion regimen. No previous studies have examined how early calcium disturbances occur and whether calcium disturbances are observed prehospital. **This study aimed to identify whether trauma-related calcium disturbances occur before hospital arrival.**

Methods

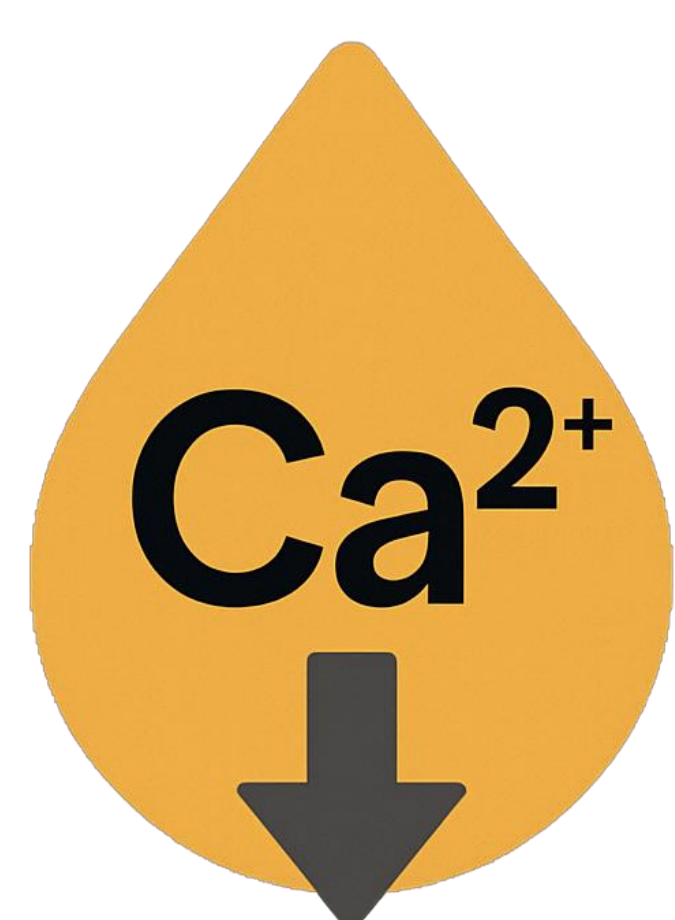
This case series examined all trauma patients treated by a single UK HEMS (East Anglian Air Ambulance, EAAA) and transported to the regional major trauma centre (MTC) between 01.01.2024 and 31.12.2024.

Data were retrieved from the HEMS electronic medical record (HEMSbase, Medic One Systems Ltd, UK). POCT was performed using the i-STAT[®]1 (Abbott Point of Care) with CG8+ cartridges; two to three drops of blood, reporting iCa in a range of 0.25–2.50 mmol/L (reference range: 1.12 – 1.32 mmol/L). POCT was non-protocolised and used at the treating clinician's discretion.

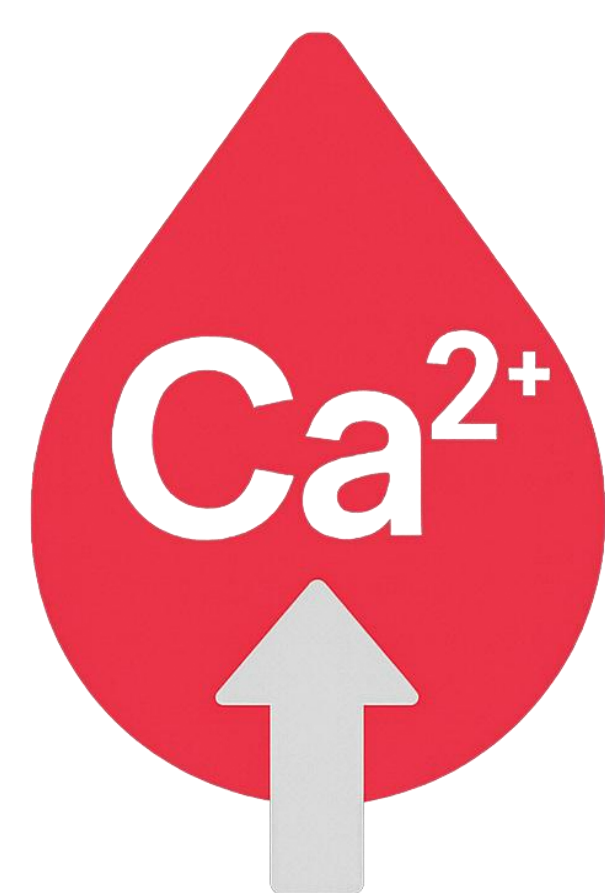
Results

In 38 patients with a prehospital iCa level, ionised hypocalcaemia was present in 7/38 (18.4%, median 1.05 [0.99–1.07] mmol/l), and ionised hypercalcaemia in 4/38 (10.5%, median 1.49 [1.46–1.61] mmol/l).

The baseline characteristics, injury details, treatments received, outcomes, and timings of POCT are shown in the table. Blood transfusion prior to POCT was documented in 7/38 patients (18.5%) and observed in both the hypocalcaemia and hypercalcaemia groups. The median interval from injury to POCT was 95 minutes, and from scene arrival time to POCT was 57 minutes.



Hypocalcaemia
7/38 18.4%



Hypercalcaemia
4/38 10.5%

	Total n=38	Hypo- calcaemia n=7	Normo- calcaemia n=27	Hyper- Calcaemia n=4
Age in years, median [IQR]	48.0 [27.0-62.3]	31.0 [25.0-67.0]	48.0 [27.0-63.0]	44.5 [24.5-54.8]
Blunt mechanism, n (%)	35/38 (92.1%)	7/7 (100.0%)	25/27 (92.6%)	3/4 (75.0%)
Isolated head injury, n (%)	19/38 (50.0%)	4/7 (57.1%)	14/27 (51.9%)	1/4 (25.0%)
Intubated, n (%)	30/38 (78.9%)	5/7 (71.4%)	24/27 (88.9%)	1/4 (25.0%)
Traumatic cardiac arrest, n (%)	2/38 (5.3%)	0/7 (0.0%)	1/27 (3.7%)	1/4 (25.0%)
Prior to measurement:				
Pre-hospital crystalloids, n (%)	20/38 (52.6%)	3/7 (42.8%)	16/27 (59.3%)	1/4 (25.0%)
Blood products, n (%)	7/38 (18.5%)	2/7 (28.6%)	2/27 (7.4%)	3/4 (75.0%)
Calcium chloride, n (%)	4/38 (10.5%)	1/7 (14.3%)	0/27 (0.0%)	3/4 (75.0%)
Hospital mortality, n (%)	10/38 (26.4%)	0/7 (0.0%)	7/27 (25.9%)	3/4 (75.0%)
Injury time to POCT in mins, median [IQR]	95 [81-120]	109 [88-146]	95 [81-120]	90 [67-114]
Scene arrival POCT in mins, median [IQR]	57 [48-69]	61 [51-69]	57 [46-77]	60 [39-77]

Conclusion

In conclusion, this study demonstrates that **trauma-related calcium disturbances occur before hospital arrival**, underscoring the need for prospective multicentre research while also signalling to prehospital teams that point-of-care testing may be beneficial for delivering safer calcium replacement.

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