

# CITRATE ACCUMULATION (CA)

CRRT medical troubleshooting guide  
FHFT, CRRT Guideline Version 5.0

## PATIENT AT RISK

- **Acute liver failure** (high AST/ALT, lactate and INR)
- **Fluid responsive lactic acidosis** (Lactate > 5mmol/l, circulatory shock, metformin etc.)

## Signs of citrate accumulation

1. Increasing Calcium Dose requirements
2.  $\text{CaCl}_2$  dose > 2.1 mmol/L
3. Total (uncorrected) : Ionised Calcium (T:I) Ratio > 2.3
4. Increase in Total Calcium (uncorrected), possibly >3.0 mmol/L
5. Metabolic acidosis

## SUSPECTED CA

Increasing Calcium dose requirements  
Hypocalcaemia ( $\text{SiCa}^{2+}$  < 1mmol/L)  
Metabolic acidosis is present

Adjust Calcium dose immediately then check 4 hourly  
Check T:I ratio immediately then 4 hourly  
Consider giving sodium bicarbonate to correct acidosis  
Refer to Clinically Relevant CA if T:I > 2.3

## CLINICALLY RELEVANT CA

Increasing Calcium dose requirements  
Hypocalcaemia ( $\text{SiCa}^{2+}$  < 1mmol/L)  
Metabolic acidosis is present  
(often unresponsive to dialysis and/or worsening)  
T:I Ratio > 2.3  
Increase in Total Calcium, possibly > 3mmol/L

Adjust Calcium dose and check T:I ratio immediately then 4 hourly. Consider giving sodium bicarbonate to correct acidosis  
Let  $\text{PFIa}^{2+}$  rise to the range of 0.35 to 0.4mmol/L (Reduce citrate dose in decrements of 0.1mmol/L, checking the  $\text{PFIa}^{2+}$  5mins after each adjustments until the desired level is achieved)  
Also consider reducing blood flow by 20 ml/min  
If CA persists refer to Severe CA

## SEVERE CA

Signs of citrate accumulation accompany a rapidly increasing lactic acidosis and/or  
T:I > 2.5

Switch to another form of anticoagulation (citrate will just make acidosis worse)

**Management of CA requires close monitoring and a dynamic approach. You may change anticoagulation to a non-citrate CVVHD (heparin, epoprostenol or without anticoagulation) anytime. Refer to CRRT guideline.**