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Managing citrate toxicity

Citrate in the anticoagulant binding to the patient's circulating calcium causes citrate toxicity. This causes lower levels of ionized calcium, which presents as circumoral numbness, paresthesia, muscle cramps or spasms, nausea, vomiting, chills or anxiety. Persistent hypocalcemia can lead to more serious issues such as hypotension, seizures or potential cardiac issues.

PREVENTION

- Encourage high calcium foods and drinks before and during the collection.
- Provide PO calcium supplements prior to starting the collection.
- Review the signs and symptoms of hypocalcemia with the donor before the collection starts.
- Start prophylactic IV calcium when the return line is established.

Terumo® recommends starting with an inlet:AC (I:AC) ratio of 12:1, increasing to 15:1 during the run if the patient tolerates.[1]

TREATMENT*

*Your attending physician should always consider the patient's history and current clinical status before determining the best treatment for hypocalcemia.

- Treat early!
- Decrease the inlet by 10mL/min if the donor complains of any numbness or tingling in their mouth or nose.[1]
- Provide PO calcium supplements in addition to IV replacement.
- Decrease the AC infusion rate.
- Consider increasing the I:AC ratio.
- Pause the procedure and titrate the IV calcium per your center's guidelines if symptoms do not resolve after 10 minutes.

Not all calcium is the same. Calcium gluconate has 93 mg of elemental calcium per gram while calcium chloride has 272 mg per gram. Knowing how much elemental calcium is given can help to ensure additional issues do not arise.[2]

Key contacts at NMDP℠

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WATCH FOR CLUMPING!

- Over calcifying may lead to clumping.
- To determine if too much calcium is being administered, you can use the following equation:
  - (Milligrams of elemental calcium x grams given)/AC to the patient
  - A reasonable value to target is ≤0.5.
- Recirculation can occur if calcium is administered at the return site, which can lead to clumping.
- Clumping may be seen if the procedure is paused, but the calcium infusion is not.[3]

REFERENCES

1. Terumo BCT. *Spectra Optia Apheresis System Operator's Manual;* 2019.

2. Balogun RA, Aqui N, Garcia A, et al. *Principles of apheresis technology: Technical principles of apheresis medicine*. American Society for Apheresis; 2020.

3. Connelly-Smith L, Alquist CR, Aqui NA, et al. Guidelines on the use of therapeutic apheresis in clinical practice - evidence-based approach from the Writing Committee of the American Society for Apheresis: The Ninth Special Issue. *J Clin Apher*. 2023;38(2):77-278. doi: 10.1002/jca.22043

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