Predicting hypocalcemia in multiple myeloma patients undergoing autologous stem cell collection

Prabhjot Singh Chahal[1], Esther Soundar, MD, MPH[1,2]

[1]Indiana University School of Medicine, Indianapolis, Indiana; [2]Indiana University School of Medicine, Department of Pathology and Laboratory Medicine, Indianapolis, Indiana

Background/Objective:

Multiple myeloma is a plasma cell dyscrasia that can be treated with an autologous stem cell transplant, which involves the harvest of autologous hematopoietic cells by apheresis following induction therapy. Citrate anticoagulation-induced hypocalcemia is more common with large volume apheresis, which is defined as processing 3 or more total blood volumes. Although calcium is given parenterally to mitigate this complication, about a third of this patient population still experiences symptoms of hypocalcemia. Total calcium to ionized calcium ratio (T:iCa) has been employed widely to predict iatrogenic hypocalcemia induced by citrate anticoagulation during renal dialysis. Our aim is to assess the utility of total to ionized calcium ratio to predict hypocalcemia in multiple myeloma patients during autologous stem cell collection by leukapheresis.

Methods:

A retrospective chart review study of a cohort of patients with multiple myeloma, who underwent autologous stem cell collection over a period of 6 months from October 2023 to March 2024 was conducted after an institutional review board approval. Demographic, clinical and laboratory data were obtained from the electronic medical record. The cohort was categorized into two groups: T:iCa ≥ 2.00, and T:iCa < 2.00. The binary outcome variable measured was the presence or absence of symptoms of hypocalcemia. A 2x2 table was constructed to examine the relationship between the two categorical variables.

	Hypocalcemia (D+)	No hypocalcemia (D-)	Total
T:iCa ≥ 2.00 (T+)	3	6	9
T:iCa < 2.00 (T-)	3	10	13
Total	6	16	22

Results:

A total of 22 multiple myeloma patients that underwent apheresis for the harvest of autologous stem cells were identified. About 55% of the patients were female; the median age of the patients was 56 years (IQR, 48-62) and the median weight of the patients was 79 kg (IQR, 72-100). The pre-procedure median peripheral CD34+ cell count was 46 cells/μL (IQR, 33-72), the median pre-procedure ionized calcium was 1.14 mmol/L (IQR, 1.1-1.2), and the median pre-procedure total calcium was 9.2 mg/dL (IQR, 8.8-9.4). The median duration of the apheresis procedure was 329 mins (IQR, 286-365). During apheresis, the median number of total blood volumes processed was 4.25 (IQR, 3.43-4.88), and the median volume of ACD-A infused was

1504 mLs (IQR, 1241-1914). The overall prevalence of symptoms of hypocalcemia was 27% during the apheresis procedure. The median T:iCa was calculated to be 1.96 (IQR, 1.89-2.06). Results of the analysis of the 2x2 table are as follows: sensitivity 50%, specificity 62.5%, positive predictive value 0.33, and negative predictive value 0.77 using a T:iCa cut-off of 2.00.

Conclusion/Potential Impact:

Hypocalcemia is highly prevalent among multiple myeloma patients undergoing apheresis for hematopoietic stem cell collection**.** A third of the patient cohort have an increased probability of developing symptoms of hypocalcemia with a T:iCa of ≥ 2. Additional calcium supplementation in this subset of patients may be helpful in mitigating hypocalcemia during the procedure. A majority of the patient population who have T:iCa of ≥ 2 are likely to undergo autologous stem cell collection without experiencing symptoms of hypocalcemia.