Oncologic Emergencies Related to Structural Alterations: Hyperleukocytosis

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Definition:

Hyperleukocytosis is defined as a white blood cell (WBC) count >100,000/mm$^3$ and is a major contributing factor to the development of leukostasis syndrome (A – 1). Myeloid leukemia is more often associated with leukostasis syndrome, which results in intracranial bleeding and pulmonary insufficiency secondary to increased viscosity. In patients with lymphoid leukemia, hyperleukocytosis is associated with tumor lysis syndrome and other metabolic complications. Death can be caused by hyperleukocytosis-related central nervous system (CNS) hemorrhage or thrombosis, pulmonary leukostasis (leukemic cell--lysis pneumonopathy) and metabolic alterations associated with tumor lysis. A leukocyte count greater than 300,000/mm$^3$ increases the risk of intracranial bleeding and death.

Risk Factors:

Hyperleukocytosis is most often associated with newly diagnosed leukemia. Hyperleukocytosis occurs in 9% to 13% of patients with ALL, 5% to 22 % of patients with acute non-lymphoblastic leukemia (ANLL) and almost all children and adolescents with chronic myelogenous leukemia in the chronic phase. Patients who have extramedullary organ involvement and monocytic or promyelocytic ANLL are also at risk.

Management:

The primary management goals are:

- to reduce the number of WBCs
- to prevent complications (A – 2).

These goals are accomplished through leukapheresis, exchange transfusion and chemotherapy. Aggressive intravenous hydration (3000 ml/m$^2$ daily) and other measures to reduce the risk of tumor lysis are also implemented. Other essential management measures include maintenance of adequate urinary output (1-2 ml/kg per hour), correction of metabolic abnormalities and blood product support.
Nursing Intervention:

While caring for the patient with hyperleukocytosis, the nurse should closely monitor the cardiopulmonary (A – 3) and neurologic status (A – 4) of the patient. Because of aggressive hydration and correction of metabolic consequences, the patient’s fluid status and electrolytes should be closely monitored. Nursing observations and actions should be focused toward prevention and management of circulatory or fluid overload, hyperuricemia and hyperkalemia.

Patient and Family Education:

Patients and their families should be informed about their condition and the treatments being implemented. The families should be taught to watch for symptoms that suggest the following complications of hyperleukocytosis and its treatment: fluid overload and CNS-related complications such as persistent headache, irritability, unconsolability and changes in the levels of consciousness.

Helpful Web Links:

eMedicine
Oncologic Emergencies
http://www.emedicine.com/ped/topic2590.htm

Acute Leukemia with a Very High Leukocyte Count: Confronting a Medical Emergency

Related Cure4Kids Seminars:

Seminar #386: Early Complications of Acute Leukemia: Hyperleukocytosis
Eric Lowe, MD
http://www.cure4kids.org/seminar/386

Seminar #830: Acute Complications of Childhood Leukemia
Scott Howard, MD, MS
http://www.cure4kids.org/seminar/830
APPENDIX:

A – 1 Leukostasis Syndrome

Courtesy of S. Howard, MD, St. Jude Children's Research Hospital
A – 2 Complications in Patients with Hyperleukocytosis

Metabolic Complications (refer to the document on tumor lysis syndrome for signs and symptoms) –
- Hyperkalemia
- Hyperphosphatemia
- Hypocalcemia

Acute Renal Failure – increased BUN and creatinine levels, metabolic alterations as above, oliguria or anuria, flank pain

Respiratory Complications (pulmonary leukostasis/leukemic cell--lysis pneumonopathy) –
- Chest pain
- Fever
- Shortness of breath
- Hypoxemia or hypoxia
- Lung sound decreased or absent in certain sections

Courtesy of Raul Ribeiro, MD, St. Jude Children's Research Hospital

Courtesy of Eric Lowe, MD, St. Jude Children’s Research Hospital
Hemorrhagic Complications
   CNS – headaches, changes in levels of consciousness, paresis, seizures

Gastrointestinal – Abdominal pain, tarry or bright red stools, blood in the stools
   Decreased hemoglobin and hematocrit
   Nausea, vomiting

Pulmonary – Hemoptysis, cough, shortness of breath or air hunger, adventitious lung sounds

Pericardial – Distant heart sounds, blood pressure changes, heart failure

A – 3 Related Cardiopulmonary Nursing Assessments

Fluid Overload – Increased vital signs
   Polyuria
   Increased blood pressure, pulse and respiratory rates
   Shortness of breath
   Feeling of fullness
   Weight gain or edema, especially in distal areas

Physical Assessment Findings – Increased blood pressure, pulse and respiratory rates
   Distant heart sounds, presence of S3 or S4
   Adventitious sounds – rales, decreased or absent breath sounds
   Skin color suggestive of hypoxemia
A – 4 Related Neurologic Nursing Assessments

CNS hemorrhage or thrombosis –

Subjective
  Headaches
  Nausea
  Visual changes

Objective
  Speech slurred
  Unilateral weakness or paresis
  Vomiting
  Irritability, changes in the levels of consciousness
  Sluggish pupillary reaction