

Bone Marrow Injury

Description:

Hematopoietic progenitor cells within the bone marrow can be damaged by cytotoxins, industrial chemicals, ionizing radiation, alcohol, or pharmacotherapy. Characteristically, all three major hematopoietic cell lines (erythroid, myeloid, and megakaryocytic) are affected. Depending on the intensity and duration of exposure to the offending agent, cytopenias may be transient or permanent: a standard course of chemotherapy typically induces a transient, mild to moderate reduction in hematopoiesis, whereas high-dose conditioning chemotherapy and total body irradiation preceding hematopoietic stem cell transplantation leads to complete, irreversible eradication of host hematopoiesis.

Immune-mediated mechanisms can also selectively target individual or multiple marrow lineages (e.g., in aplastic anemia or pure red cell aplasia).

Certain medications can also selectively affect neutrophilic granulocytes (e.g., metamizole-induced isolated neutropenia/agranulocytosis).

Diagnostics:

The complete blood count demonstrates a reduction across cell lines (bicytopenia or pancytopenia). A low absolute reticulocyte count confirms an underlying hypoproliferative bone marrow disorder.

Treatment:

- Immediate cessation of the suspected offending agent whenever possible.
- Guided transfusion support with packed red blood cells or platelet concentrates according to clinical guidelines.
- Infectious disease prophylaxis utilizing tailored antimicrobial regimens.
- Hematopoietic growth factors (G-CSF, erythropoietin [EPO], or TPO-RAs).
- Immunosuppressive therapy for primary immune-mediated marrow disorders (e.g., aplastic anemia).
- Allogeneic hematopoietic stem cell transplantation for severe, refractory cases.

References:

Thomas L, Labor und Diagnose, 2023, Release 5: <https://www.labor-und-diagnose.de/index.html>

Parameterkatalog des Klinischen Instituts für Labormedizin, Med.Univ.Wien und AKH Wien:

<https://www.akhwien.at/default.aspx?pid=3982>

Leistungsverzeichnis der Klinischen Chemie, Univ.Klinikum Ulm:

<https://www.uniklinik-ulm.de/zentrale-einrichtung-klinische-chemie/leistungsverzeichnis.html>