**Introduction**

In acute myeloid leukemia (AML), malignant proliferation of myeloid progenitor cells in the bone marrow occurs. AML appears mostly in adults; approx. half of the patients are over 60 years old. Men are affected slightly more often than women. The bone marrow of patients is usually clearly hypercellular, whereas the white blood cell count in peripheral blood is increased in only approx. half of the patients. By definition, the myeloblast proportion in the peripheral blood or bone marrow must be above 20%. In addition, neutrophil granulocytes are greatly reduced in the blood and bone marrow, and anemia and thrombocytopenia also appear. The classification of AML subtypes is based on the WHO classification of 2008, and in accordance with FAB. Our current survey specimen is derived from a 40-year-old patient with acute promyelocytic leukemia (APL), FAB AML M3. This type of AML exhibits the typical cytogenetic translocation t(15;17)(q22;q12). APL assumes a special position among AMLs in terms of diagnostics, prognosis, and treatment since very high remission rates (> 90%) are achieved with current treatments. The major risk for APL patients are disease-associated coagulation disorders.

**Pathogenesis and aberrations of bone marrow and peripheral blood smear**

Acute myeloid leukemia (AML) is characterized by the malignant clonal expansion of precursor cells in bone marrow myelopoiesis. This results in formation of significantly hypercellular marrow. Myeloblasts are predominantly found (>20%) which, depending on stage of maturation, may also contain granulation or Auer rods.

In the majority of AML, blast migration does not occur. Pancytopenia is commonly found in APL (FAB M3); in approx. 80% of cases the course is aleukemic. In absence of blast or promyelocyte migration into peripheral blood, morphological diagnosis can be made only in bone marrow. Therefore, with unclear pancytopenia, there is always an urgent indication for bone marrow aspiration.

If left untreated, acute myeloid leukemia quickly leads to death. Because of the absence of mature, functional neutrophils and monocytes, patients do not have functioning immune protection.

**Classification of acute myeloid leukemia per WHO 2008**

Compared to the FAB classification (French-American-British) the WHO classification applies additional criteria. These are genetic characteristics of the leukemia cells, the presence of multilineage dysplasia, and the medical history of the patient regarding pre-existing conditions and previous cytostatic treatments.

To simplify, 4 types of AML are distinguished:
1. Genetically defined AML with specific chromosomal aberrations or mutations
2. AML with dysplasia in at least two lineages
3. Treatment-related AML/MDS
4. AML not otherwise classified

Diagnostics:
Course of AML therapy

1. Induction therapy
   - with cytostatic combinations
     Goal: achieving a complete remission (blast content <5% in bone marrow)

2. Consolidation and potential maintenance therapy
   - cytostatic therapy
     Objective: stabilization, elimination of last remaining leukemia cells - minimal residual disease (MRD)
     - Potential allogeneic bone marrow or stem cell transplantation.

Examples of cell morphology in acute myeloid leukemia

AML FAB M0
Survey specimen MQZH 2011-04 H3B

a - d) myeloblasts without maturation characters (no granules)

WHO: AML with multilineage dysplasia with prior hematologic neoplasia (CMML)
Survey specimen MQZH 2010-03 H3B

e - f) polychromatic erythroblasts
g) myeloblast
h) atypical monocyte with nucleus loss and erythroblast with karyorrhexis (nucleus fragmentation)

WHO: AML - APL Akute Promyelozytenleukämie Translokation t(15;17), AML FAB M3
Survey specimen MQZH 2014-01 H3B und 2007-04 H3B

i - k) atypical promyelocytes with Auer rods
j - k) saddle-shaped nucleus
l) atypical promyelocyte from MQ 2007-4 H3B with bundles of Auer rods (-Faggot Cell-)

AML FAB M1
Survey specimen MQZH 2006-04 H3B

m) myeloblast with single Auer rod
n) myeloblast with weak azur granulation
o) ungranulated myeloblast with irregular nuclear contours and 1 nucleolus

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