Difference Between MDS and Leukemia

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Key Difference – MDS vs Leukemia

Leukemia can be defined as the accumulation of abnormal malignant monoclonal white blood cells in the bone marrow. Myelodysplastic syndromes describe a set of acquired bone marrow disorders that are due to the defects in the stem cells. **Leukemia is a malignancy, but myelodysplasia is a precursor lesion that can undergo malignant transformation.** This is the key difference between MDS and leukemia.

What is MDS?

Myelodysplastic syndromes (MDS) describe a set of acquired bone marrow disorders that are due to the defects in the stem cells. The characteristic feature of these disorders is the increasing bone marrow failure with both quantitative and qualitative abnormalities in the all the myeloid cell lineages (i.e. red blood cells, white blood cells, and platelets). Somatic point mutations in genes such as TP53 and E2H2 are believed to be the underlying cause of this condition.

Clinical Features

MDS is usually seen among elderly people. The most frequently observed manifestations are,

- Anemia
- Bleeding due to pancytopenia
- Neutropenia
- Monocytosis
- Thrombocytopenia

These features can be seen either individually or in conjunction with each other.

In spite of the presence of pancytopenia, the bone marrow shows increased cellularity. Dyserythropoiesis is a common complication. Granulocyte precursors and megakaryocytes have an abnormal morphology.

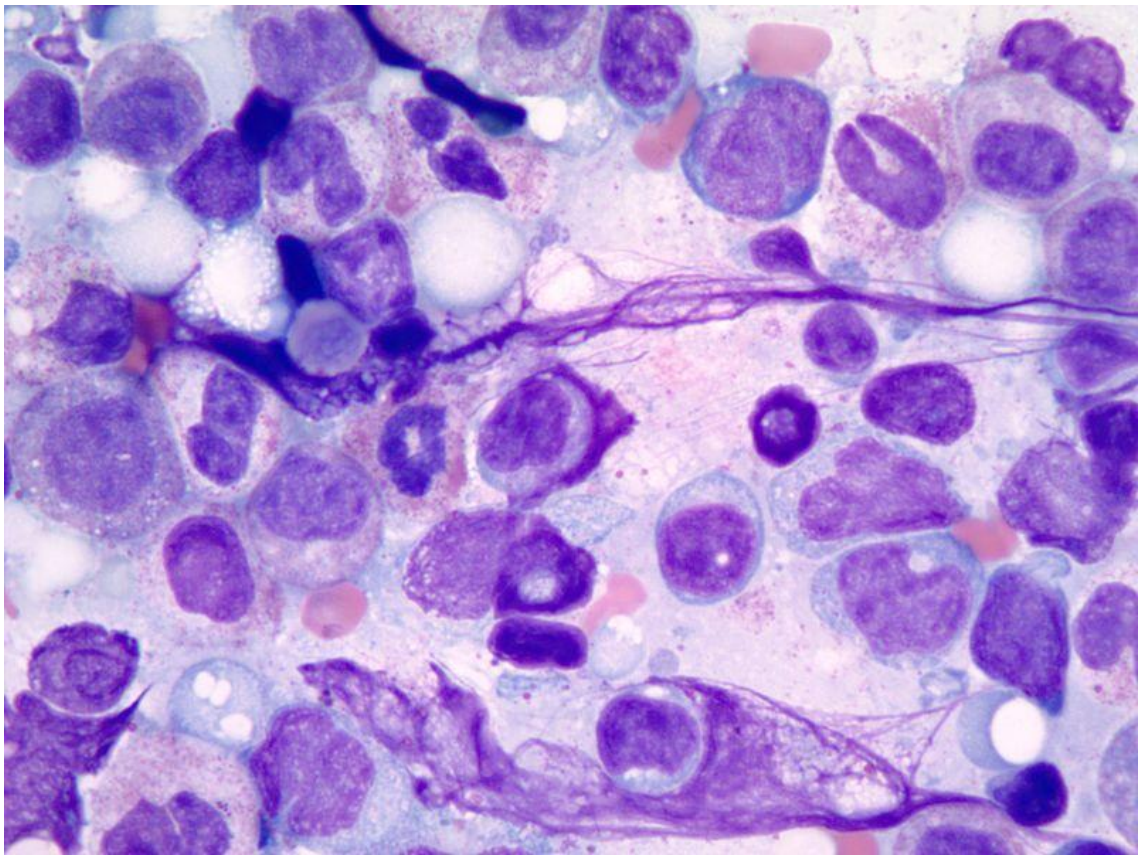

Figure 01: Myelodysplasia

WHO Classification of MDS

Disease	Marrow blasts (%)	Clinical presentation	Cytogenic abnormalities (%)
Refractory anemia	<5	Anemia	25
Refractory anemia with ring sideroblasts	<5	Anemia, > 15 % ringed sideroblasts in the red cell precursors	5-20
MDS with isolated del	<5	Anemia, normal platelets	100
Refractory cytopenia with multilineage dysplasia	<5	Bicytopnenia or pancytopenia	50
Refractory anemia with	5-9	Cytopenia with peripheral	30-50

excess blasts-1		blood blasts (<5%)	
Refractory anemia with excess blasts-1	10-19	Cytopenia with peripheral blood blasts	50-70
Myelodysplastic syndrome, unclassified	<5	Neutropenia and thrombocytopenia	50

Investigations

- Examination of blood and bone marrow cells obtained from a blood sample and a bone marrow biopsy.

Management

Patients with <5% of blasts in the bone marrow undergo a conservative management that includes,

- Red cell and platelets transfusions
- Antibiotics for infection

If the percentage of blasts in the bone marrow is >5% the management is through the following procedures,

- Supportive care to minimize the risk of getting other complications
- Chemotherapy
- Administration of lenalidomide
- Bone marrow transplantation

What is Leukemia?

Leukemia can be defined as the accumulation of abnormal malignant monoclonal white blood cells in the bone marrow. This results in bone marrow failure causing anemia, neutropenia, and thrombocytopenia. Normally, the proportion of blast cells in the adult bone marrow is less than 5%. But in the leukemic bone marrow, this proportion is over 20%.

There are 4 basic subtypes of leukemia as,

- Acute myeloid leukemia(AML)
- Acute lymphoblastic leukemia (ALL)

- Chronic myeloid leukemia(AML)
- Chronic lymphocytic leukemia (CLL)

These diseases are relatively uncommon and the annual incidence of them is 10/1000000. Usually, leukemia can occur at any age. But ALL is predominantly seen in the childhood whereas CLL frequently occurs in elderly. Etiological agents causing leukemia include radiation, viruses, cytotoxic agents, immunosuppression and genetic factors. Diagnosis of the disease can be done by the examination of a stained slide of peripheral blood and bone marrow. For sub-classification and prognostication, immunophenotyping, cytogenetics, and molecular genetics are essential.

Acute Leukemia

The incidence of acute leukemia increases with advancing age. The median age of presentation for acute myeloblastic leukemia is 65 years. Acute leukemia may arise de novo or due to prior cytotoxic chemotherapy or myelodysplasia. Acute lymphoblastic leukemia has a lower median age of presentation. It is the most common malignancy in the childhood.

Clinical Features of ALL

- Breathlessness and fatigue
- Bleeding and bruising
- Infections
- Headache/confusion
- Bone pain
- Hepatosplenomegaly/lymphadenopathy

Clinical Features of AML

- Gum hypertrophy
- Violaceous skin deposits
- Fatigue and breathlessness
- Infections
- Bleeding and bruising
- Hepatosplenomegaly
- Lymphadenopathy
- Testicular enlargement

Investigations

For Confirmation of Diagnosis

- Blood Count – Platelets and hemoglobin are usually low; White blood cell count is normally raised.
- Blood Film – Lineage of the disease can be identified by observing the blast cells. Auer rods can be seen in AML.
- Bone marrow aspiration – Reduced erythropoiesis, reduced megakaryocytes, and increased cellularity are the indicators to look for.
- Chest X-ray
- Cerebrospinal fluid examination
- Coagulation profile

For Planning Therapy

- Serum urate and liver biochemistry
- Electrocardiography/echocardiogram
- HLA type
- Check HBV status

Management

Untreated acute leukemia is usually fatal. But with palliative treatment, the lifespan can be extended. Curative treatments can be sometimes successful. Failure can be due to relapse of the disease or due to complications of the therapy or because of the nonresponsive nature of the disease. In ALL, remission induction can be done with combination chemotherapy of Vincristine. For high-risk patients, allogeneic stem cell transplantation can be performed.

Chronic Myeloid Leukemia

CML is a member of the family of myeloproliferative neoplasms which exclusively occur in adults. It is defined by the presence of the Philadelphia chromosome and has a more slowly progressive course than acute leukemia.

Clinical Features

- Symptomatic anemia
- Abdominal discomfort
- Weight loss
- Headache
- Bruising and bleeding
- Lymphadenopathy

Investigations

- Blood counts – Hemoglobin is low or normal. Platelets are low, normal or raised. WBC is raised.
- Presence of mature myeloid precursors in blood film
- Increased cellularity with increased myeloid precursors in bone marrow aspirate.

Management

First line drug in the treatment of CML is Imatinib(Glivec), which is a tyrosine kinase inhibitor. Second line treatments include chemotherapy with hydroxyurea, alpha interferon, and allogeneic stem cell transplantation.

Chronic Lymphocytic Leukemia

CLL is the most common leukemia that mostly occurs in old age. It is caused due to clonal expansion of small B lymphocytes.

Clinical Features

- Asymptomatic lymphocytosis
- Lymphadenopathy
- Marrow failure
- Hepatosplenomegaly
- B-symptoms

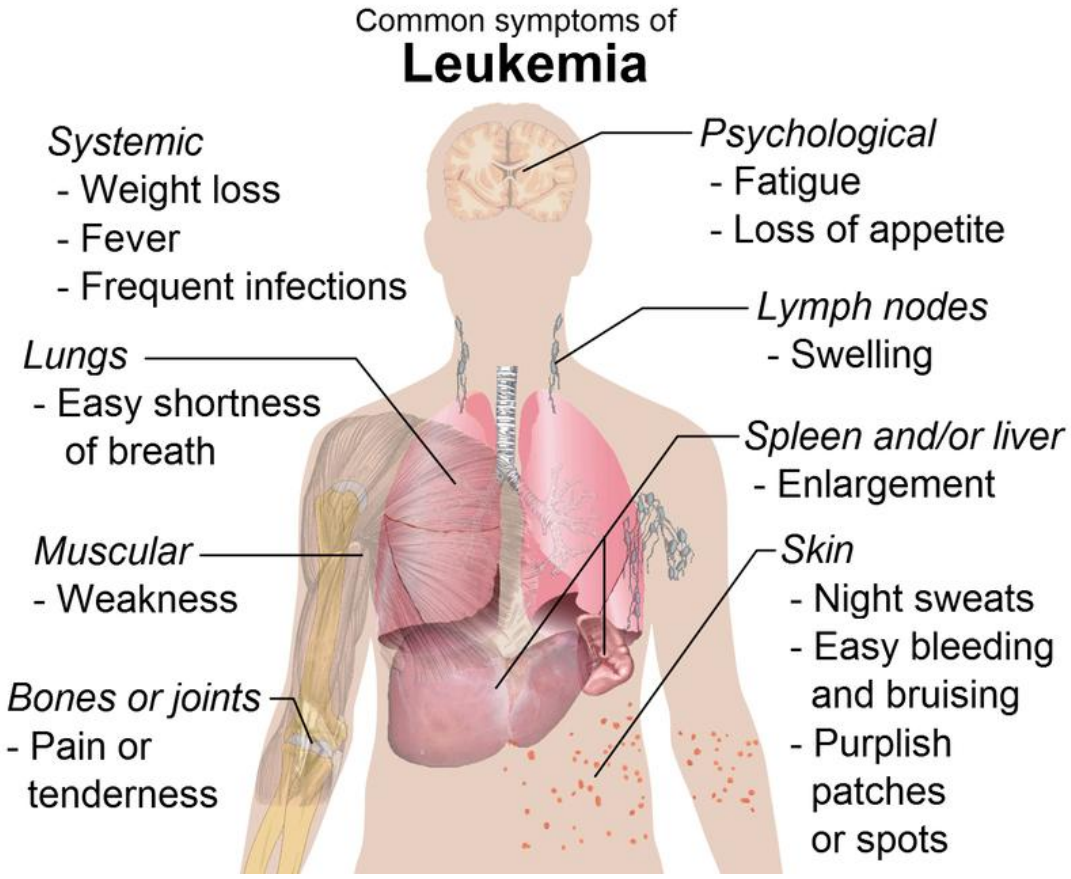

Figure 02: Common Symptoms of Leukemia

Investigations

- Very high white blood cell levels can be seen in blood counts
- Smudge cells can be seen in blood film

Management

Treatment is given to troublesome organomegaly, hemolytic episodes, and bone marrow suppression. Rituximab in combination with Fludarabine and cyclophosphamide show a dramatic response rate.

What are the Similarities Between MDS and Leukemia?

- Both are hematological disorders that are due to the abnormalities in the bone marrows.

- The examination of a blood film and bone marrow biopsy are carried out for the diagnosis of both conditions

What is the Difference Between MDS and Leukemia?

MDS vs Leukemia	
Myelodysplastic syndromes describe a set of acquired bone marrow disorders that are due to the defects in the stem cells.	Leukemia can be defined as the accumulation of abnormal malignant monoclonal white blood cells in the bone marrow.
Type	
This is a precursor lesion that has the potential of a malignant transformation.	This is a malignancy.
Incidence	
This is usually seen among elderly people.	This can be seen in any age group but adults are more affected by this condition than the children.
Clinical Picture	
The common clinical features are, · Anemia · Bleeding due to pancytopenia · Neutropenia · Monocytosis · Thrombocytopenia	Frequently seen clinical features of leukemia are, · Gum hypertrophy · Violaceous skin deposits · Fatigue and breathlessness · Headache/confusion · Infections · Bone pain

	· Bleeding and bruising · Hepatosplenomegaly · Testicular enlargement · Lymphadenopathy
Management	
Patients with <5% of blasts in the bone marrow undergo a conservative management that includes, · Red cell and platelets transfusions · Antibiotics for infection If the percentage of blasts in the bone marrow is >5% the management is through the following procedures, · Supportive care to minimize the risk of getting other complications · Chemotherapy · Administration of lenalidomide Bone marrow transplantation	The management varies according to the type of leukemia that the patient has. Chemotherapy plays a major role in the treatment of leukemia.

Summary – MDS vs Leukemia

Myelodysplastic syndromes describe a set of acquired bone marrow disorders that are due to the defects in the stem cells whereas Leukemia is the accumulation of abnormal malignant monoclonal white blood cells in the bone marrow. Myelodysplasia is a precursor lesion that can undergo malignant transformation

but leukemia is a malignancy. This is the main difference between MDS and leukemia.

References:

1. Kumar, Parveen J., and Michael L. Clark. Kumar & Clark clinical medicine. Edinburgh: W.B. Saunders, 2009.

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APA: Difference Between MDS and Leukemia. (2017, October 16). Retrieved (date), from http://www.differencebetween.com/ difference-between-mds-and-vs-leukemia/

MLA: "Difference Between MDS and Leukemia" Difference Between.Com. 16. October 2017. Web.

Chicago: "Difference Between MDS and Leukemia ." Difference Between.Com. http://www.differencebetween.com/ difference-between-mds-and-vs-leukemia/ (accessed [date]).