Multiple Myeloma Pathophysiology

Multiple myelomas are B cell proliferations with neoplastic plasma cells that secrete a monoclonal Ig or Ig fragment as opposed to polyclonal Igs seen in an immune response. A monoclonal Ig identified in blood is referred to as an M component that can be detected via serum protein electrophoresis. Polyclonal IgG appears as a broad band as opposed to a sharp protein bar in monoclonal Ig. The most common monoclonal Ig is IgG in 55% of patients followed by IgA in 25% of cases. Commonly the high level of M proteins causes red cells on peripheral blood smears to stack on one another in linear arrays like poker chips, a finding referred to as rouleaux formation. Unlike normal plasma cells where the production of light chains and heavy chains are tightly balanced, neoplastic plasma cells often synthesize an excess of either light or heavy chains. Free light chains are small enough to be excreted in the urine, where they can be detected and are called Bence-Jones proteins. Clinical features of multiple myeloma include bone resorption, which often leads to pathologic fractures and chronic pain. Increased bone resorption also leads to hypercalcemia. Decreased production of normal immunoglobulins lead to increased susceptibility to bacterial infections. 50% of patients also suffer from renal failure due to a combination of Bence Jones proteinuria because the light chains are toxic to renal tubular epithelial cells and amyloidosis, which can exacerbate renal dysfunction.



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Pathophysiology

Monoclonal Plasma Cell Cancer

Plasma-TV with plasma cell

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Clock Face Chromatin

Clock face in plasma cell

Plasma cells are large lymphocytes with a high nucleus to cytoplasm ratio and a characteristic appearance on light microscopy. These cells have a basophilic cytoplasm and an eccentric nucleus with chromatin in a clock face arrangement.

Diagnosis

M Spike on Protein Electrophoresis

M Spike on Electrophoresis-cards

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Increased IgG and IgA

Up-arrow (IgG) Gold-Goblin and (IgA) Apple-Goblin

The most common monoclonal Ig is IgG in 55% of patients followed by IgA in 25% of cases.

Fried Egg Appearance (BM Biopsy)

Fried egg

Bone marrow core biopsy sometimes demonstrates an abundant clear to pale cytoplasm with a fried egg appearance.

Rouleaux Formation

Rolex-watch

The high level of M proteins cause red cells on peripheral blood smears to stack on one another in linear arrays like poker chips, a finding referred to as Rouleaux formation.

Stacked RBC's

Stacked RBC's

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Bence Jones Protein

Benz Jones

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