**Multiple Myeloma**
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 **Overview** Multiple myeloma is a cancer of plasma cells. It is characterized by the clonal proliferation of malignant plasma cells within the bone marrow. Normal plasma cells are found in bone marrow and are an integral part of the body’s immune system. The B cells that help fight infections mature and turn into plasma cells. Plasma cells are what create the antibodies and immunoglobulins. When these plasma cells grow out of control and become cancerous, it is called multiple myeloma. Instead of making regular antibodies, the cancerous plasma cells create abnormal antibody known as monoclonal immunoglobulin or monoclonal protein. Eventually the abnormal cells created in the bone marrow overtake healthy blood cells dis-allowing the creation of immune-fighting cells. Instead they create harmful proteins that damage the kidneys and other parts of the body.

**Etiology**
Genetic abnormalities that manifest in tumor plasma cells play a major role in the pathogenesis of myeloma. Multiple myeloma evolves from a pre-malignant condition known as monoclonal gammopathy of undetermined significance or MGUS. Although MGUS is mostly asymptotic and usually discovered by accident, studies show that MGUS almost always precedes multiple myeloma.

**Clinical Presentation**
Multiple myeloma is hard to detect early. Many people don’t have symptoms until the condition worsens. The symptoms are bone pain, feeling sick, no appetite, feeling tired, losing a lot of weight, and frequently getting sick. When the clinician does further testing, multiple myeloma presents with a low red blood cell count, higher than normal protein level in blood and urine (specifically the monoclonal (M) protein), high blood calcium level, poor functioning kidneys, 60% more blood plasma cells in the bone marrow, a positive biopsy indicating multiple myeloma, and bone irregularities. The bone lesions manifest as lytic punched out lesions can be seen from x-rays and other scans as well as osteoporosis.

**Demographic** This cancer mostly affects the elderly. There is a higher prevalence of MGUS in black people and for that reason, multiple myeloma is twice as common in blacks as compared to whites. In western countries, the incidence rate is 5.6 cases per 100,000 people. There is a slight male predominance. The median age of those who are diagnosed is 70 years old. 37% of patients are younger than 65, 26% are between the ages of 65 and 74 years old, and 37% are 75 years of age or older.

**Biopsy / Histology / Radiographs**
A bone marrow biopsy and aspiration takes place to confirm the presence of multiple myeloma. A needle is inserted to the back of the pelvic bone and the syringe is used to remove a small amount of liquid from the bone marrow. Once in the lab, the aspiration from the bone marrow is observed under a microscope and the appearance, size, shape, how the cells are arranged, and how many of them present are observed. A sample of the aspiration can be sent for further testing such as a immunohistochemistry and flow cytometry. These tests use special proteins to stain specific cells to help identify myeloma cells. Chromosome analyses, including karyotype and fluorescent in situ hybridization (also known as FISH) are other tests that can help identify myeloma cells. These tests evaluate chromosomes in bone marrow cells and myeloma cells. They observe whether these cells have too few chromosomes, too many, abnormalities, or deletions. Other biopsies used to confirm the presence of multiple myeloma are core needle biopsy and fine needle aspiration biopsy. Image testing is used to observe the bone in patients who have and may have multiple myeloma. X-rays are used to observe bone destruction caused by multiple myeloma. In an x-ray, the bone looks like there are lytic punched out lesions in the bone which will eventually lead to fractures. Severe osteoporosis can also be present. A CT scan can observe bone as well as organs. An MRI, echocardiogram, and PET scan can be used to look at the bone marrow in patients with multiple myeloma. Seeing osteolytic bone lesions on the image tests can confirm the multiple myeloma diagnosis.

**Differential Diagnosis**
The major differential diagnosis of multiple myeloma includes MGUS, smoldering multiple myeloma, immunoglobulin light chain amyloidosis, and solitary plasmacytoma.

**Treatment**
Treatment of multiple myeloma involves chemotherapy, radiation, and stem cell transplants to those who are eligible. Advances in therapy have resulted a great improvement of over-all survival. New drugs introduced in the last few years include carfilzomib, pomalidomide, and panobinostat. In addition, monoclonal antibodies such as elotuzumab and daratumumab have shown promising clinical activity.

**Prognosis**
The median survival for patients with multiple myeloma is 5-7 years but there is a major variation in survival depending on the stage of multiple myeloma (also known as the tumor burden), the host factors of the patient, the biology of the specific multiple myeloma the patient presents with, and the patient’s response to treatment. A cytogenic bone marrow biopsy can help predict the person’s prognosis.

**Professional Relevance**
 A patient with multiple myeloma could feel discomfort in their bones so we should always make sure that the position that there in during dental treatment is comfortable for them. Multiple myeloma can involve the jaw. The jaw may appear to look like there is chronic generalized bone loss with osteolytic lesions. Presence of multiple myeloma lesions in the jaw can also look like periodontitis. Its important for dental professionals to know the unique circumstances that the patient is being faced with and how it affects their oral health, especially when it comes to home care instructions because their oral condition may not be getting better due to the bone loss and inability to create antibodies no matter how much they follow our home care instructions. We should be understanding of this. Because of the bone loss, periodontitis, and inability to create normal antibodies especially at the later stages of the disease, patients will experience tooth mobility, inflammation, and bleeding. A treatment plan must be devised to ensure that the patient is getting the best and most comfortable treatment for their unique situation.

**Citations**

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