**Multiple Myeloma**
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**Overview**
Multiple myeloma are cancerous plasma cell tumors that mainly develop in the bone. This includes a massive proliferation of plasma cells that can occur anywhere in the entire skeleton. Bone marrow is taken over by the plasma cells, which can result in the dissolving, weakening, and even breaking of bones. (1)

**Etiology**
The cause of multiple myeloma has still not been defined. Scientists have been researching how specific changes in DNA can lead to a cancerous manifestation of plasma cells. There are genes in DNA responsible for promoting cell division called oncogenes, but also genes that slow down the cell division process called tumor suppressor genes. Mutations in oncogenes are most often found with myeloma cells within the bone marrow, while the spread of this cancer to other tissues is in relation to tumor suppressor genes. Dentritic cells are cells in the bone marrow that release the hormone interleukin-6(IL-6). This hormone stimulates plasma cell growth, however if the hormone is produced in excess, there will be a likelihood in producing plasma cell tumors. (1)

**Clinical Presentation**
Patients who suffer from multiple myeloma usually complain of back or bone pain, and fatigue. These patients usually have reduced blood counts, which can result in anemia. Patients are diagnosed with the condition if at least 10% of cells in the bone marrow are plasma cells, along with high blood calcium levels, poor kidney function, holes in bone as a result from tumor growth, and abnormal area of bone, and bone marrow, seen through MRI scan. If 60% of cells in the bone marrow are plasma cells, this would be an automatic diagnosis of multiple myeloma. Oral and maxillofacial manifestations include osteolytic lesions, and may be the first sign of the disease. More than 30 % of patients develop osteolytic lesions in the jaw, which are more prevalent in the mandible than the maxilla, specifically the posterior teeth area, ramus and condylar process. The patient usually experiences pain, swelling, tumor-like formation, and tooth mobility. Amyloidosis may be an additional complication of multiple myeloma, occurring in 6% to 15% of patients, in which oral manifestations may be indicators. (1,3)

**Demographic**

Men are more likely than women to develop multiple myeloma. For reasons unknown, the condition is also found more in African Americans, than Caucasian Americans and affects older patients in the 6th decade. Genetics is another risk factor, in that if one sibling or parent has had myeloma, they are 4 times as likely to develop the cancer. Obesity seems to be another risk factor of multiple myeloma. (1,3)

**Biopsy / Histology / Radiographs**
A fine needle bone marrow aspiration biopsy can be taken to withdraw a small amount of bone and marrow. This will help determine the size and shape of cells, as well as detect if myeloma cells are present. This biopsy allows of the use of the aspirate to be ran through further tests which include; immunohistochemistry, flow cytometry, and chromosome analysis.(4)

Histology consists of “round plasma cells with an eccentric nucleus, prominent nucleolus, and clock face organization of chromatin”. There is a clear area known as the “Hoffa clear zone” next to the nucleus. (4) Radiographically defined by ill-defined margins, punched out osteolytic lesions, and multiple radiolucencies with varying sizes. It can also exhibit loss of density in bone, osteoporotic alterations, and bone with alteration.(3)

**Differential Diagnosis**
Multiple myeloma can be mistaken for it’s symptoms and not the sum of them as a whole. Osteoporosis, anemia, hypercalcemia, renal insufficiency and kidney disease are all characteristic of multiple myeloma. (1,2,3)

**Treatment**
Based on the stage and progression of the disease, there are several options in treating multiple myeloma. This includes; chemotherapy, biphosphonates, radiation, surgery, stem cell transplant, and plasmapheresis. Asymptomatic multiple myeloma does not require treatment. Symptomatic multiple myeloma is usually treated with Autologous Stem Cell Transplantation (ASCT). This involves the removal and storage of the patient’s own stem cells during the period in which the patient is receiving high dose chemotherapy, and also radiation if needed, to eliminate the cancer. Once the cancer is eliminated, the patient’s stored stem cells are infused back into the bloodstream. This procedure is the standard of treatment for the condition, however most doctors recommend two ASCT’s 6 to 12 months apart because of cancer recurrence. Plasmapheresis involves the removal of myeloma protein from the blood, which can assist in blood circulation because of an increased amount of myeloma protein buildup. Even though this reduces the protein levels, relieving symptoms, it does not kill the cancer. As a result, plasmapheresis is followed by chemotherapy. Biphosphonates are used to slow down the bone breakdown process, enabling bones to stay strong. Pamidronate and zoledronic acid are the standards in biphosphonates and are administered intravenously. Biphosphonates assists in the prevention of bone damage, but it does have a rare side effect called osteonecrosis of the jaw, which usually occurs after dental extraction or surgery of the jaw. This side effect is characterized by part of the jaw dying, which results in jaw infections, open sores in the oral cavity which do not heal, and on occasion, tooth loss. It is recommended that these patients requiring biphosphonates treatment have a dental examination beforehand. (1,2,3)

**Prognosis**
Overall survival is associated with the stage in which the disease is in and if secondary factors play a role. Such factors can include renal disease and hypercalcemia. The median survival from diagnosis is 3 years, with shortest survival in patients with renal failure. In regards to staging, the stage 1 survival rate is 62 months, stage 2 is 44 months, and stage 3 is 29 months.(1)

**Professional Relevance**
As dental hygienists, we encounter patients with different conditions that manifest themselves similarly in the oral cavity. It is the responsibility of the dental hygienist to not confuse an oral manifestation with another condition, as this can lead to misdiagnosis and further complications for the patient and clinician. It is imperative to carry out a detailed medical history, which should include medical conditions, medications, past dental history, including past oral infections. During the assessment phase of care, it is important to document petechiae, bruising not caused by trauma, gingival hemorrhage, tooth mobility and migration, and any facial pain, as these are indicative of multiple myeloma. One must also keep in mind that dental and periodontal diseases are risk factors for osteonecrosis of the jaw. Evaluation of radiographs for evidence of osteolytic lesions is necessary. If the patient is aware of their condition, we must educate and instruct the patient to implement proper oral hygiene, as this will reduce the risk of infection. Therapeutic treatment should include antibacterial mouthrinses, scaling, and broad spectrum antibiotics, but should always be done after consultation with their specialist. It is essential to take into consideration the increased risk of infection, anemia and osteonecrosis on the jaw, and the bleeding tendency of these patients with multiple myeloma.(3)

**Bibliography**

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