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# **Multiple Myeloma**

## ****What is Multiple Myeloma?****

Multiple myeloma is cancer that begins in the plasma cells. Plasma cells are a type of white blood cell found mainly in bone marrow throughout the body. Multiple myeloma develops when there is a build up of abnormal plasma cells in the bone marrow. The build up of these cells makes it difficulty for other blood cells in the bone marrow to develop and work normally. Myeloma cells can form tumors in bones (plasmacytomas). When many tumors are found in the bones, the condition is called multiple myeloma (MM). An estimated 2,900 new cases of multiple myeloma are diagnosed each year. The average age at diagnosis is 62 years.

## ****What risk factors cause this cancer?****

Many risk factors for multiple myeloma have been identified. While multiple myeloma can develop in people without these risk factors, common risk factors for this form of cancer include:

* Family history of multiple myeloma
* Being overweight or obese
* Occupational exposures (pesticides, chemical exposures)
* Autoimmune conditions (rheumatoid arthritis, polymyalgia rheumatica, ankylosing spondylitis)
* Viral infections (hepatitis B and C, HIV/AIDS)

## What are the Clinical Manifestations?

Multiple myeloma may not cause any signs or symptoms early in the course of the disease. Once tumors form in the bone marrow, signs and symptoms will begin to appear. The most common signs and symptoms of multiple myeloma are referred to as CRAB (high blood **c**alcium level, **r**enal insufficiency, **a**nemia, **b**one disease). Some common initial signs and symptoms include:

* Bone pain (often related to fracture) in the back, front of the best, ribs, hips, or skull
* Bone weakness (this can lead to osteoporosis)
* Unusual fatigue
* Feeling of overall weakness
* Shortness of breath
* Dizziness
* Paleness of skin
* Frequent infections
* Fever
* Increased bleeding (nose bleeds, bleeding gums)
* Extreme thirst
* Frequent urination
* Weight loss

## ****What are the Treatment Options?****

Multiple myeloma cannot be cured. Treatment goals are to reduce symptoms and slow the progression of the disease. Each case of multiple myeloma is unique and requires a personalized medical treatment plan. The main types of treatment for multiple myeloma include:

* Targeted therapy:use of medication to target specific molecules on the surface of cancer cells. These medications stop the growth of cancer cells while causing limited harm to other healthy cells. This is a main treatment approach for multiple myeloma.
* Chemotherapy: systemic treatment to kill cancer cells and prevent them from dividing. Chemotherapy drugs can be taken by mouth or given in a vein or muscle. They kill cancer cells and normal healthy cells.
* Stem cell transplant: replacement of damaged or destroyed cells with new healthy blood forming stem cells. Stem cell transplants can be autologous (the patient’s own stem cells are removed and transplanted-this is standard for individuals with multiple myeloma), or allogenic (patient gets blood forming stem cells from another person). Allogenic transplants are a higher risk than autologous transplants, however, they are thought to be more effective at fighting the cancer.
* Radiation therapy: doses of high-energy rays used to kill cancer cells. Radiation is often used to treat areas of bone damaged by myeloma. It can also be used to prevent bone fractures, adjuvant post fractures and control symptoms in advanced MM.
* Surgery:used to remove single plasmacytomas. For multiple myeloma it can also be used to treat spinal cord compression, prophylactically to prevent bone fracture or post fractures for bone stability (ex. kyphoplasty, vertebroplasty).

## ****What are the Possible Side Effects of Treatment?****

1. Targeted therapy:

* The side effects of targeted therapy depend on the type of drug or combination of drugs used, the dose and, how it is administered. Side effects can include:
  + Drowsiness and fatigue
  + Nerve pain, including peripheral neuropathy
  + Low white blood cell count
  + Infection
  + Shortness of breath
  + Skin rash
  + Blood clots
  + Birth defects

2. Radiation Therapy:

* Skin changes (redness or blistering and peeling)
* Fatigue
* Nausea
* Low blood counts (this can lead to infection, easy bruising and bleeding, and anemia)

3. Chemotherapy:

* Hair loss
* Mouth sores
* Loss of appetite
* Nausea and vomiting
* Low blood counts (this can lead to infection, easy bruising and bleeding, and anemia)
* Infection
* Fatigue
* Difficulty breathing

4. Stem Cell Transplant:

* The early side effects from stem cell transplants are similar to chemotherapy and radiation therapy, however, tend to be more severe
* Low blood count is the most serious side effect. This can lead to risk of serious infections and bleeding.
* Allogenic transplants have the risk of graft-versus-host disease. This occurs when the new immune cells see the patient's tissues as foreign and attack them. When this occurs it is life threatening.

5. Surgery:

* Pain
* Infection
* Swelling
* Wound separation
* Blood clots

## ****What is the role of Physiotherapy and Rehab?****

The goals of rehabilitation depend on the extent of the disease and the treatment that a patient has received. Physiotherapy can help manage the side effects of treatment and improve functional levels for individuals with multiple myeloma.  
   
Physiotherapy for Individuals with Multiple Myeloma:

* Falls Assessment and Prevention Programs
  + Musculoskeletal symptoms reported by individuals with MM include bone pain, skeletal muscle wasting, and generalized weakness. These symptoms and side effects put the individual at an increased risk of falls.
  + Kyphotic posture is an independent risk factor for falls in older adults, thus postural awareness is integral not only to prevent falls but also linked to vertebral compression fractures.
  + Physiotherapists should implement falls assessment, along with postural assessments in order to provide prevention programs to decrease risk of pathological fracture, maintain function, improve posture and quality of life.
  + Falls assessments strategies can include many common outcome assessments including the Berg Balance Scale, Timed Up and Go, and simple balance tests.
* Education
  + Basic instructions on comfortable sleeping and sitting positions and safe lifting and bending techniques should be given to individuals with MM so that they can safely continue with activities of daily living without increasing risk of musculoskeletal injury
  + During end-of-life, physiotherapists can provide recommendations on home adaptations to allow the individual to remain as independent and safe as possible in order to maintain QOL
* Physical Activity
  + Regular physical activity and exercise programs are effect in improving muscle wasting, cancer related fatigue, and quality of life for individuals with MM.
  + Prior to beginning an exercise program, individuals with MM should undergo medical screening, a physical examination, and have a bone scan. The results of these examinations should be considered when designing an exercise program. Basic recommendations include:
  + Aerobic Exercise:
    - Walking (treadmill or outdoors) and cycling is most commonly used in the literature. Postural and biomechanical awareness should be reviewed with cycling secondary to spinal position.
    - Should be performed 4-5 days a week for 15-30 minutes at a moderate intensity (50-70% of HR max or 11-16 on the RPE scale).
  + Resistance Exercise:
    - Resistance exercises using body weight or resistance bands is most commonly used in the literature.
    - Examples of exercises to perform include knee flexion/extension exercise, bicep/triceps curls, chair stands, and upright rows.
    - Should perform 5-8 repetitions, 3 days per week
  + Flexibility Exercise:
    - Static prolonged stretches for 10-30 seconds should be performed 3 days per week for all major muscle groups

New Areas of Research: Exercise***during***Stem Cell Transplant:

* Research is now looking into the feasibility and effectiveness of exercise interventions for individuals receiving stem cell transplantation.
* A recent systematic review and meta-analysis found that exercise during hospitalization for stem cell transplantation led to a higher quality of life and less fatigue in patients with allogenic stem cell transplants at the moment of discharge from hospital.

Further research is needed in this area to determine the best timing of these exercise interventions and the most suitable parameters

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