Multiple myeloma is a cancer that is formed in the white blood cells, specifically the plasma cells. Instead of fighting infections and making antibodies the plasma cells in multiple myeloma are cancerous and build up in the bone marrow. In this disease there is also an overproduction of paraproteins which are nonfunctional antibodies. These paraproteins are left in various tissues causing renal impairment, which is the inability of the kidney to filter blood. Paraproteins are also left in other organs like the heart. This type of cancer is mostly in older adults, sometimes in middle aged adults, and never seen in children. It is also more common in black people rather than Asian or Caucasian people.

Treatments can be divided into two categories: intensive and non-intensive. A combination of steroids and medicines that change the immune system along with a stem cell transplant. The non intensive treatment is using the same drugs but with lower doses and no stem cell transplant. Multiple myeloma is said to be a very treatable cancer, but it always remains incurable. Most patients will survive a year, but 10-year survival is only achieved by 10% of patients.

Genetic analysis of bone marrow samples has been able to offer both diagnostic and prognostic information. Multiple myeloma is usually a heterogenous disease, meaning it has many causes instead of the same cause for all cases. The genetic abnormalities will be used to inform treatment decisions like which patients should be given more aggressive therapy.

Cytogenetics is used to look for changes in chromosomes like chromosomes that are broken, missing, rearranged or if there is an extra. The cytogenetic analysis in MM is done during metaphase like all cytogenetic analysis. Cell-cycle arrest is induced allowing samples to be harvested and stained to then be karyotyped. This analysis can give a whole genome analysis. It is time consuming, slow, and expensive. The FISH technique involves an indirect analysis of chromosomes using fluorescent labelled target DNA. This technique can be done during metaphase or interphase. This is still problematic because the number of plasma cells in patients with MM is low. Of course, there are other ways that are used to look at genes and they all have their pros and cons.

From all the different genetic research it allows doctors to choose which treatment would be the most effective and appropriate for the patient. There is a plethora of different genetic technologies that can provide information of the patients genes and where the root of the problem for MM is. As more research and techniques come out genetic testing is more accessible and accurate.

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