Effects of Osteosarcoma in Bone

Department of Biology, University of Alaska Fairbanks

Damian Casillas

Human Anatomy and Physiology I

How does Osteosarcoma interfere with the maintenance of bone? The big questions for this paper: What is Osteosarcoma? How is bone maintained? What cells does Osteosarcoma affect? These are some of the questions i will be answering in this paper.

 Osteosarcoma is a bone cancer, but before we dive into Osteosarcoma, what is a Cancer? Cancer is a disease cause by cells multiplying out of control. These rogue cells can form a mass known as a tumor; a tumor can be cancerous or benign. A benign tumor is a tumor that can grow but won’t spread to other organs or tissues through the bloodstream and/or the lymphatic system. A cancerous tumor is malignant, meaning it can continue to grow and spread to other surrounding organs and/or tissues through one’s bloodstream or lymphatic system; this process of spreading is called metastasis. Tumors aren’t the only form of cancer, doctors separate cancer into types based on where it starts. The four types of cancer are: Carcinomas, Sarcomas, Leukemias, and Lymphomas. Carcinomas begin on the skin or the surface tissue of organs and glands, usually forming solid tumors. Forms of carcinomas include: prostate cancer, breast cancer, lung cancer, and colorectal cancer. The next form of cancer are Sarcomas. Sarcomas begin in connective tissues, these tissues are connective tissue proper, bone, blood, and cartilage. Another form of cancer are Leukemias. Leukemia is a cancer of the blood. With Leukemias the blood cells begin to change and grow uncontrollably. The last kind of cancer are Lymphomas, cancer that begins in the lymphatic system.

For this paper we will be studying a Sarcoma, Osteosarcoma. To understand Osteosarcoma(OS) and the anatomy of the bone. The bone is a complex tissue that has many unique qualities that make it a hospitable microenvironment for metastatic cancer cells. Fun Fact: breast cancer and prostate cancer are known for their inclination to metastasize to the bone. All bones have a dense outer layer, known as cortical bone, but differ in their relative amounts. The inside, called trabecular bone is also referred to as cancellous bone or spongy bone. Less dense than cortical bone, spongy bone looks how it sounds, porous. Since bone are always being graded and degraded, there are three main cell types that facilitate bone remodeling: osteoclasts, osteoblasts, and osteocytes. Osteoblasts secretes the matrix for bone generation, osteoclasts Osteoclasts are a multinucleate bone cell that absorb bone tissue during growth and healing, and an osteocyte is an osteoblast that eventually becomes embedded in the matrix it has secreted. Overall, osteoblasts, osteoclasts, and osteocytes work in unison to maintain our bones, but cells become diseased it interferes with the maintenance of the bone(Homeostasis).

Homeostasis is tightly regulated by a balance between bone adsorption and resorption. However, Osteosarcoma can interfere with this balance, specifically, osteoblast activity. Osteosarcoma usually start in osteoblasts, though the exact cause of osteosarcoma is not known, it is believed to be due to DNA mutations inside the bone cells— genetic or acquired. These mutated cells go on to create bone tumors or abnormalities in the bones.

 In this clay model you can see clay model you can see the abnormalities and excess growth of bone on the frontal bone of the skull, where the mutated osteoblasts are reproducing out of control—disrupting the balance of bone adsorption and resorption. This specific cancer is identified as: Sarcoma Cranii.

References

Shupp, A. B., Kolb, A. D., Mukhopadhyay, D., & Bussard, K. M. (2018). Cancer

 Metastases to Bone: Concepts, Mechanisms, and Interactions with Bone

 Osteoblasts. *Cancers*, *10*(6), 182.

Setiawati, R., & Rahardjo, P. (2018, December 14). *Bone Development and growth*. IntechOpen.

Retrieved November 23, 2021, from https://www.intechopen.com/chapters/64747.

*Osteosarcoma*. Johns Hopkins Medicine. (n.d.). Retrieved November 23, 2021, from

https://www.hopkinsmedicine.org/health/conditions-and-diseases/sarcoma/osteosarcoma.

*Understanding bone cancer*. American Cancer Society. (n.d.). Retrieved November 23, 2021,

 from https://www.cancer.org/cancer/bone-cancer/about/what-is-bone-cancer.html.