Example of bone cancer research paper

Health & Medicine, Cancer

Bone cancer is the malignant tumor, or in other words, an abnormal growth of the bone that destroys the normal bony tissue. An abnormal growth is termed as cancer, when cells in that part of the body start to grow out of control.

- Classification

Bone cancers are currently classified according to the line of differentiation of cancerous cells and their resemblance to normal cells. Cancer can begin in any type of bone tissue. The two parts of the bone are the hard tissue, termed osteoid; and the flexible tissue, termed cartilage. Accordingly, bone cancer can arise in the osteoid, termed as osteosarcoma, or it can arise in the cartilaginous tissue, termed as chondrosarcoma (Franchi 93).

Primary bone cancers are relatively uncommon. The three most commonly seen cancers of the bone are the osteosarcoma, chondrosarcoma, and the Ewing's sarcoma; and these accounts for only 0. 2% of all malignancies in the UK and USA; however, in children less than 15 years of age, these cancers account for approximately 5% of all malignancies (Kindblom 2). Of all the bone cancers, these three types of cancers account for more than 75% (Kindblom 2). Cancer registry data indicate that osteosarcoma is the most common primary cancer of bone, accounting for approximately 35 percent of cases, followed by chondrosarcoma (25%), and Ewing sarcoma (16%) (Dorfman 227). The table below (table 1) shows the frequency of occurrence of primary bone malignancies (Kindblom 2)

The table below (table 2) shows the classification of primary bone cancers, peak age of diagnosis, and most common site distribution (Kindblom 4)

According to SEER pediatric monograph, bone cancer represents only 0. 5%

of all malignancies among children younger than 5 years, compared with 5% for those 5-9 years, 11% for those 10-14 years, and 8% for adolescents 15-19 years (Gurney 101). The most frequent site of bone cancer development is the long bones of the lower limbs (Gurney 105). In North America and Europe, the incidence rate for bone sarcomas in males is approximately 0. 8 new cases per 100, 000 population and year (Dorfman 227).

- Biology

Histologically, the bone is mainly formed of two types of cells, the osteoblasts and the osteoclasts. Osteoblasts are the bone forming cells and osteoclasts are the bone resorbing cells. Maintenance of bone mass is a balance between the activity of osteoblasts and the osteoclasts. The mechanisms responsible for the growth of cancer in the bone are complex and involve cancer stimulation of the osteoblasts, the osteoclasts, and the response of bone to the microenvironment. In addition, the hormone, estrogen, too plays a key regulatory role in this cycle of bone remodeling by mediating effects through the estrogen receptor, present on several cell types in the bone (Allan 6209).

- Three main types of bone cancers

Osteosarcoma is the most common bone cancer in children and adults. It accounts for a total of about 1000 new diagnoses per year and approximately 400 new cancer diagnoses per year in children less than 18 years old. When treated solely by surgical removal, only 16% of patients have long-term survival. This suggests that micro metastasis is present in an overwhelming majority of newly diagnosed patients (Amankwah 151). Metastatic osteosarcomas at diagnosis and relapsed disease with metastases

both have a poor prognosis. Osteosarcomas require surgery for cure, but metastatic and unresectable disease has a dismal prognosis with very few long-term survivors (Amankwah 152). The relapse rate is approximately 30% for localized osteosarcoma and 80% for cancers that have metastasized. Long interval to relapse or a single site affected and use of chemotherapy are among the positive prognostic variables (Amankwah 152).

Ewing’s sarcoma - There are roughly 250 new cases of Ewing sarcoma per year in the USA, with 20% – 30% of these patients presenting with metastases (Amankwah 152). In general, adult patients have a poorer prognosis than children and adolescents. It had been known for long that metastasis is the poorest clinical prognostic marker for patients with Ewing’s sarcoma; however, studies have shown improvements in survival for both localized as well as metastatic patients over time. Metastatic presentation of Ewing’s sarcoma is most often in the lungs, although it can occur in the bone itself, or the bone marrow and other soft tissues (Amankwah 153). Ewing’s sarcoma is known to be a disease primarily of childhood and young adults; occurrence in older adults is extremely rare (Gurney 101).

Chondrosarcomas, which after osteosarcomas are the most common of bone cancers among adults, are very rare in children (Gurney 101). More than 50 % of chondrosarcomas occur in the long bones of the extremities. The other major sites of involvement are the pelvis and ribs (Dorfman 227).

- Clinical features

The etiology of bone cancer is uncertain (Gurney 109) and clinical features of bone malignancies are non-specific. It is possible that the cancer is diagnoses after some time has elapsed. Pain, swelling and general

discomfort are the cardinal symptoms; however, limited mobility and spontaneous fracture may also be important features (Dorfman 228). Pain is the most common and the first symptom in nearly all types of bone cancers. In bone cancers, swelling develops more rapidly. In late stages of malignancy, the person may also have fatigue, high temperature, and weight loss (Dorfman 229).

- Diagnosis

Since primary bone cancers are rare, physicians and surgeons rarely gain enough experience in the management of such cancers. Therefore, accurate diagnosis requires thorough evaluation of clinical, radiological, and pathological features. The following clinical parameters provide essential diagnostic information and are generally a part of every diagnostic algorithm (Letson 1):

- Age (if the patient’s age is outside the typical range for a cancer, the diagnosis should not be confirmatory)
- Family history (if patient has a family history of a particular bone cancer)
- Past history (if patient has a past history of any particular bone cancer)
- History of presenting complaint (characteristics of pain, swelling, etc)
- Thorough physical examination

For diagnosis, conventional radiograph is the starting point. A CT scan is also helpful (Dorfman 230). Most primary bone cancers are treated with preoperative chemotherapy before resection. A surgical staging system for bone cancers is most logically accomplished with the assessment of the surgical grade, the local extent, and the presence or absence of local or distant metastasis. Further, it can be divided into two grades: low grade

lesions- that have less than 25% risk of metastasis and high grade lesions that have more than 25% risk of distant spreading (Dorfman 232).

In summary, primary bone cancers are rare, but can be seen at any age. Diagnosis may be difficult due to its rare occurrence. Osteosarcoma, chondrosarcoma and Ewing's sarcoma are the most common cancers and long – term survival rates are better in children as compared to adults.

References:

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