Clinico-morphological Pattern and Frequency of Bone Cancer

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Abstract

Objective: The present study was done to find out the frequency of malignant tumors of bone and to categorize the prevelence of various histological types of osseous malignancies with respect to age, sex and site of origin.
Setting: This study included consecutive cases of malignant bone tumors, which were diagnosed in the department of pathology at the Aga Khan University Hospital, Karachi during the period of three years (1995-1997).
Methods: These tumors were initially evaluated on H & E stained section from paraffin embedded tissue blocks. Special stains and immunohistochemical analysis was performed whenever required.
Results: A total of 169 malignant bone tumors were diagnosed during the study period. Metastatic tumors accounted for 28.4% of all malignant tumors of bone. Osteogenic sarcoma (27.2%) was the most frequent primary tumor of bone followed by Ewing's sarcoma (12.4%), Non- Hodgkin's lymphoma (10.6%), Chondrosarcoma (8.3%), Plasma Cell Myeloma (8.3%) and other rare entities (4.8%) in order of frequency.
Conclusion: The most common malignant neoplasm diagnosed in osseous biopsies was metastatic tumors. Osteogenic sarcoma was the most frequent primary bone tumor in this series. The bone tumors were relatively more prevalent in males. The frequency of malignant bone tumor was relatively high as compared to developed countries UPMA 49:110, 1999).

Introduction

Marked variation in the prevalence rate of malignant tumors of bones has been observed in the different regions of the world. In developed countries, bone tumors are quite infrequent[1,2], while in developing countries, the prevalence of bone cancer is relatively high[3-5]. In Pakistan, a relatively high frequency of bone tumors has been observed in the northern region as compared to southern part of the country[6-9]. Environmental, genetic and racial factors influence the geographical distribution of cancer[10]. Data about the cancer from the different regions of the world helps to find out the various associated factors, which could provide clues regarding the identification of the cause of disease". The aims and objectives of the present study were to find the frequency of malignant tumors of bone and to categorize the prevalence of various histological types of osseous malignancies with respect to age, sex and site of origin.

Materials and Methods

This study included consecutive cases of malignant bone tumors, which were diagnosed in the department of pathology at the Aga Khan University Hospital, Karachi during the period of three years (1995-1997). These tumors were initially evaluated on Haematoxylin & Eosin stained sections of paraffin embedded 10% buffered formalin fixed tissue blocks. Special stains like peroxidase acid schiff (PAS), peroxidase acid schiff with diastase (PASD), Reticulin, PAS Alcian blue and PAS Alcian blue with diastase were performed whenever required. The immunohistochem ical staining with

Cytokeratins, Leukocyte Common Antigen (LCA), PAN B (CD 20, L26), PAN T (UCHL 1), Vimentin, Neuron Specific Enolase (NSE), Neurofilament and S-100 protein was done by using Peroxidase-Antiperoxidase (PAP) technique whenever indicated. Clinical details like age, sex and site of the lesion were also recorded.

Results

A total of 8541 malignant tumors were diagnosed in the period of three years (1995-1997), which included 169 (2%) malignant tumors of bone. The most common malignant neoplasm diagnosed in osseous biopsies was metastases, which constituted 28.4% of all malignant tumors of bone. Osteogenic sarcoma (27.2%) was the most frequent primary tumor of bone, followed by Ewing's sarcoma (12.4%), Non Hodgkin's lymphoma (10.6%), Chondrosarcoma (8.3%) and plasma cell myeloma (8.3%) in order of frequency. Rare entities like primitive neuroectodermal tumor (PNET), chordoma and malignant fibrous histiocytoma constituted 4.8% of all bone tumors (Table 1).

Table 1. Frequency of malignant tumors of bone.

Type of tumor	Males	Females	Total	%
Metastatic tumor	27	21	48	28.4
Osteogenic sarcoma	22	24	46	27.2
Ewing's sarcoma	13	8	21	12.4
Non-Hodgkin's lymphoma	14	4	18	10.6
Chondrosarcoma	10	4	14	8.3
Plasma cell Myeloma	7	7	14	8.3
Primitive neuroectodermal tumor (PNET)	3	1	4	2.4
Miscellaneous	2	2	4	2.4
Total	98	71	169	100

Metastatic tumors were seen in adults with male to female ratio of 1.3:1. The mean age was 60 years in males and 55 years in females. Osteogenic sarcoma was slightly more common in female with male to female ratio of 1:1.09. A significant number (4 1%) of these tumors were seen in children below the age of 15 years. The mean age was 19 years for males and 15.6 years for females in the cases of ostegenic sarcoma. In about three fourth cases, osteogenic sarcoma was around the knee joint. This tumor most

frequently involved the femur (55.2%) followed by tibia (20.6%) and humerus (17.2%). The other less frequent sites (7%) included hip bone, radius and ulna. Ewing's sarcoma was the second most common primary malignant tumor of the bone with male to female ratio of 1.6:1. Majority of these tumors (57%) occurred in children under the age of 15 years. The mean age was 13.3 years in males and 12.8 years in females in the cases of Ewing's sarcoma. Chondrosarcoma most frequently occurred in adults with male to female ratio of 2.5:1. The mean age was 39.2 years in males and 5.1.2 years in females. In Non-Hodgkin's lymphoma cases the male to female ratio was 3.5:1. The mean age was 35.5 years in males and 21.2 years in females. In plasma cell myeloma, the male to female ratio was 1: 1. The mean age was 58 years in males as well as in females (Table 2).

Table 2. Age distribution of bone tumors (Years)

	Minimum	Maximum	Mean	Median
Metastatic tumor				
Male	30	85	60	60
Female	25	70	55	55
Osteogenic sarcoma				
Male	9	45	19	17
Female	7	33	15.6	14
Ewing's sarcoma				
Male	3	20	3.3	14
Female	5	18	12.8	12
Chondrosarcoma				
Male	16	72	39.2	42
Female	40	65	51.2	55
Non-Hodgkin's lymphoma				
Male	8	60	35.5	35
Female	8	45	21.2	15
Plasma cell myeloma				
Male	35	72	58	60
Female	35	85	58	56

Discussion

Cancer is one of the leading cause of death in the developed countries but the morbidity and mortality caused by malignant disorders is becoming an increasingly serious problem in the developing countries as well. In absolute numbers, there are more cases and increased mortality due to malignant neoplastic

lesions in the developing countries as compared to developed nations[10].

The prevention and control of cancer requires the identification of agents and circumstances, which are the cause of the disease. The study of variation in the frequency and patterns of cancer in different regions can provide clues about the causes and risk factors. The change in the prevalence rate of the disease in a region over a period of time, provides valuable information about the presence of preventable predisposing factors.

The frequency of malignant bone tumors varies from 0.2% to 5.1% in the different regions of the world[1-8]. The prevalence of bone cancer is low in the Western countries as compared to the developing nations. The relatively higher frequency of malignant bone tumor in developing countries could be attributed to the relatively increased population of children as approximately thirty nine percent (39%) of the population of developing countries comprises of children under the age of 15 years[12]. While in western countries the paediatric age group constitutes 23% of the total population[12]. Primary tumors of bone are more common in young age groups[13]. This may be one reason for the increased frequency of bone tumors in developing countries.

In our series, the bone tumors comprised 2% of all malignant neoplasms. Primary bone tumors were 3.14% of all tumors in a series from northern region of Pakistan[9]. The difference would be even greater because the present study included the metastatic tumors also. The bone tumors were relatively more prevalent in males with male to female ratio of 1.3:1. High male to female ratio has been observed in other types of malignant tumors as wel[15-8,14]. According to western literature, cancer used to be more common in females in the past but now it is relatively more frequent in males[3].

In the present study, metastatic tumor (28.4%) was the most common category of cancer diagnosed in the osseous biopsies. The increased prevalence of metstatic tumors in bones could be due to late presentation of patients or lack of appropriate diagnostic and treatment facilities.

Osteogenic sarcoma was the most common primary bone tumor in our series, which is in accordance with the previous published series[9]. In the present study, osteogenic sarcoma was slightly more frequent in females with male to female ratio of 1:1.08. But in the other series, osteogenic sarcoma was more common in males with male to female ratio of 3.3:1g.

In this study, Ewing's sarcoma (12.4%) was more prevalent as compared to chondrosarcoma (8.3%) and plasma cell myeloma (8.3%). A published series from AFIP Rawalpindi revealed that chondrosarcoma (22.1%) and Plasma cell myeloma (15%) were more common as compared to Ewing's sarcoma (8.6%)[9]. In Ewing's sarcoma, the mean age was 13.3 years for males and 12.8 years for females and it was less than the mean age reported in the earlier published series[9,15]. The age of the patient has got prognostic significance as well. The response rate to the treatment decreases with increase in age in the cases of Ewing's sarcoma[16,17].

An elevated risk of bone cancer has been reported in children whose fathers were employed in agricultural occupation[12,18]. The high prevalence of bone tumors in developing countries may be attributed to the parental occupation. A significant proportion of the population of the developing countries is associated with agriculture as compared to the industrialised nations. In this regard, further studies in the developing countries would be helpful.

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