MALIGNANT BONE TUMOURS- A RETROSPECTIVE ANALYSIS IN RELATION TO AGE, SEX AND SITE

Arvind Kumar[1], Usha Singh[2]

[1]Assistant Professor, Department of Orthopaedics, Vardhman Institute of Medical Sciences, Pawapuri, Nalanda, Bihar.
[2]Consultant, Department of Radiation Oncology, Mahavir Cancer Sansthan, Patna, Bihar.

ABSTRACT

BACKGROUND

Malignant bone tumour could be primary or secondary. This is based on predominant components of the tumours, example chondrosarcoma refer to cartilage forming tumour.

Aim of the study is to find out frequency of malignant tumour of bone and to categorise the various histological type of bone cancer with respect to age, sex and site.

MATERIALS AND METHODS

This is a retrospective, nonrandomised analysis of all patients with biopsy confirmed malignant primary bone tumour including multiple myeloma and secondary metastatic bone tumour who presented between May 2015 to April 2016 in OPD of Radiation Oncology Department of Mahavir Cancer Sansthan. Epidemiological data related to patient demographics, location and histology were recorded and analysed.

RESULTS

In our study, 48.4% patients were suffering from primary bone tumours, 51.5% patients were having secondary bone tumour. Peak incidence of primary malignant tumour was seen in the age group of 10-19 years (48.3%) and for secondary metastatic tumour peak seen in 60-69 years of age. Male-to-female ratio were 1.8:1 in primary bone tumours, 1:2 in secondary bone tumours. Ewing's sarcoma (41.9%) was more common than osteosarcoma (19.3%), multiple myeloma in 22.5%, malignant giant cell tumour 9.6% and chondrosarcoma in 6.4% patients. For metastatic bone tumour, most common source were of breast cancer (39.3%), followed by 21.2% uterine cervix, 15.1% head and neck cancer, 12.1% prostate cancer, 3% ovary and 3% renal cell carcinoma.

CONCLUSION

Most common bone affected in primary malignant bone tumour was femur 32.2% followed by tibia 19.3% and for secondary bone tumour vertebra 60.6% followed by pelvic bone 51.5%. Most common malignant neoplasm diagnosed was metastatic tumours of bone. Ewing's sarcoma was the most frequent primary bone tumour in our study. The primary bone tumours was more common in males. The most common source for metastatic bone tumour was breast cancer.

KEYWORDS

Primary Bone Malignancies, Secondary Bone Malignancies, Epidemiology.

HOW TO CITE THIS ARTICLE: Kumar A, Singh U. Malignant bone tumours- A retrospective analysis in relation to age, sex and site. J. Evid. Based Med. Healthc. 2017; 4(40), 2432-2436. DOI: 10.18410/jebmh/2017/480

BACKGROUND

Malignant bone tumour could be primary or secondary. This is based on predominant components of the tumours, example chondrosarcoma refer to cartilage forming tumour. There is marked variation in the prevalence rate of malignant tumours of bone in the different regions of world. In developed country, bone tumours are quite infrequent, (Anne P 1998, Al-Tainimi et al 1997)[1,2] while in developing countries prevalence of bone tumour is relatively high (Doll et al 1996, Parkin DM 1986, Ahmad J 1992).[3,4,5] The frequency of malignant bone tumour varies from 0.2% to 5% of all cancer in the different region of the world. Environmental, racial and genetic factors are associated with distribution of cancer (Magrath I et al 1993).[6]

Malignant bone tumours are frequently discovered by coincidence on standard radiographs after minor trauma. Despite the availability of multiplanar imaging, standard radiographs are still the mainstay in detection and characterisation of malignant bone tumour. Histology is still the gold standard for definitive characterisation of a malignant bone tumour. However, the combination of age, location, multiplicity and features on standard radiographs can narrow the differential diagnosis.

This study was aimed to find out frequency of malignant tumour of bone and to categorise the various histological type of bone cancer with respect to age, sex and site.

This is retrospective, nonrandomised analysis of all patients with biopsy confirmed malignant primary bone tumour including multiple myeloma and secondary

Financial or Other, Competing Interest: None.
Submission 26-04-2017, Peer Review 03-05-2017,
Acceptance 07-05-2017, Published 17-05-2017.
Corresponding Author:
Dr. Arvind Kumar,
Assistant Professor, Department of Orthopaedics,
VIMS, Pawapuri, Nalanda, Bihar.
E-mail: ranjitzool17@@gmail.com
DOI: 10.18410/jebmh/2017/480

metastatic bone tumour who presented between May 2015 to April 2016 in OPD of Radiation Oncology Department of Mahavir Cancer Sansthan. Total of 64patients were reviewed after permission of ethical committee. Epidemiological data related to patient demographics, tumour location and histological types were recorded and analysed. The classification was based on the current World Health Organization (Fletches CD et al 2002).[7]

RESULTS

Out of 64 patients, 31 (48.4%) patients were primary tumours, 33 (51.5%) patients were secondary bone tumour. Primary bone tumours age ranges from 3 to 70 years, secondary bone tumour age ranges from 16 to 90 years. Peak incidence of primary malignant tumour was seen in the age group of 10-19 years (48.3%), and for secondary metastatic tumour, peak incidence was seen in 60-69 years of age. In primary bone tumours, males were 20 (64.5%) and females were 11 (35.4%) in numbers. In secondary bone tumours, males were 11 (33.3%), females were 22 (66.6%) in numbers. Male-to-female ratio were 1.8:1 in primary bone tumours, 1:2 in secondary bone tumours. Among primary malignant bone tumour out of 31 patients, Ewing's sarcoma were seen in 13 (41.9%) patients, multiple myeloma in 7 (22.5%) patients, osteosarcoma in 6 (19.3%) patients, malignant giant cell tumour were 3 (9.6%), chondrosarcoma in 2 (6.4%) patients. Among secondary metastatic bone tumour out of 33 patients, 13 (39.3%) were of breast cancer, 7 (21.2%) patients were of uterine cervix, 5 (15.1%) patients were of head and neck cancer, 4 (12.1%) patients were of prostate cancer, 1 (3%) patient were of ovary and 1 (3%) patient were of renal cell carcinoma.

Most common bone affected in primary malignant bone tumour was femur 10 (32.2%) followed by tibia 6 (19.3%) and for secondary bone tumour vertebra 20 (60.6%) followed by pelvic bone.

17 (51.5%) among primary bone tumour, Ewing's sarcoma was most commonly seen in age range of 11-15 years followed by 16-20 years. Male-to-female ratio were 1.6:1, most common site was femur lower end followed by tibia.

Osteosarcoma was second most common primary malignant tumour in our study seen in age range of 11-15 years. Male-to-female ratio were 1:1, most commonly affected site were femur lower end followed by tibia upper end. Malignant giant cell tumour were 9.6%, age range were 16-20 years followed by 41-45 years. Male-to-female ratio were 2:1, affected bone was lower end of radius, ulna and upper end of tibia.

Chondrosarcoma were seen in 6.4% with age range of 46 to 60 years. Male-to-female ratio was 1:1. Bone affected sites were ribs and scapula. Multiple myeloma were seen in 22.4% cases with age range of 51->60 years. Male-to-female ratio were 6:1, affected bone were vertebrae followed by pelvis bone. Metastatic bone tumour were seen in 51.6% cases, majority were >60 years of age followed by 51-60 years. Minimum age range was 16-20 years. Male-to-female ratio 1:2. The site for primary tumours were breast 39.3%, uterine cervix 21.2%, head and neck cancer 5.1%, prostate cancer 12.1%, lung cancer 6%, renal cell carcinoma 3% and ovarian cancer 3%. Most common site were vertebrae followed by pelvic bone.

Age (Years)	Primary Tumour (Numbers=31)	Percentage	Secondary Tumour (Numbers=33)	Percentage
1-9	2	6.4	0	0
10-19	15	48.3	1	3
20-29	2	6.4	1	3
30-39	1	3.2	4	12.1
40-49	2	6.4	6	18.1
50-59	4	12.9	8	24.2
60-69	4	12.9	9	27.2
70-79	1	3.2	3	9
80-89	0	0	0	0
90-99	0	0	1	3

Table 1. Age of Patients (p = 0.0799)

	Primary Tumour (Numbers=31)	Percentage	Secondary Tumour (Numbers=33)	Percentage
Males	20	64.5	11	33.3
Females	11	35.4	22	66.6

Table 2. Sex of Patients (p = 0.2231)

Primary Bone Tumour (n=31)	Numbers	Percentage
Ewing's sarcoma	13	41.9
Osteosarcoma	6	19.3
Malignant giant cell tumour	3	9.6
Chondrosarcoma	2	6.4
Multiple myeloma	7	22.4
Secondary Bone Tumour (n=33)	**Numbers**	**Percentage**
Breast CA	13	39.3
Prostate CA	4	12.1
Head and neck CA	5	15.1
RCC	1	3

Cervix CA	7	21.2
Ovary CA	1	3
Lung CA	2	6

Table 3. Types of Tumour in Patients (p = 0.6308)

	Primary Bone Tumour (Numbers=31)	%	Secondary Bone Tumour (Numbers=33)	%
Skull	3	9.6	3	9
Humerus	0	0	2	6
Ulna	1	3.2	2	6
Sternum	0	0	4	12.1
Scapula	1	3.2	4	12.1
Ribs	2	6.4	7	21.2
Clavicle	0	0	1	3
Pelvic bone	3	9.6	17	51.5
Vertebrae	6	19.3	20	60.6
Femur	10	32.2	8	24.2
Tibia	6	19.3	0	0
Metatarsal	1	3.2	0	0
Radius	1	3.2	0	0

Table 4. Site of Bone Affected in Patients (p = 0.6244)

Age (yrs.)	0-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50	51-60	>60
Ewing sarcoma	1	1	5	4	0	1	0	1	0	0	0	0
Osteosarcoma	0	1	4	0	1	0	0	0	0	0	0	0
GCT	0	0	0	2	0	0	0	0	1	0	0	0
Chondrosarcoma	0	0	0	0	0	0	0	0	0	1	1	0
Multiple myeloma	0	0	0	0	0	0	0	0	0	0	4	3
Metastatic secondary tumour	0	0	0	1	1	3	0	3	2	5	8	10

Table 5. Histological Types and Age Range Distribution of Bone Tumours (p = 0.0188)

	Male	Percentage	Female	Percentage
Ewing's sarcoma	8	25.8	5	16.1
Osteosarcoma	3	9.6	3	9.6
Giant cell tumour	2	6.4	1	3.2
Chondrosarcoma	1	3.2	1	3.2
Multiple myeloma	6	19.3	1	3.2
Metastatic secondary tumour (n=33)	11	33.3	22	66.6

Table 6. Histological Types and Sex Distribution of Bone Tumours (p = 0.7029)

	Ewing's Sarcoma	Osteosarcoma	GCT	Chondrosarcoma	Multiple Myeloma	Metastatic Bone Tumour
Skull	0	0	0	0	3	3
Humerus proximal	0	0	0	0	0	1
Humerus distal	0	0	0	0	0	1
Radius	0	0	1	0	0	0
Ulna	0	0	1	0	0	2
Sternum	0	0	0	0	0	4
Scapula	0	0	0	1	0	4
Ribs	1	0	0	1	0	7
Clavicle	0	0	0	0	0	1
Vertebrae	2	0	0	0	4	20
Pelvic bone	0	0	0	0	3	17
Femur upper	0	1	0	0	1	4
Femur middle	2	1	0	0	0	4
Femur lower	3	3	0	0	0	0
Tibia upper	2	2	1	0	0	0
Tibia lower	2	0	0	0	0	0
Fibula	0	0	0	0	0	0
Metatarsal	1	0	0	0	0	0

Table 7. Histological Types and Anatomical Bone Affected Sites (p = 0.5193)

DISCUSSION

Cancer is leading cause of death especially more in developing countries than developed countries (Magrath I et al, 1993).[6] The higher frequency of malignant bone tumour in developing countries could be due to increased population of children approximately 39% of population of developing

countries comprises of children less than 15 years of age (Hanluwka H et al, 1986).[8] Primary bone tumours are more common in young age group (Hum L et al, 1998; Omlolu et al, 2002; Mohammed A et al, 2007).[9,10,11] In our study, primary bone tumours were more common in young age range from 10-19 years.

Ewing's sarcoma is highly malignant, undifferentiated peripheral primitive neuroectodermal tumour occurring most commonly at the diaphysis of long bones in less than 20 years age. Males are affected more than females (Bone RJ et al, 1996; Aston W et al, 2010; Rosenberg AE et al, 2010).[12,13,14] In this study, among primary bone tumour, Ewing's sarcoma was most common seen in age range of 11-15 years followed by 16-20 years. Male-to-female ratio were 1.6:1. Most common site was femur lower end with extension to mid shaft followed by tibia. Osteosarcoma is the most common primary malignant bone tumour in young, most frequently in second decade. It occurs in metaphysis region of lower end of femur followed by upper end of tibia (Bahebeck J et al, 2003; Yarmish et al, 2010).[15,16] In our study, osteosarcoma was second most common primary malignant tumour seen in age range of 11-15 years. Male-to-female ratio were 1:1, most commonly affected sites were femur lower end followed by tibia upper end. Incidence is less than Ewing's sarcoma in our study due to less numbers of cases of osteosarcoma. Malignant giant cell tumour, its origin is unknown, age range 3rd to 4th decade. Females are affected more than males. Most frequent site is ends of long bones. Distal femur is most common site. Other sites are proximal end of tibia, distal radius, sacrum (Unni K. K, Huros AG).[17,18] In our study, malignant giant cell tumour were 9.6%, age range were 16-20 years followed by 41-45 years. Male-to-female ratio were 2:1, affected bone was lower end of radius, ulna and upper end of tibia.

Multiple myeloma is the most common primary malignant bone tumours occurring most commonly in sixth and seventh decade of life with multiple site involvement (Bahebeck J et al, 2003)[15] with predilection to the central skeleton including skull, spine. Male-to-female ratio is 8:1. In this study, multiple myeloma were seen in 22.4% cases with age range of 51->60 years. Male-to-female ratio were 6:1. Affected bone were vertebrae followed by pelvis bone. Chondrosarcoma is most common primary malignant tumour image of 40-60 years. It commonly affects pelvis, femur, ribs, shoulder girdle and vertebrae with male predilection. Male-to-female ratio is 2:1. In our study, it is seen in similar age range, affecting scapula, ribs with male-to-female ratio is 1:1.

Metastatic bone tumours most frequently seen in age above 50 years, commonly originate from lung, breast, prostate and thyroid. Galasko has reported that majority of skeletal metastasis are from breast cancer followed by prostate cancer, thyroid and lung (Galasko C. et al, 1981).[19] In our study, skeletal metastasis from breast cancer followed by cervical cancer is most common. Similar study by Yuceturk et al who also stated breast and lung cancer were most common sites for metastasis to bone. Male-to-female ratio 1:2. Most common site were vertebrae followed by pelvic bone. The metastatic spread of bony metastasis occurs through Batson venous plexus, preclinical model confirms that skeletal sites rich in cellular marrow with active turnover.

CONCLUSION

Metastatic bone tumours were more common than primary bone tumours. Ewing's sarcoma was the major bulk of primary bone tumours. Breast cancer was most common source for metastatic bone tumours. Femur and tibia was the most common site for primary bone tumour, vertebra and pelvic bone was most common site for metastatic bone tumours.

REFERENCES

[1] Anne P. Lanier cancer incidence in Alaska natives. Comparison of two time periods 1989-93 vs 1969-73. Cancer 1998;83(8):1815-1817.
[2] Al Tamimi TM, Ibrahim EM, Ibrahim AW, et al. Cancer in the eastern region of Saudi Arabia: a population based study. Ann Saudi Med 1997;17(1):53-65.
[3] Doll R, Peto P. Epidemiology of cancer. Oxford textbook of medicine. 3rd edn. Oxford: Oxford University Press 1996:197-198.
[4] Parkin DM. Cancer occurrence in developing countries IARC Scient Pub No.75. Lyon: IARC 1986:263-278.
[5] Ahmad J, Hashmi MA, Naveed IA, et al. Spectrum of malignancies in Faisalabad 1986-1990. Pak J Pathol 1992;3:103-110.
[6] Magrath I, Litvak J. Cancer in developing countries: opportunity and challenge. J Nat Cancer Inst 1993:85(11):862-874.
[7] Fletcher CD, Unni KK, Mertens F. World Health Organisation classification of tumors. Pathology and genetics of tumor of soft tissue and bone. Lyon: IARC Press 2002.
[8] Hansluwka H. Cancer mortality in the developing countries. Oniar YT, Gjorgor A, Ismail AS, eds. Cancer prevention in developing countries. Proceedings of the second UICC conference on cancer prevention. New York: Pergamon Press 1986:85-92.
[9] Hum L, Kreiger N, Finkelstein MM. The relationship between parental occupation and bone cancer risk in offspring. Int Epidemiol 1998;27(5):766-771.
[10] Omololu AB, Ogunbiyi JO, Ogunlade SO, et al. Primary malignant bone tumours in Ibadan. West Afr J Med 2002;21:201-203.
[11] Mohammed A, Isa HA. Pattern of primary tumours and tumour like lesions of bone in Zaria, northern Nigeria: a review of 127 cases. West Afr J Med 2007;26(1):37-41.
[12] Bone RJ. Joints. In: Rosai J, ed. Ackerman's surgical pathology. St. Louis: Mosby 1996:1917-2020.
[13] Aston W, Briggs T, Solomon L. Tumors. In: Solomon L, Warwick D, Nayagam S, ed. Apley's system of orthopaedics and fracture. 9th edn. London: Hodder Arnold 2010:187-224.

[14] Rosenberg AE. Bones, joint and soft tissues tumors. In: Kumar V, Abbas AK, Fausto N, et al, eds. Robbins and Cotran pathologic basis of disease. 8th edn. Elsevier 2010:1205-1256.
[15] Bahebeck J, Atangana R, Eyenga V, et al. Bone tumours in Cameroon: incidence, demography and histopathology. Int Orthop 2003;27(5):315-317.
[16] Yarmish G, Klein MJ, Landa J, et al. Imaging characteristics of primary osteosarcoma: non-conventional subtypes. Radiographics 2010;30(6):1653-1672.
[17] Unni KK. Dahlin's bone tumor. General aspects and data on 11,087 cases. 5th edn. Philadelphia: Lippincott-Raven 1994.
[18] Huvos AG. Bone tumor diagnosis, treatment and prognosis. Philadelphia: WB Saunders 1991:429-467.
[19] Galasko C. The anatomy and pathways of skeletal metastasis. In: Weiss L, Gilbert A, eds. Bone metastasis. Boston: GK Hall 1981:49-63.