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Bone and soft tissue tumours of the foot: review of 83 cases

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ABSTRACT

Purpose. To review cases of bone and soft tissue tumours of the feet managed at the Hyogo College of Medicine, Nishinomiya and Takarazuka Municipal Hospital, Takarazuka, Japan.
Methods. Retrospective analysis of 83 patient records treated for bone and soft tissue tumours of the feet between 1974 and 2000.
Results. There were 33 benign bone tumours, one primary malignant bone tumour, and 2 metastatic bone cancer. Marginal resection was performed in cases of osteochondroma and curettage in cases of other benign bone tumour. Despite below-knee amputation in the case of chondrosarcoma, the patient died because of pulmonary metastasis. Two patients with metastatic cancer also died, and 2 cases of osteochondroma and one of benign chondroblastoma recurred. There were 47 cases of soft tissue tumour. Treatment for benign soft tissue tumours was marginal resection; no cases recurred. In contrast, all patients with soft tissue sarcoma died after surgery. The majority of bone tumours were located in the toe and hindfoot areas, in the first and second decades of life, whereas soft tissue tumours occurred mainly in the midfoot area and in patients aged between 20 and 50 years. The sex distribution was almost even for bone tumours (male : female ratio, 19 : 17), whereas about half as many males as females had soft tissue tumours (14 : 33).
Conclusion. Bone and soft tissue tumours of the feet are uncommon. Most bone tumours are chondrogenic, but differential diagnosis of malignant from benign disease is difficult and prognosis is poor. Management of benign tumours by marginal resection has good prognosis, whereas prognosis of soft tissue sarcomas is very poor.

Key words: *bone tumor; soft tissue tumor; foot*

INTRODUCTION

Bone and soft tissue tumours of the feet continue to present the clinician with one of the most difficult problems in medicine. These tumours are uncommon, but there have been very few reports of large series in the literature, and the epidemiology of these tumours is not well known. We reviewed the experience with bone and soft tissue tumours of the feet seen at the Hyogo College of Medicine and Takarazuka Municipal Hospital over a 26-year period.

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MATERIALS AND METHODS

After reviewing about 900 cases of tumours of the locomotor system observed at Takarazuka Municipal Hospital, Takarazuka, and Hyogo College of Medicine, Nishinomiya, Japan, between 1974 and 2000, we identified 83 cases of bone and soft tissue tumours located in the feet.

The age and sex of the patients, and location and pathological diagnosis were obtained from hospital records for retrospective analysis. In this study, the location of the tumour was categorised as follows: toe area (more distal than the metatarsophalangeal joints), midfoot area (between the metatarsophalangeal joints and Chopart joint), and hindfoot area (proximal to the Chopart joint) of the foot.

RESULTS

Bone tumours

There were 33 benign bone tumours, one primary malignant bone tumour, and 2 metastatic bone tumours (Table 1). The majority of the benign tumours were chondrogenic (17 cases of exostosis, 7 of enchondroma, and 2 of benign chondroblastoma). Marginal resection was performed in cases of osteochondroma and curettage in cases of other benign tumour. Two cases of osteochondroma and one of benign chondroblastoma recurred.

Below-knee amputation was performed for one case of chondrosarcoma; the patient died because of pulmonary metastasis. Bone biopsy was performed in 2 cases of metastatic cancer; both patients died of the disease.

Table 1
Diagnosis of cases of bone tumour of the foot

Diagnosis	No. of patients
Benign	
Osteochondroma	17
Enchondroma	7
Chondroblastoma	2
Solitary bone cyst	4
Lipoma	1
Osteoma	1
Ganglion tumour	1
Malignant	
Chondrosarcoma	1
Metastatic cancer	2
Total	**36**

Case report

A 52-year-old man presented to the Hyogo College of Medicine in September 1985 with chondrosarcoma of the left talus, after having been admitted to another hospital for left ankle pain. Open biopsy of the left talus had been performed, and microscopic examination had revealed no malignant features (Fig. 1). The lesion had been curetted following bone grafting in July 1984. The initial diagnosis at the previous institution was benign chondroblastoma.

The patient was referred to our hospital for local recurrence of the tumour 5 months later. A plain X-ray taken in September 1985 showed collapse of the left talus and soft tissue mass (Fig. 2). Computed tomography confirmed soft tissue invasion of the tumour and destruction of the cortex of the talus (Fig. 3). A biopsy performed at our institution revealed atypical cells compatible with chondrosarcoma (Fig. 4). Although below-knee amputation was performed, the patient died another 5 months later.

The problem in this case was delay in the correct diagnosis. The diagnosis of chondrogenic tumour is, however, difficult by nature. Firstly, most chondrosarcomas occur around the hip joint; they are seldom found in the foot. Secondly, the cytological grade of malignancy does not always correlate with

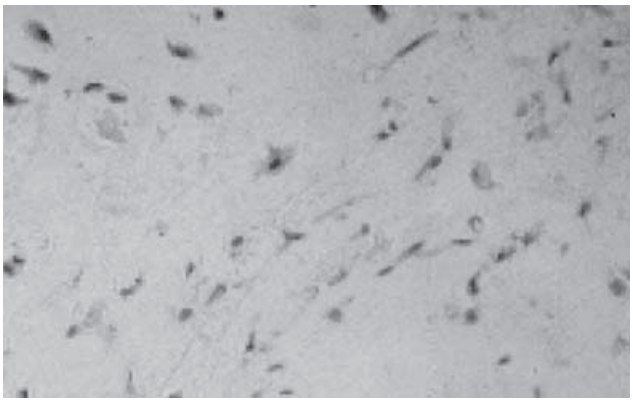

Figure 1 Photomicrograph of biopsy performed in July 1984, showing no malignancy.

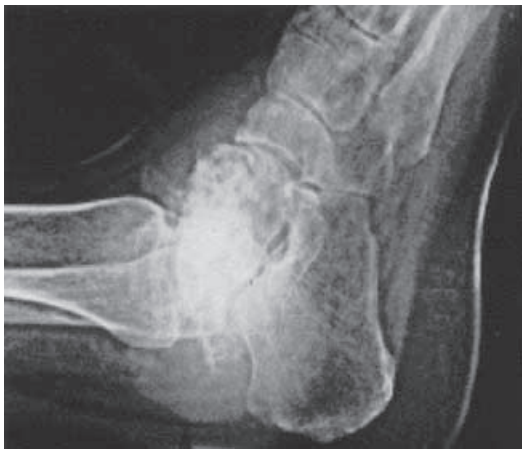

Figure 2 Plain radiograph showing soft tissue mass around the collapsed talus.

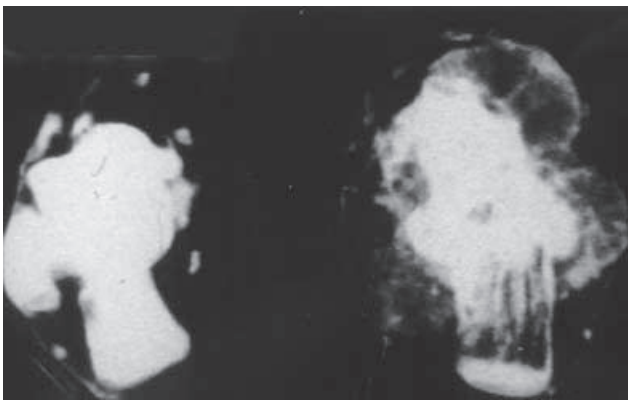

Figure 3 Computed tomogram which reveals the talus was replaced by low density mass invaded into the soft tissue.

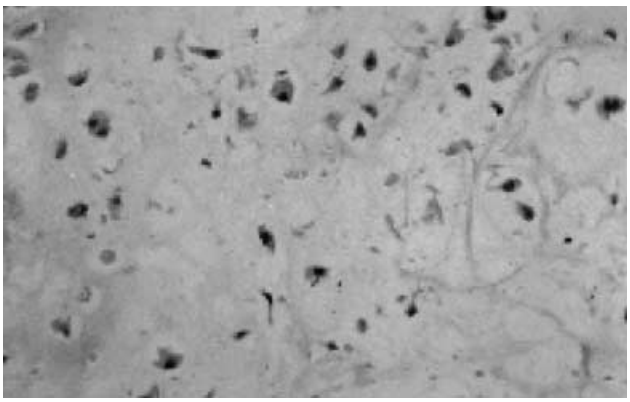

Figure 4 Second biopsy performed in September 1985, showing moderate pleomorphism compatible with chondrosarcoma grade 2.

clinical behaviour. Hence, information of the tissue pattern is needed to distinguish malignant from benign chondrogenic tumours. Radiographic findings are also useful: destruction of the cortical bone, together with soft tissue invasion, is a likely indicator of a malignant tumour.

Table 2
Diagnosis of cases of soft tissue tumour of the foot

Diagnosis	No. of patients
Benign	
Ganglion tumour	7
Giant cell tumour of tendon sheath	6
Angioleimyoma	5
Granuloma	3
Pigmented villonodular synovitis	2
Haemangioma	2
Fibroma	2
Rheumatoid nodule	2
Lipoma	1
Lymphangioma	1
Plantar fibromatosis	1
Schwannoma	1
Neuroma	1
Benign fibrous histiocytoma	1
Myxoma	1
Unclassified*	6
Malignant	
Soft tissue sarcoma†	3
Skin cancer	2
Total	**47**

* Cases in which pathological materials were not good enough to confirm the diagnosis

† One case of synovial sarcoma, one case of rhabdomyosarcoma, and one case of hemangiopericytoma

Soft tissue tumours

Among the 47 cases of soft tissue tumour in the feet were numerous types of soft tissue lesions (Table 2). Treatment for benign tumours was marginal resection; no case recurred. In contrast, all patients with soft tissue sarcoma died after surgery.

Table 3
Relation between diagnosis, location of bone and soft tissue tumour, and sex of patient

Diagnosis	Toe area		Midfoot area		Hindfoot area	
	Male (n)	Female (n)	Male (n)	Female (n)	Male (n)	Female (n)
Bone tumour						
Osteochondroma	4	10	0	0	3	0
Enchondroma	2	4	1	0	0	0
Chondroblastoma	0	0	0	0	1	1
Solitary bone cyst	1	0	0	0	3	0
Lipoma	0	0	0	0	0	1
Osteoma	0	1	0	0	0	0
Ganglion tumour	0	0	1	0	0	0
Chondrosarcoma	0	0	0	0	1	0
Metastatic cancer	0	0	0	0	2	0
Soft tissue tumour						
Ganglion tumour*	0	1	1	4	0	0
Giant cell tumour of tendon sheath	2	3	0	1	0	0
Angioleimyoma†	0	0	0	2	0	0
Pigmented villonodular synovitis	0	0	0	0	0	2
Haemangioma	0	1	0	1	0	0
Fibroma	0	0	0	2	0	0
Lipoma	0	0	0	0	1	0
Lymphangioma	0	0	0	0	0	1
Plantar fibromatosis	0	0	0	0	1	0
Schwannoma	0	0	1	0	0	0
Benign fibrous histiocytoma	0	0	0	0	1	0
Myxoma	0	0	0	0	0	1
Soft tissue sarcoma‡	0	0	1	0	2	0
Skin cancer	0	1	1	0	0	0
Unclassified§	2	1	0	2	0	1
Miscellaneous‖	0	1	0	2	0	0

* Incomplete patient information in one case
† Incomplete patient information in 3 cases
‡ One case of synovial sarcoma, one case of rhabdomyosarcoma and one case of hemangiopericytoma
§ Diagnosis was not confirmed histologically
‖ Granuloma, rheumatoid nodule or neuroma; patient information incomplete in 3 cases

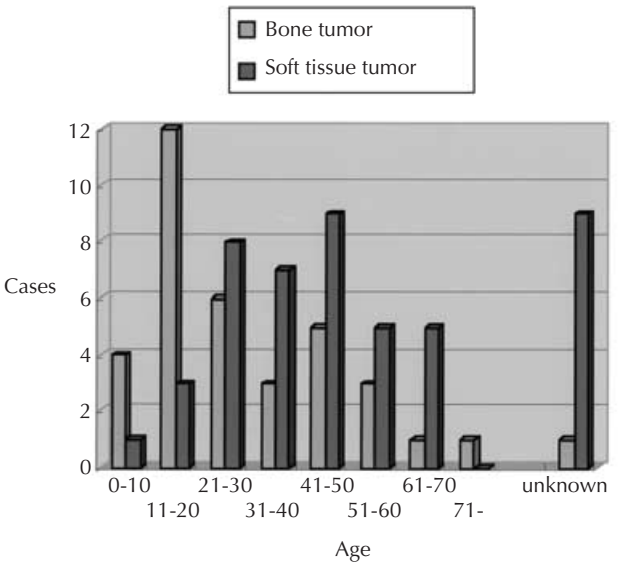

Figure 5 Comparative distribution of bone and soft tissue tumours by age.

Comparison between bone and soft tissue tumours

The majority of bone tumours were located in the toe area (22 cases; 61%) and hindfoot area (12 cases; 33%), whereas soft tissue tumours occurred mainly in the midfoot area (18 cases; 45%) [Table 3]. Bone tumours (osteochondroma and solitary bone cyst) commonly occurred in the first and second decades of life (16 cases; 44%), while most soft tissue tumours (24 cases; 63%) occurred in the patients aged between 20 and 50 years (Table 4 and Fig. 5). The sex distribution was almost even for bone tumours (male : female, 19 : 17), whereas about half as many males as females had soft tissue tumours (14 : 33) [Fig. 6].

The majority of bone tumours that were located in the toe area were osteochondromas and enchondromas (20 cases; 91%). About half as many males as females had these tumours in the toe area (7 : 15), whereas 5 times as many males as females (10 : 2) were affected in the hind area (Table 3). In contrast, the mid-area was the predominant location for all groups of soft tissue tumour except giant cell tumour, and females were predominantly affected among all groups (Table 3).

DISCUSSION

Although the majority of bone tumours in our series were osteochondroma and enchondroma, osteoid osteoma was the most frequent lesion among the

Table 4
Age distribution of patients according to type of bone and soft tissue tumour

Diagnosis	Age (years) [n]		
	≤19	20–49	≥50
Bone tumour			
Osteochondroma	12	4	1
Enchondroma	0	7	0
Chondroblastoma	1	1	0
Solitary bone cyst	3	0	1
Lipoma	0	0	1
Osteoma	0	1	0
Ganglion tumour	0	1	0
Chondrosarcoma	0	0	1
Metastatic cancer	0	0	2
Soft tissue tumour			
GCT* or PVNS†	1	7	0
Ganglion tumour‡	0	2	3
Angioleimyoma§	0	2	1
Fibroma‖	0	1	0
Plantar fibromatosis	0	1	0
Haemangioma or lymphangioma	0	3	0
Miscellaneous¶	2	3	3
Unclassified**	0	2	2
Skin cancer	0	2	0
Soft tissue sarcoma	1	1	1

* GCT Giant cell tumor of tendon sheath
† PVNS Pigmented villonodular synovitis
‡ Age of 2 patients were unknown
§ Age of 2 patients were unknown
‖ Age of one patient was unknown
¶ Granuloma, rheumatoid nodule, neuroma, lipoma, schwannoma, myxoma or benign fibrous histiocytoma; the age of 2 patients were unknown
** Diagnosis was not confirmed histologically; age of 2 patients were unknown

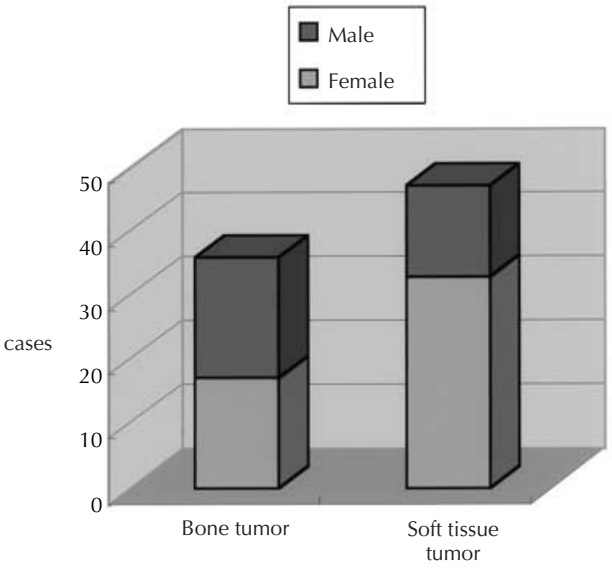

Figure 6 Comparative distribution of bone and soft tissue tumours by sex.

patients described by Casadei et al.[1] followed by bone cyst. Osteochondroma, however, was not included as a true neoplasm (which does not match their criteria of true neoplasm) in their report. In their series, most bone cysts were treated conservatively, and bone cysts were not included in our data. We found no cases of osteoid osteoma in our study: this is the significant difference between our and their series and possible explanations are racial or different basis of diagnosis.

In our series, the mid-area of the foot was the least commonly affected area for bone tumours. The hindfoot was the more common site of bone tumour in the report of Casadei et al.[1] If we excluded cases of osteochondroma as Casedei et al did, the hindfoot becomes the more commonly affected area than forefoot in our series. Thus the pattern of tumour locations is compatible between the 2 series.

In our series and that of Kirby et al.[2] females had soft tissue tumour more commonly than did males. In our series, the mid-area was more commonly affected than the other parts. Ganglia were more commonly located in the report by Kirby et al. In our institution, the glanglia were commonly treated by just aspiration. Most ganglia operated on in our institutions were atypical and located in the plantar aspect of the foot, making preoperative diagnosis very difficult.

CONCLUSION

In our series, bone tumours were more commonly located in the forefoot and hindfoot, and was soft tissue tumours in the midfoot. Most bone tumours were chondrogenic. Chondrosarcoma was very rare, the differential diagnosis from the benign counterpart was difficult, and the prognosis was poor. Management of benign tumour by marginal resection was associated with a good prognosis, whereas prognosis of soft tissue sarcomas was very poor.

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