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THE ROLE OF X-RAY EXAMINATION IN PRIMARY AND METASTATIC TUMORS OF LONG BONES COMPLICATED BY PATHOLOGICAL FRACTURE

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The X-ray method is one of the most accessible and significant in the diagnosis of bone tumors.

Plain radiography in two projections is the main component in the detection of pathological fractures of long bones.

All 136 patients underwent X-ray examination. The studies were carried out on an X-ray machine "EBK-750V" with a voltage of 35-55 kV, a current of 70-150 mA and a focal length of 65-90 cm. At the same time, the main attention was paid to the X-ray variants of fractures: the nature of the fracture, the fracture line, the displacement of bone fragments, the nature of displacement, etc.

Out of 136 patients, pathological fracture was localized in the femur in 72 (53.0%), humerus in 51 (37.5%), tibia fracture in 10 (7.3%), fibula fracture in 2 (1.5%), and radius fracture in 1 (0.7%) (Table No1).

Table No 1.

Distribution of patients depending on localization

Localization tumors	Quantity patients		Localization		
	Abs.	%	Q/3	C/3	N/3
Femur	72	53,0%	44	10	22
Humerus	51	37,5%	32	10	5
Tibia	10	7,3%	4	1	5
Fibula	2	1,5%	2		
Radius	1	0,7%			1
Total	136	100%	82	21	33

In benign tumors and tumor-like lesions, pathological fracture was localized in 25 (49.0%) cases in the epimetaphysis, in 10 (19.6%) metaphysis, in 10 (19.6%) metadiaphysis, and in 6 (11.7%) bone diaphysis. According to the X-ray picture, a lytic fracture was observed in 21 (41.2%), in 4 (7.8%) osteoblastic, and in 26 cases (50.9%) a mixed fracture. By fracture line, transverse fracture was observed in 19 (37.2%), oblique fracture in 13 (25.5%), longitudinal fracture in 2 (3.9%), and mixed fracture in 17 cases (33.3%). By the nature of the displacement, in 2 (3.9%) patients it was observed in width, in 2 (3.9%) at an angle, in 4 (7.8%) embedded fractures, and in 43 (84.3%) patients the displacement was not determined.

In malignant tumors, pathological fracture was localized in 35 (53.0%) cases in the epimetaphysis, in 14 (21.2%) metaphysis, in 8 (12.1%) metadiaphysis, and in 9 (13.6%) bone diaphysis. According to the X-ray picture, a lytic fracture was observed in 50 (75.5%) and in 16 cases (24.5%) a mixed fracture. Along the fracture line, transverse fracture was observed in 15 (22.7%), oblique fracture in 8 (12.1%) cases (Fig. 1), longitudinal fracture (Fig. 2) in 4 (6.1%) cases, and mixed fracture (Fig. 4) in 39 cases (59.1%). By the nature of the displacement in 5 (7.5%) patients was observed in width, in 9 (13.6%) at an angle, in 10 (15.1%) patients hammered in and in 42 patients (63.6%) displacement was not determined.

Pathological fracture in metastatic lesions was localized in 7 (36.8%) cases in the epimetaphysis, in 6 (31.6%) metaphysis and in 6 (31.6%) bone diaphysis. According to the X-ray picture, a lytic fracture and 11 cases (57.8%) a mixed fracture were observed in 8 (42.1%) cases. Along the fracture line, a transverse (Fig. 3), 1 (5.3%) longitudinal fracture and 10 (52.6%) mixed fractures were observed in 8 (42.1%) cases. By the nature of the displacement, in 5 (26.3%) along the length, in 7 (36.8%) cases the displacement was not determined (Fig. 5) and in 7 (36.8%) cases.

As shown in Table No12, the tumor size in 33 patients (24.3%) was up to 5 cm, in 51 (37.5%) - from 5 to 10 cm, in 37 (27.2%) - from 10 to 15 cm, and in 13 patients (9.5%) the tumor size was from 15 cm and more.

It should be noted that in 33.8% of patients (46 out of 136) the tumor size was significant, which had to be taken into account when developing a treatment plan.

Table 2

Размер опухоли (см)	**Гистологическая структура**		
	Доброкачественный и опухолеподобный	Первично злокачественный	Метаста тический
До 5 (33)	12(23,5%)	14(21,2%)	8(42,1%)
От 5 до 10(51)	21(41,3%)	24(36,4%)	6(31,6%)
От 10 до 15 (37)	15(29,5%)	19(28,9%)	4(21,1%)
От 15 и больше (13)	3(5,9%)	9(13,5%)	1(5,3%)
Всего	**51(100%)**	**66(100%)**	**19(100%)**

Distribution of patients depending on the histological structure and size of the tumor

Tumor size (cm)	**Histological structure**		
	Benign and tumor-like	Primary malignant	Metasta Physical
Up to 5 (33)	12(23,5%)	14(21,2%)	8(42,1%)
From 5 to 10(51)	21(41,3%)	24(36,4%)	6(31,6%)
From 10 to 15 (37)	15(29,5%)	19(28,9%)	4(21,1%)
From 15 and more (13)	3(5,9%)	9(13,5%)	1(5,3%)
Total	**51(100%)**	**66(100%)**	**19(100%)**

Thus, the most common pathological fracture was localized in the epimetaphysis in benign and tumor-like lesions (49.0%), primary malignant (53.0%) tumors and metastatic lesions (36.8%). According to the X-ray picture, benign and tumor-like lesions were characterized by a mixed

(50.9%), primary malignant (75.5%) and metastatic (57.8%) lytic fracture. Along the fracture line, benign and tumor-like lesions were characterized by a transverse (37.2%), primary malignant (59.1%) and metastatic (57.8%) mixed fractures.

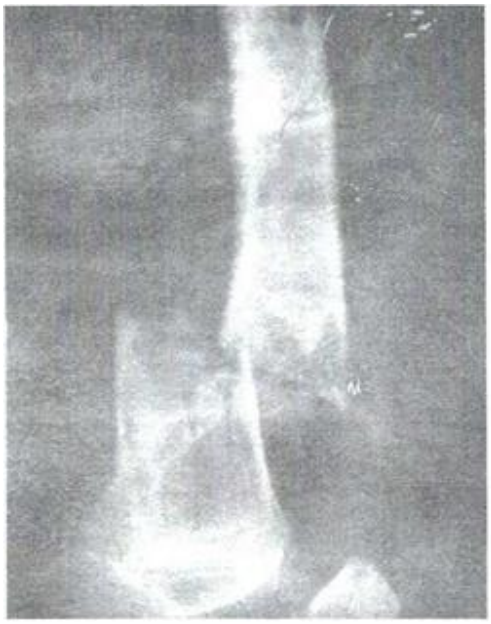


Fig.1 Patient N. I/b 4859. Malignant giant cell tumor of the distal portion of the left femur. Pathological oblique fracture.

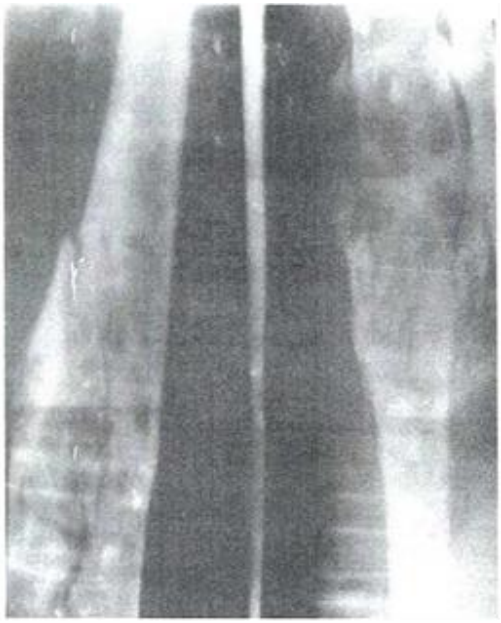
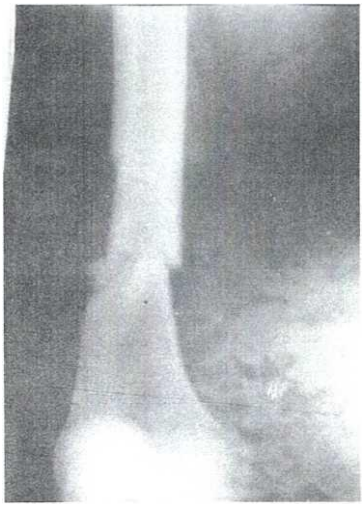


Fig.2 Patient K. I/b 5694. Osteosarcoma of the left femoral diaphysis, Pathological longitudinal fracture.

The most common pathological fractures were embedded (15.4%) (Fig. 5). Less commonly, mixing of bone fragments at an angle (8.0%) (Fig.6), width (5.1%) and length (3.6%) (Fig.7-8) In the remaining 92 (out of 136) cases (68.0%), mixing of bone fragments was not found.



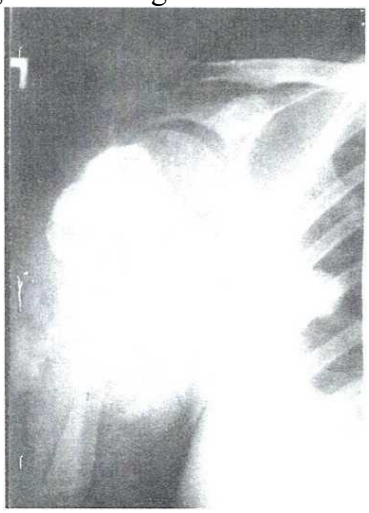


Fig.3 Patient E. I/b 354. Metastatic lesion of the distal part of the right femur. Pathological transverse fracture.



Fig. 5. Patient Zh. I/b 3833. Metastatic lesion of the proximal portion of the right femur. Pathologically embedded fracture.

Fig. 4 Patient U. I/b 1383. Fibrosarcoma of the proximal portion of the right humerus. Pathological mixed fracture

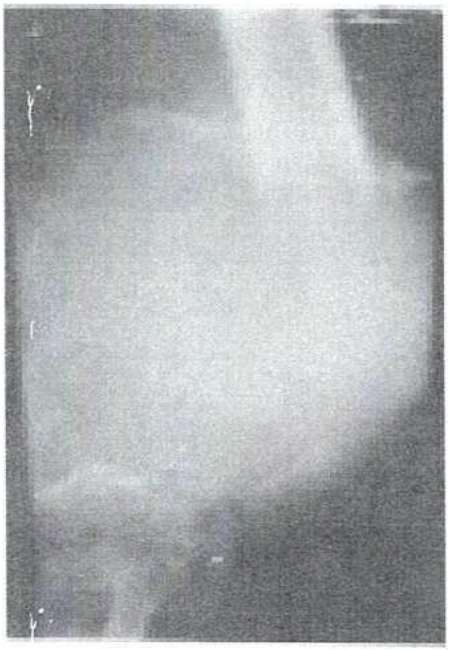


Fig. 6 Patient A. I/b 5384. Osteosarcoma of the distal part of the right femur. Pathological fracture (mixing at an angle).



Fig. 8. Bolnoy M. I/b 2288. Osteosarcoma of the

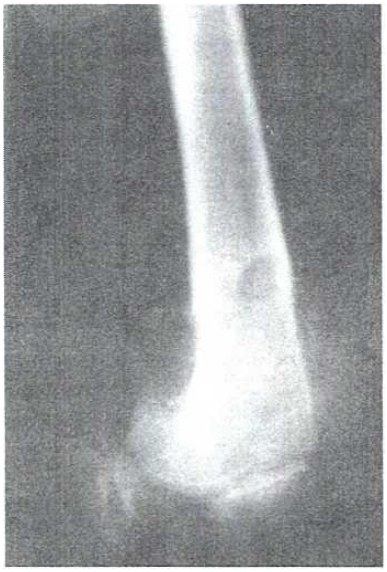


Fig. 9. Bolnoy Sh. I/b 3169. Metastatic lesion of

proximal portion of the right humerus. Pathological fracture

(thinning of the cortical layer).



Fig. 10. Bolnoy A. I/b 168. Tumor of the proximal portion of the left humerus. Pathological fracture (bone swelling).

the distal portion of the left femur. Pathological fracture (mixing in length)



Fig. 11. Patient K. I/B 1661. Tumor of the diaphyseal region of the left femur. Pathological fracture

(areas of calcification

In addition, radiographic signs - thickening or thinning of the bone, osteodestruction, osteolysis, lucidity, thinning or thickening of the cortical layer, spicules, bone sclerosis, bone swelling, reactive osteogenesis and osteoplastic changes were evaluated.

As can be seen from this Table No3, small-focal osteo destruction was characteristic of primary malignant (68.2%) and metastatic lesions (84.2%), in benign and tumor-like lesions, large-focal osteodestruction (78.4%). Thinning of the cortical layer was characteristic of primary malignant (89.4%) and metastatic (68.4%), less often in benign and tumor-like (60.8%) lesions. Areas of calcification (45.4%) and the presence of a soft tissue component (69.7%) were characteristic of malignant tumors.

Table 3.

Distribution of radiographic features depending on the histological structure

X-ray Signs	**Localization**		
	Dobroka-Honorable	Evil-Honorable	Metastatic-The Turks and Peasants
Small-focal osteodestruction	11 (21,6%)	45 (68,2%)*	16 (84,2%)*
Large-focal osteodestruction	40 (78,4%)*	21 (31,8%)	3 (15,8%)

Bone swelling	13 (25,5%)	3 (4,5%)	1 (5,2%)
Thinning of the cortical layer	31 (60,8%)	59 (89,4%)*	13 (68,4%)
Spicules	-	37 (56,1%)*	-
Sclerosis	2 (3,9%)	3 (4,5%)	-
Areas of calcification	5 (9,8%)	30 (45,4%)*	6 (31,6%)
Reactive osteogenesis	7 (13,7%)	10 (15,1%)	-
Presence of osteophytes	4 (7,8%)	16 (31,4%)*	-
Availability of m/t component	29 (56,9%)	46 (69,7%)	11 (57,9%)
Bone defect	-	20 (30,3%)*	-
Total	**51**	**66**	**19**

Significantly different (P<0.05)

In general, X-ray examination for pathological fractures of long bones made it possible to determine the localization of the fracture, the mixing of bone fragments, the degree of spread, and the nature of the tumor

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