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THE OCCURRENCE OF BONE TUMORS IN THE ANTHROPOLOGICAL REMAINS BELONGING TO THE SZÉKKUTAS-KÁPOLNADŰLŐ CEMETERY (HUNGARY) OF THE LATE AVAR PERIOD

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Abstract

During the paleopathological examination of 518 human skeleton remains belonging to the Székkutas-Kápolnadűlő cemetery (Hungary, territory east of the river Tisza) of late Avar (8th century) and Sarmatian period, the autor noticed the traces of tumorous lesion on 16 individuals. Most of them were consequences of benign tumorous diseases: osteochondromas in 7 and osteomas in 6 cases. We have to accentuate that malign tumors occurred in 3 cases: in one case a multiple myeloma and in two cases metastatic carcinoma were the presumable diseases. The differential diagnosis was made by examinations using macroscopic morphological, X-ray and scanning electron microscopes.

Key words: paleopathology, Avar period, osteochondroma, osteoma, multiple myeloma, metastatic carcinoma.

Introduction

There are known several ways of classifying the tumors of bone both in the recent and in the paleopathological literature. All of them, however, agree in the principle of separating the primary tumors from the secondary (metastatic) ones (ORTNER and PUTSCHAR, 1981; BARTA, 1986). In case of primary tumors the authors of recent papers, besides a simple separation of the individual benign and malign diseases (PARSONS, 1980; ZIMMERMAN and KELLEY, 1982), consider the process how the different tumor types were developing in and from the tissues (STEINBOCK, 1976; GLAUBER et al., 1980; ENDES, 1983; REVELL, 1986). Most of them take as a basis the classification of 1971 by SPJUT et al., and following it, separate each others tumors of cartilage, bone, fibrous, medullary and vascular origins.

The analysis of bone tumors is one of the most difficult problem in the paleopathology. The tissue elements of the tumors, excepting a special part of the ossifying tumors, vanish together with the viscera and, consequently, their identification becomes impossible. When historical anthropological remains are examined generally the larger structural changes (pathological hypertrophy or hypotrophy of the bones) give the necessery information. These examinations, however, excepting a few relatively unambiguous diagnoses (osteoma eburneum, osteochondroma, osteosarcoma osteoplasticum) mostly cause differential

diagnostical problems. There are, namely, several infectious or metabolic changes which cause processes involving bone production. In case of osteolytic phenomena the postmortal origin or the suspicion of different infectious diseases are reasonable suppositions. Further difficulties may be caused by the separation of tumors involving similar osteologic symptoms (e.g. multiple myeloma, osteolytic metastasis, multiple eosinophile granuloma).

Nevertheless, in the paleopathological literature of the recent years one may experience vivid interest regarding the tumorous lesion detectable in historical anthropological series (SOULIÉ, 1980; LOBDELL, 1981; CYBULSKI and PETT, 1981; TKOCZ and BIERRING, 1984; STROUHAL and VYHNANEK, 1981, 1987; GREGG and GREGG, 1987; GRUPE, 1988). The separation of the tumor types has been facilitated by the development of the differential diagnostical processes (UHLIG, 1982; SCHULTZ, 1986).

Materials and methods

The subject of the examination consisted of the anthropological remains of the Székkutas-Kápolnadűlő cemetery of late Avar and Sarmatian period stored in the collection of the Department of Anthropology, Attila József University. During the period 1965—1986 altogether 555 graves were explored under the direction of archeologist KATALIN B. NAGY, and 533 of them can be dated from the Avar Period.

Skeletal remains of 518 individuals were dug out of those graves. Most of them were fragmentary (66,8%) or in a middling preservation (24,5%).

The aim of our work was to assess the pathological changes detected on the remains of the late Avar period (8th century). That assessment was carried out together with the determination of sexes and ages at death by using macroscopic morphological methods and taking the corresponding special literature into consideration.

For identifying the pathological cases and, especially, for carrying out the more difficult differential diagnosis, it was necessary the use of X-ray analysis, as well as the adoption of stereomicroscopic and scanning electronmicroscopic examinations.

Discussion

When the examinations of the late Avar period remains were carried out, besides other disease types, tumors of bone of different origin and appearance also occured. Among them we could differentiate lesions of chondrogen, myelogen and metastatic origins.

Among the examined remains in seven cases the occurrence of osteochondroma was detected as a representative form of the tumors of chondrogen origin. The most frequent benign tumor of bone is the osteochondroma or exostosis cartillaginea: a bone formation with a growing cartilaginous apex (ZIMMERMAN and KELLEY, 1982). The occurrence of this variety can be noticed in all cases where there is an enchondral ossification. It originates, however, mostly in the metaphysis of tubular bones. GLAUBER (in BARTA, 1986) classifies it as a type of semimalign

hamartomas. All the examined cases were 5—10 mm long, pin-shaped exostoses having their origins in the metaphysis of long bones (3 tibiae, 2 humeri, 2 fibulae, 1—1 radius and femur). Division according sexes and ages at death was, as follows: 1 adult female, 3 adult males and 3 mature males.

Regarding the tumors of osteogen origin the occurrence of osteoma was detected at 6 individuals. The benign tumor consisting of mature bone tissues was to be noticed almost in all cases on the skull bones, and could be classified as a type of the benign hamartomas (GLAUBER et al., 1980). The observed cases were so called „button" osteomas of 3—8 mm diametres. They occured in 4 cases on the surface of tabula externa, in one case on the surface of the tabula interna and in one case on that of the angulus mandibulae (Fig. 1.). The lesions were distributed among one adult female, three mature females, one senile female and one adult male. One has to separate from the osteomas the exostoses of thorn- or crest-formation originating in periosteum which usually were caused by inflamed, traumatic or other metabolic influences (ENDES, 1983).

By the following three cases of malign tumors may be aroused absolutely more interest than by the frequent changes of chiefly benign tumors.

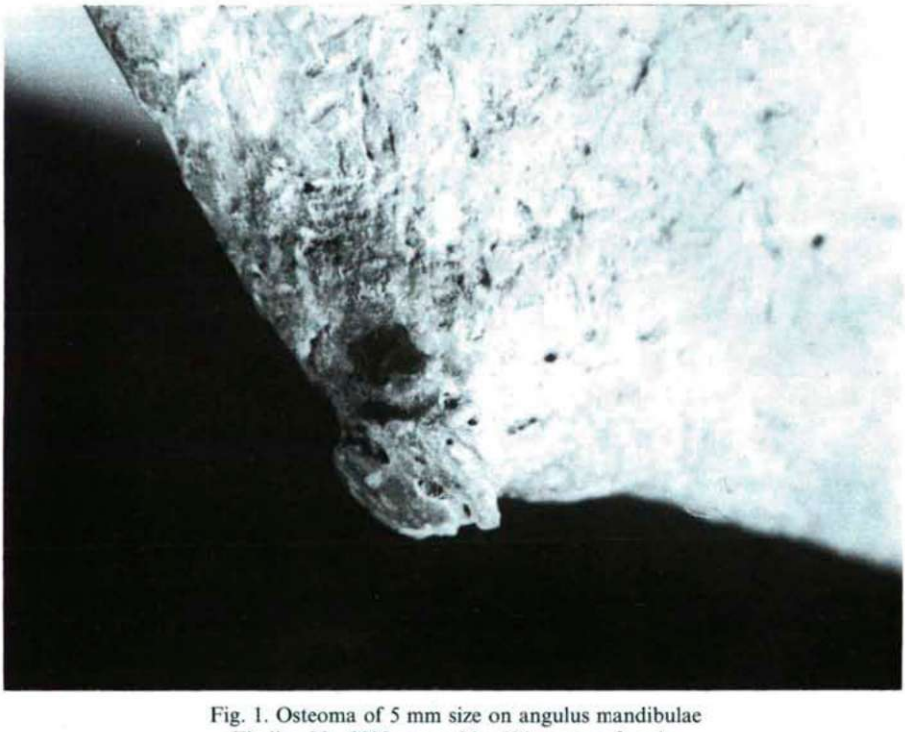

Fig. 1. Osteoma of 5 mm size on angulus mandibulae
Finding Nr. 9902, grave Nr. 524, mature female

— 1st case: grave Nr. 135 (number of finding: 8270). Fragmentary skeleton of a mature male. Several small osteolytic lesions usually of 3—6 mm diametres can be observed on the outer surface of the os frontale and on that of the right and left side os parietale (Fig. 2). The largest lesion (10x11 mm) can be seen on the surface of the left side os parietale. It has been probably caused by the fusion of three smaller foci into one spot. The smaller lesions have a shape of a regular circle. The shapes of the larger ones are not so regular. Most of those lesions perforated only the tabula externa, but a few of them completely perforated the vertex. When viewing from direction of the tabula interna one can see on the left side os parietale one and on the right side os parietale 4 smaller lytic areas. On the internal surface of the os frontale no lesion is to be seen.

Around the lesions no reaction of bones were to be seen neither with macroscopic nor with stereomicroscopic examination. No similar lesion has been detected by us on the very fragmentary frontal skull and postcranial skeleton. On can see cribra orbitalia in orbita sinistra and caries on molars 36 and 37.

On the X-ray photographs of the vertex (Fig. 3) we can see several lytic area to be found only in the diploë. No one of those lytic areas have broken through, however, any of the tabulae.

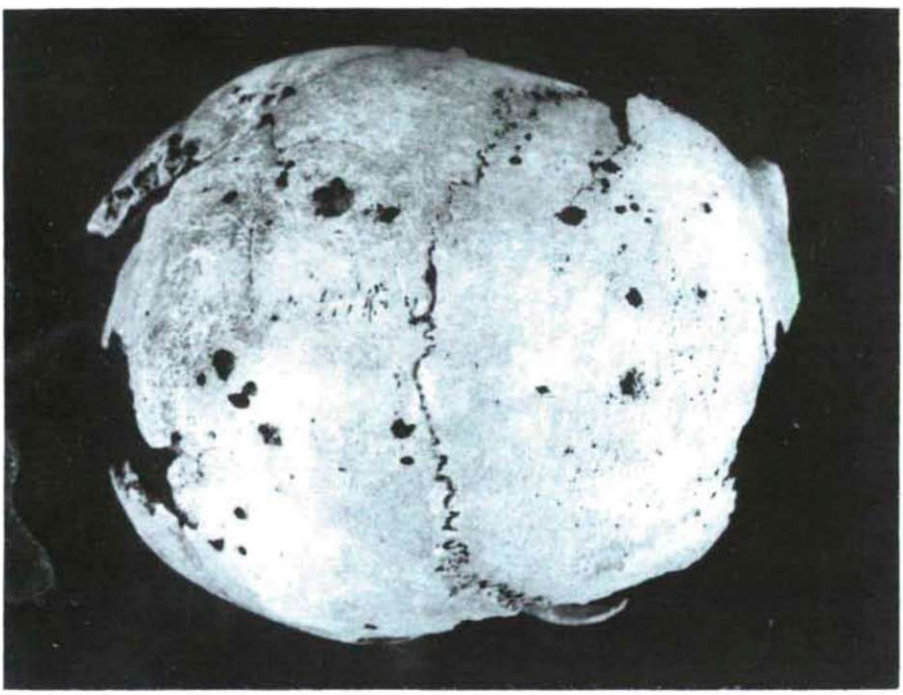

Fig. 2. Osteolytic lesions on the vertex
Finding Nr. 8270, grave Nr. 135, mature male

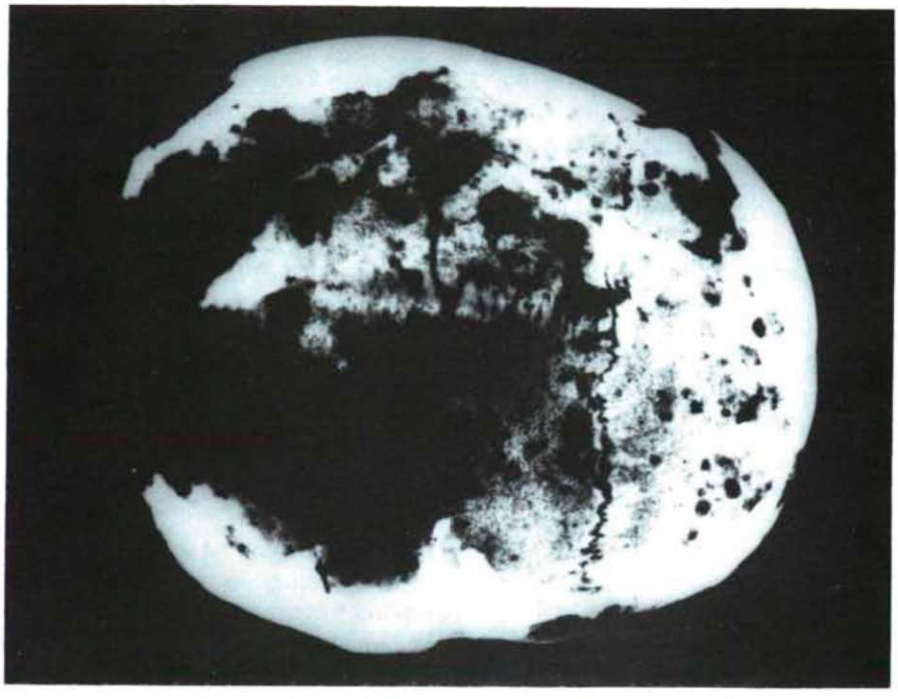

Fig. 3. X-ray photograph of the calvarium to be seen on Fig. 2.
Finding Nr. 8270, grave Nr. 135, mature male

During the paleopathological analysis of the osteolytic processes it was always the suspicion of postmortal origin that first emerged. That suspicion was, however, disclosed by the presence of the lesion localized to the diploë only, to be seen very distinguishably in the X-ray photographs chiefly on the right side of the os frontale.

When the morphological analysis is carried out for making diagnosis both the osteolytic metastatic carcinoma and the multiple myeloma (plasmocytoma) may be a reasonable supposition. Both diseases occur generally at individuals belonging to the age group over 50 years with similar localization (ORTNER and PUTSCHAR, 1981) because both of them prefer the flat bones containing active red medulla even at higher ages. Nevertheless, according to data to be found in the special literature, the multiple myeloma occurs more frequently on the vertex (STEINBOCK, 1976). In cases of multiple myeloma no sclerosis can be detected around the lesion and, consequently, the lysis is of punche-out character without condensation on the edges (ZIMMERMAN and KELLEY, 1982; ENDES, 1983; CSÁKÁNY and FORRAI, 1984). These statements can be proven by our X-ray photographs, too. The defects of similarily „perforated" character caused by eosinophil granuloma (histiocytosis X) are usually larger, and the disease mostly occur before the twentieth year of life. Consequently, it can probably be disclosed (GLAUBER et al., 1980). The high

number, the small diametre and the constant measure are characteristic to the multiple myeloma (UHLIG, 1982).

But in the case of the grave Nr. 135 the probability of osteolytic metastatic carcinoma may not completely be disclosed. Although the character of the defects can be chiefly compared to the case Nr. 4 (Abusir 204/h/78) described by STROUHAL and VYHNANEK (1981, 1987) their localization rather makes the multiple myeloma of myelogen origin probable which caused the death of the mature male with a great probability.

It is worth to mention the cribra orbitalia to be seen in orbita sinistra which could be caused by anaemia because of iron insufficiency (STUART-MACADAM, 1987). A connection can be supposed between these two processes because the damage of red medulla (both multiple myeloma and osteolytic metastasis) can cause production of haematopoietic problems. The common occurrence of cribra orbitalia and osteolytic tumor was announced by STROUHAL in two cases (1976—1977).

— 2nd case: grave Nr. 209, (number of finding: 8338). Skull and postcranial remains of a senile female. Despite the very fragmentary state of the bones several osteolytic defects can be detected. A lesion of 18x20 mm can be seen on the left side os parietale above the sutura sphenoparietalis and another one of 9x7 mm on the os occipitale. 2 larger lesions of 12—14 mm diametres have merged into a larger one on the left side os temporale, one lytic area of 6x5 mm can be seen on the os frontale and three smaller lytic areas 2—3 mm each can be seen on the same bone. The defects extend to both tabulae and the diploë the observed lesion. An osteolytic process can be observed on the mandibula, in several ribs and in the vertebrae.

By using a stereomicroscope or, especially, a scanning electronmicroscope we can observe that the defects on the vertex are notched, their edges are toothed. The lesions to be seen on the os occipitale and on the os frontale show on their edges a sclerotic formation of new bones (Fig. 4 and 5).

On the postcranial skeleton, in the right os ilium we can observe larger (29x19 mm) and in the vertebrae thoracales and lumbales smaller (5—7 mm) lesions. They have round shapes, notched edges. The lesions to be seen on the ribs penetrate through the cortical only in a diffuse manner (Fig. 6). Over the extensions of the cortical subtances we can see macroscopically and by scanning electronmicroscopes several spongiosa-like new bone tissues (Figures 7 and 8).

The X-ray photographs show over the intact area of the os frontale a lesion localized to the diploë. On the right side os ilium we can see three destructions originating in separate foci similarily to the other finding of the Avar period described by REGÖLY—MÉREI (1962). On the remains of the senile female from the grave Nr. 209, besides the lesions mentioned above, we can observe medially severe arthrosis deformans of both cubital articulations, a healed fracture of the right metacarpus 2 and an abcessus periapicalis and odontogenic fistula around the premolar 35.

The bone reactions and the lesions localized to the diploë disclose the supposition of postmortal origin. On the basis of the age at death and the

Fig. 4. Lytic area of 4x7 mm on os occipitale (5x)
Finding Nr. 8338, grave Nr. 209, senile female

localisation both the metastatic carcinoma and the multiple myeloma are reasonable assumptions. The latter, however, can be abandoned based on the differring sizes of the lesions, on their sclerotic edges and on the formation of osteoplastic substances, respectively (ORTNER and PUTSCHAR, 1981).

There are numerous kinds of primary tumors which can cause metastases in bones by haematogenic or lymphogenic diffusion. Most frequent of them are the metastases caused by mammary, prostatic, pulmonary, kidney and thyroid cancers (SPJUT et al., 1971). In the paleopathological examinations it is very difficult to make conclusions regarding the primary tumors because of lacking the soft tissues. According to the literary data the osteolytic-osteoplastic mixed metastases are mostly caused by mammary (SPJUT et al., 1971), mammary or prostatic (CSÁKÁNY and FORRAI, 1984; BENDER, 1987) and pulmonary (ORTNER and PUTCHAR, 1981) cancers. In similar metastasis regards SCHULTZ (1986) in his work the prostatic carcinoma the probable cause. GRUPE (1988) presents very similar lesions on the pelvis and ribs of a 40—50 years old male. He assumes that those lesions are of bronchogenic origin, and supports his results with microelement analysis. In our case the sex of the examined individual discloses the possibility of prostatic cancer. We can make the possible assumption, indeed, that the senile female suffered a

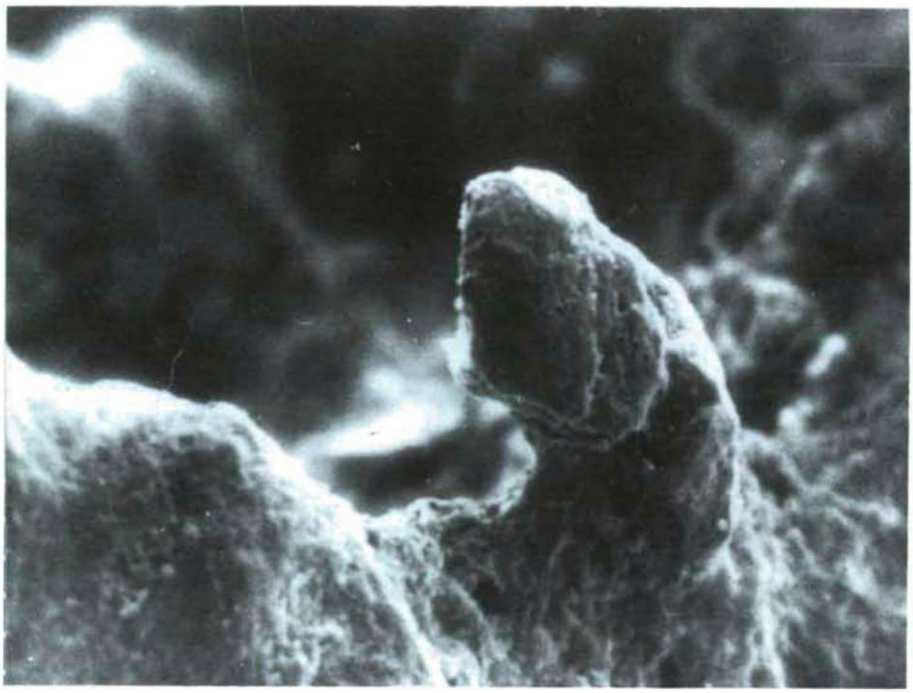

Fig. 5. A part of the sclerotic edge to be seen on Fig. 4. (180x)
Finding Nr. 8338, grave Nr. 209, senile female

pulmonic or laryngeal cancer but the possibility of a mammary cancer can't be disclosed either.

— 3rd case: grave Nr. 305 (number of finding: 11567). A fragmentary postcranial skeleton and a skull in a middling preservation belonging to an adult female. Numerous lytic lesions can be observed on the corpores of the vertebrae belonging to the upper thoracic region and on the ribs, respectively, as well as on the areas of caput and tuberculum costae. The sizes of the lesions are 2—11 mm, and because of their high number on a few vertebrae they take up the larger part of the substancia spongiosa (Fig. 9). Already a macroscopic examination clearly shows that a new compacta-like bone substance has been formed in the place of the original substancia spongiosa around the lytic areas.

No other osteolytic or other pathologic changes can be seen on the skull or on the other bones of the postcranial skeleton. We can observe even traces of lytic foci extending to the substancia spongiosa on the X-ray photographs of the ribs (Fig. 10).

The postmortal origin may be refused by a reasoning similar to that of the 2nd case. On the corpores of the vertebrae we can see that the intervertebral discus was not destroyed during the individual's life and, consequently, the spondylitis

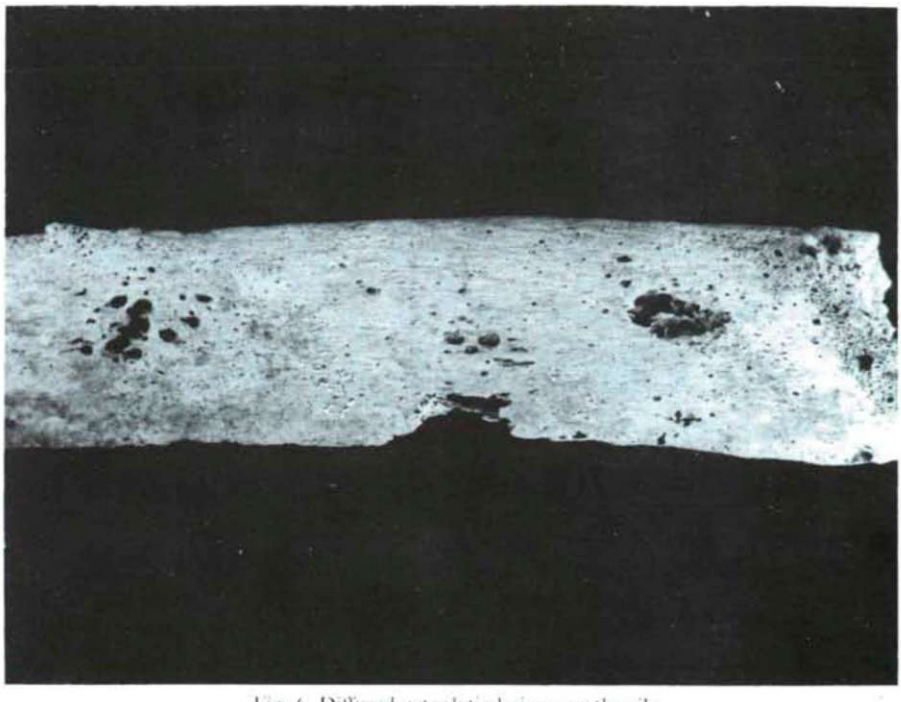

Fig. 6. Diffused osteolytic lesions on the rib
Finding Nr. 8338, grave Nr. 209, senile female

tuberculosa can be disclosed. Similar pathography can be caused by multiple myeloma often localized to vertebrae and ribs either (CYBULSKI and PETT, 1981) but in those cases the edge of lysis is not in a phase of condensation and no sclerosis can be found around it (GLAUBER et al., 1980; OLÁH, 1987). At his age of life (25—35 years old) the occurrence probability of multiple myeloma is very slight (UHLIG, 1982). We have more data regarding the occurrence of metastatic carcinoma at younger ages although that disease more often occurs at older ages (ORTNER and PUTSCHAR, 1981; UHLIG, 1982). The destruction of vertebrae described in the 3rd case can far mostly compared to the lesions to be seen on the thoracal vertebrae of the 30—35 years old Pueblo Indian female (PM 59834) described by HOOTON in 1930 (STEINBOCK, 1976).

Based on the character of the lytic foci, the sclerosis of the tabeculae and the localization, similarily to the case published by ORTNER and PUTSCHAR (1981) on the basis of the pathological anatomy's material (FPAM 5697), mammary carcinoma can be assumed as the probable cause. Because of the cystic character of the metastasis, a metastatic carcinoma of kidney or thyroid origin cannot be disclosed either (BENDER, 1987).

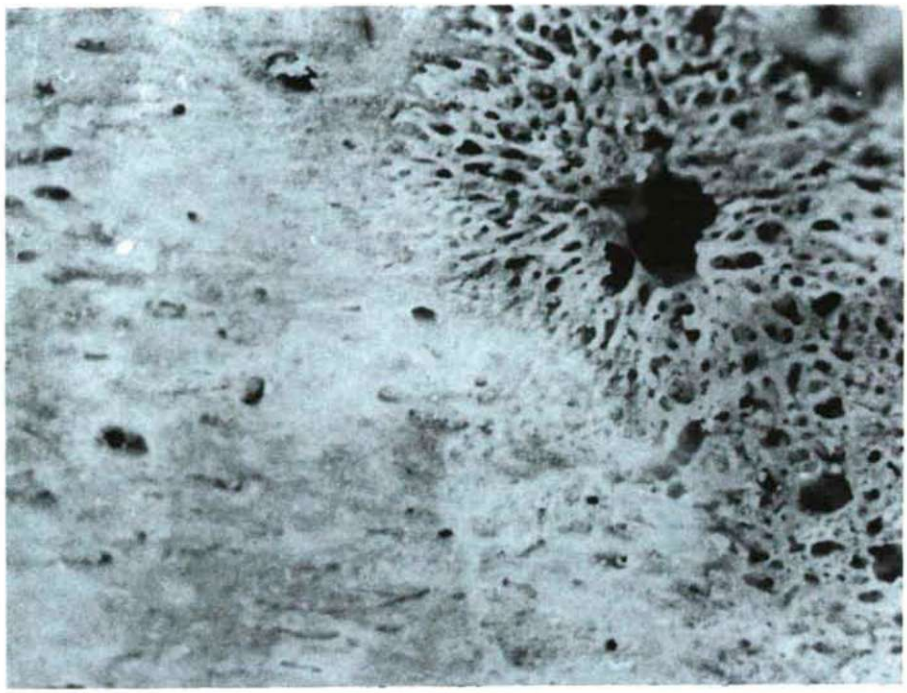

Fig. 7. Osteoplastic metastasis on rib surface (14x)
Finding Nr. 8338, grave Nr. 209, senile female

Conclusions

During the paleopathological examinations of the late Avar period skeleton remains belonging to the Székkutas cemetery in 16 cases was noticed the occurrence of neoplasms (3,08%). That value does not differs significantly from GLADYKOWSKA-RZECZYCKA's data (1988). She mentions the occurrence of tumors regarding the 2584 skeleton remains found in Czechoslovakia in 60 cases (2,3%) and regarding the 2666 skeletons found in Poland in 51 cases (1,9%).

The osteochondroma is the most frequent tumorous lesion of bones even in recent populations (GLAUBER et al, 1980). The frequency in paleopathology of the likewise frequent osteomas was experienced by KELLEY in the different remains between 0,5 and 3,7% (in: ZIMMERMAN and KELLEY, 1982).

We have emphasize among the tumorous lesions the occurrence of the three malign tumors. Their frequency in the sample of Székkutas (0,57%) is very similar to the occurrence of malign neoplasms (0,59%) in the Avar period remains found in Bačka-Topola (FARKAS and MARCSIK, 1979) but significantly lower than the occurrence experienced in the Egyptian sample (1,4%) published by STROUHAL and

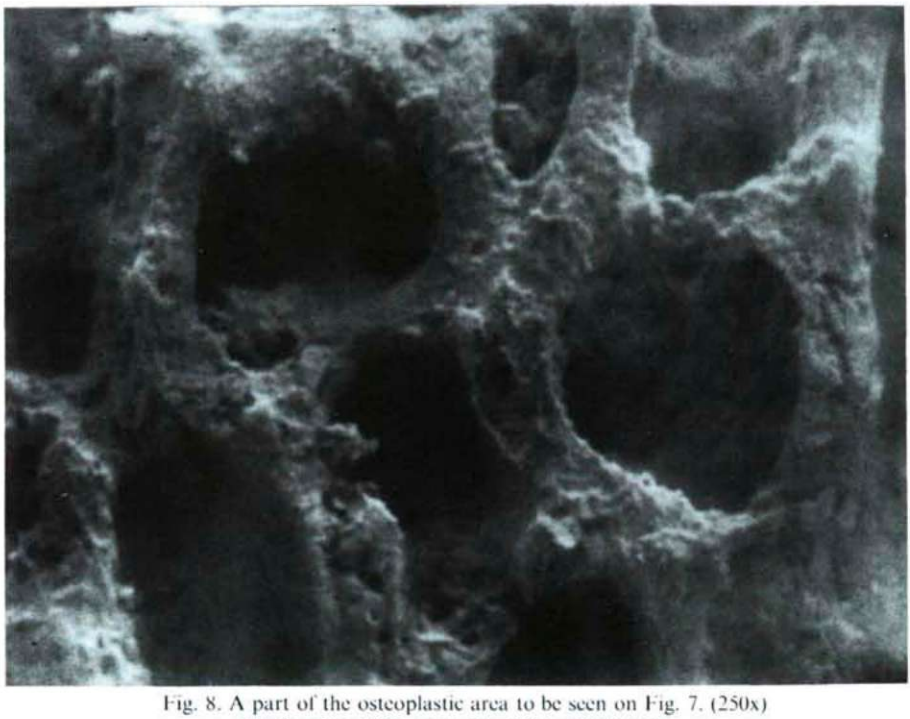

Fig. 8. A part of the osteoplastic area to be seen on Fig. 7. (250x)
Finding Nr. 8338, grave Nr. 209, senile female

VYHNANEK (1981 and 1987) and than the frequency observed by BLONDIAUX (1984) in the remains found in Northern France (4,1%).

The primary malign tumors occuring on the bones represent only 1—1,5% of all the malign processes (ENDES, 1983). The metastatic bone tumors are, however, much more frequent: according to the clinical data 12—17% of the malign tumors can cause metastases in bones (STEINBOCK, 1976; ORTNER and PUTSCHAR, 1981). Taking the above-mentioned data into consideration and basing on the data referring to the present population, i. e. in 1986 20,31% of the death cases were caused by cancer in our country (ECKHARDT, 1989), one could expect the occurrence of metastases in the examined skeleton remains in a higher percentage. There are several assumptions to explain why the actual facts differ from these expectations:

— the average lifetime of the Avar period population was lower than the lifetime for the time being, and the metastatic carcinoma usually developes at higher ages;

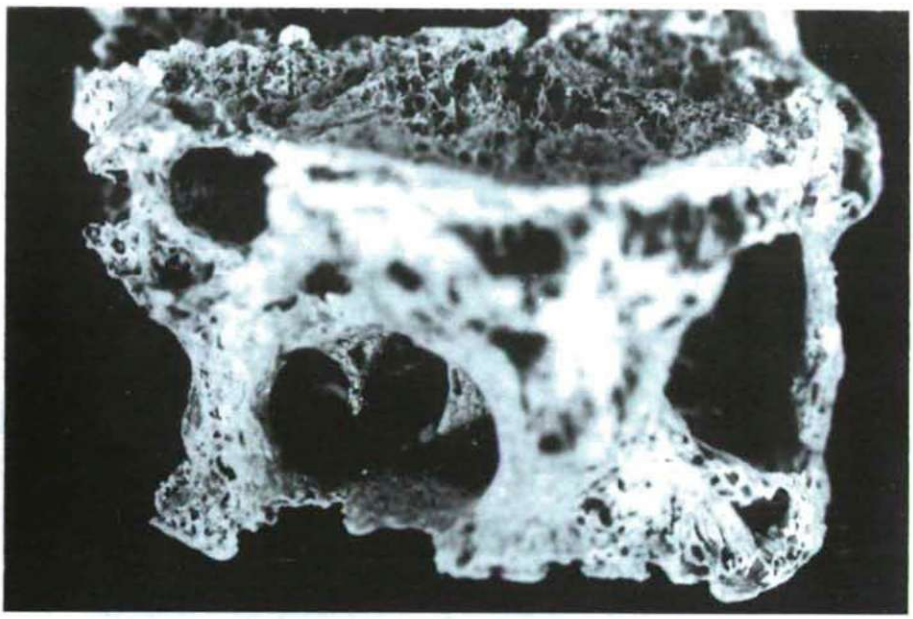

Fig. 9. Osteolytic lesions on a thoracic vertebra
Finding Nr. 11567, grave Nr. 305, adult female

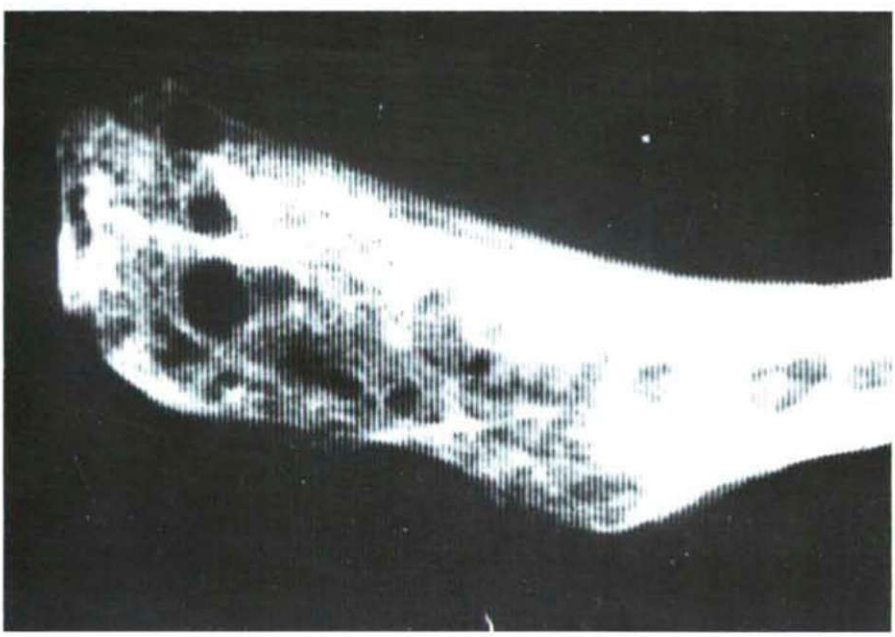

Fig. 10. Lytic foci on the X-ray photograph of the rib
Finding Nr. 11567, grave Nr. 305, adult female

— the well known cancerogenic environmental factors much less endangered the Avar population living 1200 years ago;

— because of the unfavorable and fragmentary preservation of the remains of Székkutas several lesions might have remained undetectable during the examinations.

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