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Palaeo-Oncological Findings from Prehistoric Crete

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Four possible cases of bone neoplasms from prehistoric Crete were identified in the mid-1970's, a period of refinement in archaeological approaches and the use of techniques from other disciplines (1, 2). In Greece at that time human remains from excavations were not thought to be of any scientific value. They were usually ignored, cast aside, or reburied – at best a sample of skulls might be retained – because few archaeologists realised that human remains are in fact an immense untapped reservoir of information about the lives of our distant ancestors. The point of this brief prologue is to evoke the pioneering era in which the research took place, when no one was interested in keeping or studying human remains and to remember that the procedures then available were limited to observation, photography and x-rays. The oncological findings I am about to present come from three sites that yielded human burials.

PLATYVOLA

Chronologically the earliest case comes from Platyvola Cave, difficult to access, as it clings to the side of a steep gorge. Though only 12 km from Chania, still without roads or electricity in 1980 when I visited, it felt as remote as it must have been in Early Minoan times. The site was identified by P. Faure in 1956 (3, 4, 5) and subsequently investigated by local archaeologists (6, 7, 8). An excavation there in 1967-8 by the Ephor produced more artefacts, bones and a topographical plan of the 4 chambers used for habitation and burials (9, 10). In 1980 I was given permission to conduct a three-day investigation of the burial chamber to collect more human remains and establish a firm date for the burials. Gas lights and ropes were needed to descend into the sinkholes 4 to 6 metres deep to recover a sub-

stantial amount of skeletal remains associated with Early Minoan scored and incised wares, a copper shaft-hole axe and a Late Minoan cup sherd. The burials appeared to be comingled with scatters of bones representing adults and children. Bone samples submitted to the British Museum for C^{14} dating produced results ranging from 2717-2240 BC, indicating that these are the absolute dates for the cultural horizon of the burials (11, 12).

Amongst the material was a tibia with a clearly pathological appearance, illustrated in Figure 1, next to the x-ray in which we can see thickening and distortion of the compact cortical bone above the middle of the diaphysis of the tibia and areas of increased and decreased radiographic shadow. I suggested that this might be an osteogenic osteoma or more likely Paget's disease that usually affects individuals over forty years of age and males slightly more frequently than females in a ratio of 4:3. - On the right is the tibia of a

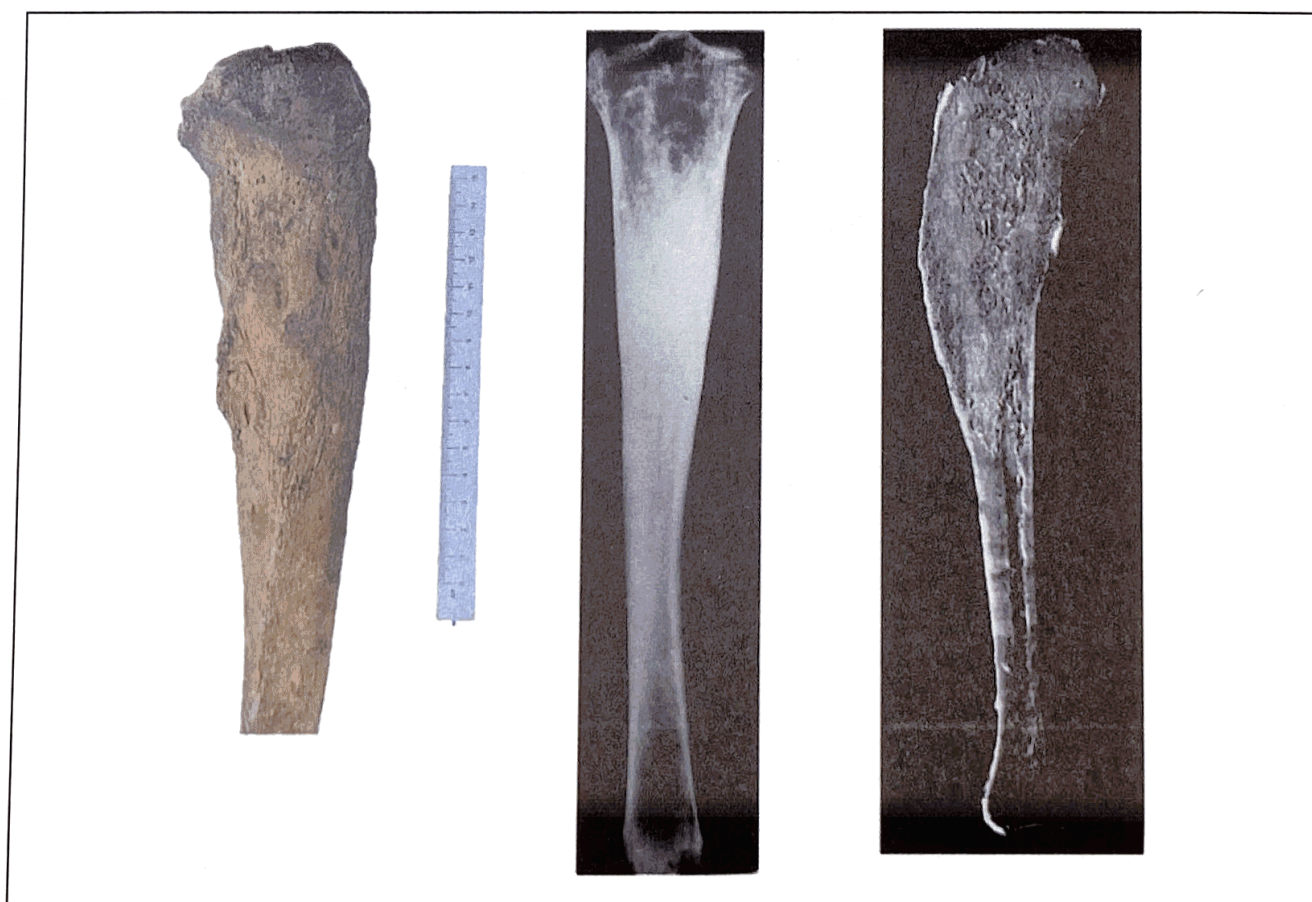


Figure 1. Platyvola tibia (left and middle) compared with the tibia (on the right) of a 57-year-old female with advanced Paget's disease.

¹See p. 231, fig. 97.

57 year-old female with advanced Paget's disease (13).¹ A CT scan of the tibia was taken in August 2019.

HAGIOS CHARALAMBOS

The next case of a possible neoplasm is from Hagios Charalambos, also known as the Gerontomouri Cave, a natural cavern on slopes overlooking the Lasithi plain. The cave, 835 metres above sea level, was discovered accidentally in 1976 in the course of building a new road. The first two chambers of the original seven were destroyed by dynamiting producing the rubble strewn outside the cave. Several excavations were conducted between 1976 and 2003 (2, 14 - 18). The chambers literally brimmed with human remains, that were originally buried elsewhere (19), and were transported and redeposited in the cave in MM IIB, ca 1700 BC, together with abundant grave gifts: about 1800 vases, seal stones, figurines, stone tools, weapons, artefacts of silver and gold sourced from Egypt, and six clay sistra, a type of musical instrument shaken like a rattle to accompany singing (20). The burials and grave offerings were comingled and retaining walls had been constructed inside the cavern to keep the bones in place. Some of the finds date to the Neolithic period, but the bulk of the pottery dates to the Early Minoan III to Middle Minoan I period, ca 2200-1950 BC, which is therefore assumed to be the date of most of the burials (20-22). So far more than 31,000 bones – mainly broken, though some are intact – have been catalogued. They represent three to four hundred individuals. DNA analyses indicated the phenotypic traits of hair and eye colour of five adults, three females and two males, with brown/black/blond hair and brown eyes (23).²

The cave ossuary and the artefacts accompanying the burials indicate that this community was highly organised, integrated into a long-distance trade network, but not without societal conflict. A number of spectacular head traumas received surgical attention

²See Extended Data Table 2: Lasithi: 3 females one of whom was possibly blond; 2 males one of whom had black hair.

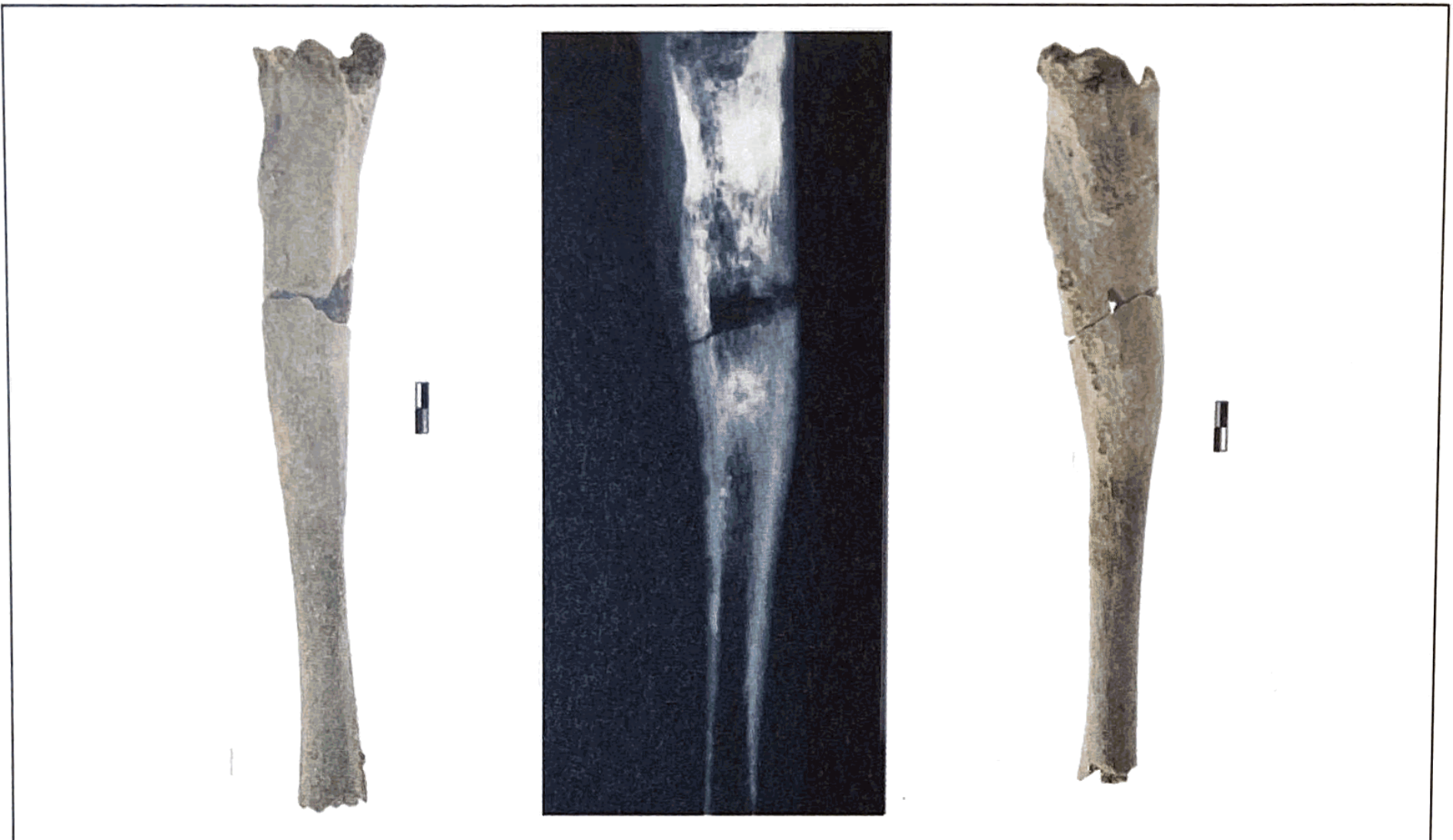


Figure 2. Hagios Charalambos tibia with enlarged upper shaft.

with a level expertise that shows that the foundations of Hippocratic medicine were already laid early in the 2nd millennium BC (20,³ 24).

Amongst this material was a tibia shown in the x-ray and photographs in figure 2. The shape of the bone is abnormal. The upper shaft is enlarged; corresponding to the area of radio-translucence in the x-ray where the loss of cortico-medullary definition is clearly discernible. This too could be a case of Paget's disease but, like the *Platyvola* example, it is not from a discrete burial from which one might derive more detailed clinical information, as well as the age and sex of the individual.

ARMENOI

Armenoi, 10 km south of Rethymnon, is the location of a Late Minoan cemetery with over 200 rock cut chamber tombs, with extraordinarily well-preserved inhumation burials. Chamber tombs are typical of this period in Crete. They have a long dromos, sometimes with steps, leading to an underground chamber. Entrances up to 2 metres

³See p. 578-594 for traumas and trephinations in (20).

high, accessed chambers with architectural details such as carved columns, benches and niches. This cemetery was used in the 14th and 13th centuries BC during the period of Mycenaean domination.

Burials were sometimes made in decorated clay coffins, but more often were simply laid on the floor (25, 34). Tombs contained multiple burials with up to 15 or 16 people. Physical resemblances (and non-metrical inherited traits) indicated that they were family tombs (35). One individual with a bronze arrowhead embedded in his spine may have been killed in a hunting accident, another, a warrior with multiple wounds probably inflicted by a sharp weapon, must have been killed in a duel or a skirmish (36). When tombs became overcrowded, earlier burials were swept into a pile to make room for new ones. However, it was usually possible to separate out individual skeletons on the basis of age, sex and stature.

Among the funerary gifts, there were many items connected with weaving: spindle-whorls and loom-weights that indicated people's involvement with wool and textile production. The site's suitability for animal husbandry is reflected by the landscape. The population's preoccupation with animals is indicated by zoonotic disease; there was a high incidence of bone lesions probably caused by chronic tuberculosis or brucellosis infections. These finds and the nature of the landscape led one epigraphist to suggest that the toponym, *da-*22-to*, recorded in the Knossos "sheep tablets" might refer to Armenoi (37, 38, 39⁴).

At the time of the study, over 100 tombs had been excavated and 364 individuals studied, providing information on a cross-section of the population that included 114 children, 143 males and 107 females. Half of the children were under five. The mean age at death for men was 30.7; for women it was 27.63 years, 3 years younger, whereas today women usually live longer. Mean stature was 1.68 cm for men and only 1.55 cm for women (40). Osteoporosis was seven times more frequent in women. Women who reached the age of 35 had lost 40% of their teeth, and many of the remaining teeth (30%) were diseased. These stress indicators and the high number

⁴However, Bennett later appears to place the toponym in the general area of Rethymnon – see p. 243

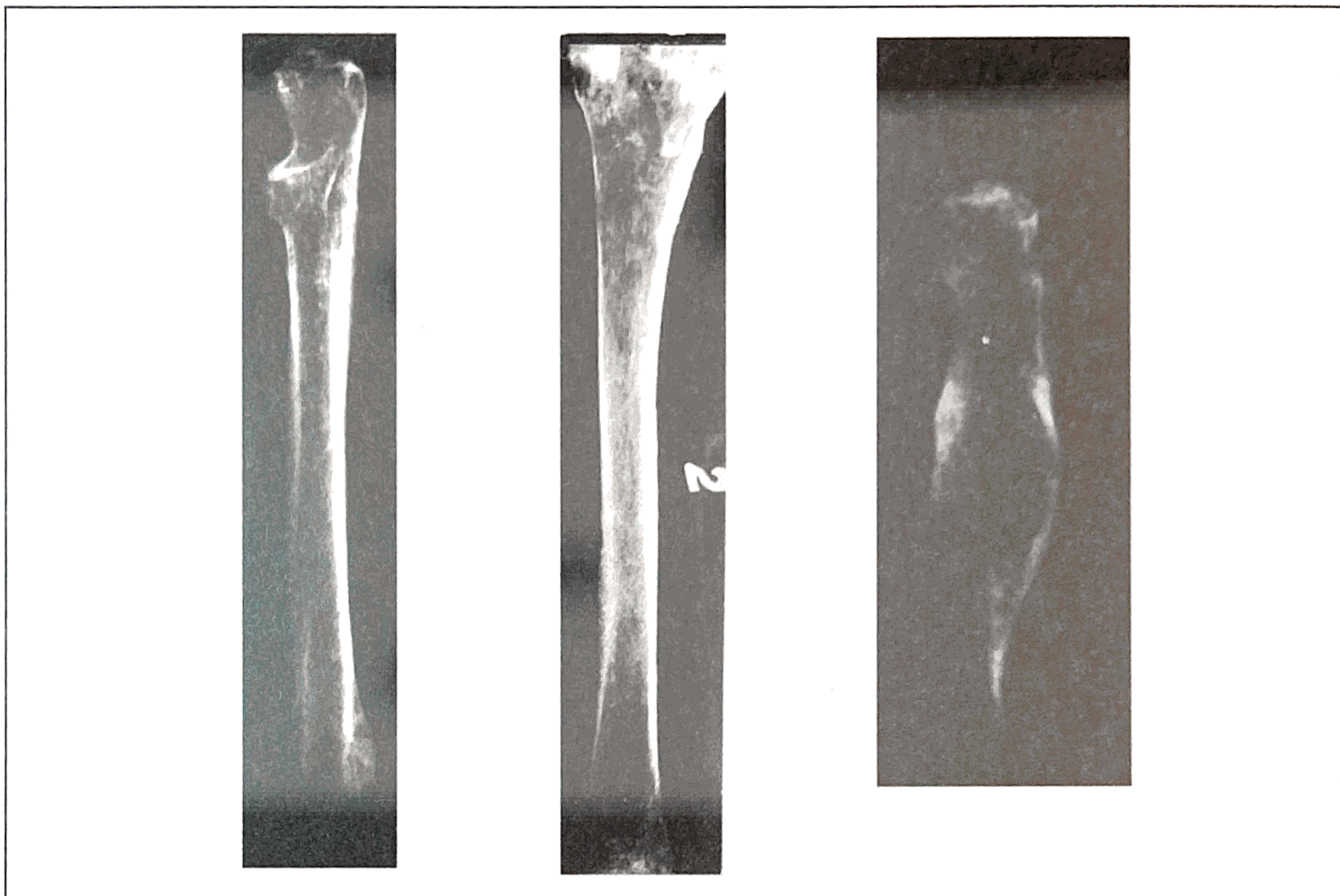


Figure 3. Armenoi tomb 95 right ulna, metacarpal and tibia of 45-year-old man with possible osteoblastic periosteal sarcoma.

of female deaths between ages 20-25 years seems to be linked to the peak period of childbirth (41, 42). Amongst the 364 individuals are two possible cases of neoplasms.

In Tomb 95 a man about 45 years of age (quite old for this population) was buried among 14 adults and children. The distal third of the diaphysis of his right ulna (Figure 3), is significantly enlarged and far bulkier than normal, enclosed in a thin layer of periosteum. In the differential diagnosis this could be Paget's disease with a pathological fracture and secondary callus, or an osteoblastic type of neoplasia, for instance osteoblastic periosteal sarcoma.

Besides the ulna, the compact bone cortex of the tibia of the same man appears in places partially thicker and could be a metastasis of the hypothesized ulna sarcoma. On the right, is the diaphysis of the metacarpal bone which appears balloon-shaped and very much enlarged in width. The cortex is extremely thin and the spongy bone porotic.

In Tomb 103Δ was the burial of a man about 30 years of age. Diffuse sclerosis can be seen in the x-ray of his sacrum with lumbarised first sacral vertebra and fused coccyx (Figure 4). This could be the result of metastases to bone of malignant neoplasia, or Paget’s disease that frequently affects the axial skeleton (43). On the right of the x-ray, half of the 1st lumbar, L3, 4 and 5 appear dense. Is it a metastatic neoplasia? Or a primary malignant tumour? One cannot be certain of a diagnosis.

MORBIDITY

Factors such as the serendipity of bone preservation and the lack of evidence for diseases that leave no trace on bones, handicap serious consideration of the question “How frequent were carcinomas or other diseases?” Another factor is life expectation, which is far

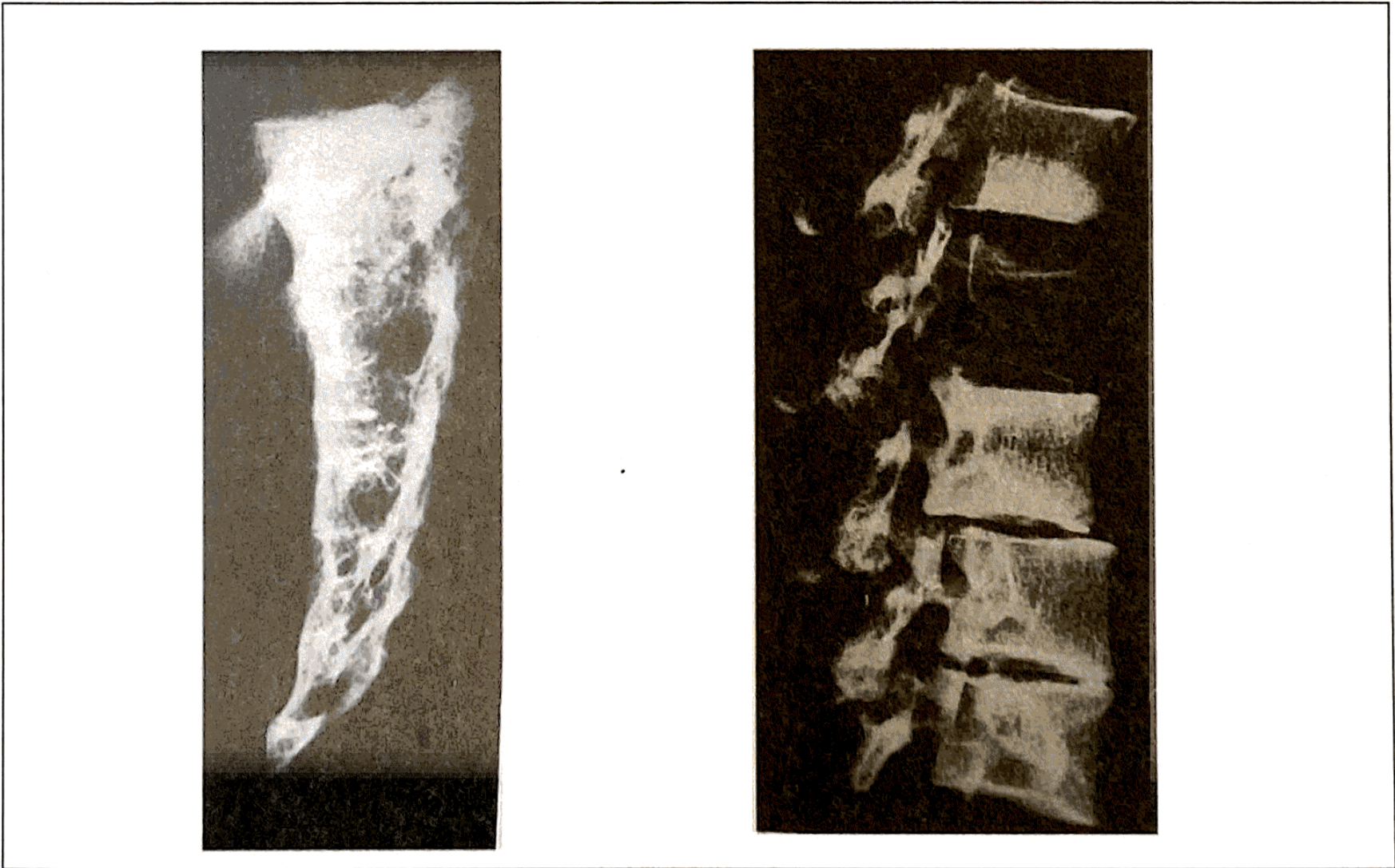


Figure 4. Armenoi tomb 103Δ lumbar and sacrum of a 30-year-old male with possible metastatic neoplasia or a primary malignant tumour.

⁵See illustration on p.123, fig. 4.

higher now than it was in the Minoan period or in the relatively recent pre-antibiotic past. Undoubtedly diseases, including carcinomas for which risk increases with age, have always been part of the inheritance of mankind needing to be dealt with. Medical practitioners in Minoan times confronted the challenges of disease using bold invasive surgical techniques and drugs, as well as more conservative procedures such as bone setting and tooth extraction (2, 20, 24, 42). Minoans also deposited at peak sanctuaries – precursors of the healing sanctuaries of Asclepeius – votives of limbs afflicted by disease that look very painful and realistic (2, 42⁵). These were human appeals for divine intervention. Similar, though less realistic, votives are still deposited today in Orthodox Christian churches - plus ça change, plus c'est la même chose. They too are petitions for cures and demonstrate the unbroken continuity of this practice despite enormous medical advances confronting the challenges of ever-mutating diseases.

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Περίληψη

Παρουσιάζονται τέσσερις περιπτώσεις πιθανών οστικών νεοπλασμάτων σε προϊστορικό σκελετικό υλικό. Οι περιπτώσεις αυτές διαπιστώθηκαν τη δεκαετία 1970 κατά τη διάρκεια μελετών των ανθρώπινων υπολειμμάτων από αρχαιολογικές θέσεις στην Κρήτη που χρονολογούνται στην Εποχή του Χαλκού. Η πρωιμότερη περίπτωση από Πρωτομινωικό I-II υλικό, χρονολογημένο με C¹⁴ μεταξύ 2717 ± 110 π.Χ. και 2240 ± 66 π.Χ., είναι πιθανή περίπτωση νόσου Paget σε προσβεβλημένη κνήμη. Η επόμενη περίπτωση από Πρωτομινωικό II-Μεσομινωικό I υλικό, περίπου 2200-1950 π.Χ., είναι

επίσης πιθανή περίπτωση νόσου Paget σε κνήμη. Τέλος, δύο περιπτώσεις από Υστερομινωικό IIIA-IIIB νεκροταφείο χρονολογούνται μεταξύ 1390 και 1190 π.Χ. Η πρώτη περίπτωση είναι πιθανό οστεοσάρκωμα σε δεξιά ωλένη ενός μέσης ηλικίας άνδρα. Η δεύτερη περίπτωση είναι πιθανός μεταστατικός οστικός καρκίνος που έχει προσβάλει τους οσφυϊκούς σπονδύλους και το ιερό οστό ενός επίσης άνδρα.

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