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SKELETAL INDICATORS OF HEALTH CONDITIONS IN THE BRONZE AGE SAMPLE FROM TOPPO DAGUZZO (BASILICATA, SOUTHERN ITALY)

ABSTRACT — The combined use of various skeletal indicators of stress (dental disease, enamel defects, cribra orbitalia, Harris lines, adult stature reduction, skeletal evidence of disease and trauma) in a Bronze Age sample from Southern Italy allowed an evaluation of the general health status. The results point to conditions of good nutritional status, although with mediocre health conditions. This kind of integrated approach can significantly contribute to reconstructing the way of life of past human populations, when the information is combined with archaeological and palaeoenvironmental data.

KEY WORDS: Palaeopathology — Skeletal stress indicators — State of nutrition — Dental anthropology — Bronze Age — Southern Italy.

INTRODUCTION

Evaluating health conditions in past human populations was initially done by using single indicators, such as cribra orbitalia, Harris' lines, etc. (see, among others, Bailit et al. 1970, Carlson et al. 1974, Garn et al. 1968, Jaffee 1972, Mc Henry 1968, Stini 1969). There is now a tendency to use a combination of various stress indicators (see, e.g., Buikstra and Cook 1980, Cohen and Armelagos 1984, Gilbert and Mielke 1985, Wing and Brown 1980). This integrated approach appears to be more suitable than the use of single indicators, as information is not only added, but the interaction among various stressors can be considered. In fact, each stress indicator furnishes slightly different bits of information (Roosevelt 1984), and the interpretation of some indicators can change according to the whole pattern.

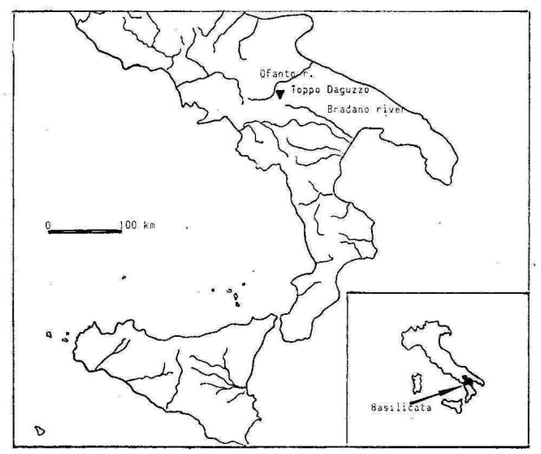

FIGURE 1. *Geographical position of Toppo Daguzzo site.*

Skeletal stresses can be subdivided into physiological stress, related to malnutrition and/or disease, and functional stress, related to biomechanical agents (*Table 1*). Skeletal indicators of physiological stress can furnish information on general health status, while indicators of functional stress can contribute to the reconstruction of subsistence patterns and régime related activities (Borgognini Tarli and Repetto 1986).

TABLE 1. *Categories of skeletal stress and their potential utilization as indicators of growth alterations, malnutrition, disease and régime related activities.*

PHYSIOLOGICAL STRESS (nutritional stress and/or disease)		
1. INDICATORS OF GROWTH DELAY AND ARREST		
	HARRIS' LINES	nutritional stress and/or disease followed by recovery
	ENAMEL HYPOPLASIA	nutritional stress and/or disease
	ADULT STATURE REDUCTION	protein malnutrition (but see genetic factors)
2. INFECTIOUS BONE DISEASE (OSTEITIS, PERIOSTITIS AND MORE SPECIFIC DISEASE)		infectious disease and/or functional stress, often linked to degenerative joint disease
3. CRIBRA ORBITALIA		iron deficiency in diet (but see genetically- and parasitically-caused anemiae)
4. DENTAL PATHOLOGY		
	CARIES	dietary habits, infectious disease, masticatory stress, poor oral hygiene
	ABSCESSES	
	PERIODONTAL DISEASE	
	ANTE-MORTEM TOOTH LOSS	
FUNCTIONAL STRESS (biomechanical stress and strain)		
1. DEGENERATIVE JOINT DISEASE		bone remodelling caused by mechanical stress (but see infectious disease)
2. TRAUMA		any bone lesion related to wound or injury (fractures etc.)

The first type of indicators will be the object of the present research, which is aimed at evaluating the prevalence of the most reliable stress indicators in a small Middle Bronze Age sample from Toppo Daguzzo (Ripolla, Basilicata, *Fig. 1*)

MATERIAL AND METHODS

Toppo Daguzzo was a large inland settlement on a volcanic hill at the junction between the Bradano and the Ofanto river valleys. Because of its strategic position at the confluence of important trade-routes, which connected the Adriatic, Thyrrhenian and Ionian sea (Cipolloni Sampò 1973, 1979, 1986a), it was more or less continuously inhabited from the Copper Age to the Iron Age. The excavations began in the 70's under the direction of Dr. M. Cipolloni Sampò and the patronage of the Archaeological Superintendency of Basilicata and the Department of Historical, Archaeological and Anthropological Sciences of Antiquities of the University (Rome). The sample under study was found in the acropolis and has been excavated since 1983. It comes from the intermediate level of a chamber burial dated to the Middle Bronze Age, whose upper layer contained about 20 disturbed burials (the subject of an ongoing research) and whose lower level contained only some bone fragments.

TABLE 2. *Sample composition by sex and age of the skeletal material from the second level of the Middle Bronze Age chamber burial of Toppo Daguzzo (Basilicata, Southern Italy)*

Specimens	Sex	% concordant sex diagnoses	Age
TD1	male	80	adult
TD2	female	100	adult
TD3	male	91	adult
TD4	female	100	adult
TD5	male	100	mature
TD6	unsexed	—	5 years ±16 M.
TD7	male	*	about 17 years
TD8	female	*	12—13 years
TD9	male	80	young adult
TD10	female	70	adult
TD11	female	100	adult

* Only morphological methods were applicable.

Sample size and composition are shown in *Table 2*.

Sexing was done using 25 morphological cranial and pelvis traits (Ferembach et al. 1979) and 12 univariate and multivariate techniques based on metric traits (Black 1978, Giles and Elliot 1963, Jordanidis 1961, Pettener and Brasili Gualandi 1979, Pettener et al. 1980, Sauter and Privat 1954—55, Steele 1976, Witschel and Mangelsdorf 1956 cit. in Breul 1974). Metric traits allowed to quantify the reliability of the diagnosis, expressed as a % concordance among the techniques which gave a definite diagnosis (3rd column of *Table 2*).

Age at death was estimated, in the case of subadults, by examining developmental stages of the dentition and epiphyseal union of various parts of the skeleton (Brothwell 1981, Ubelaker 1978). In the case of adults, age classes were assigned on the basis of dental wear, exo- and endocranial suture closure and the general state of calcification.

Skeletal indicators of stress and pathology were investigated by visual inspection and by microscopical and X-ray examination, using a Wild M5A binocular microscope and Italray X-ray equipment.

1. *Harris lines* — following the procedure by Maat (1984), only opaque lines of increased density extending at least halfway across the shaft were scored in left tibiae (N = 9). The age of the formation of the lines was evaluated according to Hunt and Hatch (1981) and Maat (1984).

2. *Enamel hypoplasia* — following the procedure by Perzigian et al. (1984), only the cases with prominent, relatively deep horizontal grooves, depressed lines and/or series of pits on the buccal surface (categories moderate to severe) were scored. Maxillary and mandibular permanent canines (N = 21), considered to be good indicators of stress from birth to about 6.5 years of age, were examined. The age of temporary disruption in amelogenesis was evaluated according to Massler et al. 1941, as modified by Swärdstedt 1966.

3. *Adult stature reduction* — stature reduction was evaluated by reconstructing the body size with the formulae by Trotter and Gleser (1952, 1977) for Whites and Negroes.

4. *Cribra orbitalia* — were scored following the procedures of Nathan and Haas (1966) and of Hengen (1971) on 7 observable skulls.

5. *Dental caries* — following the procedure of Ubelaker (1984), only tooth cavities showing clear evidence of tissue necrosis with subsequent collapse of hard tissues were scored. Caries were classified according to their localization, severity and type of possible initiating process, by Black's classification.

6. *Periodontal disease* — following the procedure of Clarke et al. 1986, periodontal disease was scored only when the bone crest of the alveolar margins showed either the loss of the cortical bone or the appearance of a porous surface.

7. *Dental calculus* — was scored following the method of Dobney and Brothwell 1987.

RESULTS AND DISCUSSION

1. *Harris lines* — tibial growth arrest lines were found in one case only (11.1 %) as a single line detectable with careful inspection (Maat's type I). The age of line formation was 15 years according to the method of Hunt and Hatch (1981) and 14 years according to that of Maat (1984). In another subject oblique radio-opaque lines were present at the distal end of the diaphysis: they should reflect regional differences in bone remodelling.

The interpretation of Harris lines as indicators of stress is somewhat problematic. According to Buikstra and Cook (1980) and to Huss-Ashmore et al. (1982), both in studies on archaeological material and in clinical studies, there is a poor association between the frequencies of Harris lines in long bones and other indicators of stress, such as mortality rate. The more accredited hypothesis relates Harris lines to recovery from nutritional stress or disease (Dreizen et al. 1964, Mc Henry and Schulz 1976, Rathbun 1987). According to Dickel et al. (1984), episodic stress would be involved.

2. *Enamel hypoplasia* — is present in 3 : 7 subjects whose permanent canines were observable (42.9 %), in two cases in a moderate, in one case in a severe degree (*Fig. 2*). The age of appearance is between 3 and 4.5 years.

Enamel hypoplasia is considered to indicate growth disruption (Goodman et al. 1980), often related to an unbalanced or inadequate diet, particularly probable at the moment of weaning (P. Smith et al. 1984) or in the course of infectious disease. According to Goodman et al. (1980) there is a good association with other indicators of health conditions, e.g. mortality rate, and probably records chronic stress on an annual base.

Interobserver differences in scoring the presence of enamel hypoplasia were noted by Rathbun (1984). Although such differences limit the possibility of comparisons, some reference data are shown in

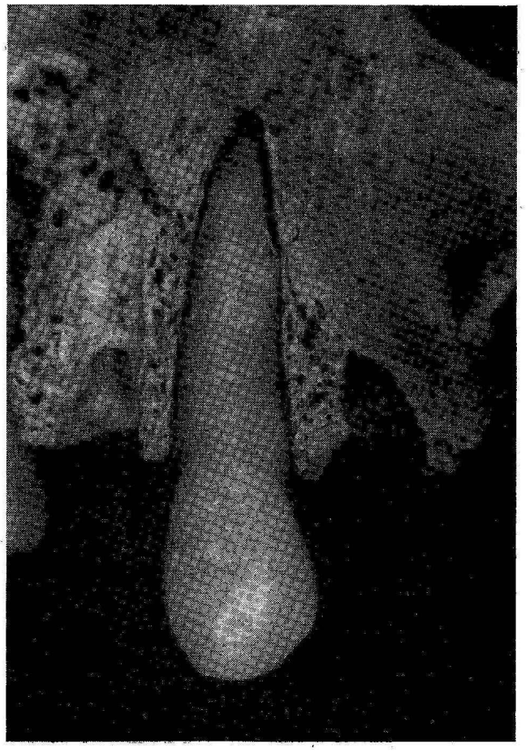

FIGURE 2. *Enamel hypoplasia of the right maxillary canine in the adolescent man TD7.*

TABLE 3. *Prevalence of enamel hypoplasia in samples from the circum-Mediterranean region during the Bronze Age*

Samples	N	% of affected individuals (permanent dentition with varying degree of hypoplasia)		
		Moderate	Severe	Total
Toppo Daguzzo (Present paper)	7	28.6	14.3	42.9
Lerna (Angel 1971)	60	43.0	18.0	61.0
Mycenaean Kings (Angel 1971)	20	—	—	4.0
Jericho (Smith et al. 1984)	28	—	—	53.0

Table 3. The sample from Toppo Daguzzo shows a lower prevalence of hypoplasia as compared to other circum-Mediterranean Bronze Age populations, with the exception only of the very selected sample of Mycenaean Kings, in which enamel defects are almost absent.

3. *Adult stature reduction* — although genetic factors are involved, many authors have demonstrated that protein malnutrition and other nutritional stress can affect growth, causing stature reduction (see, among others, Larsen 1984, Stini 1969). Comparisons between the sample under study and other Italian coeval or geographically proximal and circum-Mediterranean Bronze Age samples are shown in *Table 4.* As can be seen, Toppo Daguzzo shows a high stature as compared to coeval and proximal samples, being equalled only by Mycenaean Kings. This fact allows us to exclude protein malnutrition or other regular and/or severe nutritional stress during growth.

TABLE 4. *Adult stature in Italian and circum-Mediterranean Bronze Age samples and in Neolithic and Medieval series from the same region of the sample under study*

Samples	Average Stature (Trotter & Gleser 1952, Whites)			
	Males	(N)	Females	(N)
Toppo Daguzzo	172.1	(4)	160.3	(4)
Lerna (1)	166.1	(83)	153.5	(54)
Mycenaean Kings (1)	172.5	(14)	160.1	(3)
	Average Stature (Trotter & Gleser 1952, Negroes)			
	Males	(N)	Females	(N)
Toppo Daguzzo	167.5	(4)	156.3	(4)
Trentino (2)	163	(4)	151	(7)
Verona (2)	164	(2)	156	(1)
Scoglietto (2)	163	(3)	157	(2)
Galleraie (2)	166	(11)	152	(4)
Castiglione (2)	166	(49)	156	(38)
Matera Neolithic (3)	164.4	(4)	154.1	(4)
Matera Medieval (4)	165.3	(4)	151.9	(2)

(1) Angel 1971
(2) Formicola 1983
(3) Borgognini Tarli 1978
(4) Borgognini Tarli & Giusti 1986

4. *Cribra orbitalia* — are present in 4 : 7 individuals (66.7 %), from all age classes (one infant, one juvenile, one young adult and one adult). They are generally not severe (porotic type of Nathan and Haas 1966, degree 1—3 of Hengen's 1971 scale, *Fig. 3*). In the Sicilian Middle Bronze Age sample partially studied by Di Salvo and Tusa (unpub. data) cribra orbitalia of Hengen's degree 2—3 are present in 20 : 70 subjects (28.6 %, including all the subadults and some young adults). In spite of the low sample size, it can also be noted that in the Toppo Daguzzo sample the alteration is present in all the subadults, but in 2 : 5 adults only. This is in agreement with the literature, in which the prevalence and severity of cribra orbitalia are reported to decrease with increasing age, because of healing (Hengen 1971, Nathan and Haas 1966).

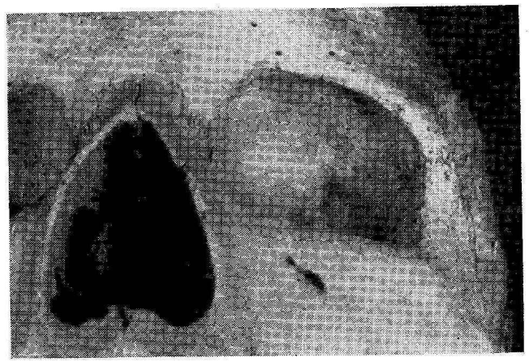

FIGURE 3. *Cribra orbitalia in the young adult man TD9.*

Cribra orbitalia are present in chronic iron-deficiency anaemia (Goodman et al. 1984, Perzigian et al. 1984, Von Enoth and Ortner 1982) of primary or secondary alimentary origin (lack of Iron in food and Iron malabsorption or impaired utilization, respectively). They can also be present in haemolytic anaemias of genetic or parasitic origin (e.g. thalassaemia or malaria) and in haemorrhagic anaemias (e.g. due to chronic bleeding) (Ortner and Putschar 1981). In the case of haemolytic anaemias, porotic hyperostosis (Angel 1966) of the cranial vault is usually present, which is often associated (especially in case of genetic origin) with the thinning of the subperiosteal cortical bone and expansion of the diploe (hair-on-end appearance in X-ray films). The absence of these features in the cranial material under study allows us to exclude the presence of haemolytic anaemias. Iron deficiency anaemia of an alimentary origin cannot be wholly excluded, even if other indicators of nutritional stress (see above) seem to point to an adequate diet. In fact, according to Mensforth et al. (1978), physiological demand of Iron can increase during growth, thus rendering infants (especially from birth to about 4 years) susceptible to functional iron-deficiency anaemia. The presence of cribra orbitalia associated with enamel hypoplasia in subadults would suggest that such condition was possible in the human remains from Toppo Daguzzo. However, it has to be taken into account that Iron malabsorption can be linked to the presence of some subacute parasitic and/or infectious disease, frequent in regions with a live-

stock — agricultural economy and high population density (Kent 1986), which could well be, according to archaeological evidence, the case of Toppo Daguzzo. Finally, a delayed weaning can produce temporary iron-deficiency, because of the low Iron content of milk (Palkovich 1987, Underwood 1977). The presence of enamel hypoplasia in the sample from Toppo Daguzzo at 3—4 years of age would suggest a possible association between nutritional stress linked to weaning and cribra orbitalia.

In conclusion, in the sample under study haemolytic anaemias can be excluded as a potential cause of cribra orbitalia, while haemorrhagic anaemias are considered as a possible but not very probable factor. A mild iron-deficiency of limited duration would therefore represent the most probable etiology.

4. *Dental caries* — when individual teeth are considered, 12 out of 164 observable permanent teeth show carious lesions (7.3 %), but no caries are present in 9 deciduous teeth. When subjects are considered, 5 out of 8 individuals with permanent teeth have caries (62.5 %). The distribution of caries by arch, tooth category and side is shown in *Table 5.*

TABLE 5. *Distribution of caries by arch, tooth category and side and by degree of severity and tooth localization in the sample from Toppo Daguzzo*

	N of caried teeth	total observable teeth	%
Mand	4	96	4.2
Max	8	68	11.8
Ant	1	40	2.5
Post	11	124	8.9
Right	5	85	5.9
Left	7	79	8.9
	N of caried teeth	total observable carious lesions	%
Occlusal	8	12	66.7
Interprox/Cervical	4	12	33.3
Penetrant	4	12	33.3
Non Penetrant	8	12	66.7

Caries are more frequent in maxillary than in mandibular and in posterior than in anterior teeth (*Fig. 4*). Occlusal and non penetrant caries are more frequent than interproximal and penetrant ones. The most affected teeth are M1 and M3. Most carious lesions (8 : 12 = 66.7 %) belong to Black's class I (cavities beginning in structural defects in the occlusal surfaces; pits and fissures), some (2 : 12 = 16.7 %) belong to the II class (cavities in proximal surfaces of premolars and molars, due to food stagnation) and one belongs to the V class (cervical caries, of intrinsic or extrinsic origin). A comparison between the prevalence of caries in the Toppo Daguzzo sample and that of other coeval or geographically proximal samples is shown in *Table 6.* No appreciable difference among the frequencies of carious lesions is observable.

TABLE 6. *Comparison between the prevalence of dental caries in the sample from Toppo Daguzzo and that of other European coeval or geographically proximal series*

Series	N of permanent teeth	%carious teeth
Toppo Daguzzo	164	7.3
Belcaire (1)	200	5.5
Unetice (2)	1 022	6.8
Matera Neolithic (3)	387	9.0
Matera Medieval (4)	89	9.0

(1) Barthet & Riquet 1980
(2) Čechová & Titlbachová 1978
(3) Borgognini Tarli 1978
(4) Giusti 1983—84

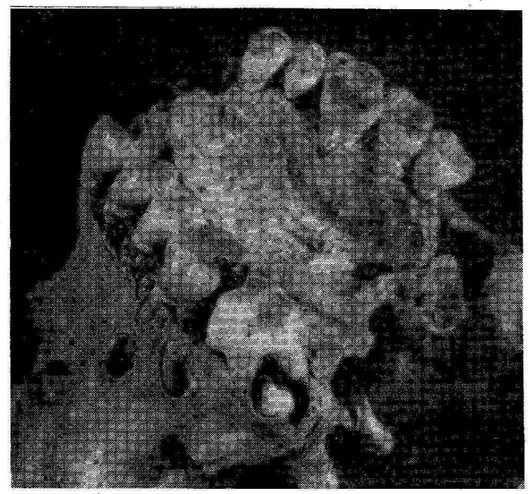

FIGURE 4. *Occlusal penetrant carious lesion of the right maxillary first molar in the adult man TD 3. Note the alveolar abscesses at the level of the same carious tooth and the impaction of the third molar.*

TABLE 7. *Comparison between the prevalence of dental abscesses in the sample from Toppo Daguzzo and that of other circum—Mediterranean coeval or geographically proximal series*

Series	N of adults	N of abscesses/adult subjects	
Toppo Daguzzo	6	0.33	
Lerna (1)	64	1.25	
Mycenaean Kings (1)	20	0.20	
	N of abscesses	N of alveoli	%
Toppo Daguzzo	2	234	0.85
Matera Neolithic (2)	8—10	387	2.1—2.6
Matera Medieval (3)	4	129	3.1

(1) Angel 1971
(2) Borgognini Tarli 1978
(3) Giusti 1983—84

5. *Alveolar abscesses and ante-mortem tooth loss* — the frequency of these pathologies (*Fig. 4, Tables 7 and 8*) is low in the sample under study as compared to other circum-Mediterranean Bronze Age samples and to geographically proximal Neolithic and Medieval series. Similar low values are found in Mycenaean Kings only.

TABLE 8. *Comparison between the prevalence of ante-mortem tooth loss in the sample from Toppo Daguzzo and that of other circum—Mediterranean coeval or other geographicall proximal series*

Series	N of adults	N of tooth loss/subject	
Toppo Daguzzo	6	1.3	
Lerna (1)	64	3.3	
Mycenaean Kings (1)	20	0.5	
	N of lost teeth	N of alveoli	%
Toppo Daguzzo	8	234	3.4
Matera Neolithic (2)	12—14	387	3.1—3.6
Matera Medieval (3)	9	129	7.0

(1) Angel 1971
(2) Borgognini Tarli 1978
(3) Giusti 1983—84

6. *Periodontal disease, dental calculus and anomalies* — the frequencies are shown in *Table 9*.

Periodontal disease is present in about one third of the observable teeth, in the majority of cases with mild to moderate degree of severity. Anterior teeth are more affected than posterior dentition, the right side is slightly more affected than the left one, while upper and lower teeth are affected in an even proportion. The pattern of calculus distribution does not perfectly parallel the distribution of periodontal disease. The total number of teeth with calculus is approximately equal to the number of teeth with periodontal disease, anterior dentition has more calculus than posterior dentition, but left and right side show similar frequencies of calculus and lower teeth have more calculus than upper teeth (as expected, considering the role played by salivary stagnation). On the other hand, dental micro-wear (Borgognini Tarli et al. in press) and macro-wear do not seem to indicate heavy masticatory stress.

TABLE 9. *Distribution of periodontal disease by arch, tooth category and side and by degree of severity and frequencies of dental calculus and anomalies in the sample from Toppo Daguzzo*

	Total Observable Teeth	% of teeth with periodontal disease		
		mild	moderate	severe
Max	68	17.6	10.3	5.9
Mand	96	8.3	19.8	4.2
Ant	40	17.5	37.5	7.5
Post	124	10.5	8.9	4.0
Right	85	14.1	18.8	4.7
Left	79	10.1	12.7	5.1
Total	164	12.2	15.8	4.9

% Presence of Calculus (Degree by Dobney, Brothwell 1987)

	0	1	2	3	4
N = 164	70.1	26.2	3.1	0.6	0

Cases of Dental Anomalies

	Impaction	Malposition	Agenesia
N = 164	1 (M3)	7 (I2, C, M2, M3)	2 (M3)

Therefore, calculus and dental plaque were the most important factors in the etiology of periodontal disease in the sample from Toppo Daguzzo, while masticatory stress seems to have played a less important role.

Dental anomalies in permanent dentition are fairly frequent (5 : 8 affected individuals = 62.5 %). They are represented by malposition (rotation) in 7 : 10 teeth, agenesia in 2 : 10 teeth and impaction (*Fig. 4*) in 1 : 10 teeth. The most affected tooth is, as expected, M3 (6 : 10).

7. *Skeletal evidence of disease and trauma* — the following changes were observed: fractures and exostoses, arthropathies of the joints, especially of the vertebral column, osteitis of the paranasal sinuses and of the dorsum sellae, signs of tumours.

X-ray examination showed a healed compression fracture of L4 in the adult woman TD4: the vertebral body shows reduced height (about 1/6) and the presence of a large protrusion in the left, lower part, with a corresponding cavity in the upper part of L5 (*Fig. 5*).

A bony excrescence was observed on the internal face of the left ilium (in the region of insertion of the iliac muscle) and in the corresponding external face (in the region of insertion of the gluteus medius) of the adult man TD1. This change was probably related to trauma (sprain).

Arthropathies of trunk and limb joints were observed in the mature man TD5. Other adult subjects (TD1, TD2, TD4, TD11) show slight signs of arthropathies of the vertebral column, most frequently in the lumbar region.

Osteitis of the paranasal sinuses is present in two adult subjects, a man and a woman (TD9 and TD10): in both cases X-ray examination shows the presence of a radio-opaque area in a maxillary sinus, probably resulting from an infectious process, such as sinusitis.

Osteitis of the dorsum sellae is observable by visual inspection in two adult subjects, a man and a woman (TD3 and TD11): the changes consist of a cribrous appearance of the external surface of the dorsum, which is, however, radiologically intact. The interpretation of these changes, in the absence of other skeletal evidence of disease in TD3 and considering the complex pathological situation of TD11 (see below), remains problematic.

Changes associated with the presence of a probable hypophyseal tumour were detected in a young

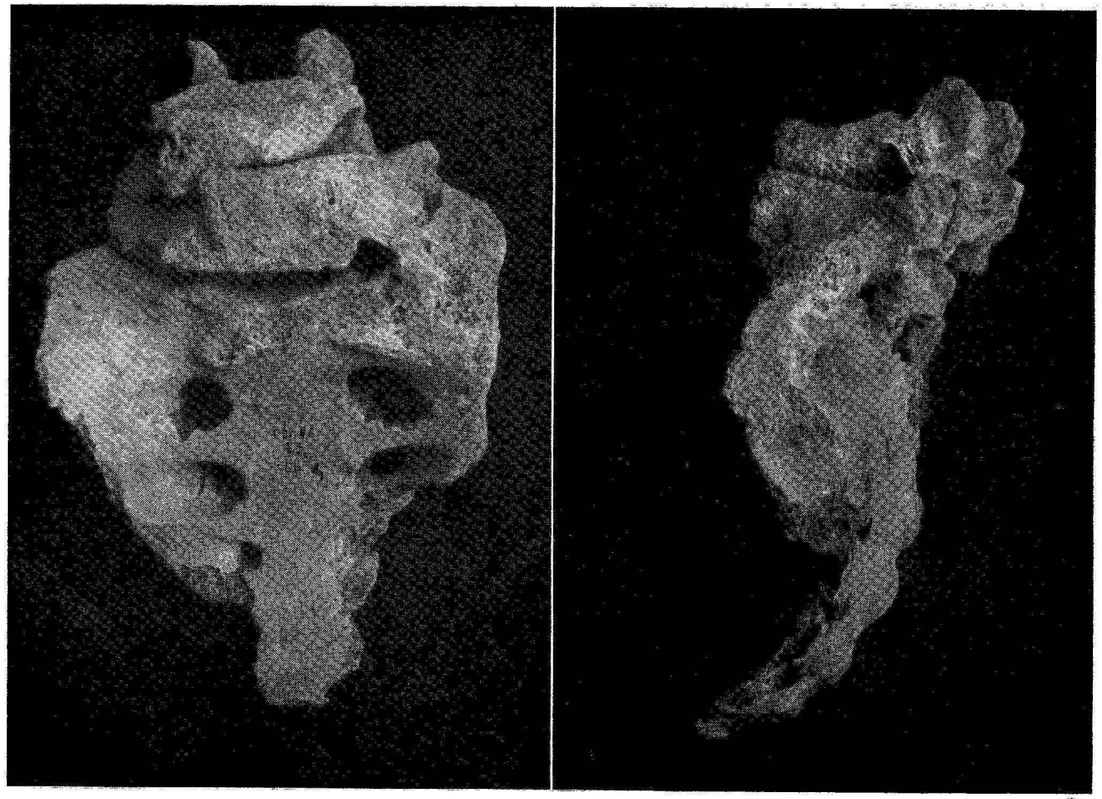

FIGURE 5. *Sacrum, L4 and L5 of the adult woman TD4 showing the healed fracture of L4 and the unilateral sacralization of L5. Frontal and left lateral views.*

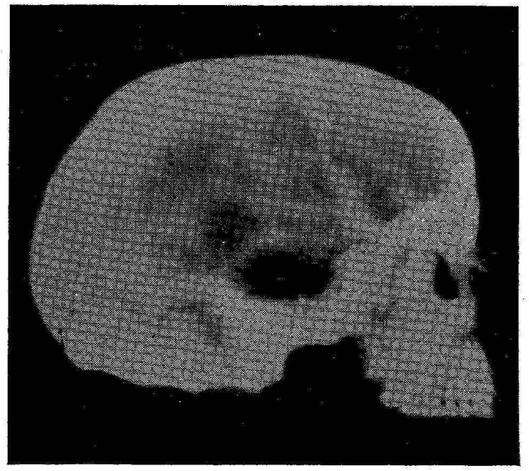

FIGURE 6. *Lateral X-ray graph of the skull of the young adult man TD9 showing changes in the volume and profile of the sella turcica.*

adult man (TD9): X-ray examination showed an enlargement of the sella turcica and a thinning of the clinoid processes, while direct visual inspection, after removing of the skull cap, allowed us to note a uniform circular sellar enlargement, with erosion of the floor, partial destruction of the dorsum and blunting of the anterior clinoid processes (*Fig. 6 and 7*). According to Ascenzi and Mottura (1980) the above features suggest the presence of a hypophyseal tumour. Adenomas are the most frequent hypophyseal tumours in modern populations (60 % according to Kraus 1945). Considering that basophilic adenomas do not cause sellar alterations and that eosinophilic adenomas do not produce destructive changes of the clinoid processes, the diagnosis of chromophobic adenoma appears to be the most probable. Moreover, eosinophilic adenomas are often associated with acromegaly in adults and with gigantism in adolescents, whose signs are absent in TD9. Nevertheless, the possibility of a rare intrasellar craniopharyngioma cannot be excluded on the basis of the sellar changes observed. More details on this interesting case, which, to our knowledge, would represent one of the most ancient cases of hypophyseal tumours so far described (see, e.g., Brothwell 1981, Ortner and Putschar 1981), can be found in Repetto and Canci (1987).

FIGURE 7. *Upper view of the sella turcica of the young adult man TD9 (see Fig. 6). Note the erosion of the floor and of the clinoid processes and the partial destruction of the dorsum.*

An X-ray graph revealed, in the frontal bone of the adult woman TD11, an irregular region of increased radiolucency, with an osteolytic appearance. The osteolytic process began in the diploe and subsequently extended through the inner table of the

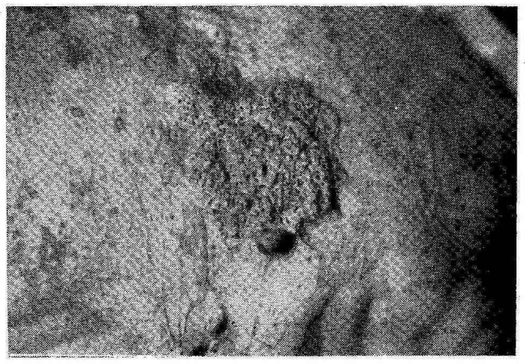

FIGURE 8. *Osteolytic lesion in the endocranial surface of the frontal bone of the adult woman TD11.*

frontal bone (*Fig. 8*). A central focus of lysis (max. diam. 5 mm, min. diam. 3.5 mm), similar to that described by Manchester (1983), is evident. A comparison with other cases from the literature (Møller and Møller-Christensen 1952, Soulie 1980) would suggest metastasis from a malignant growth as a possible cause of the above change. The study of this rather complex case is still in progress.

SUMMARY AND CONCLUSIONS

The low frequency of Harris lines would indicate a low incidence of stress during infancy and adolescence. This is confirmed by the prevalence of enamel hypoplasia, which is present, mostly in a moderate degree, with a frequency lower than that of other coeval samples.

Cribra orbitalia are present in all the subadults and in two adults. Although their prevalence is relatively high, they are not severe and the absence of other cranial changes associated with chronic anaemia allows the exclusion of severe dietary or disease-related stress.

Combining cribra orbitalia and enamel hypoplasia data (including age of onset), a moderate dietary stress during delayed weaning can be hypothesized.

Adult stature, which is high as compared to that of coeval or geographically proximal samples, also points to a lack of severe or chronic dietary stress during growth.

Dental caries are present with a frequency comparable to that of other Bronze Age European samples. Most carious lesions belong to Black's first class, suggesting structural defects in the occlusal surfaces as a possible initiating factor. The prevalence of dental abscesses and ante-mortem tooth loss is low. Periodontal disease is present with a rather low frequency: its distribution by arch, tooth category and side is partly related to that of dental calculus, suggesting poor oral hygiene as the most important etiological factor. Dental anomalies relative to two main categories (agenesia of M3 and malposition) are fairly frequent.

The whole pattern of dental pathology suggests the lack of heavy masticatory stress and of regular, frequent sugar intake. The lack of macroscopically observable dental structural defects, together with the good state of bone calcification observed in X-ray graphs, suggests adequate Calcium content in the diet.

All the above considerations point to a good nutritional status: this is in agreement with the archaeological evidence, according to which the burial was utilised by the upper social class (Cipolloni Sampò, 1986c).

The frequency of degenerative changes is rather low, while that of infectious disease and of tumours is fairly high.

The presence of two cases of tumour in a small sample, whose average age at death is rather low, is notewhorthy. One explanation is that this high incidence could be familial. This possibility is supported by the distribution of some non-metric traits and by the presence of family burials in Italy during the Bronze Age as suggested by other sites (Cipolloni Sampò 1987, Peroni 1985).

We hope to shed further light on the living conditions of the individuals from this sample, by the study of the skeletal remains from the upper layer and by chemical (trace element and stable isotope dosage) and paleoserological analyses (research in progress). These data will be integrated into the information derived from the final archaeological studies of the site.

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