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DENTAL AND SKELETAL PATHOLOGIES OF TWO HUMAN SAMPLES BURIED IN THE NECROPOLISES OF CANTONE (COLLELONGO-AQ) AND ARCIPRETE (ORTUCCHIO-AQ), 1st CENTURY BC – 1st CENTURY AD

ABSTRACT: The skeletal pathologies of human remains (45 adults and 2 children) buried in 30 tombs in the necropolis of Cantone-Collelongo (AQ) and dated to the 1st century BC – 1st century AD, have been analysed and described in this article. The skeletons show some stress indicators useful to understand the health status of an ancient human sample. They are markers of nutritional or disease-induced stresses (such as enamel hypoplasia and cribra orbitalia*), mechanical and functional stress (degenerative joint disease and trauma) and others (dental pathologies). The sample has been compared to another human group of the same age and inhabiting the same area, represented by the individuals of Arciprete-Ortucchio (AQ) and to other human groups of Late Roman age living on the Thyrrenian coast: S. Vincenzino-Cecina (LI) and Vada-Rosignano Solvay (LI).*

KEY WORDS: Human skeletal materials – Paleopathology – Roman Age

INTRODUCTION

The necropolises of Cantone (commune of Collelongo) and Arciprete (commune of Trasacco) both in the province of Aquila (Abruzzo) are located in two opposite valleys on the same ancient route that linked the Amplero valley to the Fucino basin, the former at a height of around 1000 m. asl, and the latter at a height of around 670 m. asl. They are dated between the first century BC and the first century AD *(Figure 1)* (Paoletti 1991). Since 1969 the Archaeological Mission of Pisa University has brought to light during several campaigns 30 tombs at Cantone and 12 at Arciprete. The tomb typology that includes five kinds of burial structures, is the same in both sites. The burials are mostly single (23 at Cantone and 8 at Arciprete), or double (2 at Cantone and 1 at Arciprete), or multiple (5 at Cantone) with a minimum number of three and a maximum number of five individuals buried in each.

Some of the tombs had a painted plaster interior (tombs 14, 22, 24, 28 at Cantone and tombs 1 and 2 at Arciprete) and outside a "stele-door"; in some other cases (tombs 3, 4, 18, 22, 28 at Cantone and tomb 12 at Arciprete) the name of the dead person was inscribed on it (Letta, D'Amato 1976). In every tomb grave goods and animal

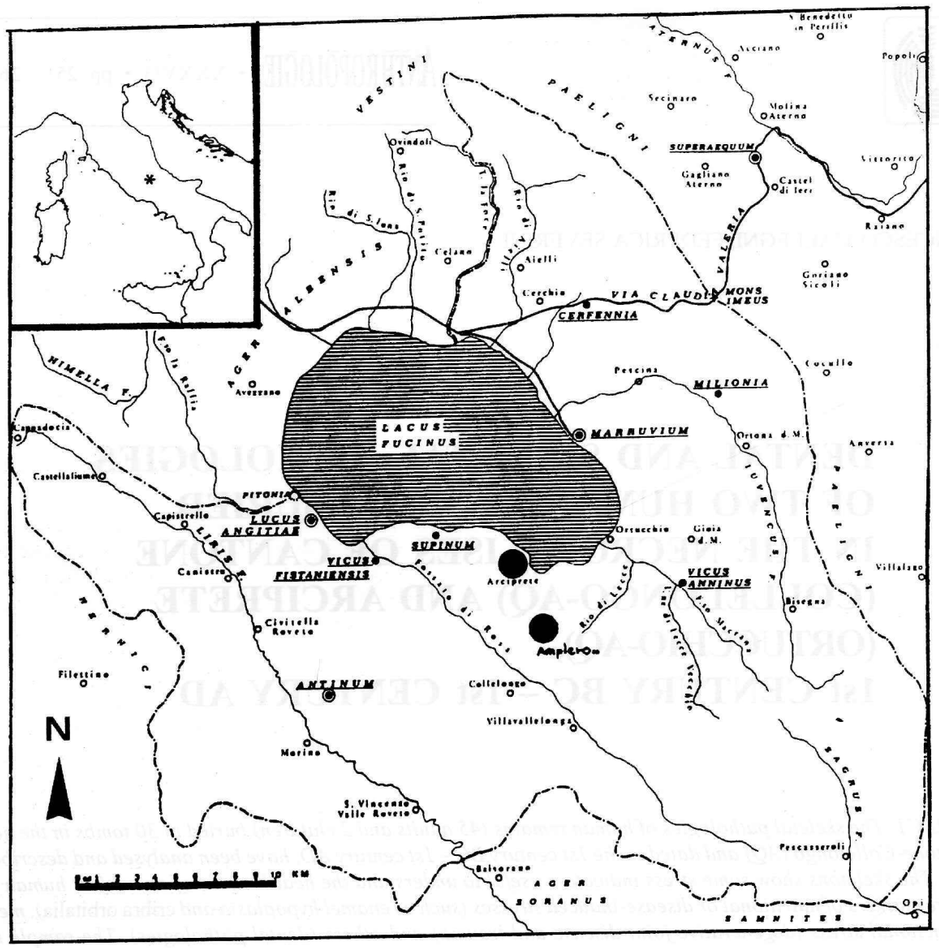


FIGURE 1. Location of the two necropolises (indicated by the two black dots).

bones (remains of the funerary meal) could be found. Sometimes in the outdoor area the remains of the "silicernium" could also be traced (Paoletti 1991).

In total we have counted 47 individuals at Cantone (45 adults and 2 children) and 9 at Arciprete (8 adults and 1 child) (Severini 1991a, b).

AIM OF THE INVESTIGATION

This study is mainly concerned with the detection of pathologies and stress indicators of the two population samples. Its aim is to obtain information concerning the health status of these two human groups (teeth and bone pathologies) and to relate, when possible, their different ways of life and how much these lifestyles and the surrounding environment could have influenced the expression of their fenotype.

SEX AND AGE AT DEATH

Sex has been determined, for adult individuals, through the analysis of the pelvic girdle and, when lacking, of the skull, following the methods of Schultz (1930), Ferembach *et al.* (1977-1979) (about the pubic symphysis), Brothwell (1981), Miles (1963), Molnar (1971) and Lovejoy (1985) (about the occlusal surface of teeth).

The individuals that constitute the Cantone sample have already been object of metrical studies and comparisons performed by other researchers (Borgognini Tarli, La Gioia 1977). The Arciprete sample is currently under examination by the authors. The analysis of stress indicators in the two population samples, as it has been pointed out above, constitutes the aim of this project and therefore has forced us to a further revision of the Cantone materials, because some errors in sex determination have been found in the previous work (Borgognini Tarli,

TABLE 1.

	Individual	Tomb typology	Sex	Age at death
CANTONE:	1	B	M	*ca* 60
	2I	B	F	45–50
	2II	B	M	55–60
	2III	B	M	55–60
	2IV	B	M	40–60
	3	C	M	*ca* 60
	4	B	M	*ca* 25
	5	A	M	40–60
	6	B	M	45–60
	7	B	F	50
	8	B	M	*ca* 50
	9	B	M	*ca* 40
	10	C	M	>60
	11I	B	M	50–55
	11II	B	F	21–40
	11III	B	F	*ca* 45
	11IV	B	C	1–2
	12	B	F	*ca* 20
	13	B	F	21–40
	14I	D	M	55–60
	14II	D	F	35–40
	14III	D	F	*ca* 25
	14IV	D	C	6–8
	14V	D	M	21–40
	15	C	M	21–40
	16	C	F	18–21
	17	D	F	21–40
	18	B	M	>60
	19BI	D	M	*ca* 35
	19BII	D	M	*ca* 35
	19BIII	D	F	21–40
	19AIV	D	F	21–40
	20I	B	F	21–40
	20II	B	M	21–40
	21	B	M	>60
	22	B	F	*ca* 40
	23I	D	M	21–40
	23II	D	F	>60
	24	B	F	21–40
	25A	C	F	*ca* 60
	25B	C	M	35–40
	26	B	F	*ca* 60
	27I	D	M	21–40
	27II	D	F	21–40
	27III	D	F	21–40
	28	B	F	*ca* 30
	29	E	F	25–28
ARCIPRETE:				
	1	D	M	45–50
	2	D	M	25–30
	3	B	F	20–25
	4	B	C	2–3
	7A	E (?)	F	30–35
	7B	E (?)	M	25
	8A	B	F	20
	9A	B	F	35–40
	10	B	M	50

Key: M = male; F = female; C = child
type A: squared stone-blocks coffin with slabs covering; type B: loculus with slab covering; type C: loculus with vault covering; type D: chambered tomb; type E: grave dug in the rock.

La Gioia 1977). New sex determinations, confirmed also by the archaeological study of grave goods, are shown in *Table 1*, together with those of Arciprete.

DENTAL PATHOLOGIES

Dental pathologies found in the individuals of Cantone and Arciprete can be observed in *Tables 2a* and *2b*. Loose teeth found among the multiple burials of tombs 2 (only maxillary), 11 and 14 have not been considered in the total calculation.

We can immediately notice the presence of caries on the lower and upper jaw teeth (57 out of 343, equal to 16.61 % at Cantone and 9 out of 43, equal to 20.93 % – only maxillary – at Arciprete), abscesses and granuloma (14.03 % at Cantone, absent or not detectable because of the missing part at Arciprete), with subsequent *ante mortem* loss of teeth.

Dental caries of Cantone individuals (that have been classified in *Table 3* according to the size of the lesion and its position on the tooth) affect more heavily molars and premolars (inferior and superior). At Arciprete they are present in both teeth with the same degree and modality and are more frequent at the neck and in the interproximal area. They are caries and advanced caries, always of high degree at both Arciprete and Cantone.

The major incidence of this pathology is related to mature individuals: for them we have often to record pathological phenomena such as abscesses and granuloma subsequent to caries *(Tables 2a* and *Figure 2/D*).

The Cantone population shows, both for males and females, a high percentage of teeth lost *intra-vitam (Table 4)* in both the dental arches, more precisely 21 % for maxillary molars and premolars, 8 % for incisors and canines and 6 % for mandibular anterior teeth, with a major incidence for premolars and molars (17 %).

Caries are located mostly at the neck (26 % on maxillary premolars and molars and 42.10 % on mandibular ones at Cantone and 60 % on maxillary molars and premolars at Arciprete) and in the interproximal spaces (21 % on maxillary premolars and molars and 53 % on mandibular teeth at Cantone and 60 % on maxillary premolars and molars at Arciprete) (*Table 3*).

Regarding their position, caries could have been caused by bad oral hygiene (Konig 1989), intake of food with a high component of carbohydrates (Konig 1989), or by lack of fluorine in the water supply (Konig 1989, Hillson 1986). The presence of calculus in the Cantone sample and on upper premolars and molars of Arciprete individuals could imply bad oral hygiene; in Cantone sample it has to be considered severe, especially on lower premolars and molars (21 %) *(Table 4)*.

It is well known that calculus, or calcified plaque usually does not allow (in case of hypersaturation of the dental surface) the formation of caries (Konig 1989). It is interesting to notice that calculus is always present on

TABLE 2a. Maxillary (x) and mandibular (y) teeth of Cantone individuals.

Burial number		M3	M2	M1	P2	P1	C	I2	I1	I1	I2	C	P1	P2	M1	M2	M3
T1	x																
	y	–	–	–	+	+	+	+	( )	( )	( )	( )	–	–	–	–	–
T2/I	x																
	y	O	+	+	+	+	( )	+	( )	( )	( )	–	( )	( )	+	+	–
T2/II–2/III	x																
	y	–	–	–	–	( )	( )	( )	( )	( )	+	+	+	( )	–	–	–
T2/III–2/II	x																
	y	–	–	+	+	+	+	( )	+	+	+	+	h	+	+	+	+
T3	x	*			*			* h								+	–
	y	–	–	–	+	+	( )	( )	i	.....	.....	.....	+	+	–	+	–
T4	x							*					*				
	y	oC	+	+	+	+	+	( )	( )	*	+	+	+	+	+	doAC	+
T6	x	–	A	–	R	( )	+	+	+	+	( )	+	R	–	–	nAC	–
	y	( )	dnC	–	+	+	+	+	( )	+	+	h	+	+	–	.....	.....
T7	x	O	+	lnAC	+	+	+	+	+	( )	( )	+	+	+	+	lnAC	( )
	y	O	lC,vnC	dC,lC	h	h	h	h	h	h	h	h	h	hdC	mlAC	lnC	O
T8	x	.....	A	* AC	–	–	( )	+	+	+	( )	–	+	+	A	+	–
	y	( )	( )	RA	+	dnC	dnC	mnC	–	dnC	mnC	dC	mC	+	–	–	–
T9	x	+	+	A	–	R	+	( )	( )	( )	( )	( )	( )	( )	.....	.....	.....
	y	+	+	+	+	+	+	( )	–	( )	+	+	+	+	+	+	+
T10	X																
	y	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
T11/I	x																
	y	.....	–	–	+	+	( )	–	–	–	( )	+	( )	( )	–	....	.....
T11/III	x																
	y	mnAC	oC	oC	+	+	+	+	+	+	+	+	+	+	dAC	dAC	....
T12	x	( )	+	( )	( )	+	( )	+	( )	( )	+	( )	+	+	+	+	oC
	y	+	+	+	+	+	+	h	h	h	h	+	+	+	+	+	+
T14/I	x	.....	.....	.....	.....	( )	( )	( )	+	+	( )	⊕	+	( )	( )	( )	+
	y	+	+	+	+	( )	+	+	+	+	( )	+	( )	+	dAC	A	+
T14/II	x																
	y	–	dC	nC	+	nC	+	( )	( )	+	( )	+	nC	+	nC	.....	.....
T14/III	x												*				
	y	+	+	+	+	( )	+	+	+	+	( )	+	+	+	+	+	+
T16	x				* nC	* nC											
	y																
T18	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
	y	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
T19B/I-19B/II	x																
	y	–	–	+	+	+	+	( )	+	( )	+	+	+	+	+	–	–
T19A	x		....	....	AC	+	+	+	+	.....	.....	.....	.....	.....	.....	.....	.....
	y																
T22	x	O	+	+	+	+	+	+	( )	+	+	+	+	+	+	+	O
	y	O	+	+	+	+	+	+	+	+	+	+	+	+	+	+	O
T24	x																
	y			*nAC,oC									*	*			
T25A	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
	y	( )	( )	( )	mC	+	–	–	–	( )	–	–	+	dnCC	( )	( )	( )
T25B	x																
	y	( )	( )	( )	+	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	dnAC	mnAC
T26	x						*				*						
	y	–	–	–	( )	dC	+	+	( )	( )	( )	( )	( )	( )	–	–	–
T28	x	–	+	RA	+	+	( )	+	+	+	+	+	+	+	RA	+	–
	y	O	+	–	+	+	+	+	+	–	+	+	+	dC	–	+	O
T29	x	+	+	+	+	+	( )	+	( )	+	( )	+	+	+	dAC	omAC	.....
	y	–	oAC	+	+	+	+	+	+	+	+	*	*	*	*	*	dAC,vC

x = MAXILLARY TEETH; y = MANDIBULAR TEETH; + = tooth present ; – = *ante mortem* loss;
( ) = *post-mortem* loss; AC = advanced caries; C = caries; o = occlusal; n = neck caries; m = mesial; d = distal;
v = vestibular; l = lingual; * = loose tooth; O = agenesiac tooth; R = root; A = abscess; ... = missing alveolar part;
h = hypoplasia; ⊕ = tooth in formation.

TABLE 2b. Maxillary teeth (x) of Arciprete individuals.

		M3	M2	M1	P2	P1	C	I2	I1	I1	I2	C	P1	P2	M1	M2	M3
T7a	x	O	–	+	+	+	+	+	+	+	+	+	+	+	+	mnAC	O
T8a	x	+	+	+	( )	( )	+	( )	( )	( )	( )	+	+	( )	+	+	+
T9a	x	–	–	–	( )	( )	+	( )	( )	R	( )	( )	( )	( )	+	.....	.....
T10	x	–	dnAC	+	+	+	+	+	( )	+	+	dnAC	mnAC	+	+	.....	*

x = MAXILLARY TEETH; y = MANDIBULAR TEETH; + = tooth present ; – = ante mortem loss; ( ) = post-mortem loss;
AC = advanced caries; C = caries; o = occlusal; n = neck caries; m = mesial; d = distal; v = vestibular; l = lingual; * = lose tooth;
O = agenesiac tooth; R = root; A = abscess; ... = missing alveolar part; h = hypoplasia.

TABLE 3. Dental pathologies of male and female individuals from the sites of Cantone and Arciprete.

	Carious teeth		Caries and adv. caries		Occlusal caries		Neck caries		Interproximal caries		Caries		Abscess and granuloma		VL caries	
Maxillary	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B
Anterior	a	5%	a	20%	a	a	a	20%	a	20%	a	a	a	a	a	a
Pmol/Mol	18%	8%	58%	60%	11%	a	26%	60%	21%	60%	21%	a	32%	a	11%	a
Mandibular	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B
Anterior	2%	/	a	/	a	/	13%	/	13%	/	13%	/	a	/	a	/
Pmol/Mol	14%	/	42%	/	16%	/	42%	/	53	/	53%	/	5%	/	16%	/

Key: A: Cantone – Collelongo 1st c.BC – 1st c.AD; B: Arciprete – Ortucchio 1st c.BC – 1st c.AD; a: absent pathology; /: missing part; VL: vestibular-lingual caries.

TABLE 4. Dental pathologies of Cantone and Arciprete individuals.

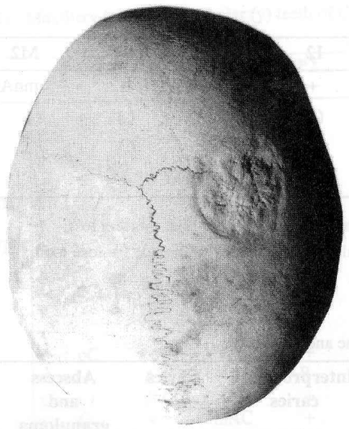
	Intra vitam loss		Agenesy		Calculus	
Maxillary	A	B	A	B	A	B
Anterior	8%	a	a	a	5%	a
Pmol/Mol	21%	a	3%	3,3%	1%	8%
Mandibular	A	B	A	B	A	B
Anterior	6%	/	a	/	14%	/
Pmol/Mol	17%	/	3%	/	21%	/

Key: A: Cantone - Collelongo 1st c.BC – 1st c.AD; B: Arciprete – Ortucchio 1st c.BC – 1st c.AD; a: absent pathology; /: missing part.

TABLE 5. Dental pathologies of male and female individuals from the sites of S.Vincenzino and Vada.

	Carious teeth		Caries and adv. caries		Occlusal caries		Neck caries		Interproximal caries		Caries		Abscess and granuloma		VL caries	
Maxillary	SV	V	SV	V	SV	V	SV	V	SV	V	SV	V	SV	V	SV	V
Anterior	a	8%	a	100%	a	67	a	a	a	a	a	a	a	a	a	33%
Pmol/Mol.	1%	a	100%	a	a	a	100%	a	a	a	a	a	a	a	a	a
Mandibular	SV	V	SV	V	SV	V	SV	V	SV	V	SV	V	SV	V	SV	V
Anterior	a	4%	a	33%	a	a	a	11%	a	33%	a	11%	a	a	a	44%
Pmol/Mol.	7%	4%	13%	22%	25%	33%	13%	11%	12 %	a	63%	33%	25%	a	38%	a

Key: SV: S. Vincenzino (Li); V: Vada (Li); a: absent pathology.



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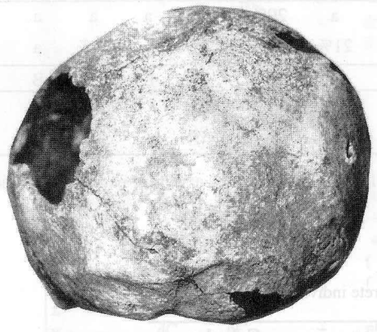

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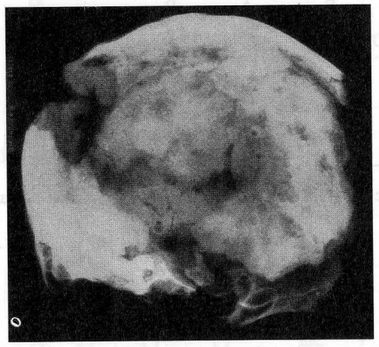

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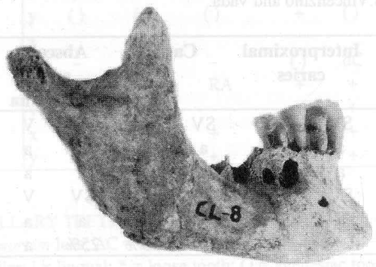

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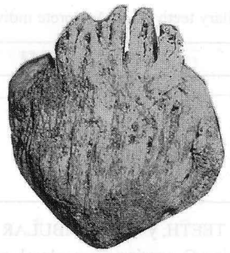

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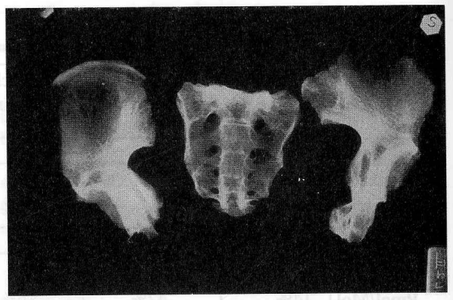

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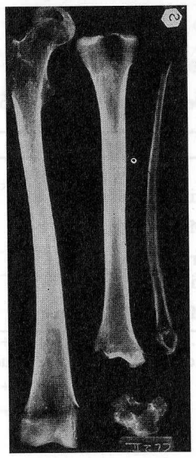

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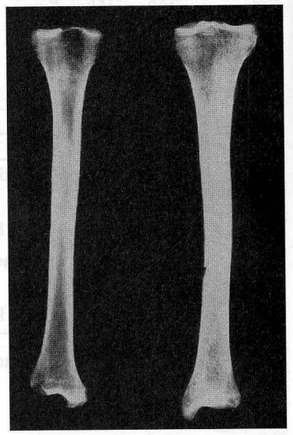

H

FIGURE 2. A. Results of an attempt of cranial trephination on the right parietal bone of the male individual of tomb 18 – Cantone. B. Symmetrical biparietal thinning of the skull (seen in *norma posterior*) of the male individual of tomb 10 – Cantone. C. X-ray of the sample of *Figure 2B*. D. Mandible belonging to the male individual of tomb 8 – Cantone, seen in right lateral norma: a drainage hole for an abscess of M1 can be observed. E. Left patella of the male individual *(Figure 2F, G, H)* of tomb 2/II – Cantone: we can notice evident enthesophytes on the impression of the quadriceps muscle tendon. F–G. Radiography of the pelvic girdle and lower left limb of male individual buried in tomb 2/II (Cantone). It reveals the remodelling of the left acetabulum and the thinning of the compact bone of the diaphysis, subsequent to poliomyelitis. H. A comparison between the two tibiae of male individual of tomb 2/II. The left tibia is strikingly different in volume from the right one.

TABLE 6.

CANTONE	Individual	Sex	Osteo-arthritis	*Cribra orbitalia*	Polio-myelitis (?)	Biparietal thinning	Trauma	Others
	1	M	*					
	2I	F	* X					
	2II	M	X		•			
	2III	M	* X					
	3	M	X	•				
	4	M						•
	5	M	X					
	6	M		•				
	7	F	*					
	8	M					•	
	9	M	*					
	10	M				•		
	12	F	*					
	13	F	*					
	15	M	X					
	17	F	*					
	18	M					•	
	23I	M	*					
	23II	F	*					
	24	F	*					
	25A	F	*					
	25B	M	*					
	27I	M	X					
	28	F	X					
ARCIPRETE								
	2	M		•			•	
	7A	F		•				
	9A	F	X					
	10	M	X					

Key: x = osteoarthritis of the spine; * = osteoarthritis of other bones; • = other pathologies; M = male; F = female.
Note: vertebrae not belonging with certainty to a single individual of tombs 11, 14, 19, show traces of osteoarthritis.

lingual or buccal surface where there are no traces of caries; these, if present, appear on the opposite side of the tooth.

From the paleonutritional analysis we can find the confirmation that the diet was based mostly on carbohydrates (Severini 1991b). For the Cantone sample, the study shows how the values of Sr are particularly high (Sr/Ca = 0.60 (0.206), while the Zn value is low (Zn/Ca = 0.395 (0.102), thus indicating a scanty intake of meat.

This kind of diet seems to be confirmed also by the economy of this area as it is suggested by historical and literary sources about its agricultural landscape (Letta 1972, Severini 1991b).

Some tests on spring waters of the Amplero valley (on the slopes of which the Cantone necropolis lies) and close to the site of Arciprete have given us the chance to know the concentration of fluorine in the waters drunk by the two human groups. The hypothesis of a lack of fluorine in them has been suggested by the fact that, following a personal observation, also the contemporary population of this area is largely affected by caries (Mallegni, pers. comm.).

As it is well known, fluorine plays an important role in the chemical composition of teeth: it guarantees, if assumed in the right dose, a protection from pathologies like caries.

The analyses, performed by Dr. Ceccanti (Istituto di Chimica per il Terreno, CNR of Pisa) have made clear that fluorine concentration values are between 0.076 ppm and 0.49 ppm; these values are largely inferior to the limit of 0.8–1.0 mg/l (Konig 1989), recommended by WHO for a correct fixing of fluorine ion in the composition of enamel hydroxyapatite:

Amplero Basin-Pozza Vacche: F = 0.076 ppm; Pozza Buoi: F = 0.24 ppm; Ortucchio-Arciprete: F = 0.49ppm.

At Cantone caries affects both males (12.14 %) and females (16.74 %): the percentages have been obtained on 343 maxillary and mandibular teeth belonging to 27 individuals (13 males and 14 females). From these data we can notice that it has a greater incidence in females

and affects more commonly the first molar and the premolars *(Table 2)*. This extremely high frequence of caries could be quite convincingly related to a scanty intake of fluorine from water. In addition we made a further comparison with the data on fluorine concentration of the waters probably used by other Roman and Late Roman age groups, S. Vincenzino-Cecina (LI) (Bartoli and Severini 1989) and Vada-Rosignano Solvay (LI) (Mallegni *et al.* 1972). The fluorine concentration, contrary to what happens at Cantone and Arciprete, is excellent in San Vincenzino (F = 0.75 ppm) and Vada (F = 0.96 ppm) spring waters. This feature could partly explain the low frequency of caries in these two samples.

At San Vincenzino-Cecina (LI) caries is rather infrequent in superior molars and premolars (0.86 %) and not very common also in inferior ones (6.77 %); at Vada (LI) it is present with a percentage of 7.69 % in upper anterior teeth and of 3.53 % in lower anterior teeth and of 4.42 % in mandibular premolars and molars *(Table 5)*.

It is more commonly found on the occlusal surfaces, while neck and interproximal caries are much less frequent (at San Vincenzino-Cecina in molars and premolars and in incisors and canines at Vada-Rosignano).

The presence of caries in these two sites, though rare, could be related to bad oral hygiene or other causes (such as high carbohydrate intake), rather than to poor concentration of fluorine that, as we have seen, is present in the water of the area with high concentration values.

SKELETAL PATHOLOGIES

Cranial and post-cranial skeletal pathologies are summarized in *Table 6;* 25 adults from Cantone (55.55 %) and 4 from Arciprete (50 %) are affected by pathologies linked mostly to functional stresses, for which also the age of the subject plays an important role. We start here with a description of these pathologies and shortly after we will discuss the data obtained.

Osteoarthritis

In Cantone sample osteoarthritis can be noticed in the temporo-mandibular joint of 9 out of 45 adults (20 %) *(Table 6)* with osteophytosis on the condyles (52.94 %); this pathology is more evident on the left condyle of individual III of tomb 2 (male, aged around 60) and of the female individual of tomb 7 (aged around 50); in the female individuals buried in tombs 2 and 12 it comes together with a remodeling of the surface of the glenoid fossa.

Evident marks of osteoarthritis can be seen also on the spine of some individuals (17.77 % at Cantone, 25 % at Arciprete), especially on thoracic and lumbar vertebral bodies, accompanied by the formation of osteophytes on the superior and inferior margin.

The presence of this pathology has to be recorded also for some young individuals (aged less than 30) (tombs 12 and 28, at Cantone): in this case the phenomenon could be explained with intense physical labour.

It is difficult to define precisely the cause of formation of Schmorl's nodes or herniations on the surfaces of the vertebral bodies. They represent a sort of "prolapse" of the intervertebral disk tissue that subsequently calcifies and chondrificates, and this is due to a vacuum (whether congenital or acquired) in the spongy bone under the cartilagineous lamina of the vertebral body (Dompè 1992). According to other authors they could be the result of degenerative processes of functional kind, sometimes related to the age of the subject (Kelley 1983, Resnick 1989, Kennedy 1989), even if these herniations have been observed also in children between 8 and 12 years of age (Resnick 1989). At the moment their formation is believed to be caused also by other unknown mechanisms and it is not possible to find a cause-effect relationship between osteochondrosis and pathological processes.

Marks of osteoarthritis represented by flattening, deformation and osteophytes of the medial surface of the right clavicle can be observed on the clavicle-sternum joint of the male individual of tomb 1, aged around 60.

Osteoarthritis of the hip with degeneration of the articular surface of acetabulum and sometimes with the formation of exostoses on the acetabular margin, affects five individuals (1 male and 4 females) out of 26 adults of tombs 2/I, 13, 24, 25A and 25B – Cantone with pelvis present (19.23 %) and 5 acetabula out of 44 (11.36 %) of which 8.69 % is on the right and 14.28 % on the left.

Enthesopathies can also be observed: these pathologies tend to affect the proximal epiphyses of humerus and tibia and the distal ones of radius and ulna (Köhler, Zimmer 1986). They are present (especially on the olecranon of the ulna, tombs 23 and 25B, and on the patella, tombs 2/II and 9 – *Figure 2/E*) on the postcranial remains of 7 individuals from Cantone (15.55 %); on long bones they appear as gross bone projections, sometimes spur-shaped: usually they are accompanied by thinning of the compact bone and a rarefaction of the spongy bone.

Trauma

Two cases of traumatic lesions of the skull (one at Cantone, tomb 18 and one at Arciprete, tomb 2) have been noticed and described.

In the first case *(Figure 2/A)* we can observe a cribrotic depression on the right parietal bone of the male individual aged more than 60: it is close to the coronal suture, largely remodelled and cicatrized, and shows a circular groove that can be connected almost certainly to a surgical operation following a trephination. The appearance of the lesion on its inner surface could imply that the trephination was not completely performed; anyway the infection caused was serious enough to produce the new cribrotic bone previously described (Steinbock 1976, Germana, Fornaciari 1991). This seems to be the first case of an attempt of skull trephination dated to Roman age in which longitudinal

grooves, possibly related to a "scraping" process can be described.

The reason for the performance of this attempt is unknown, but it was not consequent to any trauma, given that X rays of the skull show no trace of it but the remodelling of the bone.

The male individual of Arciprete – tomb 2 shows two injuries on the frontal bone, the first one on the right eminence and the the second on the left, both of which have ended in two slight hollows, the former with a more vertical development, the latter circular with traces of healing. Perhaps they represent the result of two injuries to which the individual survived, but still of unknown origin.

We can register a big osteophytic formation on the external occipital protuberance of the skull belonging to the male individual buried in tomb 8 – Cantone, on the right side of the superior margin of the occipital area. In this case we diagnosed the ossification of the nuchal ligament (Köhler, Zimmer 1986), as a response to a possible traumatic episode and, given the inclination of the osteophyte, subsequent to the stretching of its insertion.

Cribra orbitalia or *Hyperostosis spongiosa orbitae* (Hengen 1971)

It is a deficiency syndrome that appears as small holes (more or less clustered and of different diameters according to the seriousness of the affection) on the anterior part of the orbital roofs (Hengen 1971, Steinbock 1976, Mann, Murphy 1990, Roberts, Manchester 1995).

Cribra orbitalia, together with other skeletal manifestations, such as porotic hyperostosis, "hair on end" appearance of the diploe, vascular neoformations on the surface of post-cranial bones, can be the expression, more or less severe, of microcytemia.

The presence of this disease is rare in Cantone individuals with 2 cases out of 47 (4,25 %), and does not come together with serious manifestations as the ones caused by thalassemia. It is difficult to admit its presence in a sample living on the hills, but the closeness of the site to Fucino lake could have caused a certain incidence on the gene pool caused by the immigration of peoples affected by this disease from the lake marshy areas. This can be observed in two skulls out of 15 (13,33 %) among the ones that still have the orbits (male individuals of tombs 3 and 6).

At Arciprete we have an incidence of 40 % (2 out of 5 skulls) (individuals of tombs 2 and 7A, male and female). Also in this case the lesions are not very relevant (grade 3 of Hengen 1971), but the scarcity of the sample can bias the real incidence of this phenomenon, more serious for the male sex (in the two samples).

Other anomalies

The male individual 2/II of Cantone, aged around 60, shows underdeveloped innominate and left lower limb bones (especially the fibula) compared to the right ones. Traces of ossification of the hip muscles around the acetabulum can also be observed *(Figure 2/F, G, H)*.

The articular surfaces of left tibia condyles are much less worn compared to the right ones: left tibia is almost completely lacking the osseous crest; osteophytes are absent (while present in the right tibia). Left medial malleolus is flattened and of reduced dimensions and shows an eburnated surface thus indicating club foot (better defined as "*varus supinatus* hindfoot") (Ragghianti, pers. comm.).

Left posterior tarsus is also underdeveloped and affected by osteophytes on the articular surface margins, while the same bones on the right side show traces of eburnation on the contact surfaces.

A reduction in thickness of compact and spongy bone of the side interested by this pathology is evident from X-rays of the pelvic girdle and limbs.

DIFFERENTIAL DIAGNOSIS

The causes of such a serious damage to the innominate and left lower limb are difficult to diagnose: it could have been the result of a hemiparesis subsequent to a damage of the sciatic nerve during birth (maybe due to podalic presentation in the parturition canal) or it could be also the result of poliomyelitis that had affected the subject during childhood.

As it is known the effects of poliomyelitis on the limbs of the living subjects are muscular atrophy, underdevelopment of the limb affected, and reduction of bone diameters caused by demineralization and subsequent osteoporosis (Pieraccini 1943, Dompè 1992).

We tend to diagnose poliomyelitis for the subject in question, not existing traces of a fracture on the left side of the pelvis.

Left side deformation and different length and diameters of its bones (tibia and fibula) are subsequent also to the reduced usage of this part of the body, while, on the contrary, right side was more used for standing and walking; muscular attachments are very well marked and articular surfaces of posterior tarsal bones were affected by eburnation consequent to hyperactivity.

The skull of the old adult male of tomb 10 – Cantone shows a rather rare anomaly, commonly known as "*malum biparietale*" (Mallegni 1977, Breitinger 1983): it is an atrophy of the diploe the causes of which are uncertain; however, a genetic origin has been put forward for this affection (Breitinger 1983).

The sample presents parietal thinning (bilateral and symmetrical); bone lesions close to the two zones are absent, as reported by paleopathological literature on this topic (Ortner, Putschar 1985: Fig. 2/B, C).

Biparietal thinning is not an age-related phenomenon (Mann, Murphy 1990) as it was once thought, and the name of "*malum senile*" (Virchow 1854) should be rejected, given that we face an anomaly not dependant on atrophy or on other pathologies related to age (Mallegni 1977, Breitinger 1983).

This cranial anomaly apparently implies no disturbance for the living subject and therefore the knowledge of its causes is still uncertain.

Individual 4 from Cantone (male, aged around 25) shows the atlas without the posterior arch and partially fused with the epistropheus because its medial portion did not develop and the fact was due to a hereditary anomaly (Testut 1942, Köhler, Zimmer 1986).

CONCLUSIONS

From the study of dental and skeletal pathologies of the individuals buried in the Roman necropolises of Cantone (47 individuals: 23 males, 22 females, and 2 children) and Arciprete (9 individuals: 4 males, 4 females and one child) we can conclude that the two human groups shared some of them, especially the ones regarding teeth and spine.

Dental pathologies are very common and their high incidence can be partially explained with the low concentration of fluorine in the spring waters of the two sites (Conca di Amplero-Cantone and Ortucchio-Arciprete), with a carbohydrate-based diet (Letta 1972, Severini 1991b) and with bad oral hygiene (calculus deposits are present especially on mandibular teeth).

Regarding skeletal pathologies, the most affected area is the spine (thoracic and lumbar vertebrae), even in young individuals (at Cantone).

It is a more or less developed osteophytosis of the two vertebral margins; considering the tracts of the spine for which it is more evident, it can be inferred that roughly half of each human group was involved in an activity that caused functional stress on the shoulder or the torso (e.g. efforts for lifting and carrying weights).

Other pathological affections such as traumas, congenital anomalies, should be considered rather exceptional (*malum biparietale*, poliomyelitis) or casualty-related (such as traumas).

It is possible then that the two populations of Cantone and Arciprete (two sites close to each other) shared the same life-style and environmental stresses and possibly also the same intense physical labour such as agriculture. Columella (12, 10, 1 and 2, 9, 7–8) mentions "*granum fabae marsicae*", orchards, vineyards (Letta 1972) and animal husbandry (sheep, goat, cattle and pigs) (Montanari 1988). Therefore this evidence, testified also by faunal and botanical remains, confirms the historical and literary sources on this area.

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