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Preliminary study of human skeleton with syphilis discovered in the postmedieval city of Iași (Romania)

Vasilica-Monica Groza[1], Mariana Popovici[1]*, Luminița Bejenaru[1,2], Ozana-Maria Petraru[1,2]

Abstract. In this study, the authors present a human skeleton with syphilis of 15th-19th centuries discovered at the "Dormition of the Mother of God" Roman Catholic Cathedral from Iași (Romania). The skeleton is originated from a reburial tomb, and it was excavated in 1995 by archaeologists from the Centre for European History and Civilization of Iași. The skeleton orientation was according to the Christian ritual. Estimation of biological age at death (35-40 years old) and sex determination (male) was performed according to classic methodology. Morphometric data indicate a general background of Europoid type, with a height of 167.05 cm. The syphilis evidences are evaluated by macroscopic analysis, showing hypertrophic and sclerotic changes at skull and long bones. The syphilis is a debilitating disease, sexually transmitted and caused by the bacterium *Treponema pallidum*. This paper contributes to the knowledge of the syphilis spreading in ancient populations of the Pre-Antibiotic Era.
Keywords: syphilis, human skeleton, Roman Catholic Cathedral, 15th-19th centuries, Iași, Romania.

Studiul preliminar al unui schelet uman cu sifilis descoperit în orașul postmedieval Iași (România). În acest studiu, autorii prezintă un schelet uman cu sifilis, din secolele XV-XIX, descoperit la Catedrala Romano-Catolică „Adormirea Maicii Domnului" din Iași (România). Scheletul provine dintr-un mormânt de reinhumație și a fost cercetat în anul 1995 de arheologii de la Centrul de Istorie și Civilizație Europeană din Iași. Orientarea scheletului era conform ritualului creștin. Estimarea vârstei biologice la deces (35-40 ani) și determinarea sexului (masculin) au fost efectuate conform metodologiei clasice. Semnele sifilisului au fost evaluate prin analiză macroscopică, indicând modificări hipertrofice și sclerotice la nivelul craniului și oaselor lungi. Sifilisul este o boală debilitantă, transmisă sexual și cauzată de bacteria *Treponema pallidum*. Această lucrare contribuie la cunoașterea răspândirii sifilisului în populațiile vechi din perioada pre-antibiotică.
Cuvinte cheie: sifilis, schelet uman, Catedrala Romano-Catolică, secolele XV-XIX, Iași, România.

[1] Romanian Academy –Iași Branch, "Olga Necrasov" Center of Anthropological Research, Romania
[2] Alexandru Ioan Cuza University of Iași, Faculty of Biology, Romania
* Corresponding author: sorexmin@yahoo.com

Introduction

The archaeological research, conducted in 1995 at the "Dormition of the Mother of God" Roman Catholic Cathedral from Iași (Iași County, Romania) (N47.156392, E27.587453) (**Fig. I/1-2**), led to the discovery of a necropolis with 89 inhumation skeletons (children, adolescents, adults, matures and seniles). They are coming from individual tombs and reburials. According to information provided by the archaeologists (based on numismatic discoveries), the burials were dated to the 15th-19th centuries. The skeletons' orientation was according to the Christian ritual (Cheptea 1994-1995).

The preliminary estimation of the sex indicates 36 males and 32 females. The anthropological study of this sample has not been finalized nor published.

The history of the Catholic community of Iași is closely related to the foundation of medieval Moldova and the development of the towns. Historians date the beginnings of the Catholic community of Iași city at the end of the 14th century AD (Caproșu 2001, p. 499). The Catholic population of Iași knew significant diversity over time – Germans, French, Italians, Hungarians, and Polish, all rallied under the Catholic Church umbrella. The number of Catholics in Iași, originating from all over Western and Central Europe significantly increased starting with the second half of the 16th century AD. During the 17th-18th centuries, the demography of Iași continued to remain positive, although the city was often attacked by Turks, Tatars, and later Cossacks (Cheptea 1994-1995). The sinuous history of Iași, marked by periods of destruction and reconstruction is also illustrated by the evolution of the Catholic Church. In the current state of research, we can sketch the most important stages in the history of the first five centuries of the Catholic edifice from Iași. Thus, the first edifice, founded in the 15th century AD, was followed by another, built in the first decades of the 16th century AD, which was made of stone with deeper foundations, compared to other monuments of the time, and which disappeared in the first years of the next century.

In the last decades of the 17th century AD, a wooden church was built on the foundation from the 16th century AD, which has been abandoned in uncertain circumstances. Another church was built, also from wood, on the foundations close to the wall of the "Three Hierarchs" church, but apparently larger, and which was consecrated in 1755. Becoming derelict, for the usual reasons, the necessary diligences for the construction of a new church are resumed; this time, the church is made of stone, on the initial location, being sanctified in 1789, and it is the current church, dedicated to the "Dormition of the Mother of God" (Cheptea 1994-1995).

In this article, we describe a human skeleton with syphilis – a chronic infectious syndrome caused by a spirochete bacterium, of *Treponema* genus (Antal *et alii*

2002). There has been much debate on the origins and spread of syphilis, particularly concerning ancient populations in the Pre-Antibiotic Era (Centurion-Lara *et alii* 2000). Currently it is believed that different *Treponema* bacteria cause different diseases: *T. carateum* is responsible for pinta, *T. pallidum* subsp. *endemicum* leads to bejel (non-venereal syphilis or endemic syphilis), *T. pallidum* subsp. *pertenue* causes yaws, whereas *T. pallidum* subsp. *pallidum* is responsible for venereal and congenital syphilis (Centurion-Lara *et alii* 2000). Each form is associated with distinctive geographic, climatic, and socio-cultural features. All of these diseases are characterized by self-limited, primary and secondary lesions, a clinical disease-free latent period and late lesions that are frequently destructive, particularly for bone and skin (except for pinta, which never involves internal organs or bones) (Aufderheide, Rodriguez-Martin 1998, p. 154).

Non-venereal forms of treponematosis have not yet been eliminated and are currently thought to affect at least 2.5 million persons (Antal *et alii* 2002). The treponematosis have probably been the most debated of all the pathological conditions that can be detected in skeletal remains, and venereal syphilis continues to be a contentious issue in science (Ortner 2003, p. 273). In 1976, in his study on modern treponematosis in dry bones, Hackett described the most common destructive and proliferative lesions, and identified a series of progressive cranial lesions (the "caries sicca" sequence) (Hackett 1976).

Clinically, syphilis can be described as having three stages: primary, secondary and tertiary (Waldron 2009). In the primary stage a painless lesion, called a chancre, develops at the site of inoculation, which is invariably somewhere on the genitalia. It is self-limiting and usually heals – no doubt to great relief – in two to eight weeks. A short while later, the second stage is heralded by a flu-like illness and a widespread rash that may appear on the soles of the feet and the palms of the hands. Just over a third of those infected will enter the tertiary stage after a latent period that may be anything up to thirty years after the initial infection. This stage is characterized by the formation of erosive granulomas called gumma which affect skin and bones. The gumma is similar in appearance to the tubercles of tuberculosis but without a necrotic center (Waldron 2009).

Material and methods

In the present paper, we describe the human skeleton originated from a reburial and marked with R26. The preservation status of the skeleton is approximately satisfactory. The study of the skeleton was preceded by a process of bone restoration to allow the morphoscopic analysis, recording of biometric data, estimation of the age at death, sex evaluation, as well as a paleopathological analysis.

The biological age at death was estimated combining different criteria: pubic symphysis degeneration and sacroiliac surface transformation (Brooks, Suchey 1990; Buikstra, Ubelaker 1994, p. 24-32; Schmitt 2005), changes in the spongy tissue from the humeral and femoral epiphyses, involution in the skeleton and the sternal rib morphology, specific pathological processes associated with age (Işcan *et alii* 1984; Işcan *et alii* 1985, Latham, Finnegan 2010; Ubelaker 1979), dental attrition data (Brothwell 1981, p. 72; Lovejoy 1985), and cranial suture obliteration (Buikstra, Ubelaker 1994).

The estimation of the sex was based on the following aspects: the development of bone relief, shape and inclination of the forehead, size of mastoid process, the mandible's robustness, the teeth' shape and size (Walrath *et alii* 2004); the pelvis' characteristics (Blanchard 2010; Bruzek 2002; Ferembach *et alii* 1979), the development of the muscle insertions, the size of the joint surfaces, the skeleton's massiveness and robustness (Ubelaker 1979, p.72-80; Buikstra, Ubelaker 1994, p. 16-21).

The anthropometric and conformational analysis was based on the Martin and Saller techniques (Martin, Saller 1956-1966), whereas for size evaluation we used the dimorphic scales of Alexeev and Debetz (1964). Morphoscopic observations were recorded and analyzed based on the methods suggested by Olivier (1969). Stature was calculated based on the dimensions of tibiae, using the dimensional scales proposed by Manouvrier (1893), Breitinger (1938), Trotter, Glesser (1951; 1952; 1958), Bach (1965).

The syphilis was evaluated by consulting the main paleopathological literature (Aufderheide, Rodriguez-Martin 1998; Ortner 2003).

Results and discussion

The human skeleton R26, with syphilis evidences, belongs to a mature male, 35-40 years old, with an above-average height of 167.05 cm. The skull is approximately complete (missing mandible). From the postcranial skeleton are preserved only right humerus (incomplete), right ulna (incomplete), and tibiae.

Morphometric data. The cranial anthropometric value regarding the main dimensions and indices analyzed are listed in **Table 1**.

The cranium (**Fig. II/1-2**), ovoid-shaped in *norma verticalis* and "house"-shaped in *norma occipitalis,* has a short (1: 175 mm), medium (by both vertical diameter, 20: 113 mm) and wide skullcap (8: 150 mm), dimensions that show a hiperbrachycranic (8/1: 85.71 i.u.), hypsichranic (20/1: 64.57 i.u.), tapeinochranic (20/8: 75.33 i.u.) conformation; the forehead, with a pronounced glabella (grade 3), is medium-wide, both by dimensional values (9: 94 mm; 10: 120 mm) and also concerning the width of the skull – metriometope (9/8: 68.00 i.u.); the occipital

bone, high and moderately curved, belongs, both by metric value (12: 108 mm) and by the width index, to the middle category (12/8:72.00 i.u.).

As non-metric/epigenetic traits, we note the presence of metopic suture (**Fig. II/1**), located on the frontal bone, from the anterior point of the anterior fontanelle to the *glabella*. The fusion of the metopic suture begins from the *glabella*, advances progressively to the upper area, and ends at the anterior fontanelle (Weinzweig *et alii* 2003). Normally, this suture closes between the first and the second year of life and is completely closed before the subject reaches the age of three; however, it can sometimes stay open until the age of seven. There are also sporadic cases when the metopic suture remains open throughout life and it can be observed even in old people (Ide *et alii* 2003). The persistent metopic suture can be ascribed to several causes, such as: abnormal growth of the cranial bones, pathologic metopism caused by hydrocephaly, growth interruption, heredospecific factors, heredity, atavism, etc. (Castilho *et alii* 2006).

The face (**Fig. II/1-2**) has absolute and relative values placed, on the dimorphic scale, in the small category: the upper level – 48: 64 mm, maximum width – 45: 118 mm; the upper facial index: mesene (48/45: 54.23 i.u.); the orbits, almost round, with a small and medium size (width: 36 mm; height: 35 mm) are hypsiconch – high (52/51: 97.22 i.u.); the mesorrhine nose (54/55: 45.91 i.u.) has a straight line and a pyriform aperture with a slight prenasal fossa; the dental arch has a divergent paraboloid form, brachystaphyline (63/62 – 94.44 i.u.), on which the dentition (incomplete) has, in general, a low abrasion (second degree); morphoscopic, we also add, the moderate development of the zygomatic bone, its middle disposition and the slight development of the canines (grade 2).

The postcranial skeleton is gracile (**Fig. II/3-5**); the right humerus, based on the section indices, belongs to the eurybrachic type (95 i.u.); the tibiae are eurycnemic based on the flattening degree of the diaphysis in the upper area (79.50 i.u. – right, and respectively 78.46 i.u. – left).

In terms of anthropological type, the neurocranium and facial characteristics indicate a general Europoid background (Boev 1972).

Pathology. As syphilis evidences, in the macroscopic analysis on the skull, we found a *caries sicca* lesions of the frontal bone (**Fig. II/1-2**). In the *postcranial skeleton*, we macroscopically identified a new bone formation and superficial cavities in the right humerus (**Fig. II/3**) and right ulna (**Fig. II/4**). The tibiae are both affected by the pathologic process; the macroscopic picture shows irregular periosteal hyperostosis (in proximal diaphyseal region) (**Fig. II/5**). The analyzed subject is in the tertiary stage of the disease.

Periosteal new bone formation is very characteristic of syphilis and may appear in the early stages and is especially prominent on bones, such as the tibia, frontal

bone, ribs, and sternum, although other bones may be involved. The effects in the later stages of the disease are due to the formation of gumma in bones (a form of granuloma). Bony tissues adjacent to gumma undergo necrosis and are absorbed, this process being termed *caries sicca* (Waldron 2009).

Several cases of syphilis have been reported for Europe (Gaul, Grossschmidt 2014; Djurić-Srejić, Roberts 2001; Gladykowska-Rzeczycka *et alii* 2003), but in terms of the Romanian space so far the closest analogy from a chronological point of view is that of the medieval necropolis (16th-19th centuries) of the church of Saint Sava, located in Bucharest. The pathological lesions found on seven skeletons from the Saint Sava necropolis are consistent with treponemal infection (Radu *et alii* 2015). The morphology and distribution of the lesions are suggestive of treponematosis, which makes this the first case of this disease on the Romanian territory in an archaeological population.

Conclusions

In the human skeleton R26 of 15th-19th centuries, discovered at the "Dormition of the Mother of God" Roman Catholic Cathedral from Iași, syphilis evidences were identified. This skeleton belongs to a male, aged between 35-40 years old, Europoid as morphometric type, with a height of 167.05 cm.

Chronic infectious changes on the bones are identified and described, highly consistent with the characteristics of syphilis. The hypertrophic and sclerotic changes are evident on the cranium (frontal bone) and long bones (humerus, ulna, and tibiae). In the analyzed skeleton, the syphilis is not associated with other pathologies. Metopic suture is mentioned as a non-metric trait.

The study provides new evidence of syphilis in a medieval population of Romania.

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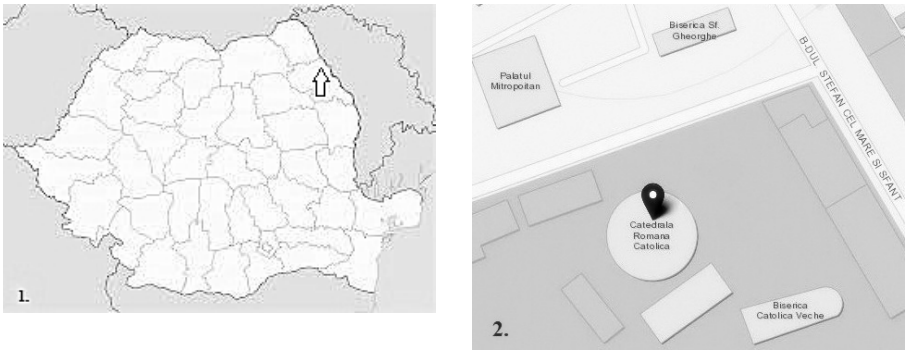
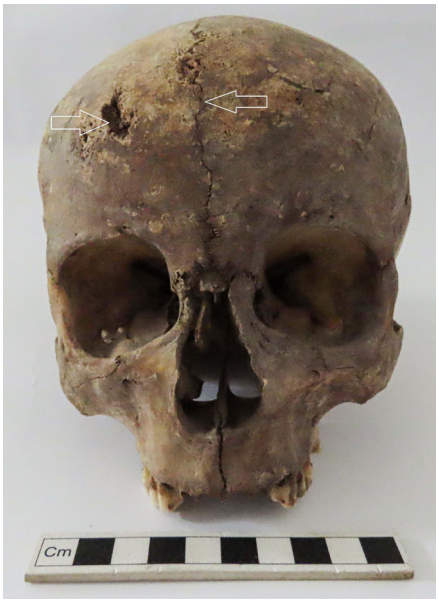


Fig. I. Location of the necropolis (1); detail (2) (Source: http://ran.cimec.ro/)
Fig. I. Localizarea necropolei (1); detaliu (2) (Sursa:http://ran.cimec.ro/)

Martin No.	Dimensions/indices*	Skeleton	R26 ♂
		Ages	35-40
1	*g-op* (maximum cranial length)		175
8	*eu-eu* (maximum cranialbreadth)		150
9	*ft-ft* (minimum frontal breadth)		102
10	*co-co* (maximum frontal breadth)		126
12	*ast-ast* (maximum occipital breadth)		108
20	*po-b* (height of the calvaria)		113
43	fmt-fmt (upper facial breadth)		103
$43_{(1)}$	*fmo-fmo* (internal biorbital breadth)		93
45	*zy-zy* (maximum facialdiameter)		118
48	*n-pr* (superior facial height)		64
51	*mf-ek* (orbital breadth, right)		36
52	orbital height (right)		35
54	*al-al* (nasal breadth)		22.5
55	*n-ns* (nasal height)		49
62	*ol-st* (the length of the palatal vault)		36
63	enm_2-enm_2(internal palatal breadth)		34
8/1	Cranial index		85.71
20/1	Auricular-longitudinal index		64.57
20/8	Auricular- transversal index		75.33
9/10	Frontal-transversal index		80.95
9/8	Frontal-parietal index		68
12/8	Parietal-occipital index		72
9/43	Frontal-parietal index		99.02
48/45	Facial superior index		54.23
52/51	Orbital index		97.22
54/55	Nazal index		45.91

* According to Martin and Saller (1956-1966)

Tabl 1. Skeleton R26: cranial dimensions (in mm) and indices
Table 1. Scheletul R26: dimensiunicraniene (mm) şi indici



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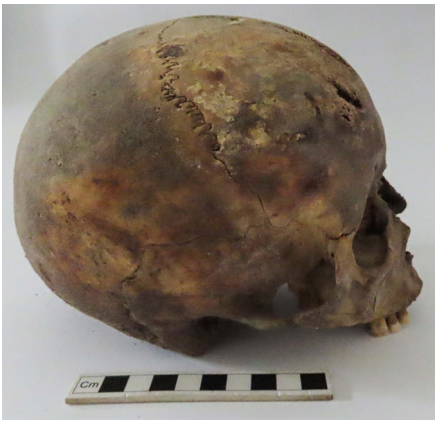

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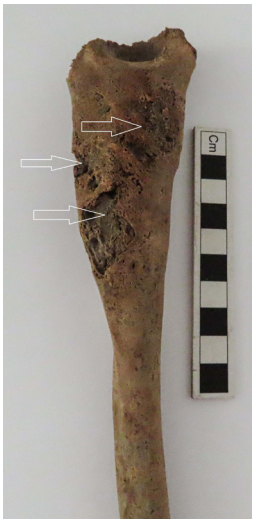

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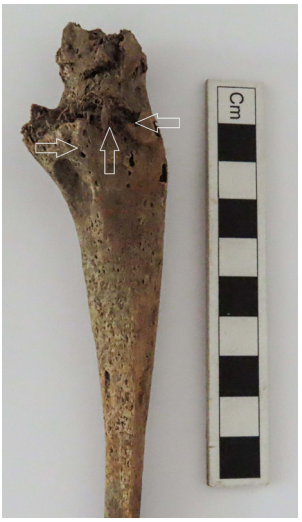

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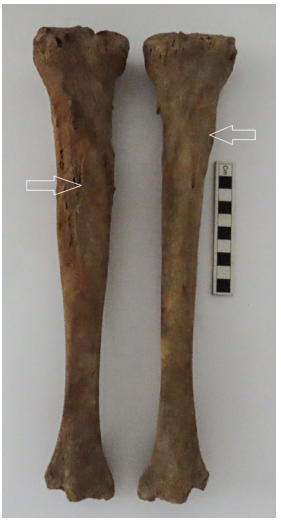

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Fig. II. The human skeleton R26, ♂, 35-40 years old. 1. *Norma frontalis* of the cranium: macroscopic view of the syphilis and metopic suture at the frontal bone; 2. *Norma lateralis* of the cranium; 3. Macroscopic view of the syphilis on the right humerus (distal, anterior); 4. Macroscopic view of the syphilis on the right ulna (proximal, anterior); 5. Macroscopic view of the syphilis on the tibiae (posterior)

Fig. II. Scheletul uman R26, ♂, 35-40 ani. *Norma frontalis* a craniului: vedere macroscopică a sifilisului și sutură metopică pe frontal; 2. *Norma lateralis* a craniului; 3. Vedere macroscopică a sifilisului pe humerusul drept (distal, anterior); 4. Vedere macroscopică a sifilisului pe ulna dreaptă (proximal, anterior); 5. Vedere macroscopică a sifilisului pe tibii (posterior)