

A brief history of syphilis in the Czech Lands

Lenka Vargová¹ · Kateřina Vymazalová¹ · Ladislava Horáčková¹

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Abstract From the end of the fifteenth century, the massive expansion of syphilis had a distinct effect on the historical development of Europe. Due to this disease, firstly the numbers of the European population were reduced; thereafter, moral and ethical principles were significantly affected and the combat readiness of armies decreased. The disease forced new legislation which was of vital importance for the development of health services. The Czech Lands, located in Central Europe, were also no exception. The material presented summarises the available information on this disease obtained from written sources and from the study of direct evidence of skeletal remains from archaeological sites of Bohemia, Moravia and Silesia. Traces of syphilitic bone affliction have been observed in almost every large early modern osteological collection to date. A number of currently documented palaeopathological findings of syphilitic changes in bones from the Czech Lands do not by a long stretch correspond to the data presented in literary sources on the mass occurrence of this disease. The submitted study aims to extend current knowledge in this area and thereby to complete a complex view of the development of syphilis in Central Europe.

Keywords Syphilis · Czech Lands · Specific inflammations · Paleopathology

Introduction

Lues venerea, morbus novus, Neapolitan, French, Gallic, Castilian, Hungarian or Polish disease all of these are designations for the redoubtable infectious disease of syphilis, which significantly affected the life of the European population and was considered a cruel scourge in modern times. The Czech Lands lie in the mild climatic zone of Central Europe, where only venereal syphilis from treponemal infections occurs, either in the acquired or congenital form of the disease (*syphilis acquisita* and *congenita*). Syphilis has become the object of interest of whole generations of physicians and the entire public. Even today, after the introduction of registers of sexually transmitted diseases, the use of modern diagnostic procedures and effective antibiotic therapy, this disease has not been completely eradicated. According to WHO (2016) reports, the incidence of syphilis has increased in several Western European countries in the past 5 years (in Europe this is at approx. 5.1 cases/100,000 inhabitants (ECDC 2013), and in the USA it is at approx. 6.5 cases/100,000 inhabitants (CDC 2015)). Therefore, considerable attention is currently being paid to syphilis, including its historical development. In this context, a great deal of very important information about syphilitic infection was obtained by a study of written and iconographic sources, and also by palaeopathological analyses of morbid changes in skeletal remains from archaeological research in recent decades. The aim of our study is to extend current knowledge to include skeletal findings with syphilitic manifestations described in Czech scientific literature and to complete the complex view on the development of syphilis in Central Europe.

✉ Kateřina Vymazalová
vymazalova@med.muni.cz

Lenka Vargová
vargova@med.muni.cz

Ladislava Horáčková
lhorac@med.muni.cz

¹ Division of Medical Anthropology, Department of Anatomy, Faculty of Medicine, Masaryk University, Kamenice 3, 625 00 Brno, Czech Republic

Theory of origin of syphilis

It is evident from the history of syphilis that the disease became a menace to the European population at the end of the fifteenth century, when it spread as an avalanche across the whole continent. The disease agent was *Treponema pallidum*; the other species of genus *Treponema* (*Treponema carateum* and *pertenue*) pathogenic to humans do not commonly occur in the Czech Lands, i.e. in the mild climatic zone of Central Europe. It is not impossible that one common predecessor of all three bacterial species existed, causing what is known as Treponematoses. The influence of a whole series of factors (e.g. climatic conditions, resistance of the population to infection and way of life) may have resulted in the differentiation of bacteria and the definition of individual types of diseases, such as venereal syphilis, bejel, pinta and yaws. Many authors have dealt with these problems, but have not yet reached an unambiguous conclusion (Ortner 2003). Unanswered questions still remain as to the specific historical period in which syphilis developed and where the source of this dangerous infection originated. The following three theories currently exist (Steinbock 1976; Baker et al. 1988):

- 1st Columbian Theory
- 2nd Pre-Columbian Theory
- 3rd Unitarian Theory

Supporters of the Columbian Theory think that syphilis was an endemic disease of residents on the American continent and that it came to the Old World together with Columbus' sailors. Shortly after their return to Spain (in 1493), syphilis spread rapidly throughout Europe and soon acquired the character of a pandemic. The rapid disease progression is attributed to the Spanish mercenaries who accompanied French King Charles VIII on his campaign against Naples between 1494 and 1495 (from this arose the nomenclature of French, Gallic and Neapolitan disease).

Followers of the Pre-Columbian Theory do not preclude the existence of syphilis in Europe already in pre-Columbian times. The explanation of why it was not considered as a separate disease is seen in the poor level of former medical care and in the commutation of syphilitic dermal manifestation with leprous disease. As the main cause of the catastrophic spread of the disease at the turn of the 15th and 16th centuries, deteriorating hygienic, nutritional and social conditions during the Franco-Italian War are considered.

The Unitarian Theory currently has the most support. It assumes that syphilis was originally not a very serious childhood dermal disease, which had already occurred in the Palaeolithic period in the African population. The disease spread to both America and Europe from there and its manifestations were modified by different natural, climatic and socioeconomic conditions. According to this theory, syphilis

existed independently on both continents before the discovery of America and was caused by various *Treponema* species, whose significant morphological similarity is attributed to one common prehistoric predecessor. The transmission of infection to different climatic and social conditions is regarded as the cause of the vast European pandemic after the return of Columbus. In American conditions, the slightly virulent *Treponema* species became highly pathogenic to the perceptive European population.

To confirm or refute the abovementioned hypotheses, a large volume of evidence was collected. Based on palaeopathological studies, we can state that syphilis existed in America at the time before Columbus' expedition (Guerra 1990). At present, skeletal remains from Europe do not provide a clear answer to confirm the origin of syphilis. The typical bone changes of syphilitic origin are only dated to modern times. The palaeopathological findings from earlier eras are not convincing and henceforward only remain suspect. Their survey is shown, e.g. in the conference proceedings focused on the synthesis of existing knowledge of this disease (Dutour et al. 1994), more recently in publication of Harper et al. 2011.

A brief history of syphilis in the Czech Lands based on written and iconographic sources

The Czech Lands also did not avoid syphilitic infection at the end of the fifteenth century and it remained a persistent problem for centuries. According to Hübschmann (1965), the oldest information on syphilis appeared in the Czech Lands in 1493. It first spread as an epidemic disease in Moravia (1495), after that in Silesia (1496) and finally in Bohemia (1499) (Niklíček and Štejn 1985). A rapidly increasing number of chronicles and official records of syphilitic infection are testimony to its extensive spread. We learn from these that the huge number of infected people in Prague in 1500 resulted in the sick lying helpless in the streets and in sheds at the Horse Market, loathed and feared by other inhabitants. By administrative order, they were later excommunicated beyond the city, where St. Paul's Hospital was founded for them in the former leper colony (Hübschmann 1965).

Tomáš Jordan from Klagenburk (1539–1585), an important protomedicus, describes in his writing *Brunogallicus seu de lue nova in Moravia exorta* (1580) a mass syphilitic infection which spread in Brno from Adam's Spa and affected almost 200 inhabitants. Adam's Spa beyond the Jewish Gate remained preserved as one of the last and most popular of medieval sixteenth-century spas. According to Tomáš Jordan, deep ulcers began to appear in spa visitors at the end of 1577, then followed eruption throughout the body and finally violent pain in the long bones, insomnia, sometimes

mental disorders, corresponding to facts of the findings on syphilis by contemporary venereologists (Zapletal 1961).

Based on empiric knowledge, general cognition spread throughout Europe that the disease was mainly transferred by sexual intercourse. The reality that it often ended in death changed the urban lifestyle, affecting prostitution in particular. For example, during the reign of Maria Theresa, new orders against prostitution were issued and cruel penalties for non-compliance were enforced (Portál 2016). During the reign of Joseph II, mandatory evidence by prostitutes, called *Reglementation*, and their regular health check within quarantine measures were introduced. In order to ensure immunity of the monarchy, *Reglementation* was also enforced in the Austrian Army in 1815. Based on this, Austrian soldiers had to undergo regular physical examinations. Syphilis patients had to receive treatment in a military hospital and were forced to disclose the source of their infection. The Czech Lands outdid the imperial ordination in this respect. From 1780, monthly examinations of the military were routinely performed in Prague. The prevention of the spread of syphilis was not the result of *Reglementation*. The fear of venereal disease contagion (Wiesner 1925) in particular was more effective than all the strict measures. One of the few benefits of this formidable disease was the transformation of former spas, institutions which had been mostly social and humanitarian for centuries, to therapeutic medical facilities (Zapletal 1952; Niklíček and Štejn 1985), where primarily syphilis patients were hospitalised.

In general, the treatment of syphilis encountered numerous obstacles. For example, an institution for the treatment of sexually ill women, predominantly prostitutes, was meant to be founded in Prague in 1802 close to the General Hospital (*Allgemeines Krankenhaus*). Because of the disagreement of surrounding inhabitants, affected women had to be placed in isolation in Karlov from 1809 (CUNI 2017). A separate ward for syphilis patients was only opened in Prague General Hospital in 1847. Complete anonymity was ensured for patients during treatment, so that they were not socially rejected due to their disease. A special section of the syphilitic ward building was earmarked, with entry only allowed for persons hospitalised there (Wiesner 1925).

However, the increasing number of infected people placed still higher demands on medical facilities. For example, in 1871, most patients were placed in the separate dermatological and syphilitic wards of the Brno Provincial Public General Hospital in Pekařská Street (the present-day St. Anne's University Hospital). Patients were not allowed to be hospitalised for longer than 3 months, according to the Institute's Statute. In 1871, a total of 4630 patients were treated in the hospital, and the majority of whom (11.5%: 514 individuals) were hospitalised due to syphilis. The next in order of diseases was tuberculosis (7%). Other diagnosed

diseases concerned only less than 5% of patients (Sajner et al. 1986).

History of medical treatment of syphilis

At the end of the fifteenth century, an unexpected syphilitic pandemic caught physicians totally unprepared. At first, they used common therapeutic agents against it, such as bloodletting, laxatives, sweat and steam spas, aromatic spices and zinc ointment. In the Czech Lands, as in the whole of Europe, mercury was among the most common cures for cutaneous manifestations of syphilis, either in vapour form or later as mercury ointment (Sigmund 1866). Mercury therapy was not a novelty in medicine. In the Middle Ages, Arab physicians, in particular Avicenna (approx. 980–1037 AD), applied it routinely to cutaneous diseases. Later, the healing effects of guaiac wood (*lignum sanctum*) were used for total treatment of syphilis. This wood was brought to Europe from West Indies by the monk, Delgado, in 1508. From the bark of this “miraculous tree”, a concoction was produced which was given after the administration of a laxative. The patient had to follow a strict diet and undergo sweat therapy (treatment by “sweat and hunger”). Among other therapeutic agents, quinine bark, potassium iodide and the root of the *Smilax officinalis Sarsaparilla Veracruz* plant may be mentioned (Wiesner 1925; Procházka 1948). The effects of balneotherapy (Wobra 1902) as an auxiliary therapeutic agent for cutaneous syphilitic manifestations were also tested.

However, none of the abovementioned medicaments was effective enough. On the contrary, symptoms of mercury poisoning (mercurialism) appeared in numerous patients during long-term treatment with mercury preparations. The bacterial originator of syphilis, *Treponema pallidum* (originally named *Spirocheta pallida*), was discovered by Fritz Richard Schaudinn (1871–1906) and Erich Hoffmann (1868–1959) in 1905. One year later, two bacteriologists, August von Wassermann (1866–1925) and Jules Bordet (1870–1961), improved a diagnostic method for assessment of luetic infection. However, the essential breakthrough occurred in 1910, when the first effective treatment for syphilis, Salvarsan, was found by Paul Ehrlich (1854–1915) and Alfred Bertheim (1879–1914). This arsenic preparation significantly decreased the total prevalence of syphilis in Europe, also in the Czech Lands. However, it was relatively toxic and had numerous side effects.

The most important discovery in the history of syphilis was the discovery of the antibacterial effects of the *Penicillium notatum* mould by Scottish physician, Alexander Fleming (1881–1955) in 1928, followed by the development of the broad-spectrum antibiotic, penicillin. The first experiments in treatment with the use of penicillin in humans were carried out in 1941. The preparation was tested on a large group of syphilis-afflicted American soldiers 2 years later (Quélet

1992). By 1944, penicillin was already successfully being produced in the Czech Lands (under the former name of BF Mykoin 510) by the Prague pharmaceutical firm of Benjamin Fragner (Wikipedia 2017). Penicillin currently remains the optimal antibiotic in the treatment of syphilis. It penetrates the placenta very well and may be used in pregnant women. It has much fewer side effects than mercury and arsenic preparations (Poláčková 2008).

The epidemiology of venereal diseases in all developed countries of the world was considerably affected by the accuracy of diagnostics, involvement of effective antibiotics and appropriate legislation in the post-war period. In Czechoslovakia, the incidence of syphilis reached the lowest values between 1955 and 1958. However, despite the significant successes of modern medicine, a global increase in the disease recurred at the end of the 1960s. The nature of this trend is very complicated and is not possible to be clearly clarified. The significant sociocultural changes in society, e.g. more liberal morals and an irresponsible approach to sex, increased migration of the population and also the underestimation of antivenereal and legislative measures (WHO 2016), probably also contribute to this trend.

Direct palaeopathological evidence of syphilis occurrence in the Czech Lands

As already mentioned in the introduction, the Czech Lands lie in the mild climatic zone of Central Europe, where only the venereal syphilis variant of treponemal infection occurs, either in the acquired or congenital form of the disease (*syphilis acquisita* and *congenita*). Acquired syphilis usually occurs in humans in three stages. The first stage is characterised by the formation of painless chancre (*ulcus durum*) in the site of the infection entrance and by chronic inflammation of regional lymph nodes. After a short rest period, the second, generalised stage of the disease occurs, accompanied by a very colourful image of various cutaneous and mucous manifestations. After a variable period of latency, sometimes longer than 10 years, the third stage occurs. Apart from the typical cutaneous manifestation in the form of gummas, in this stage traces of other organic system damage (e.g. nervous system in the form of *tabes dorsalis* or *progressive paralysis*; cardiovascular system as *aortitis*) can also appear, including in the skeletal system (Procházka 1948).

During palaeopathological studies of bone remains from various historical periods from the Czech Lands, the bone manifestations of syphilis were credibly recorded only on skeletons from modern skeletal collections. Altogether, 94 cases from nine archaeological sites (Table 1) were described in the specialised literature, and 78 of them were examined in detail at our workplace.

The diagnosis of individual findings was based mainly on the criteria given in basic palaeopathological publications, for example Hackett (1976), Steinbock (1976), Ortner and Putschar (1985), Aufderheide et al. (1998).

There are multiple foci typical of syphilis in the skeleton, whose image is very colourful. The syphilitic process may affect how the skull so the postcranial skeleton. It causes local focal decomposition of bony tissue (syphilitic gummas) known as dry caries (*caries sicca*) in the flat bones of the cranial vault. Within the large range of affliction, the whole surface of the skull appears as if “eaten by woodworm”. In the facial part of the skull, syphilis attacks the nasal and oral cavities (known as naso-palatal destruction). The nasal bones are often affected as well, resulting in the total collapse of the external nose, which then acquires the typical saddle shape (Fig. 1). All the aforementioned manifestations of skull affliction by the syphilitic process can occur separately or in combination with other changes (Hackett 1976; Suzuki 1984).

The syphilitic affliction of long bones is alternatively manifested as chronic inflammation of the periosteum, or of the whole bone (non-gummatous periostitis and osteomyelitis), still with the presence of various large focuses of syphilitic decomposition (gummatous osteomyelitis). In acquired syphilis, inflammatory affliction of the joints can occur, which is usually limited to only one joint. With considerable destruction of joint cartilages, manifestations can form which are reminiscent of deformational arthritis. The special category of joint damage represents changes in neurosyphilis, when *tabes dorsalis* can cause what are known as Charcot’s joints (Aufderheide et al. 1998; Ortner 2003) due to violation of joint innervation.

The congenital form of syphilis, acquired transplacentally from the mother, is manifested in childhood. The immune system is not fully developed in this period, so inflammatory changes in the skeleton are evident from the initial stage of the disease. These are extensive and persist into adulthood. In addition to the characteristic syphilitic focuses, distinct shape deformities can also appear in children’s skulls (*hydrocephalus*, *caput natiforme*, *caput quadratum*). The characteristic dental stigmata, when presence of the pathogen interferes with dental development giving rise to characteristic incisor manifestations known as Hutchinson’s incisors, are among other symptoms of congenital syphilis. The crowns of the teeth are barrel-shaped and the cutting edges semilunarly carved. Another affected tooth is often the first molar, where the cusps on its crown are not developed and therefore it used to be likened to a closed rosebud or mulberry (Fournier’s tooth or Moon’s molar) (Zimmerman and Kelley 1982; Ioannou et al. 2016) (Fig. 2). In the postcranial skeleton, specific inflammation affects the long bones, especially close to the growth plate cartilage.

With regard to the general principles of palaeopathological research, it is necessary to remember that the success of skeletal remains study is considerably dependent on preservation

Table 1 The occurrence of syphilitic changes on skeletal remains from the Czech Lands

Dating	Locality	Number of individ.	Number of cases	Affected parts of skeleton	Reference
13th–16th century	St. Elisabeth Znojmo	149	5	Skulls, long bones	Dofková and Drozdová 2012
13th–18th century	Ossuary Křtiny	554	14	Skulls	Horáčková and Vargová 2001*
13th–18th century	Cemetery—TGM square Břeclav	148	15	Long bones	Horáčková and Benešová 1994*
16th–17th century	Burial ground Veselí nad Moravou	185	5	Skulls, teeth, long bones	Vargová et al. 2014*
16th–18th century	Cathedral of St. Peter and Paul Brno	359	5	Long bones	Vargová and Horáčková 1999*
17th–18th century	Church of St. Benedict and Norbert Prague	850?	11	Skulls, long bones	Vlček 1996
18th century	Brothers of Charity Hospital in Brno	87	3	Long bones	Vargová and Zapletalová 2006*
18th–19th century	Town cemetery Malá Nová Brno	1083	34	Skulls, teeth, long bones	Vargová and Horáčková 2004*
Beginning of 19th century	Napoleonic battle Znojmo 1809	31	2	Teeth, long bones	Kovárník et al. 2006*

Authors explored localities marked by an asterisk. They described 94 cases of syphilis in total

and the possibilities of using conventional diagnostic procedures. In current clinical praxis, the reliable diagnosis of syphilis remains problematic in some cases. *Treponema pallidum* is actually strictly anaerobic, a distinctive bacterium reliant on host support for its metabolic processes. It is not therefore possible to cultivate it ordinarily in culture medium. The direct evidence of its presence can be seen only in a specific stage of disease development. The morphological changes in syphilis are not actually caused by the direct effect of bacteria or their toxins, but originate in damaged capillaries due to a pathological immune reaction produced by the presence of treponemes in the organism. Extensive destruction can also occur at a time when

the microbes are not yet present in the body of the patient (Wikiskripta 2017).

The main diagnostic methods in current clinical praxis are serological tests and modern genetic methods (PCR—polymerase chain reaction). However, their use in the assessment of syphilis in paleopathology encounters a number of issues (absence of *Treponema pallidum* and serum antibodies within dry bones, taphonomic changes and technical problems caused by sampling). Therefore, they can only be successfully enforced sporadically (Kolman et al. 1999). For this reason, thorough macroscopic research currently remains the most significant diagnostic method. Thereby, the quantity, localisation and character of bony lesions regarding the aforementioned diagnostic criteria are evaluated.

Fig. 1 The syphilitic destruction of the nasal bones causes formation of characteristic saddle nose, Křtiny (photo: Jana Vachová; drawing: Lexer E, 1904 (Lexer 1904))



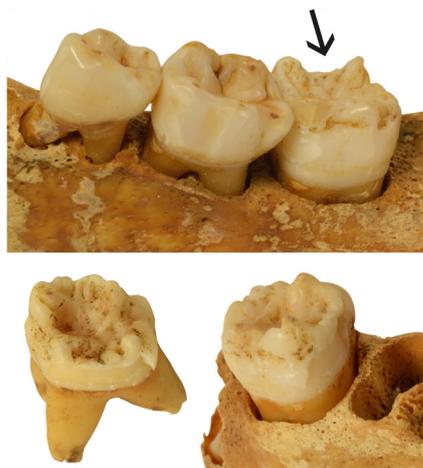


Fig. 2 The molars with syphilitic changes typical of a mulberry molar, Malá Nová, Brno (photo: Jana Vachová)

Other auxiliary methods are radiological (Výhnánek et al. 1998) and histological examinations (Schultz 1994; von Hunnius et al. 2006). A combination of all available diagnostic processes in paleopathology is normally used, because it is impossible to have absolute confidence in the determination of syphilis in any of the aforementioned methods (except the direct evidence of *Treponema pallidum* DNA in a bone sample).

At the differential diagnostics of syphilis, it depends on the character of the skeletal remains and their damage as well. The determination of this disease in well-preserved skeletons with multiple typical syphilitic changes was relatively reliable, for example in the cases of occurrence of characteristic star-shaped scars in the cranial vault at “caries sicca” in combination with chronic osteomyelitis in the long bones of the lower limbs.

It was difficult to exclude the leprosy changes, at isolated gummatous infliction of facial part of the skull known as palate-nasal destruction. With syphilis, the bone destruction usually affects also the nasal bones (typical saddle nose), and it proceeds the destructive process from the palate to the dental alveoli on the alveolar processes of the upper jaw. With leprosy, the nasal bones are usually not affected. On the jaws, the lytic process first strikes the dental alveoli and the process progresses in the cranial direction. The gummatous foci on the skull and the long bones of postcranial skeleton may be similar to bone malignant tumours. With syphilis, however, there are usually more or less expressed signs of a repair process that are missing in malignant tumours.

With lytic foci on calvary, it is necessary to exclude tuberculous infliction as well. Unlike syphilis, cranial tuberculosis usually manifests itself as a solitary focus, and evidence of mycobacterium tuberculosis DNA may be used for its diagnosis.

On the long bones, syphilis usually manifests itself in the form of periostitis and chronic osteomyelitis. Non-specific

inflammation of the bones has a form of an acute purulent osteomyelitis with numerous pyogenic cavities, fistulae, or sequestris. The most common is the post-traumatic infection, the focus is usually solitary and the symptoms of chronicity are considerably smaller than with syphilis.

The manifestation of syphilitic changes in the bones, however, is closely connected to the diachronic development of the disease.

Vlček divided the period of syphilis occurrence in the Czech Lands into five phases according to this criterion (Vlček 1975, 1984). Bones affected by syphilis are not found in the first two phases, which started in 1493 and ended in the second third of the sixteenth century. At that time, the disease actually had the form of a highly virulent acute infection, which ended in death before the tertiary stage of infliction of the locomotor apparatus could develop. The gradual increase of the population’s immunity against treponemal infection (from the end of the sixteenth century to the last quarter of the eighteenth century) led to the significant weakening of virulence and disease transition to chronicity. Due to this, in this third phase, traces of syphilitic affliction appear in the bones. The number of findings of skeletal syphilis, with rich colour in their manifestations, gradually increases in the fourth phase (from the end of the eighteenth century). Not only traces of acquired syphilis but also its congenital form appears. In the fifth phase (twentieth century), the findings of syphilitic bone changes are rare, due to effective treatment using bismuth, arsenic and penicillin.

The number of currently documented palaeopathological findings of syphilitic changes in bones from the Czech Lands does not correspond by far to the data stated in written sources about the mass occurrence of this disease. One of the causes may be the fact that most archaeological research in the past was focused in particular on prehistoric and medieval localities. Modern skeletal remains were not interesting to archaeologists (Stloukal 1988). Today, interest in modern ossuaries and cemeteries is increasing. For this reason, the number of findings of syphilis in skeletal sets is also increasing. The bones in ossuaries are among the largest modern osteological collections. These facilities served for the secondary placement of bones from old damaged graves. They were created from the fourteenth century in the Czech Lands, especially during the plague, when there was a lack of burial space in cemeteries for the dead (Matiegka 1931). Skeletal remains were placed in ossuaries for several centuries until 1784, when the burial of the dead inside towns, especially around churches, was prohibited by Caesarean decree.

The ossuary skeletal collections provide extensive study material for anthropological and palaeopathological analyses. However, this is not a representative sample of the population (in particular, more robust male bones are preserved; it is not practicable to obtain precise dating or an estimate of the number of individuals). Statistical analysis is thus problematical,

but these collections provide valuable evidence of the existence of individual diseases at the beginning of modern times. Traces after syphilitic infection were confirmed in the skeletal remains from the ossuary in the St. Peter and Paul Church in Mělník (Vlček 1989) and in Hrádek near Znojmo. The author, however, does not mention the number of examined individuals or the total number of cases and localization of syphilitic changes. Therefore, these findings were not included in Table 1. Due to the typical symmetry of the occurrence and the possibility of evaluation of the multifocal skeletal affection by the syphilitic process, the following cases could not be included in the total summary: the cases of infliction of isolated long bones from the ossuary in Křtiny (Horáčková and Vargová 2001), Kyjov (Horáčková and Benešová 1995) and from the backfill of graves from the Cathedral of St. Peter and St. Paul in Brno (Vargová and Horáčková 1999).

Problematic interpretation of the palaeopathological analysis of historical skeletons is also evident in localities where corpses were continuously buried for centuries, with superimposition of graves. Examples of this are the skeletal remains from the Cathedral of St. Peter and St. Paul in Brno, where traces of possible syphilitic changes were observed, especially in isolated bones from the backfill of graves (Vargová and Horáčková 1999). Further cases of skeletal syphilis were discovered in the early modern burial ground of the former Church of St. Benedict (later the Church of St. Norbert) in Prague (Vlček 1975), in skeletal remains of Brno inhabitants from the former Malá Nová town cemetery in Brno (Vargová and Horáčková 2004), from the burial ground in Veselí nad Moravou (Vargová et al. 2014), from the former cemetery at the Brothers of Charity Hospital in Brno (Vargová and Zapletalová 2006) and from the cemetery at the Old Hospital and Church of St. Elizabeth in Znojmo (Dofková and Drozdová 2012). Traces of syphilis were also found in South Moravia near Znojmo (Kovárník et al. 2006) in the skeletons of soldiers who had fallen in one of the Napoleonic Wars of 1809.

In addition, the early modern osteological collection (known as the Jedlička Collection), deposited in the Anthropological Department of the National Museum in Prague, contains unique exhibits (from the 19th to the first half of the twentieth century) of various pathological manifestations in skeletons, including syphilitic changes (Vlček 1996; Smrčka et al. 2009). This collection provides significant information about the extent of syphilitic infection among the Czech population.

Case studies

The findings of syphilis in important historical personalities from Czech history attract the greatest public attention. One of these in particular is Rudolph II (*1552–†1612), Holy Roman Emperor, King of Bohemia, Hungary and Croatia, Margrave

of Moravia and Archduke of Austria. In Bohemia, he was probably the most popular Habsburg on the Czech throne. During his reign, the imperial court was relocated from Vienna to Prague and the Czech Lands became the centre of art, alchemy and science. Based on literary sources, it was evident that Emperor Rudolph II was very ill in his declining years. He suffered from a lung disease, accompanied by hemoptysis and a liver function disorder manifested by anasarca. Among the Emperor's confidants, there was talk of his "French" venereal disease, which he was secretly treating. The autopsy report by Dr. Roboret would correspond with this. He described as the cause of death a cancrum, which had spread from the ulcers on the thighs. The death of Rudolph II remains unclarified, with many obscurities. His autopsy is associated with strange events, which can be considered as the defilement of a corpse. After the autopsy, the Emperor's body was embalmed and exhibited in the audience hall of Prague Castle. For only 9 months after his death, the bodily remains of Rudolph II reposed in the Royal Tomb in St. Vitus Cathedral in Prague (Smrčka et al. 2009). After exhumation of the Emperor's remains in 1975, the typical manifestations of syphilitic affliction were observed in his skeleton. Among those was a large defect on the left upper jaw in the frontal dental area, which corresponds to a healed syphilitic gumma. The tertiary stage of syphilis was confirmed by significant lodgement of newly formed bone tissue in both tibiae as a result of chronic periosteal inflammation. Literary sources reveal that Rudolph II was infected with syphilis at a young age and that this disease troubled him for the rest of his life. This disease was probably the main cause of most of his health problems in later life (including mental disorders) (Vlček 1994).

Syphilitic changes were also detected in the skeleton of Albrecht of Valdštejn, also known as Wallenstein or Waldstein (*1583–†1634)—one of the most influential personalities in Europe during the Thirty Years' War. This man, Duke of Mecklenburg and Friedland, Prince of Hlohov and Sagan, was an important Czech chieftain and politician. Due to his extraordinary abilities, he became the highest commander of the imperial army during the Thirty Years' War. According to literary sources, Albrecht of Valdštejn became infected with Hungarian disease in 1604 at the beginning of his military career, during the Hungarian campaign of Rudolph II against the Turks and Hungarian rebels. This important chieftain, who participated in European history for a considerable part of his life, finally became a victim of premeditated political murder. His eventful life has been studied in detail, based on all the available historical sources (Mann 1971; Janáček 1978). The health condition of Albrecht of Valdštejn was evaluated not only according to written documents but also based on a study of his bodily remains. Vlček implemented a detailed palaeopathological analysis in 1975 (Vlček 1993). He found traces of post-chronic inflammatory

processes in the tibiae of Albrecht of Valdštejn (the characteristic image of saber-shin tibia was found, Fig. 3) and, furthermore, traces of a healed syphilitic gumma. A grey and purple stripe in the deposit of newly formed bone tissue in a cross section of the tibiae was observed. This was caused by the long-term treatment with mercury preparations, which was confirmed by chemical analysis. The morphological deviations of the femurs testified to the valgus position of the lower extremities, which may also accompany one syphilitic form—*tabes dorsalis*. Based on direct evidence from medical-anthropological research, it is possible to evaluate the historical reports on the various diagnoses of Albrecht of Valdštejn's diseases as typical manifestations of syphilitic infection. The physical and mental disorders at the end of life were caused not only by the disease itself but also by chronic mercury poisoning.

The studies of the health status of Bedřich Smetana (*1824–†1884) attracted a great deal of attention among the professional public. Smetana was a significant composer of the Romantic period, the founder of modern Czech national music, who significantly influenced subsequent generations of Czech musical performers. It is known from the historical records and his personal correspondence that he was seriously ill in adulthood. He suffered from headaches, toothache, dizziness and hearing disorders, which resulted in complete deafness. Mental disorders, e.g. hearing hallucinations, mood swings, speech and memory disorders and disorientation, were manifested by him in his declining years. His condition was so serious that he had to be hospitalised in a psychiatric



Fig. 3 Saber-shin tibia is a typical manifestation of syphilitic inflammation of bones of lower extremities, Křtiny (photo: Jana Vachová)

hospital. The original autopsy report established progressive paralysis as the cause of death, but this was disputed by some contemporaries. Only examination of the bodily remains, using the most modern methods (especially serological tests specific for *Treponema pallidum*) confirmed the syphilis diagnosis (Vlček 2001). The question remains whether his deafness was caused by syphilis, or originated from an injury suffered by the composer in childhood (Ramba 2005).

Similarly, contemporary sources state that the painter Josef Mánes (*1820–†1871) died of advanced syphilitic disease (Březinová 2013). However, direct evidence of this is lacking because, at that time, very little was known about the progressive paralysis related to syphilis. Moreover, most afflicted persons kept their illness a secret, for fear of the moral condemnation which persists to this day.

Probably for this reason the official autopsy report of the fourth President of the Czechoslovak Republic, Klement Gottwald (*1886–†1953), was not published at the time of his death. Bleeding to death from a ruptured aortic aneurysm was established as the immediate cause of death. However, it was kept secret from the public that this was the result of the syphilitic affliction of the vascular system (Vojtěchovský 2011).

Conclusion

From the end of the fifteenth century, the extensive spread of syphilis distinctly intervened in the historical development of Europe. Due to this disease, firstly the European population was reduced. Thereafter, European moral and ethical principles were significantly affected and the combat readiness of armies was decreased. The disease forced new legislation which had vital importance for the development of health services. The Czech Lands, located in Central Europe, were no exception.

The presented material summarises the available information obtained on this disease from literary sources and from the study of direct evidence in the skeletal remains from archaeological sites in Bohemia, Moravia and Silesia. Traces of syphilitic affliction in bones have been observed in almost every large early modern osteological collection to date; however, many of them were described in detail. Up to now, the authors have been able to explore seven modern-day locations in detail (Table 1). The current number of documented palaeopathological findings of syphilitic changes in bones from the Czech Lands does not compare by any means to the data presented in literary sources about the mass occurrence of this disease. Most archaeological research has actually been focused in particular on prehistoric and medieval localities. At present, with the interest in early modern times increasing as well, it is assumed that the amount of direct evidence of syphilis will also increase.

The significant decrease in the number of syphilitic patients after the introduction of antibiotic treatment has had an influence on the disease taking the direction of eradication at the present time. This has negatively affected the compliance with anti-epidemic measures. Recently, a mild increase of syphilis has actually been recorded, as well as of other venereal diseases, which can be related especially to the massive migration of people and increasing resistance of the pathogen to antibiotics. In the twenty-first century, syphilis still remains an important medical and social problem, despite all the advances of modern medicine.

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