



People “on the Margin”: A Medieval Cemetery in Český Brod – Malechov (Central Bohemia)

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ABSTRACT

Six graves situated on the edge of the settled town suburb of Český Brod have been dated to the 2nd half of the 15th century. The group of graves situated outside the regular cemetery, and with one exception reverently buried individuals, raised the question regarding its interpretation. Anthropological study identified six men of different age with many post-traumatic changes on the bones, excessive physical strain and numerous other pathologies. DNA-based examination ruled out the possibility that they were members of minority groups (Jews, Gypsies). People buried on this site are interpreted as people in a marginal position in contemporary society.

1. Introduction

The vast majority of the population buried during the High Middle Ages in accordance with church rules in cemeteries or at the parish cemetery church (Unger 2000). One exception is the Jewish community with its separate burial grounds (Cymbalak, Staňková 2014). Graves in the areas of execution are another specific case (Sokol 2003). There are also some isolated graves, or numerically small groups, outside these areas, where usually the interpretation is lacking. Such an isolated group of graves was discovered during a systematic reconstruction of the underground sewerage and other infrastructure in some streets and squares of Český Brod (District of Kolín, Central Bohemia), reconstruction work which has been ongoing since the 1990s. In 2006–2007, sewerage work excavations were conducted in Prokopa Velikého Street, which forms the axis of Kouřimské předměstí (Kouřim Suburb). The street starts

at Kouřimská brána (Kouřim Gate), crosses the Šembera stream and continues towards the town of Kolín (historically towards the town of Kouřim). Today, this part of Český Brod bears the name Malechov (Figure 1).

Features from the 13th to 19th centuries were discovered in the course of the sewerage renovation work. A larger, more-continuous area was then excavated just in front of house No. 407. The hole dug for the sewage connection to this house contained three disturbed skeleton graves with fragments of medieval pottery in its backfill. Since the graves were situated at a level at which they were endangered by the new roadway, it was decided to make an extensive rescue excavation. A trench pit of 6.2 × 3.2 m was outlined at both sides of the sewage connection (Figure 2). This part of the excavation took part in June 2007 (Frolík 2007).

The clearly defined group of graves in the vicinity of the main road leading into the city raised the question of interpretation. Such an interpretation was made possible on the basis of the most accurate dating by archaeology and by the use of methods of the natural sciences (anthropology,

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Figure 1. Český Brod – Prokopa Velikého Street, excavated area marked with a black circle on the Cadastral contour map.

genetics), based mainly on the verification of a possible relationship between the buried individuals. Anthropology could give the essential knowledge about the physical condition of the buried, their illness or injuries. The selection of the samples for DNA analysis was based on visual observations of the skeletal remains. It was decided to use only intact teeth as these provide a very high success rate (Katzmarzyk 2007).

2. Description of the Site and Finds

2.1 Description of the Terrain

The terrain at the site was rather simple. The subsoil consisted of weathered rock (red or rusty mudstone) at a depth of 0.9–1.2 m below the roadway surface. The individual graves (A, B, C, F and G) and also two shallow pits (feature D with a depth of 0.17 m and feature E with 0.42 m) were deepened

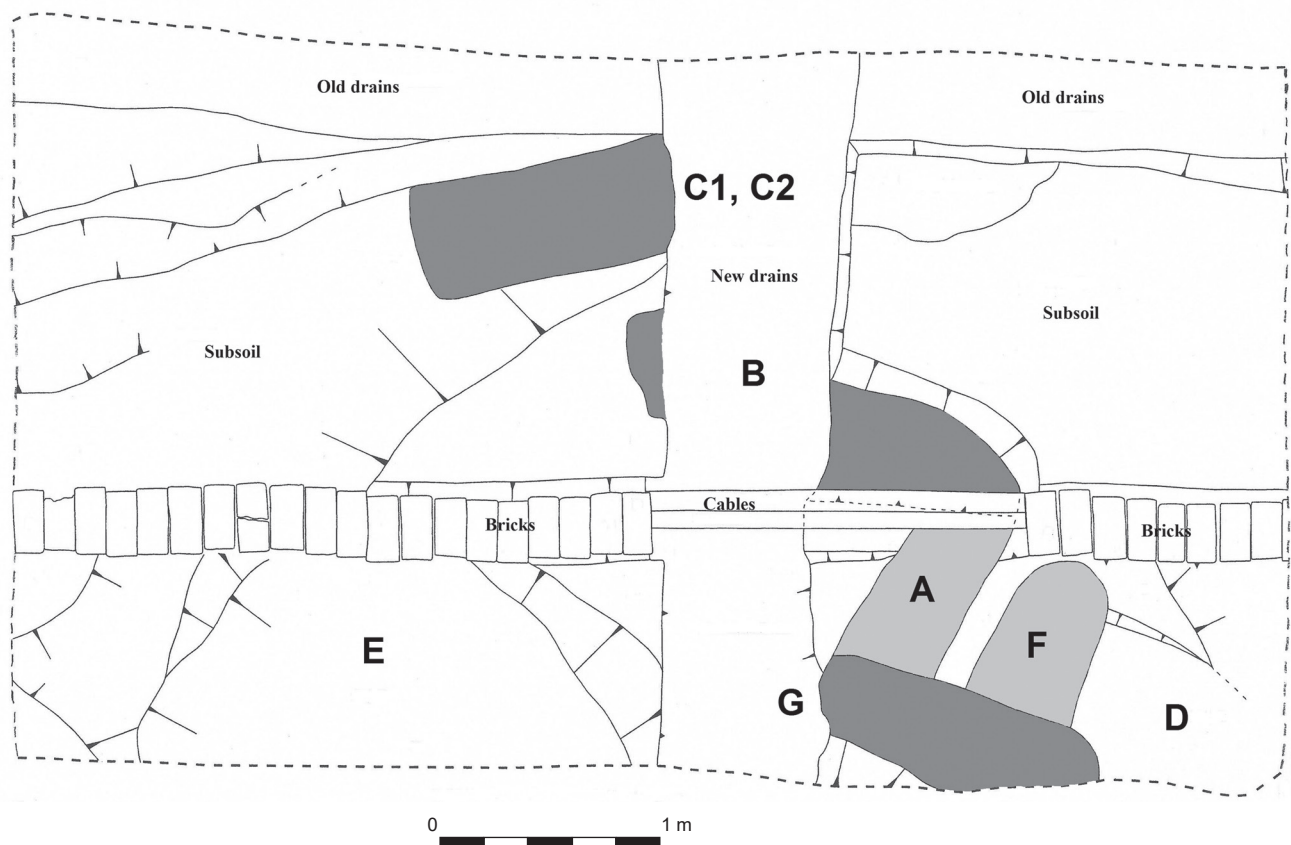


Figure 2. Český Brod – Prokopa Velikého Street, in front of house No. 407; excavated area with graves highlighted: light grey – the younger graves A and F; dark grey – the other graves; drawn by P. Pinc, digitized by D. Dvořáček.

into the subsoil and had the same backfill (red-brown clayey silt [45%] with interlayers of grey clayey silt [45%] and a small amount of charcoal and daub). The pit features and graves were covered with a single layer – dark-grey sandy-loamy soil [80%] with stones (mudstone [15%], pebbles [3%] and small brick fragments [2%]) – of a thickness of 0.2–0.5 m. This layer was covered with a pavement of quarry stones and dark-brown soil up to 0.3 m in thickness, which had survived only in the northern half of the trench pit. At some spots there was a charcoal interlayer below this pavement and above it the 0.3-metre-thick sand bedding of the current pavement. The terrain was disturbed by modern excavations (the holes from former old and recent sewerage work). The trench dug for the cables that had partially disturbed graves A and B, and also feature E, was situated approximately in the centre of the uncovered area.

2.2 Stratigraphy

The stratigraphic situation of the found features and graves is extremely simple. The subsoil consists of rock, into which the individual features were deepened. This situation proves the clearing of the terrain, consisting of the original soil's removal. The features are up to three times superimposed. For example, settlement feature D has been disturbed by grave G, which was subsequently covered or disturbed by graves A and F. At the same time, grave A has disturbed

grave B (the skull from this grave was moved into the backfill of grave A). We encountered a double superposition in the case of graves C2 and C1. Settlement feature E holds a solitary stratigraphic position; we consider that its distance to the closest grave G precludes a possible mutual contact (the surface between them was disturbed by sewerage work). Interestingly, the graves show a double superposition, which proves that the area was not just used once for burial, but used repeatedly – at least for a short time. The graves and the other features were superimposed by a single settlement layer, which itself was covered by the modern road pavement. The pavement covered the section containing graves A, B, F and G. Above the pavement, finally, the whole surface was superimposed by today's roadway and its bedding.

According to their orientation, the graves can be divided into two groups: graves B, C1, C2 and G (thus all the stratigraphically-older graves + grave C1) are oriented northwest-southeast. However, the younger graves, A and F, are aligned southwest-northeast, which may reflect two different burial periods.

The graves can be dated on the grounds of the finds in the backfill of their grave pits, mainly from the ceramic fragments. The youngest elements belong to the 15th century (vessel fragments with glaze on their inside and roller-stamp decoration); most of the graves show a mixture of fragments from the 12th to 15th centuries. Pottery from older features

that were disturbed by the digging of the original grave pits had come into the graves. Graves G (containing ceramics decorated with roller stamp and glaze on the inside) and grave B (without any ceramic fragments) are the oldest. With the only exception of grave A, the general position of the buried individual conforms to the usual habit. The person in grave A, according to the position of their hands, had been irreverently thrown into the pit. The absence of the remains of any items of clothing (buttons, belt buckles or shoes) shows that the deceased were either naked or wrapped, for example, in only a blanket. There are no traces of coffins (the occasional finds of nails do not prove their existence) and the position of the skeleton in grave A excludes the existence of a coffin.

The terrain situation does not clearly show whether the grave group was complete or only formed part of a larger group; it did not continue westwards, northwards or eastwards, in the area of the excavated roadway. The burials could have continued below the house (the margin of the trench pit was formed by some digging for former sewerage work); however, we are lacking convincing evidence. It is not at all clear if the graves were in some way marked at the surface. Multiple burials in one pit (C1 and C2) and the spatial delimitation of graves A, B, G and F could be used as arguments for a marking on the surface. On the other hand, the mutual relation between the grave pairs B+G and A+F points to the opposite conclusion.

Within the scope of the topography of Český Brod, the grave group is situated on a main arterial road leading to the former royal, and now regional, towns of Kouřim and Kolín; in view of the terrain configuration and the position

of the Kouřimská brána (Kouřim Gate), this road must have had, more or less, the same course in the past. According to research undertaken in 2006–2007, the Kouřimské předměstí (Kouřim Suburb) spread along this way or road since at least the 13th century and the inhabited area ended nearby to the graves. So the graves were thus situated at the margin of a suburb. The common inhabitants of Český Brod were buried in the churchyard of St Gotthard (in the town centre), and, after 1560, at the Trinity Chapel south-east of the town centre (Poche *et al.* 1977, 210–211), which chronologically excludes the grave group in question.

2.3 Description of Individual Graves

2.3.1 Grave A

Oblong grave pit with rounded corners (preserved length: 1.75 m, max. width: 0.45 m, depth: 0.52 m – Figure 3). The lower part of the pit was destroyed by the sewage connection work. The skeleton was stretched out, with outstretched legs, the right arm was bent at the elbow and laid across the chest and the left arm framed the head. The lower half of the lower limbs was missing (right leg from the knee downwards, left leg in the ankle). Orientation: south-west (head), north-east; backfill: red-brown loamy earth (30%) with smaller stones (mudstone 70%); finds: pottery fragments, imprints of plaster/mortar, building material, a bronze wire, a coin (bags 1205 and 1206) and human bones (bags 1209–11). The other human bones had been lifted in the course of the excavation for the sewage work (bags 1238 and 1239 – without any differentiation between graves A and F). A human skull (bag 1208 – see grave B) was found in the backfill (above the skeleton).

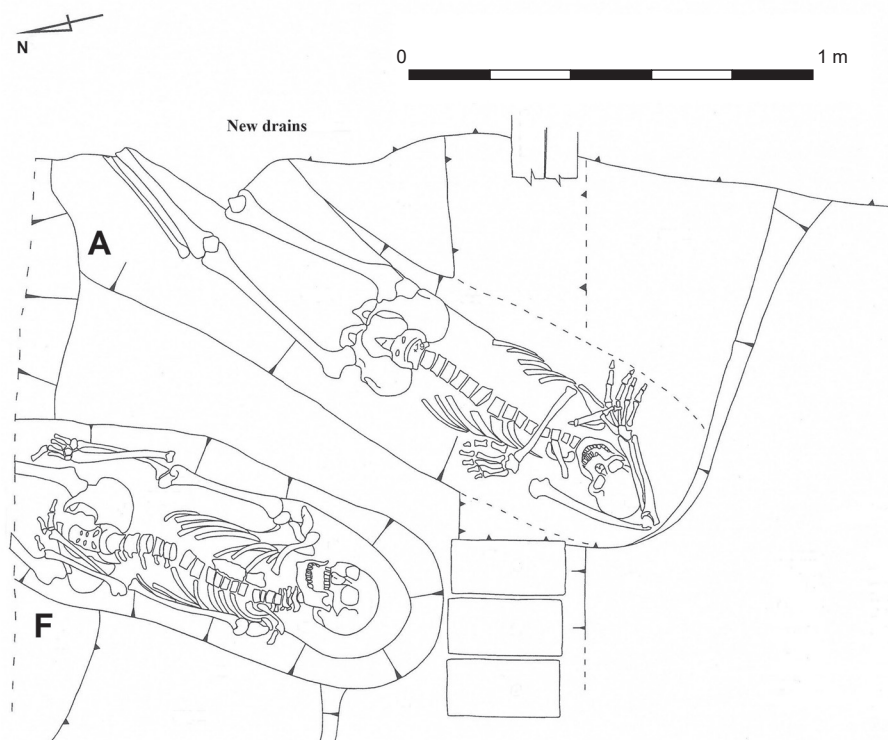


Figure 3. Český Brod – Prokopa Velikého Street, in front of house No. 407; graves A and F, drawn by P. Pinc, digitized by D. Dvořáček.

Figure 4. Český Brod – Prokopa Velikého Street, in front of house No. 407, grave B, drawn by P. Pinc, digitized by D. Dvořáček.

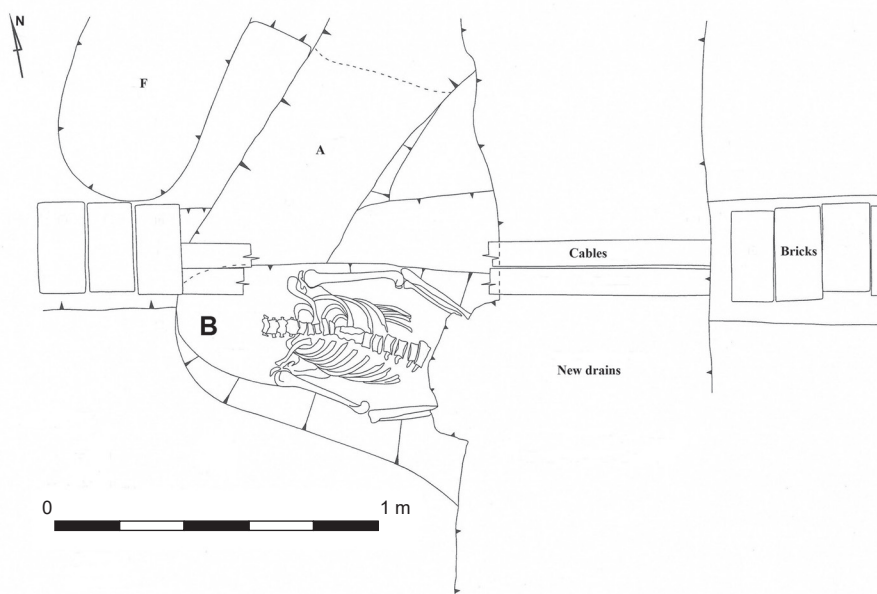
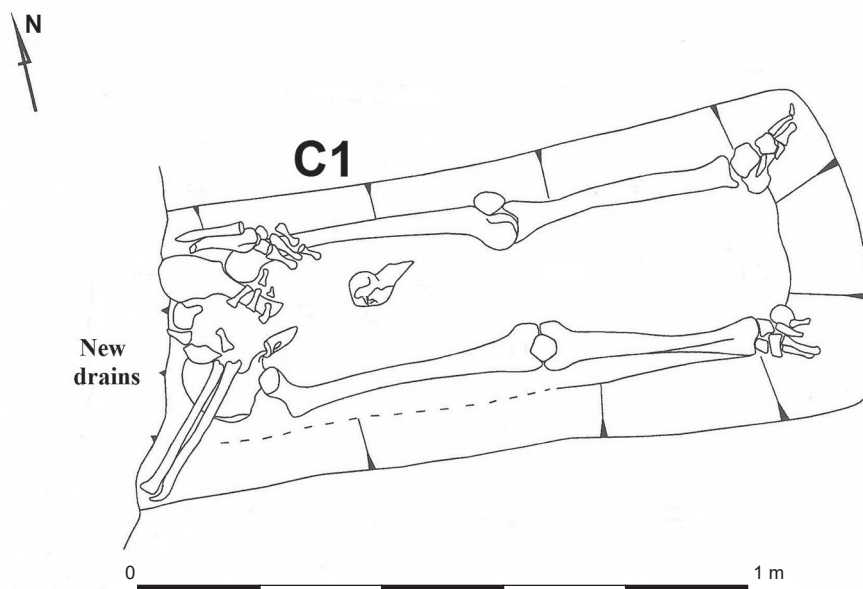


Figure 5. Český Brod – Prokopa Velikého Street, in front of house No. 407, grave C1, drawn by P. Pinc, digitized by D. Dvořáček.



2.3.2 Grave B

Oblong grave pit with rounded corners (preserved length: 0.95 m, max. width: 0.7 m, depth: 0.52 m). The lowest part of the grave pit was preserved as an unclear imprint in the east wall of the trench dug for a sewage connection, so the original length of the grave pit can be estimated at 1.95 m. The lower half of the grave pit was destroyed by the sewage work (Figure 4). The skeleton was stretched out with slightly bent arms. The skull was missing (moved during the excavation of grave pit A into its backfill – see above). The lower part of the skeleton, including the pelvis, is lost; orientation: west-north-west (head), east-south-eastwards;

backfill: cf. grave A; finds: only human bones (bags 1212 and 1213). Additional human bones had already been found during the excavation for the sewage connection (bag 1241).

2.3.3 Grave C1

Oblong grave pit with rounded corners (preserved length: 1.25 m, max. width: 0.53 m, depth: 0.51 m). The upper half of the grave pit had been removed during the excavation for the sewage work (Figure 5). The skeleton laid stretched out, legs outstretched, right arm bent and pointing to the pelvis, left arm outstretched. The upper part from the pelvis upwards was removed; orientation: west (head), eastwards; backfill: red-

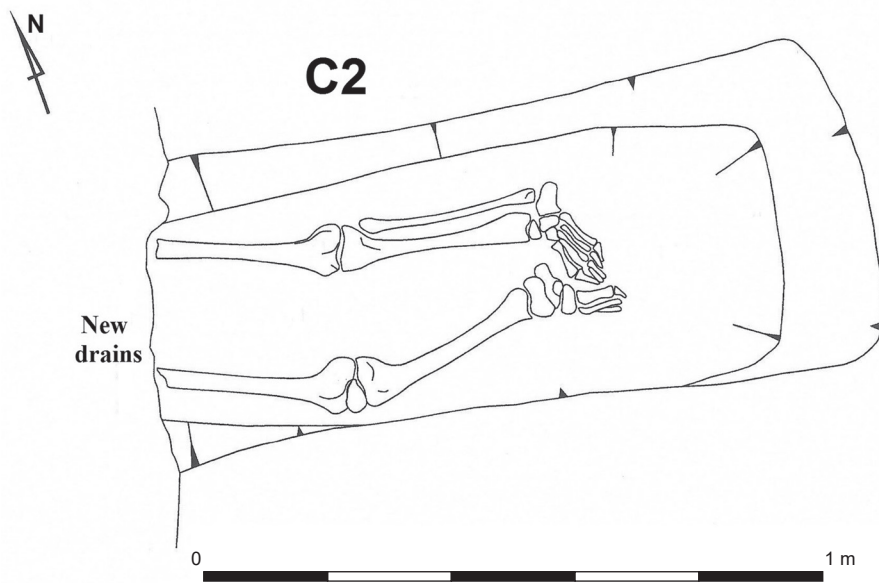


Figure 6. Český Brod – Prokopa Velikého Street, in front of house No. 407, grave C2, drawn by P. Pinc, digitized by D. Dvořáček.

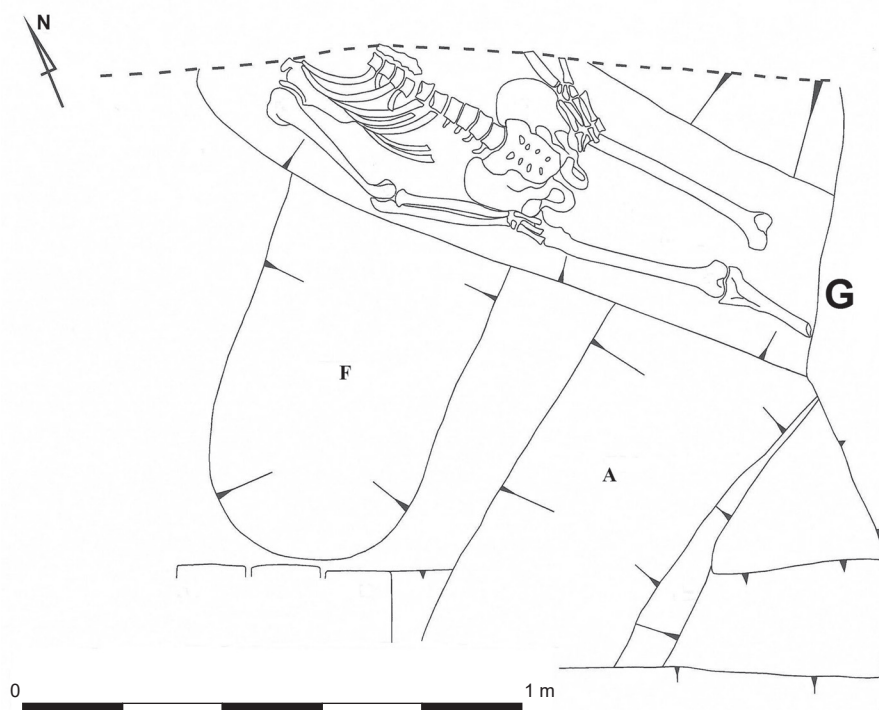


Figure 7. Český Brod – Prokopa Velikého Street, in front of house No. 407, grave G, drawn by P. Pinc, digitized by D. Dvořáček.

brown loamy earth (10%) with smaller stones (mudstone 90%); finds: pottery fragments, fragments of iron items – bags 1216 and 1223 and human bones (bags 2019–20). Additional human bones had been lifted out during the digging for the sewage work (bag 1242 – without differentiation between C1 and C2).

2.3.4 Grave C2

The grave pit with rounded corners continued below skeleton C1 (preserved length: 1.2 m, max. width: 0.52 m, depth: 0.58 m). The upper part of the grave was removed in the course of the digging for the sewage connection (Figure 6).

The other part of the grave pit was not found during the work for the sewage connection; the grave pit could have been 2 m long at most. The skeleton was stretched out with outstretched legs, its upper part (including pelvis) has been removed; orientation: westwards (head), eastwards; backfill: *cf.* grave C1; finds: pottery fragments, fragments of iron items (bag 1228) and human bones (bag 1226).

2.3.5 Grave F

Oblong grave pit with rounded corners (preserved length: 1.1 m, max. width: 0.47 m, depth: 0.59 m). The lower

part of the pit had been removed during the sewage work (Figure 3). The skeleton was stretched out with outstretched legs (?), right arm was outstretched, left arm was bent and pointing to the pelvis. The lower limbs were removed (approximately at mid-thigh); orientation: south-south-west (head), north-north-eastwards; backfill: *cf.* grave A; finds: pottery fragments, fragments of iron items (bags 1215, 1224) and human bones (bag 2025).

2.3.6 Grave G

Oblong grave pit with one preserved rounded corner (preserved length: 1.35 m, max. width: 0.45 m, depth: 0.75 m). The lower part of the pit had been removed during the digging for the new sewerage work (Figure 7). The skeleton was stretched out with outstretched legs, both arms slightly bent and the palms lay on the pelvis margin. The lower limbs were removed (right leg from mid-calf,

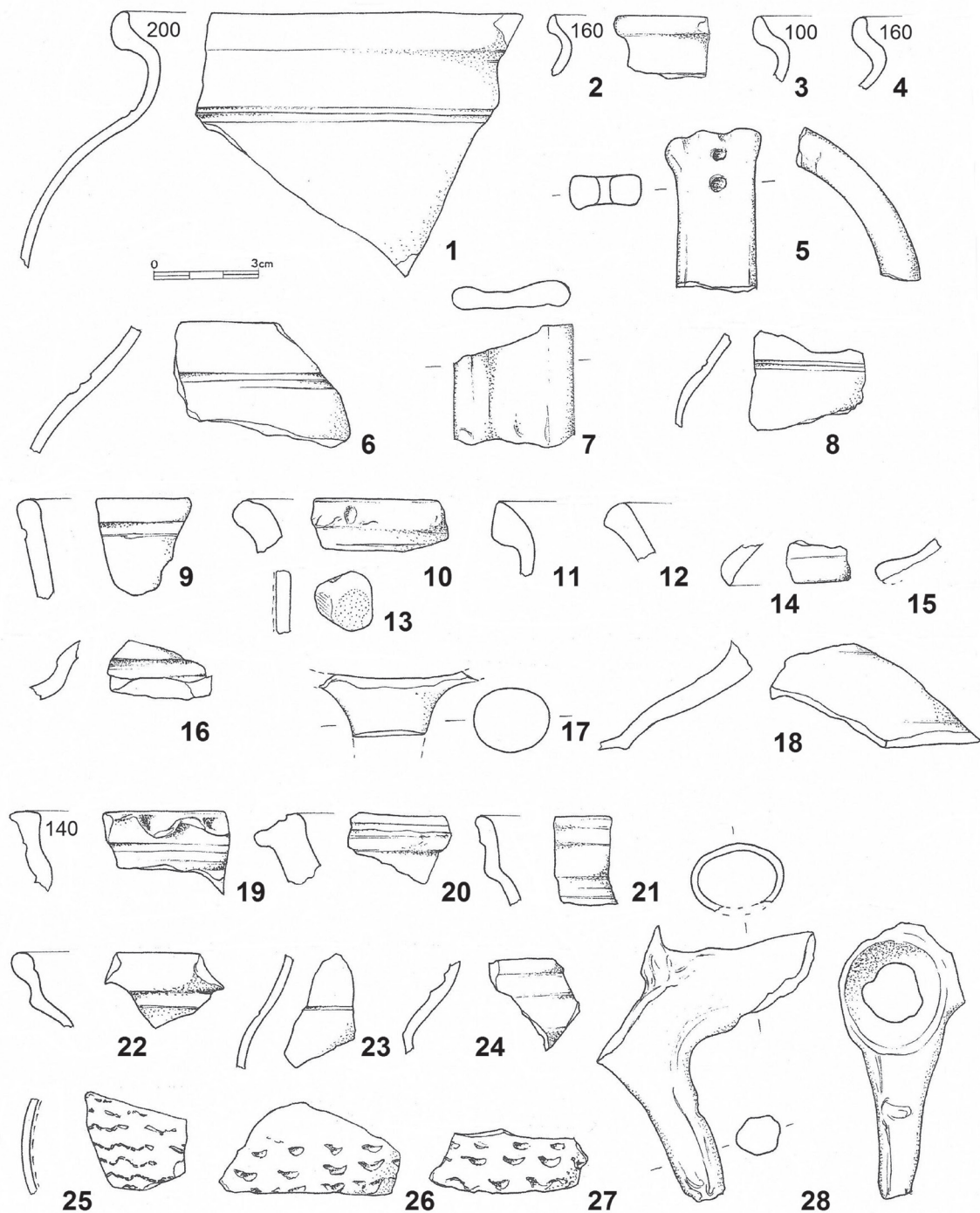


Figure 8. Český Brod – Prokopa Velikého Street, in front of house No. 407, ceramic fragments in the backfill of individual graves: 1–8 – grave A; 9–16 – layer above grave C1; 17 – grave C1; 18 – grave G; 19–28 grave F; drawn by V. Pinčová.

left from the knee downwards), head and most of the right arm and right part of the chest; orientation: north-west (head), south-eastwards; backfill: *cf.* grave A; finds: pottery fragments, fragments of iron items (bags 1227) and human bones (bags 2029–31). Pottery fragments (bag 1237) had already been found while documenting the excavation for the sewerage work in grave A, which would place them into the backfill of grave G.

3. Results

3.1 Analysis of the Archaeological Finds

The finds from the backfill of graves A, C1, C2, F and G were analysed; grave B did not contain any finds. The contents of the settlement feature D, which was disturbed by the graves, were relied on for the dating. The chronologically-last find assemblage stems from the layer that, in two distinct

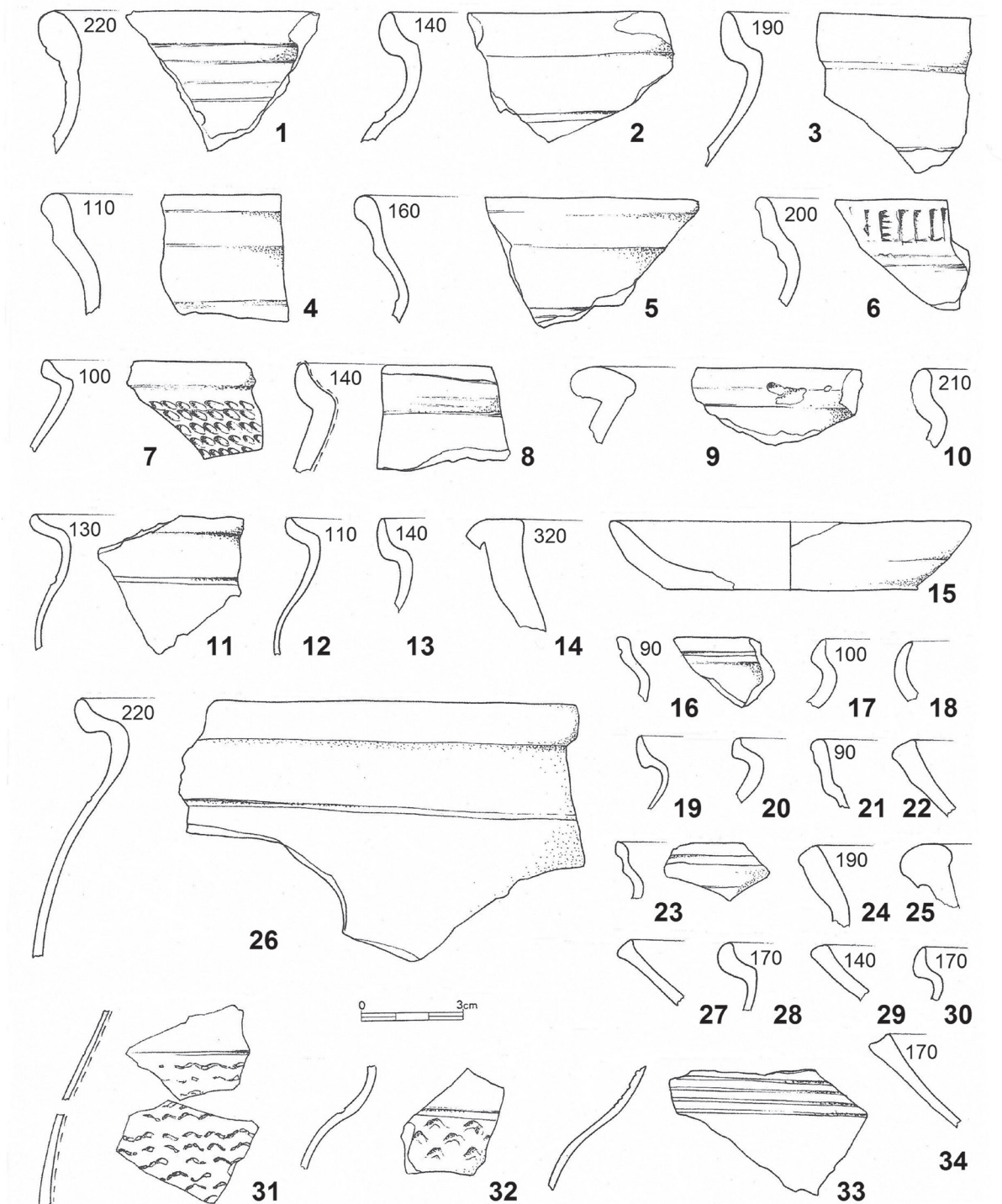


Figure 9. Český Brod – Prokopa Velikého Street, in front of house No. 407, ceramic fragments from the layer above graves A and F, drawn by V. Pincová.

parts, covered graves A and F and independently also C1. Non-stratified finds from the field walking and cleaning of the surface, as well as finds from the excavations for the sewerage work, have been omitted since they were all located out of position. There is a large amount of archaeological material from the rescue excavations in Český Brod for the years 1994–2014, which for the most part has never been published. The evaluation of the pottery material can be backed up by published assemblages from the centre of Český Brod (Frolík 1996), and from the excavations of the municipal fortification (Ebel *et al.* 1998; Frolík 1998 – Figure 8; Figure 9).

Two find complexes belong to grave A: one from the backfill (32 pieces, 265 grams), and a second from the layer above the grave, which also covered grave F (see below). The first find complex is important for the dating. It consists mainly of coarse ceramic ware of brown to grey-brown shades (26 fragments) with cornice rims sometimes decorated with a double groove below the neck. Reduction-fired ceramics is represented by undecorated fragments and a tiny rim in the shape of a cornice (2 fragments). All these fragments may be dated to the late 14th to 15th centuries. Two fragments with glaze on the inside belong among the youngest pieces. The oldest residuum is represented by a handle with two openings, whose technology corresponds to 13th–14th-century ware. The backfill of the grave also delivered a small fragment of brick and mortar. Both are indicative of a bricked-up building nearby. Further, we found a small fragment of bronze wire and two small glass fragments (4 grams). One glass fragment (opaque, today a corroded fragment of white glass) stems from the margin of the foot of an unidentified vessel; the second is a small fragment from the body of an unidentified vessel with optic decoration. These can hardly be dated, but do not contradict their dating to the 14th–15th centuries.

Important finds from backfill are small, extremely-corroded pieces of small coins. Careful work by the conservation laboratory have given the conclusion that the coin is a contemporary forgery of round money, mimicking the coins of the town of Görlitz in Upper Lusatia from the second half of the 15th century (Militký 2016).

The backfill of grave C1 yielded only three ceramic fragments (a total of 16 grams). Two belong to a ceramic of fine material with inside glaze, which started to appear during the course of the 15th century and continued into the 16th century. The fragment of a pipkin with remains of brown-yellow glaze is clearly identifiable. Another fragment of light coarse ware stems from the same period. The backfill also contains the fragments of two nails.

Two ceramic fragments stem from the backfill of the lower-situated grave C2 (a total of 7 grams). An atypical fragment of the body is covered with yellow-brown glaze on the inside; another bottom fragment belongs to the oxidation-fired ware of the 14th–15th centuries. The backfill further contains a tiny amorphous iron fragment.

The backfill of grave F contains a total of 74 ceramic fragments (341 grams) that belong to three different

technological groups. Eleven fragments are attributed to reduction-fired ware of mostly grey shades. Their rims (cornices with grooves on the rim margins) and decoration (roller stamp motif in a chain-like arrangement) and thin-walled manufacture belong among their youngest features, which appeared in the course of the 15th or start of the 16th centuries. Fragments with a roller stamp decoration most probably belong to a single vessel (6 fragments of 14 grams). Roller stamp decoration is present on an oxidised fragment with yellow-brown glaze on its inside. The fragment of a pipkin with traces of yellow-brown glaze counts among the younger elements. Other fragments are coarse ware of grey-brown shades with cornice rims. Their decoration consists of a simple groove. A fragment from the body of vessels of the so-called "hillfort-tradition" ware from the 12th–13th centuries and a simply-profiled conically-cut rim of a bowl (14th–15th centuries) are residua. In addition, one fragment of a nail is recorded.

Grave G contained 21 ceramic fragments (207 grams), to which can be added three fragments from the hole dug for an earlier sewage connection (20 grams). These are fragments from the bodies and bottoms of partially-reduced ware with a surface in various grey colours (14 fragments); they are only occasionally decorated (with a double groove on the shoulders) and belong to the 14th and 15th centuries. The rest of the fragments of coarse ware of light shades belong to the same period. Only the fragment of a lid and a nail fragment are identified.

The largest assemblage stems from a layer that covered graves A and F (with a total of 205 pieces, 1801 grams). The assemblage contains predominantly coarse oxidised ware with cornice rims or simpler profiles. The decoration consists of simple, double or multiple grooves on the shoulders. Roller-stamp decoration occurs in three cases, in one case directly below the outer surface of the rim. There are identified pots, vessels with handles and lids. The coarse ware shows the same features (oval rims or rims in the shape of cornices, decoration consisting of a simple or double groove on the shoulders). Apart from pots, vessels with a handle and lids, there are only bowls. This part of the assemblage can be dated to the 14th–15th centuries with most elements belonging to the 15th century. An older residuum (14th century) is represented by fragments of bowl rims and a reconstructed burner. The fragments of roller-stamp-decorated ware with glaze on the inside belong to the youngest features (15th–16th centuries). Also found was a fragment of a lead tube of uncertain use.

Another assemblage comes from a separated block of layers that covered grave C1. It consists of 40 ceramic fragments (175 grams). Its composition technologically corresponds to the same group as the aforementioned example; however, with a distinct distribution. The reduced coarse ware is represented by two fragments (one with a simple rim), and 19 fragments belonging to the oxidised coarse ware (thick rims with simple profiles, vessels with handles, beakers). Also, 13 fragments belong to vessels with glaze on their inside (oval rims, handles). Four fragments are an older residuum (ceramics of the "hillfort-tradition" ware from the 13th century). It is recorded a younger

intrusion as well (four fragments of glazed ware from the 18th–19th centuries). A ceramic disc cut out from a sherd with yellow or green-yellow glaze on the inside was also found. In addition, there are recorded fragments of slag (241 grams), two brick fragments (?) and one nail.

The settlement feature D contains a total of 48 ceramic fragments of 368 grams. The greater part of this material belongs to the "hillfort-tradition" ware with a mica temper, which only appears in Český Brod by around 1300. The fragment of a four-leaved bottle (?) rim is among the older elements and stems from the 13th century. Massive storage vessels or bowls are characteristic of the 14th century; the fragment of a pot with cornice rims can be dated to the same century. Regardless of the majority of the older ceramics (13th century), the feature D is dated only to the 14th century. The assemblage has, in addition, ten fragments of nails, one of which has a larger head.

From the other finds, the fragments of two hooves (one from a layer above feature E, and a second from the backfill of older sewage trench work) should be mentioned, which can be cited in support of the existence of a road at this place.

3.2 Anthropological Studies of the Buried

The sex of the skeletons was primarily determined based on pelvic characteristics (Houět *et al.* 1995; Brůžek 2002). In this way we were able to evaluate four individuals (graves A, C1, F, G) in our assemblage. In the absence of pelvic bones, we used morphological characteristics of the skulls (Acsádi, Nemeskéri 1970; Ferembach *et al.* 1979) or other parts of the skeleton (Novotný 1985) and the robustness of the skeleton generally (graves B, C2). The evaluation of age in the adults was substantially more problematic, especially in the case of individuals older than 35 years. Wherever the state of preservation allowed, we conducted a complex evaluation of all signs of skeleton biological age, *i.e.* the state of symphysis (McKern, Stewart 1957; Nemeskéri *et al.* 1960; Gilbert, McKern 1973), the state of the auricular surface of the pelvis (Lovejoy *et al.* 1985; Schmitt 2005), and teeth wear (Lovejoy 1985). We also took into account the state of the cranial suture (Meindl, Lovejoy 1985). Last, but not least, we also evaluated the overall state of the skeleton, *i.e.* the degree of degenerative growth changes on the vertebral column and appendicular joints (Stloukal, Vyhnánek 1976). We applied the method of Breitingner and Bach (Breitingner 1937; Bach 1965) to evaluate the stature. Pathological changes were evaluated according to Ortner (2003) and were consulted with J. Likovský.

3.2.1 Grave A

The skeletal remains are relatively well-preserved; however, the lower limbs were disturbed by the sewage excavation work – the right leg from the shank downwards missing, the left lacking the small foot bones. The skull is medium robust in nature or with a robust articulated area for the insertion of neck muscles. The teeth are moderately abraded and show calculus (dental plaque). The bones of the postcranial are robust, with a marked relief for muscle attachments. Metrical

and morphological analysis of the pelvis has proved this to be a male pelvis (Houět *et al.* 1995; Brůžek 2002). The measurements characterise the skull as hyperbrachycranial, stenometopic, eurymandibular. The femurs are platymeric, the left tibia eurycnemic. The body height is estimated based on Breitingner (1937) at 171.5 cm, which falls into the category of tall body heights. The skeleton shows numerous pathologies: there are seven intravital tooth losses, a superfluous dental bud in the *sutura palatina*, a healed fracture or incomplete fracture of seven ribs on the left and at least three ribs on the right, a deformational spondylosis in the C5–C7 and Th8–Th10 spine sections, spondylarthrosis of the thoracic vertebrae, lighter arthritic changes in the area of the sacroiliac joints, cortical defects on both clavicles at the *fossa costoclavicularis*, a healed fracture of the left radius and *ankylosis* of the both forearm bones, carpal and metacarpal bones (Figure 10).



Figure 10. Český Brod – Prokopa Velikého Street, in front of house No. 407, grave A: healed fracture of the left radius and ankylosis of the forearm, wrist and metacarpus; dorsal view, photographed by P. Stránská.

Conclusion: the skeletal remains belong to an adult man, age category *maturus* I–II (45–60 years).

3.2.2 Grave B

The skull of this individual belongs in the backfill of grave A, the preserved parts being: a major part of the spine and ribs, both shoulder clavicles and the long bones of both upper limbs. The lower half of the skeleton had been disturbed by recent excavation work; the pelvis and lower limbs are thus missing. The skeleton is robustly built with developed muscle attachments on the neck and long limb bones. Teeth strongly abraded, sometimes to the roots. The body height is estimated at 167.8 ± 4.5 cm, *i.e.* it falls into above-average category. A number of pathologies are observed on the skeleton: in Th7–Th11 the anterior longitudinal ligament of the thoracic spine is ossified (diffuse idiopathic skeletal hyperostosis/DISH/*Forestier's disease*), on the spine, from C3 to Th1, ankylosing spondylitis (*Bekhterev's disease*;

Figure 11) and costovertebral ankylosis on the left side at Th12, deformational spondylosis of the lumbar vertebrae and healed rib injuries.

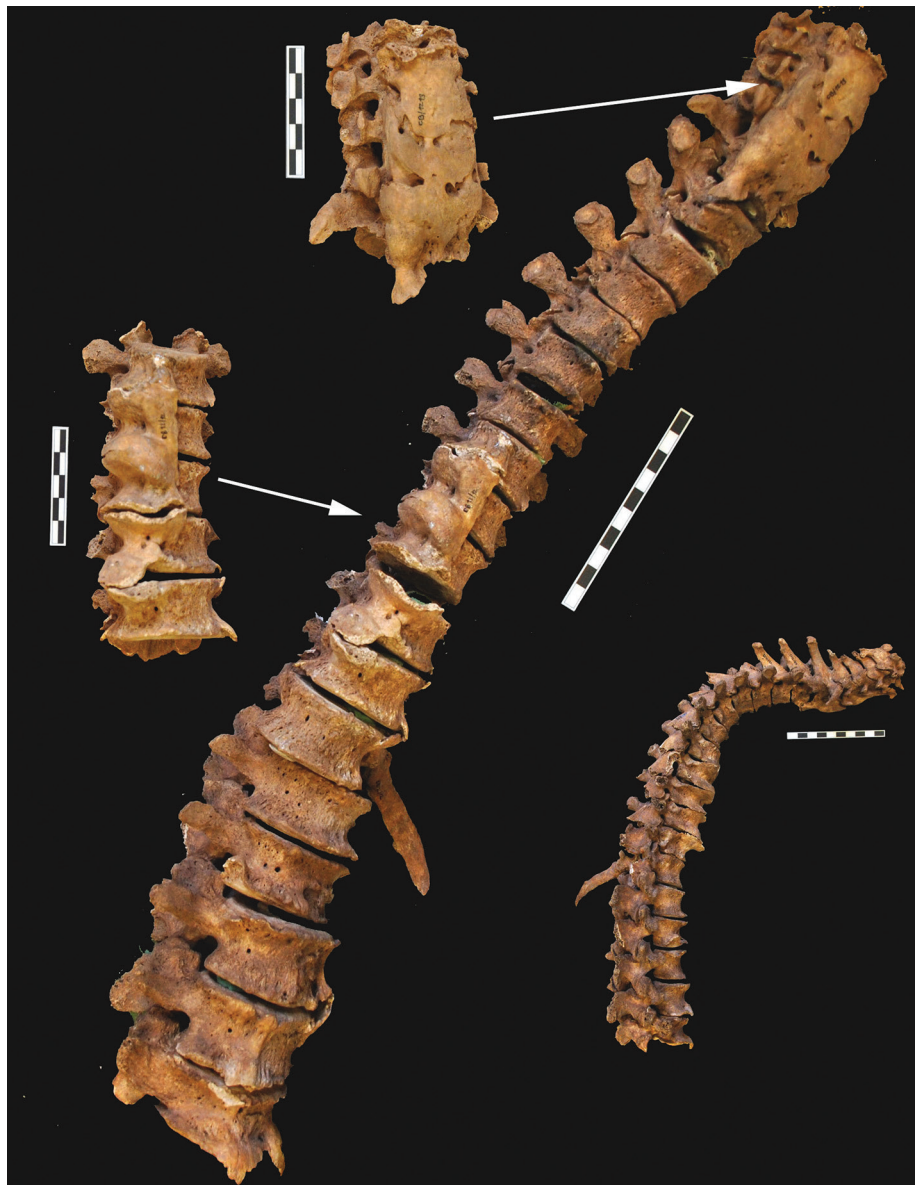
Conclusion: skeletal remains of an old man, age category *senilis*.

3.2.3 Grave C1

The right radius and ulna, fragments of the left forearm and the small bones of both hands; additionally, the larger part of both pelvises and the bones of both lower limbs are preserved. The skeleton is robustly built, shows weak to moderately marked muscle attachments. Metrical and morphological analysis of the pelvis bones clearly proves them to be male. Both femurs were eurymeric, the right tibia eurycnemic, the left tibia mesocnemic. The estimated body height of 173.2 ± 4.5 cm corresponds to the category of tall.

Conclusion: remains of a fully-grown man, age category *adultus* I–II (25–40 years).

Figure 11. Český Brod – Prokopa Velikého Street, in front of house No. 407, grave B: spine from ventral and lateral view with Bekhterev's disease extending from C3 to C7 and Forestier's disease extending from Th7 to Th11, photographed by P. Stránská.



3.2.4 Grave C2

Preserved are only the long bones of both legs and the small bones of both feet, which belong to a moderately robust body with marked muscle attachments. To estimate the sex gender, we used the talus bone and calcaneus (heel bone) (Novotný 1985). Both femurs are stenomeristic, the right tibia eurycnemic. The skeleton shows some pathological changes: the talus bone and calcaneus have grown together, showing progressed secondary arthrosis; secondary arthrosis can be seen on the distal joint surface of the left shin and calf, weak arthritic changes on both margins of larger joint surfaces.

Conclusion: unidentifiable individual, most probably male, age category *adultus* II – *maturus* I (35–50 years).

3.2.5 Grave F

The skull is slightly damaged; the axial skeleton, both arms and both pelvis bones and fragments of both femurs are preserved. The skull is robust, showing moderate

modelling of the nuchal area, the neck showing indications of bathrocephaly. Most of the teeth are preserved, slight to medium abraded. The third lower molar on the left shows caries; the first molar on the right was lost during its lifetime. The bones of the postcranial skeleton display a medium to robust structure with strong muscle attachments. The morphological and metric signs are markedly male. The skull is hyperbrachycranial, metriometopic and mesomandibular; the eye sockets are mesoconchial. The left femur is eurymeric. The body height was estimated from the humerus at 166.2±4.5 cm. Apart from dental diseases, we found other pathologies: exostosis of the right temporal bone, heterotopic ossification of the dorsal surface of the distal third of the diaphysis of the right femur, *myositis ossificans traumatica* on the right femur (Figure 12), post-traumatic adhesion of the intermediate and distal hand phalanges, cortical defects (*fossa costoclavicularis*) on both clavicles.

Conclusion: remains of a man, age category *adultus* II (30–40 years).

3.2.6 Grave G

The skull, the left arm and a part of the legs are missing. We have found the axial skeleton, the right arm, the pelvis and a part of the long leg bones. The skeleton was robustly built and showed marked muscle attachments. The sex marks on the pelvis clearly point to a male; the right femur is stenomeristic, the left femur eurymeric, the right



Figure 12. Český Brod – Prokopa Velikého Street, in front of house No. 407, grave F: *Myositis ossificans traumatica* of the right femur, photographed by P. Stránská.



Figure 13. Český Brod – Prokopa Velikého Street, in front of house No. 407, grave G: compression fracture of Th6, photographed by P. Stránská.

tibia eurycnemic. The body height of 168.8 ± 4.5 cm is above average. We have found a number of pathological phenomena: slight osteochondrosis of Th7–8, an osteophyte at Th10, a posttraumatic compressive fracture of Th6 (Figure 13), and cortical defects on the right-side tuberositas radii at the insertion of the *musculus biceps brachii*.

Conclusion: remains of a man, age category *adultus* II – *maturus* I (35–50 years).

3.3 Radiocarbon Dating

The bone samples were collected from three graves (graves A, C1 and C2 – the pieces of tibia) and they were subjected to radiocarbon dating for verification of archaeological dating. Samples were prepared in the laboratory of the Institute of Nuclear Physics in Prague and then sent to the AMS measurements in the workplace HEKAL ATOMKU in Debrecen, Hungary, the international code Deba (Světlik 2016).

Measurement provides these results. Grave A is dated based on calibrated data with a probability of 95.4% within the range 1444 to 1634 AD (57.3% probability of being from 1444 to 1528 AD, and with a 38.1% probability from 1553 to 1634 AD). Grave C1 is dated with a probability of 95.4% within the range 1450 to 1635 AD (46.6% probability of being in the period 1450–1531, and 48.8% probability in the period 1539–1635). The tomb C2 is dated with a probability of 95.4% within the range 1461 to 1638 AD.

This dating is consistent with the conclusions of the analysis of the archaeological material. It leans the dating towards the older part of the interval of the graves dating (A grave – 1444–1528 AD; grave C1 – 1450–1531 AD). Approximately the same dating was even given by a coin from the filling of grave A.

3.4 DNA Analysis

Bone samples are considered to be among the most difficult forensic samples used for DNA identification; therefore, these samples have a relatively high risk of false-positive or false-negative results (Hagelberg *et al.* 1991; Adler *et al.* 2011). DNA examination of the skeletons from graves A and F focused on the Y-chromosomal STRs with the aim of obtaining a haplotype usable for the prediction of Y-chromosomal haplogroups.

3.4.1 Cleaning

Tooth samples were cleaned by a toothbrush and washed with warm water. The samples were then transferred to a 50-mL tube and further chemically cleaned by inversion for 30 seconds in 5% commercial bleach, followed by 2–3 washes in distilled water (molecular biology grade), one thorough wash in 96% ethanol (Vanek *et al.* 2009) and left to air-dry.

3.4.2 Sampling

Tooth dentine used for DNA extraction was extracted using dental micro tools as described by Gilbert (Gilbert *et al.* 2003). See Figure 14.

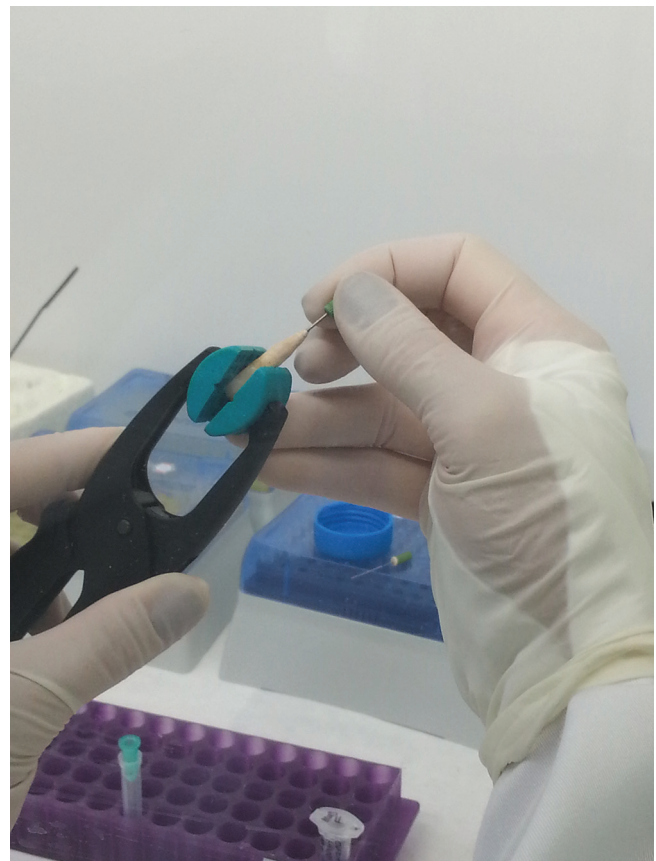


Figure 14. Tooth dentine extraction using dental micro-tools.

3.4.3 DNA extraction

DNA extraction was performed using a PrepFiler® BTA Forensic DNA Extraction Kit (Life Technologies, USA) from a starting amount of 10–30 mg dentine. The recommendations of the manufacturer were followed with the exception of the initial incubation (PrepFiler BTA Lysis Buffer, 1M DTT, and proteinase K), which was extended from the recommended 2 hours to overnight. The extracted DNA was further cleaned using a OneStep™ PCR Inhibitor Removal Kit (Zymo Research, USA).

3.4.4 DNA quantitation

Extracted DNA was quantified by real-time PCR (SYBR® Green assay, target sequence ALU transposable element, amplicon size 63 base) using the 4N6 Quant kit (Forenzni DNA servis, Czech Republic) on a MasterCycler ep realplex S instrument (Eppendorf, Germany).

3.4.5 PCR amplification

The PCR amplification was performed using the AmpFLSTR Yfiler PCR Amplification Kit (Life Technologies, USA). The PCR reaction was as follows: total volume of 25 μ l, 2.5 μ l STR boost (Biomatrix, USA), and a sample volume of 7.5 μ l. We used the recommended protocol with an increased number of cycles to 32 cycles (MasterCyclerR ep gradient S thermocycler, Eppendorf, Germany).

3.4.6 Post PCR cleaning

The PCR product was cleaned and concentrated using Amplicon Rx™ (Independent Forensics, USA).

3.4.7 Fragment analysis

Amplified STR fragments were separated on an ABI PRISM 310 Genetic Analyzer (Life Technologies, USA) under standard conditions. Samples were injected (5 kV injections) for 10 seconds. The resulting data were analyzed using GeneMapper ID software, version 3.2 (Life Technologies, USA) with an analysis threshold of 50 relative fluorescent units (RFU).

3.4.8 Y-haplotype prediction

For all haplotypes, Y-chromosome haplogroups were predicted using the method described by T. W. Athey (2005).

Both samples tested provided a sufficient amount of DNA for the analysis. The results of quantification are summarized in Table 1.

The resulting electropherograms (EPGs) were free of contamination signs and artificial peaks, and the peak heights were sufficient for reliable data analysis. Table 2 summarizes

Table 1. The results of DNA quantitation using real-time PCR (SYBR Green assay, target sequence ALU transposable element, amplicon size 63 base).

Sample	DNA concentration ng/ul	Total amount of DNA
Grave A (16mg dentine)	0.00328	39.36 pg
Grave A (21mg dentine)	0.00200	26.00 pg
Grave F (42mg dentine)	0.00040	10.00 pg
Grave F (27mg dentine)	0.00108	16.00 pg

Table 2. Partial Y-chromosome STR haplotypes obtained for samples tested.

	Grave A	Grave F
DYS456		16
DYS389I	13	13
DYS390		25
DYS389II		
DYS458	17	16
DYS19	14	
DYS385a		14
DYS385b		
DYS393	13	
DYS391	11	10
DYS439	12	
DYS635		23
DYS392		
GATA H4	7	12
DYS437		
DYS438		11
DYS448	19	20

the partial Y-chromosomal STR haplotypes. Y-chromosome haplogroups were successfully predicted for both samples. The individual from grave A belongs to the Y-chromosome haplogroup R1a and the individual from grave F belongs to haplogroup R1b. The predicted haplogroups R1a and R1b and individual haplotypes do not match with the results that are common for Jewish or Roma people (Vaněk *et al.* 2016, 191–196). The more precise determination of the geographic origin using Massive Parallel Sequencing was not performed due to the limited amount of extracted DNA.

4. Discussion

4.1 Archaeology

What we appear to have here is a grave group from the 15th century, which was situated outside the usual burial grounds (cemeteries), on the margin of the suburban dwellings, on or near one of the main roads to and from the town. Based on the archaeological findings and the historical context, we can formulate a number of hypotheses about the deceased.

A: A group of soldiers. This interpretation would suppose that most or all the deceased were men, some of which were with traces of post-traumatic changes on the bones. The position at the arterial road is in accordance with such a theory. However, the repeated use of this burial site, which enabled the development of a stratigraphy of graves; contradicts this theory. The historical accounts describe the long presence of military units in the town and its vicinity. During the Hussite Wars – which in addition predate the graves (at least according to the pot sherds) – Český Brod was conquered twice: in 1421, within a couple of days, and in 1434, within one day. However, there are no hints of a military presence between the second half of the 15th century to the beginning of the 16th century, *i.e.* virtually until the Thirty Years' War. Also, military graves or cemeteries that have been excavated in the past look different. Either they are mass graves, for example, as the victims of some battle (*e.g.* Eickhoff, Schoper 2012), or cemeteries adjacent to military camps (the camp of the Swedish army, for example, at the Riding School of Prague Castle in 1648–9; Blažková-Dubská 2006).

B: A group of people that were killed all at once or as victims of a disaster. This option is favoured by the position at the road, but does not conform to the long-term burials at the site. We would have to presuppose a repeated cause of death of the deceased.

C: A group of people (contagiously) sick in consequence of an epidemic. The arguments are the same as in the preceding case. There was a hospital in the town at St Mary Magdalene's Church on the Arnošt z Pardubic Square since 1359, with an isolation ward from the 16th century onwards (Dvořák 1992, 28–29). However, we do not have any indications that the dead were buried separately, and such a separate burial ground would have included burials of both men and women.

D: Ethnic minorities (Jews, Gypsies). The Jewish burial rite is very strict in the position of the buried person and in the keeping of spaces between different graves. The area of a grave would be protected against any disturbance from later graves by marking it with stones or a stone plate (Wallisová 2002; Cymbalak, Staňková 2014). Romany (Gypsies) are attested in Bohemia for the first time in 1416 (Šmahel 2002, 470), but we do not know of any Romany cemetery that could be used as a comparison for the studied graves.

E: The executed. This would be in accordance with the simple or irreverent position of the skeleton in grave A. However, there was no high ("blood") court in Český Brod, and we do not know whether there was a place of execution. Cemeteries related to execution often show burials with separated heads, incomplete skeletons, traumatic effects on bones showing the burial of those beheaded, of individual bones (Mašková 2005; Mašková, Michálek 2006; Sokol 2003).

F: Heterodoxy. This cannot be archaeologically proven. We know from written sources only that the parish could have banned heterodox persons from being buried in the Christian cemetery (Unger 2000, 350), and they would have to look for a burial place outside the usual cemeteries. Based on this assumption we could interpret this grave group.

G: People on the margin of society. Various people of both sex belong to this group. In the case of women, we are dealing with prostitutes, single mothers, mothers of illegitimate children, etc. There is a broader range of men (beggars, vagabonds, cattle drovers, thieves, etc. – Geremek 1999; Šmahel 2002). At least, some members of this group were not buried in regular cemeteries. Written sources mention these people only in general; namely, in the case of criminal acts (Blažková-Dubská 2005; Čechura 2009; Mašková 2009).

4.2 Anthropology

Grave A: Remains of a 45–60-years-old male (*maturus* I–II). The autopsy shows degenerative-growth changes of the spine in accordance with his age; however, that may as well be a sign of greater physical stress, especially in the lower part of the cervical spine (C7), which normally shows a minimum of spondylosis (Stloukal, Vyhnánek 1976). Broken ribs and broken radius are the results of injury; the pathology of the left wrist can also be proof of a post-traumatic situation or of MTB (*Mycobacterium tuberculosis*), and the cortical defects of the clavicles a reaction to above-average strain on the shoulder girdle (Beňuš, Masnicová 2015).

Grave B: Remains of a male, age category *senilis*. Forestier's disease (diffuse idiopathic skeletal hyperostosis; DISH) represents a systemic disease with unknown cause increasing in age. It is sometimes connected with metabolic disorders, such as obesity or diabetes. In the literature, it is cited twice as more often in men than in women (Verlaan *et al.* 2007). Ankylosing spondylitis (Bekhterev's disease) represents a progressive inflammatory disease of the spine, the costovertebral and sacroiliacal joints, with an unknown cause. It afflicts men twice as often as women between the

15th and 30th year of life (Ortner 2003). The healed ribs lay witness to the experience of traumas.

Grave C2: Unidentifiable individual, probably male (?), age category *adultus* II – *maturus* I (35–50 years). With all probability, the adhesion of the foot bones is post-traumatic.

Grave F: Male, age category *adultus* II (30–40 years), heterotopic ossification (*myositis ossificans traumatica*) can either be the result of an injury or have developed at this typical location – on the transition between the proximal and medial third of the femur diaphysis – as a result of chronic stress in the area of the thigh adductors, *i.e.* through horse riding (Stloukal, Vyhnánek 1976).

Grave G: Male, age category *adultus* II – *maturus* I (35–50 years). Cortical defects on both arms may be interpreted as the result of some higher stress on the shoulders, in connection, for example, with the lifting and carrying of heavy loads; compressive fractures are most often caused by falling (Ortner 2003).

The group of six skeletons from Český Brod consists of the remains of five men and most probably a sixth man. They belong to various age categories; most of them show robust bodies with marked muscle attachments, which mostly corresponds to great physical effort. Five of the skeletons show numerous pathologies of various causes. Degenerative growth changes of the spine (graves A and G) correspond to the age of the deceased and are connected with overall aging. A number of changes can however be better explained by traumatic experiences: the injuries to the ribs in individuals A and B, the healed fracture of the radius in individual A, the adhesion of the talus and heel bone in C2, traumatization of the thigh adductors and the adhesion of the hand phalanges in individual F, and the compressive vertebra fracture in individual G. Ankylosis of the wrist in individual A may be the result of a trauma, though more likely the expression of tuberculosis. If found separately, we would consider each case most probably a chance find; however, such an accumulation of post-traumatic diagnoses on such a small assemblage of skeletons does not look like being a coincidence. Additional pathologies may be related to the higher physical stress of specific groups of muscles in connection with repetitive activities or work; this relates to the cortical defects on the clavicles, ulnae and radii of individuals A and G.

The abovementioned findings lead to the hypothesis that these were not members of a town population, but people whose way of life was exposed to certain physical activities (*e.g.* the carrying and lifting of heavy loads, horse riding, etc.), and to the greater likelihood of physical injuries, *i.e.* they lived in the landscape or on the margin of society and witnessed more violence.

4.3 DNA Research

The quality and quantity of DNA obtained from an aged biological specimen is often strongly influenced by the environmental factors (Vanek 2015). On the other hand, partial STR profiles can be considered as one of the characteristic signs of DNA-typing results from old

bone samples (Vanek 2007; Ambers 2014) and help with the sample authentication. Partial Y-chromosomal STR haplotypes obtained from the samples enabled us to predict the Y-chromosome haplogroups. Both haplogroups are the most frequent ones in the Czech population (Zastera *et al.* 2010; Ehler *et al.* 2011). The Y-chromosome haplogroup-prediction method used utilizes the finding that the pattern of STR alleles in persons with the same haplogroup is similar (Athey, 2005). This allele frequency approach is not so precise as SNP typing (Karafet 2008) but STR typing not only provides higher robustness for compromised samples but also enables the relatedness of male lineages to be compared (Vanek, 2009). Another possible DNA-typing technology would be Massive Parallel Sequencing (MPS) (e.g. Gamba 2014) but there also exists a minimum DNA input threshold and both samples tested would not qualify for a successful MPS testing.

5. Conclusions

Only if the archaeological observations are taken in conjunction with the results of the anthropological and genetic analyses is it possible to make statements on the archaeologically-formulated hypotheses. The presence of male burials only (with a single possible exception) is exceptional and unexpected – even in cases of criminal acts, accidents (hypotheses B and C) or heterodoxy (hypothesis D) – but would, however, well correspond to soldiers (hypothesis A). It would also not be contradicted by the varying age of the buried, nor by the occurrences of healed injuries or mechanical stress from horse riding (grave F). A military “occupation”, however, is inconsistent with pathologies that would exclude any engagement in combat (graves A and B). The genetic analysis has excluded any evidence that the buried were members of a minority (hypothesis E). The buried assemblage best corresponds to a group of people on the margins of society (beggars, vagabonds, the poor, *etc.* – hypothesis G), in which physical stress, resulting in the injuries, and frequent illnesses are to be expected. The prevalence of men is typical of similar groups (Šmahel 2002; for examples from abroad, see Geremek 1999). This conclusion is supported by the presence of the fake coin in one grave, because the incidence of this type of currency would probably be expected in a similar group.

Life on the margins of society (a marginal position) often corresponds to an actual life living on the margins of settlements. It is highly improbable that these people lived for any length of time in any single town (perhaps with the exception of smaller groups in hospitals). They are also less often mentioned, or even under-mentioned, in written sources. We can sometimes find general statements on the existence of this group of people; however, information on the fates of individuals is extremely rare – which is one of the reasons why archaeologists do not usually look for them.

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