



THE REMAINS OF A SKELETON IN THE HISTORY OF A REGION

LES VESTIGES D'UN SQUELETTE ET L'HISTOIRE D'UNE RÉGION

ARTICLE ORIGINAL

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SUMMARY

During excavation works for the renovation of a house lying at the Citadel foot of Namur (Belgium), skeletal remains were discovered. With members of the DVI, we exhumed bones fragments, including both hip bones which the left one was still connected. At the medial face of the left femur shaft, we find a concretion whose core consists of a bomb mortar fragment. In the neighborhood of these bony parts, ceramics fragments dated from the 17th and 18th centuries, animal bones and an ancient bullet-like were found. The anthropological study of the bones fragments after some reconstruction established that they belonged to a male adult of average stature.

The archaeological history of the site reveals that the dwelling house is located in a ravine « Le ravin de la Foliette » under the crossfire of two fortified places. We can therefore hypothesize that the skeleton remains are from a civilian or a soldier wounded by bomb fragments during one of the military sieges of Namur.

KEYWORDS

Forensic anthropology, Anatomy, Identification, Archaeology, History.

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RÉSUMÉ

Au cours de travaux d'excavation pour la rénovation d'une maison située au pied de la Citadelle de Namur (Belgique), les restes d'un squelette humain ont été découverts. Accompagnés par les membres du DVI (Disaster Victim Identification), nous avons exhumé des fragments d'os, y compris les deux os de la hanche dont l'os coxal gauche était toujours en connexion anatomique avec le fémur. À la face médiale de la diaphyse du fémur gauche, nous trouvons une concrétion dont le noyau est constitué d'un fragment d'obus de mortier. Dans le voisinage des pièces osseuses, des fragments de céramiques datés des 17^e et 18^e siècles, des os d'animaux et une ancienne balle de fusil sont retrouvés. L'étude anthropologique des fragments osseux, après reconstruction, permet d'établir qu'ils appartenaient à un homme adulte de taille moyenne.

L'histoire archéologique du site révèle que la maison d'habitation est située dans un ravin « Le Ravin de la Foliette » situé sous le feu croisé de deux places fortes. Nous pouvons donc émettre l'hypothèse que les restes squelettiques sont ceux d'un civil ou d'un soldat blessé par des éclats de bombe pendant l'un des sièges militaires de Namur.

MOTS-CLÉS

Anthropologie médico-légale, Anatomie, Identification, Archéologie, Histoire.

1. INTRODUCTION

Several cases of infanticides which occurred a few years ago in Belgium sensitized the public-at-large and the Criminal Investigation Department when bony remains were fortuitously discovered. These bones were accidentally found during routine police investigation not related to crime [3], on road work-site construction or while restoration or building dwelling houses. In this context, and allowing a call from the DVI (Disaster Victim Identification), our forensic unit arrived at the premises of a house built in 1931 next to a ravine named "Le Ravin de la Foliette" at the foot of the Citadel of Namur, which is city located in the southern part of Belgium. Several osseous remains were exposed from under a recently built concrete fence bordering the dwelling entry. These bones were located in a cavity (dimensions in cm: 20x 20 x30) dug in a light soil resulting from the natural decomposition of schist. A few meters further, other osseous fragments, broken bricks and shards of varnished potteries are also discovered. The first goal of the mission was to consider the human or animal

origin of the bony remains. The post-mortem interval had to be estimated because of statute limitation regulations (30 years in Belgium when dealing with human bones). Another point-of-interest was attempting to explain the presence of these remains, and of the biological and mineral artefacts assuming the historical context of the location.

The purpose of the present article is to link the different materials discovered, and to give hypotheses of their mutual relationships either using medico-legal and anatomical elements, or from the historical context of the city of Namur and its Citadel [6].

2. MATERIAL AND METHODS

The excavations and sieving of the soil found under the above-mentioned concrete fence and in the surrounding ground allowed establishing the inventory of osseous fragments of various types: ceramic, potteries, animals and human bones. [(Fig.1 The fence along the dwelling entry (left) and excavation (right)) (Fig.2 Bones fragments)...].





Figure 1a

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Figure 1b



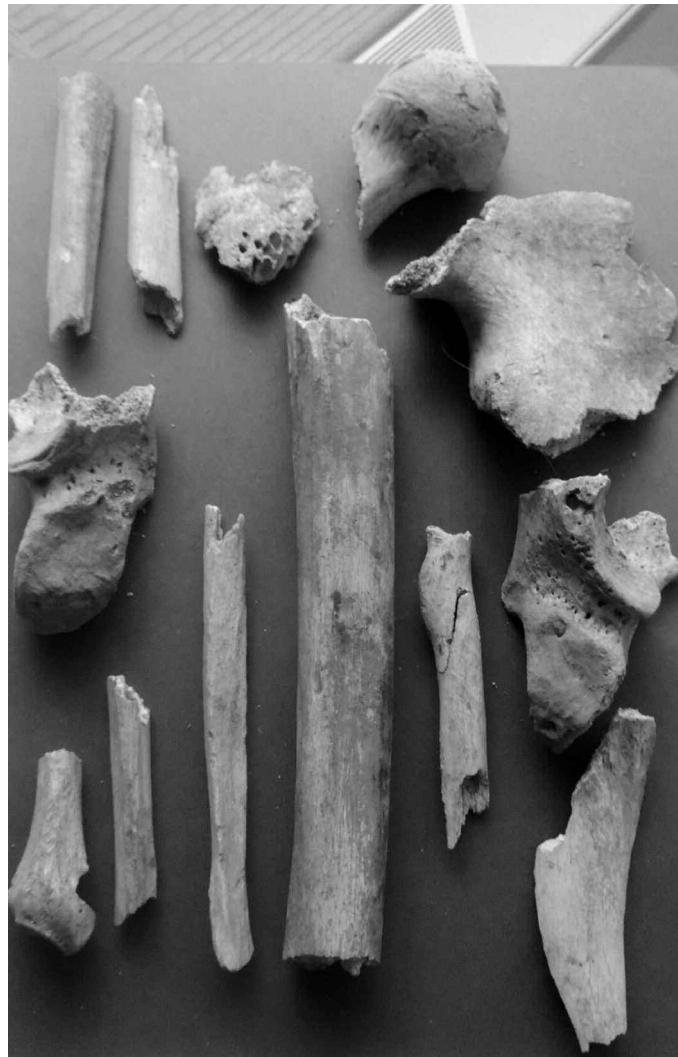


Figure 2

These fragments were unequally distributed in the soil substrate made up of mixed schist, rubbish and broken ancient bricks. A round metallic ball, which shape was close to a bullet-like ballistic projectile was also found at the same location. (Fig.3 Bullet-like projectile).

We determined the osseous fragments origin and their age by macroscopic examination and comparative anatomy [9].

The estimation of the sex was carried out using the vertical and sagittal femoral head diameters [2, 8, 13], the bicondylar width and the width between the patellar surface and the femoral condyles (medial and lateral) [1].

The stature was estimated after rebuilding of the left femur superior epiphysis according to the Steele's method [18, 22, 24]. The following measurements were then performed: F1 = distance measured between the middle of the lesser trochanter and the top of the femoral head, F4 = medial condyle height. (Fig.4 Segments F1 and F4. Method of Steele).

The femur length was then estimated according to the following equation: $0.65 (F1) + 40.91 \pm 2.32 \text{ cm}$; $5.51 (F4) + 24.661 \pm 2.55 \text{ cm}$.

This femur length was then compared to the tables of Trotter & Gleser [20] and Olivier [16]. Aging was estimated by a meticulous examination of the various osseous fragments because the usual bony elements used for age estimation purposes (e.g., pubic symphysis, 4th rib, auricular surface, acetabular fossa, cranial sutures) were either absent or strongly damaged. The post-mortem interval was also estimated according to the state of the bones fragments and the observation of the taphonomic action affecting bone tissues [11, 14, 17, 21, 23].

3. RESULTS

We were in the presence of two different sites; a first site (Site 1) containing the human bones discovered





Figure 3

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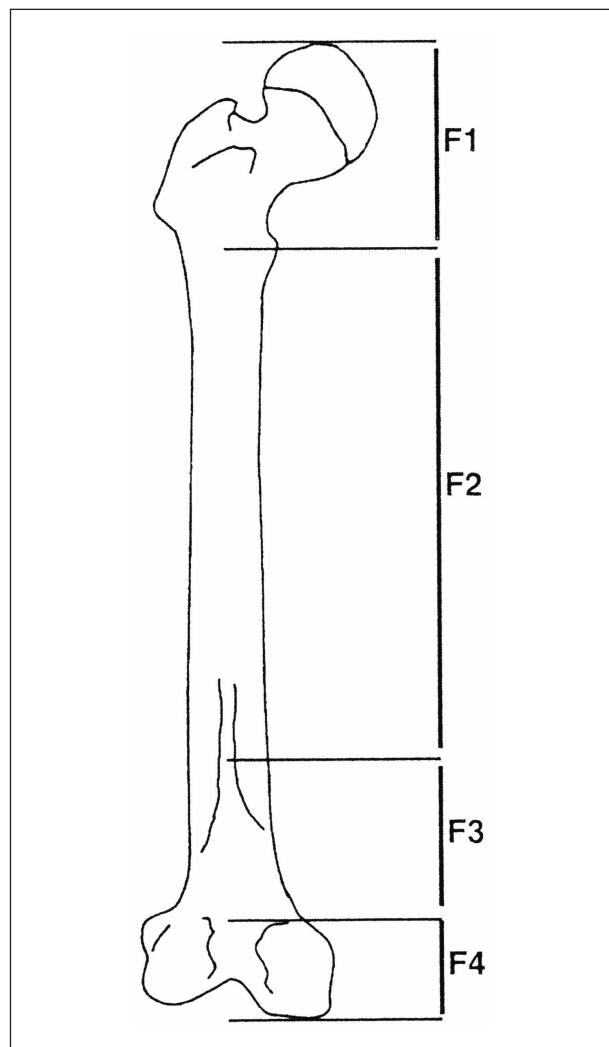


Figure 4

under the concrete fence and a second site (Site 2) located at seven meters of Site 1 and composed of pottery shards and animals bones remains.

3.1. Site 1

Among the first bony fragments that were discovered (i.e., fragments of femur, tibia, fibula, cranial bones...), a left femur and the related hip bone was also found (Fig.5 Excavation under the fence with right and left hip bones fragments). Further, a second hip bone was discovered. Table 1 gives the list of the collected bones. The following estimations from bone measurements were obtained:

3.1.1. Post-mortem interval

The diaphysis fragments of long bones (femur, tibia, fibula) present, along their longitudinal axis, cracks due to temperature and weather variations. The different faces of these diaphysis also showed traces of repeated scavenging activities by necrophagous insects and fauna. (Fig.6 Fragment of left tibia diaphysis with cracks).

The medullary cavities of the fragments were invaded by rootlets and the cavities walls were covered with soil. Epiphyseal cancellous bone and the fragments of the flat bones (i.e., ilium) were fragile. This cancellous bone were also invaded by rootlets and soil. (Fig.7 Cancellous bone and rootlet. Proximal epiphysis of left tibia)



Figure 5

Anatomical Regions	Bones
Cranium	1) Sphenoidal sinus; 2) Bony palate; 3) Left petrous part of temporal bone; 4) Fragments of parietal and frontal bones; 5) Left and right mastoid processes; 6) Spheno-occipital synchondrosis.
Vertebral column	1) Superior articular process of lumbar vertebra LV; 2) Vertebral bodies fragments of thoracic and lumbar vertebrae.
Upper limb	Fragments of right radius (proximal part of the diaphysis with radial tuberosity and distal part).
Lower limb	1) Fragments of left femur (greater trochanter, head and neck, proximal and middle parts of the diaphysis, distal epiphysis); 2) Fragments of right femur (part of the proximal epiphysis, incomplete femur head); 3) Fragments of left tibia (diaphysis and proximal epiphysis); 4) Fragments of left ilium (acetabular fossa, ischium with ischial tuberosity, auricular surface with a part of the greater sciatic notch and a part of the body of ilium); 5) Fragments of right ilium (incomplete acetabular fossa, ischium with incomplete ischial tuberosity, a part of the greater sciatic notch and an incomplete part of the body of ilium); 6) Fragments of left fibula (proximal epiphysis, head, part of the diaphysis); 7) Fragments of right fibula (middle and distal parts of the diaphysis).
Note	1) About fifty bones fragments of small size, mainly cancellous bone from the parts described above and an average length of 0.5 to 3 cm; 2) Two molars with the occlusal surface is abraded, with no decay.

Table I. Enumeration of the bones fragments from under the fence.



Figure 6

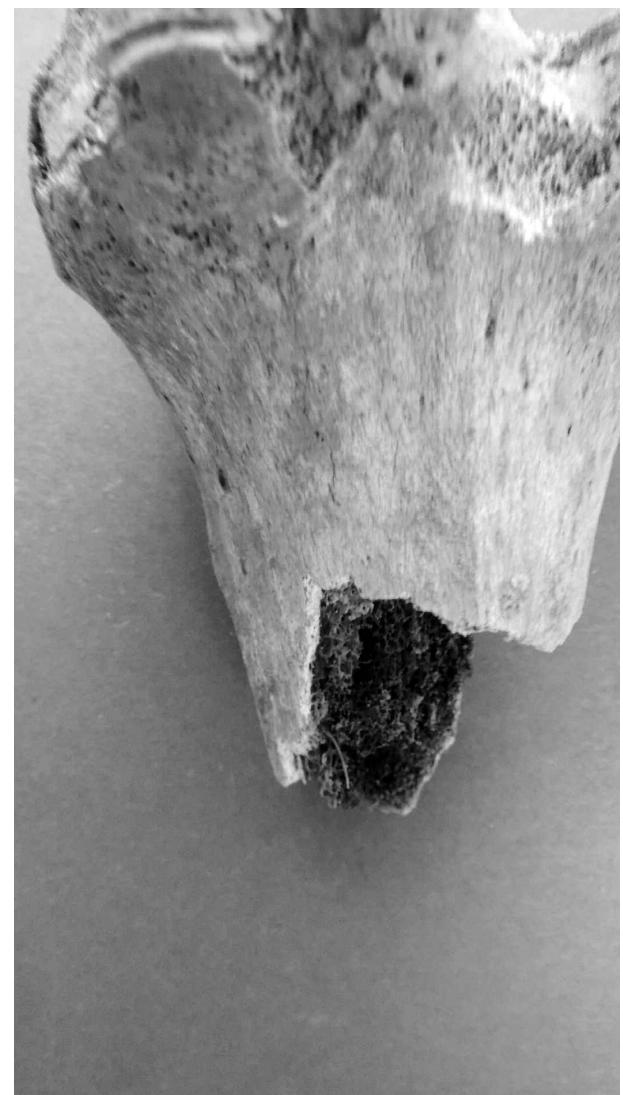


Figure 7



Estimations	Results	Conclusions
Sexe	Vertical Diameter of femur head : 50 mm	$\text{♂} > 45.5 \text{ mm}$
	Sagittal Diameter of femur head: 48 mm	$\text{♂} > 48 \text{ mm}; \text{♀} < 43 \text{ mm}$
	Bicondylar width of femur distal epiphysis: 83.20 mm	$\text{♂} > 79.6 \text{ mm}$
	Distance patellar surface – Lateral condyle of femur distal epiphysis: 66 mm Distance patellar surface – Medial condyle of femur distal epiphysis: 70 mm	$\text{♂} : 61 \pm 0.35 \text{ mm}; \text{♀} : 56 \pm 0.36 \text{ mm}$ $\text{♂} : 64 \pm 0.39 \text{ mm}; \text{♀} : 59 \pm 0.36 \text{ mm}$ Muscles insertions are clearly marked.
Stature	Steele Method: femur length with segment F1: $45.65 \pm 2.32 \text{ cm}$ femur length with segment F4: $46.15 \pm 2.55 \text{ cm}$	Tables of Trotter & Gleser : F1: Stature: $170 \pm 2.32 \text{ cm}$ F4: Stature: $171 \pm 2.55 \text{ cm}$ Table of Olivier : $169.17 \pm 3.27 \text{ cm}$
Aging	Complete fusion of the spheno-occipital synchondrosis; Complete fusion of the long bones metaphysis; Bones without degenerative signs (osteoarthritis, calcification, osteophytes, erosion of articular surfaces) or convincing signs of advanced senescence.	Adult subject

Table II. Anthropometric study of various bones and fragments.

Certain parts of the trabecular bone contained several stones of small size resulting from a collapse-crushing process of the osseous material under the effect of the ground weight. These observations let us suppose that the age of these various bones fragments was above 30 years.

The nature of the finding could therefore be qualified as archaeological according to the Belgian legislation.

3.1.2. Minimal amount of individuals (MNI)

The examination of the various bones and fragments discovered at this location suggested the presence of only one individual in this area.

3.1.3. Anthropometric analysis (Table 2)

In conclusion, we estimated that these osseous remains could belong to an adult male individual

showing an estimated stature around 170 cm (estimated interval between 165.9 cm and 173.55 cm). The bullet-like agglomerated metallic fragment, which was found embedded in the medial face of the left femur appeared to be a fragment of shell or bomb used in combination with mortar during the 18th century. [(Fig.8 Fragment of a mortar bomb (embedded in the medial face of left femur shaft)].

3.2. Site 2

Several scattered fragments of long bones of animal origins of various size were mixed with pottery and ceramic shards. These animals bones fragments are of various origin (cow, pig, sheep). The study of these bones and artefact fragments showed that this particular spot was used as rubbish storage (i.e., pit dug in open ground or low-pits for latrines) dating between the 16th and 18th centuries. (Fig.9 Fragments of ceramics from the 17th and 18th centuries).

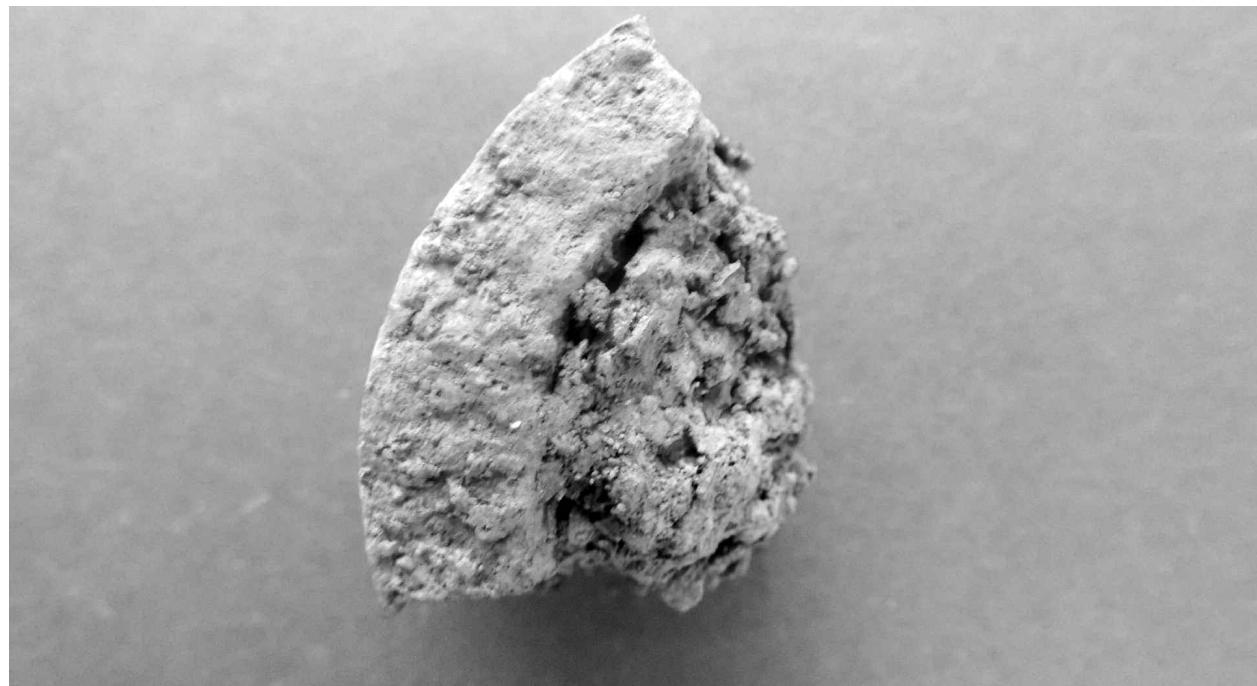


Figure 8

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Figure 9



4. DISCUSSION

The estimation of the stature by the Steele's method is regularly subjected to criticisms in particular with regard to certain osseous landmarks because their positions are not very accurate. In this paper, the selected landmarks were localised in a more precise way. For the conversion of the bone length measurement into stature estimation, the traditional Trotter & Gleser's tables was adopted; however we also considered the so-called "table of Olivier" whose estimation of the stature is based on measurements more adapted to our European populations. For safety reasons, we also could not further prospect the site under the concrete fence.

Furthermore, such destruction would require the removing of a large quantity of ground.

As we were in the presence of an archaeological finding, we could not continue this exhumation. The decision would be different in the event of recent human remains.

The Citadel of Namur, improved by Vauban, was a strategic military place at the confluence of two rivers (the Sambre and the Meuse). In this period, Namur was the most important fortified town of the Southern Netherlands. This fortress witnessed many battles during the 17th and 18th centuries. The Nine Years' War (1688-1697) during which Louis XIV and the Ottoman Empire faced Guillaume III, Leopold I (Emperor of the Holly Roman Empire), Charles II, King of Spain and the Savoy [12]. The last important war of Louis XIV in 1704 will be the war of Succession of Spain. In 1746, the war of Succession of Austria took place and then arrived the episodes of the French Revolution wars (1792 and 1794) [5].

The dwelling in restoration is situated on the side of the "Ravin de la Foliette".

Researches were performed by the City Record Office of the town in order to determine if there were really ancient buildings (16th, 17th and 18th centuries) in the vicinity of the contemporary building. The ancient plans, whose reproductions are preserved at the Service of Archaeology, revealed that indeed, several buildings were built since 1703 in the "Ravin de la Foliette"; they appear on the plans of 1703, 1747, 1757 and 1834. Taking into account the relative topographic precision of these plans, it is not possible to superimpose them rigorously on the current plans and location inaccuracy are possible. In addition, cartographers of the 18th century often simply copied the work of their predecessors without any update of the data map. Although it is difficult to claim with certainty that there is clear relationships between the remains (bones and artefacts) with the building nearby, it is a completely probable assumption.

The ceramics fragments were examined by an expert who dated these fragments without ambiguity from

the 17th and 18th centuries. The fact that the discovered set did not comprise almost any earthenware or porcelain fragments excluded a dating from 19th or 20th centuries. The association of animals bones and ceramics fragments could indicate the presence of low-pit of latrines. Such habit in Namur during that period is demonstrated by the frequent archaeological findings of such nature [excavations of the "Grognon (foot of the Citadel), of the "Place Pied du Château", of the "Rue Basse-Marcelle"...)]. In these low-pits were used to collect food remains and objects or fragments of objects considered as unusable (ceramics, metal, glass, animals bones, shells, leather, wood...). The necessary work to the foundations of the palisade destroyed any archaeological link between the discoveries on Sites 1 and 2; there is not any more stratigraphic relation between them. Thenceforth, nothing proves from a chronological point-of-view that the human bones (Site 1) and the ceramics with the animals bones fragments (Site 2) date from the same period. It is however the most probable assumption according to the reduced distance separating the two sites.

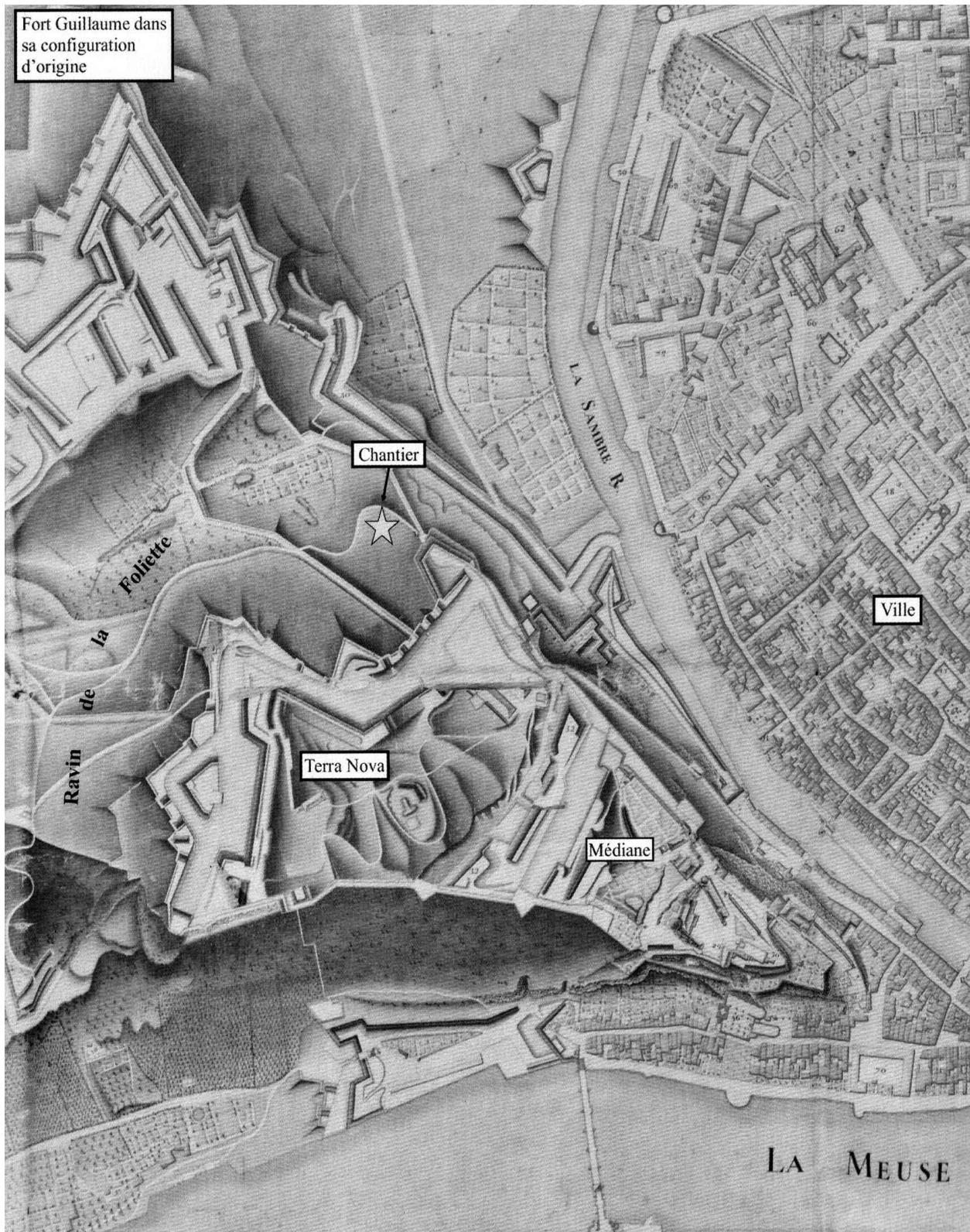
None of the old maps show cemeteries on the building site, nor in a general way in the "Ravin de la Foliette". This ravine apparently did not host, during the medieval period, any religious building where burials could take place according to this period habits. The presence of a burial at this place cannot thus be explained according to the above mentioned observations.

The human bones were exhumed in the "Ravin de la Foliette" which represents a rather deep small valley separating two high points: the Citadel at the East side with on the opposite side the "Château des Comtes", "Médiane" and "Terra Nova" and the "Montagne du Diable".

On the latter, was built between 1690-1691, the "Fort d'Orange" or "Fort Guillaume". In the event of conflict, the ravine was in an unfavourable position, wedged between two major targets for the attackers artillery: Terra Nova and the "Fort d'Orange". This situation is well-illustrated by the strategic military maps of the 18th century. [(Fig.10 Situation of the dwelling house (yellow star) in the "Ravin de la Foliette" between Terra Nova, Médiane (Citadel) and the "Fort Guillaume")]

On these maps, appear the mortars and guns batteries of artillery as well as the theoretical trajectories of the projectiles. [(Fig.11 Position of the artillery batteries and the theoretical trajectories of the shootings (in red)] According to these plans, the "Ravin de la Foliette", even if it is not a direct target is very unfavourably located and it is probable that badly adjusted shootings reached the gulch several times by missing their targets.

The metal fragment embedded in the medial face of the left femur was a fragment of bomb projected by a



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Figure 10



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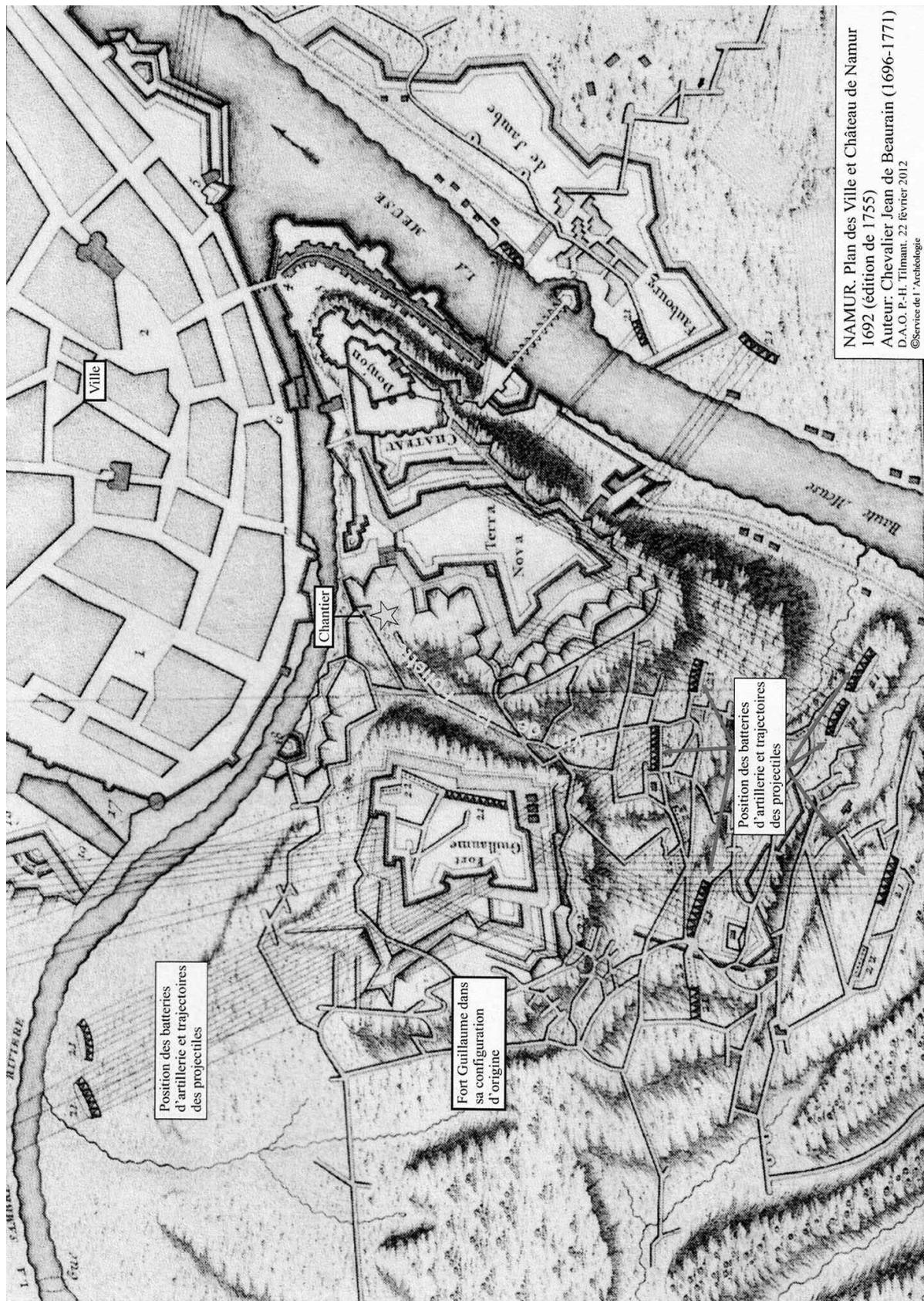


Figure 11



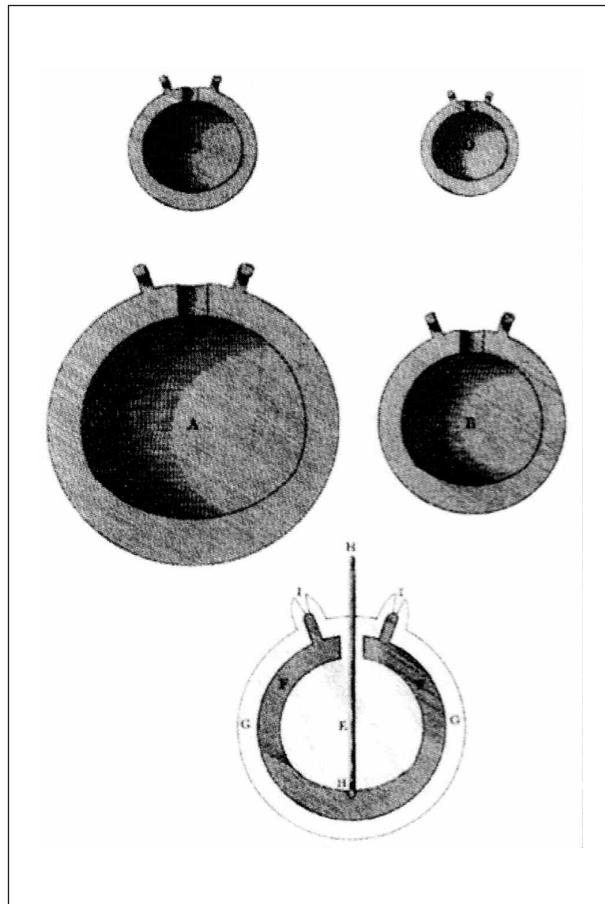


Figure 12

mortar. The principle of a hollow projectile filled with powder and exploding on a target is well known since the beginning of the 17th century (Fig. 12 Different types of mortar bombs – 17th century. D'après Surirey de Saint-Rémy, Mémoires d'Artillerie, Paris, 1697). Batteries of these mortars are reproduced on the ancient plans.

The medial region of the thigh contains large blood vessels for the lower limb vascularization (superficial, deep femoral arteries and veins). The arteries, with an average diameter about 9 mm, have a significant blood flow (about 25 – 30 mL/min) [10, 19].

This is why an injury in the medial area of the thigh (in particular by a projectile of firearm) can be responsible, in the absence of immediate care, for an irreversible haemorrhage leading quickly to a fatal hypovolemic shock [4, 7].

Because of the presence of the concrete fence, the impossibility of digging more deeply and the fragile consistency of the bones fragments, we could not recover other parts of the skeleton on which we could, perhaps, observe other traces of passaging projectiles. It should be recalled that a bullet was also found in the earthfills near the skeletal remains.

The historical and anatomical context allows to assume that the discovered burial would be of a person, civilian

or military victim, in the "Ravin de la Foliette" or even elsewhere, of one or more shrapnels of mortar bomb from an artillery shooting during one of the attacks in the end of 17th or during the 18th century.

It is probable that during one of the sieges undergone by Namur, the bodies of all the killed victims could not always be evacuated and properly buried in a cemetery. The siege of 1692 lasted from May 26 to June 30; allied troops defending Namur against Louis XIV lost about 4,000 to 5,000 men. The attack of 1695 (from July 3 to August 30) was murderous; the casualties were estimated from 10,000 to 16,000 men. Some of them were certainly buried on site within the shortest time in order to avoid any risk of epidemic [15].

A similar discovery was made in 1921. Two skeletons were exhumed during earthworks necessary to establish a Monument and linked with the sieges suffered by the city of Namur.

5. CONCLUSION

There is no formal archaeological prove to link the human remains to the animals bones associated with the ceramics fragments. The dating allotted to these fragments (17th and 18th centuries) cannot thus apply strictly to the human bones according to the techniques of archaeology and the modifications of the ground by the mechanical machines. Nevertheless, their proximity makes probable the assumption according to which the human bones would date from this period.

Parts of the skeleton remained inaccessible and its excavation would allow perhaps to collect objects, fragments of objects or any other element to specify the dating. The historical context attached to the "Ravin de la Foliette" where part of the skeleton was exhumed, allows supposes that an individual deceased during one of the sieges of Namur, probably during 17th or the 18th century was buried at that location.

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Conflict of interest: The authors declare that they have no conflict of interest. ■



BIBLIOGRAPHIE

[1] ALUNNI-PERRET V., STACCINI P., QUATREHOMME G. - Sex determination from the distal part of the femur in a French contemporary population. *Forensic Sci. Int.*, 2008, 175, 113-117.

[2] BASS W.M. - *Human osteology. A laboratory and field manual*. Columbia, Missouri Archeological Society. 1995.

[3] BEAUTHIER J.-P., LEFÈVRE PH., POLET C., WERQUIN J.-P., ORBAN R. - Les aléas d'une enquête anthropologique sur des squelettes de la Première Guerre mondiale. *Journal de Médecine Légale Droit Médical*, 2010, 53, 4, 1-9.

[4] BEAUTHIER J.-P. - *Traité de Médecine Légale*, 2nd ed. Paris, Bruxelles, De Boeck Université. 2011.

[5] BRAGARD PH., BRUCH V. - *Namur 1713-1794. Le siècle des Hasbourg d'Autriche*. Les éditions namuroises. 2001.

[6] BRAGARD Ph. - *Namur en état de siège. De Jules César au général Hodges*. Ed. Les Amis de la Citadelle de Namur. 2004.

[7] DI MAIO V.J.M. - Gunshot wounds: practical aspects of firearms, ballistics and forensic techniques. Boca Raton, London, CRC Press. 1999. In: Beauthier JP. *Traité de Médecine Légale*, 2nd ed. Paris, Bruxelles, De Boeck Université. 2011, 297-316.

[8] DU JARDIN Ph., PONSAILLE J., ALUNNI-PERRET V., QUATREHOMME G. - A comparison between neural network and other metric methods to determine sex from upper femur in a modern French population. *Forensic Sci. Int.*, 2009, 192, 127.e1-127.e6.

[9] FRANCE D.L. - *Human and Nonhuman Bone Identification. A Concise Field Guide*. CRC Press. Boca Raton, New York. 2011.

[10] GOSLING J.A., HARRIS P.F., HUMPHERSON J.R., WHITMORE I., WILLAN P.L.T. - *Human Anatomy*. Gower Medical Publishing, London. 1990.

[11] HAGLUND W.D., HARNISH SORG M. - *Advances in Forensic Taphonomy: Method, Theory and Archeological Perspectives*. CRC Press LLC, Florida. 2002.

[12] LYNN J.A. - *The wars of Louis XIV: 1667-1714*. Logman. 1999.

[13] MALL G., GRAW M., GEHRING K.D. - Hubig M Determination of sex from femora. *Forensic Sci. Int.*, 2000, 113, 315-321.

[14] MANN R.W., BASS W.M., MEADOWS L. - Time Since Death and Decomposition of the Human Body: Variables and Observations in Case and experimental Fields Studies. *J. Forensic Sci.*, 1990, 35, 1, 103-111.

[15] MORIAMÉ M.A., WEBER J.P., BRUCH V. - *Namur 1692. Louis XIV à Namur. Histoire d'un siège*. Les éditions namuroises. 1992.

[16] OLIVIER G. - L'estimation de la stature par les os longs des membres. *Bulletin et Mémoires de la Société d'anthropologie de Paris*, 1963, 4, 3, 433- 449.

[17] QUATREHOMME G. - Anthropologie médico-légale. In: *L'identification en médecine légale. Aspects actuels*. Ed. D. Malicier Paris ESKA Editions, 2003, 81-128.

[18] STEELE D.G., MCKERN T.W. - A method for assessment of maximum long bone lenght and living stature from fragmentary long bones. *Am J Phys Anthropol.*, 1969, 31, 215-228.

[19] TANK P.W., GEST R.T. - *Atlas of Anatomy*. Lippincott Williams & Wilkins, Baltimore. 2009.

[20] TROTTER M. and GLESER G.C. - Estimation of stature from long bones of American Whites and Negroes. *Am J Phys Anthropol.*, 1952, 16, 79-123. In: Bass WM *Human osteology. A laboratory and field manual*. Columbia: Missouri Archeological Society. 1995, 27-28.

[21] UBELAKER D.H. - *Human skeletal remains*. Taraxacum. Washington. 1999.

[22] VIGNAL J.N. - Application de la méthode de Steele pour l'estimation de la taille à partir d'os longs fragmentaires. Exposé de trois cas concrets. *Biom Hum Anthropol.*, 1998, 16, 3-4, 151-158.

[23] VILLA C., LYNNERUP N. - Age estimation of skeletal remains: principal methods. *Research and Reports in Forensic Medical science*, 2014, 4, 3-9.

[24] WRIGHT L.E., VÁSQUEZ M.A. - Estimation the Lenght of Incomplete Long Bones: Forensic Standards From Guatemala. *Am J Phys Anthropol.*, 2003, 120, 233-251.