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FROM THE SKELETON TO THE FUNERARY ARCHITECTURE: A LOGIC OF THE PLAUSIBLE

ABSTRACT: This paper proposes to explain the analytical approach that led to the interpretation of the original funerary deposits of a large early middle age cemetery (Les Ruelles, at Serris, France), exhaustively excavated over 20 hectares. By means of a classification of the taphonomic anomalies, linked to archaeological data from the sepulchral pits in this series, it has been possible to define the constrictions exerted on the skeleton by the architecture of the grave, and to understand some of the conditions of destruction of perishable materials, and thus to make propositions for the original fittings. We discuss the difficulties associated with the reconstruction of a precise architecture, within a variety of plausible shapes.

KEY WORDS: Archaeothanatology – Funerary architecture – Placing of the dead – Early Middle Age burials

INTRODUCTION

Grounded in the teaching of "archaeothanatology" (Duday 2009), which argues that the conditions in which the dead are buried have an effect on how the body decay is preserved, the aim of this paper is to present, by a case study, a classification of the taphonomic anomalies in relation to specific funerary devices. The archaeo-anthropological data come from the settlement Les Ruelles, at Serris (Seine-et-Marne, France) located approximately 40 kilometers east of Paris, exhaustively excavated over 20 hectares (Gentili 2010). It is a grouped habitation that originated from an aristocratic establishment founded in the 7th century and was abandoned in the early 11th century. There is one large funerary area of almost 1000 skeletons, located around two religious buildings in the northern part of the site, and several units of variable size distributed around the habitations totalizing 84 individuals. Results presented here concern only containers, which represent 35% of these entire funerary areas.

On this site, it was possible to discuss the choice implied by one or other funerary architecture, in terms of ideological and social expressions. Results have revealed some particular organizations within the cemetery and major cultural changes. The latter concern both the organization of the dead, and therefore the evolution of funerary spaces, and the symbolic functions

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of the burial, where the expression of a sociocultural identity gives way to that of a spiritual collective identity (Blaizot 2011, Blaizot in press).

IDENTIFICATION OF A WOODEN STRUCTURE

The deposit into a box (coffin, bier), or in a framework of boards that can be without a base, is identified by signs of decomposition in a void, constraints, and "linear delimitations" that occur jointly at a distance from the edges of the pit (Duday 2009: 45). It is the reason why only those graves with delimited pits can be taken in account.

Coffins made out of boards

The rectilinear delimitations present straight walls compatible with the assumption of board coffins. No coffin on the site is nailed; of the few nails found, there is never more than one in each grave: they could have been used to assemble two boards on site, or illustrate the re-use of previously nailed boards.

Horizontal shape of the container

The "linear effects of delimitation" make it possible, in theory, to ascertain the horizontal shape of the containers. On the site however, forearms of the skeletons are frequently brought in front of the abdomen; the maintaining of the humerus in lateral position is thus

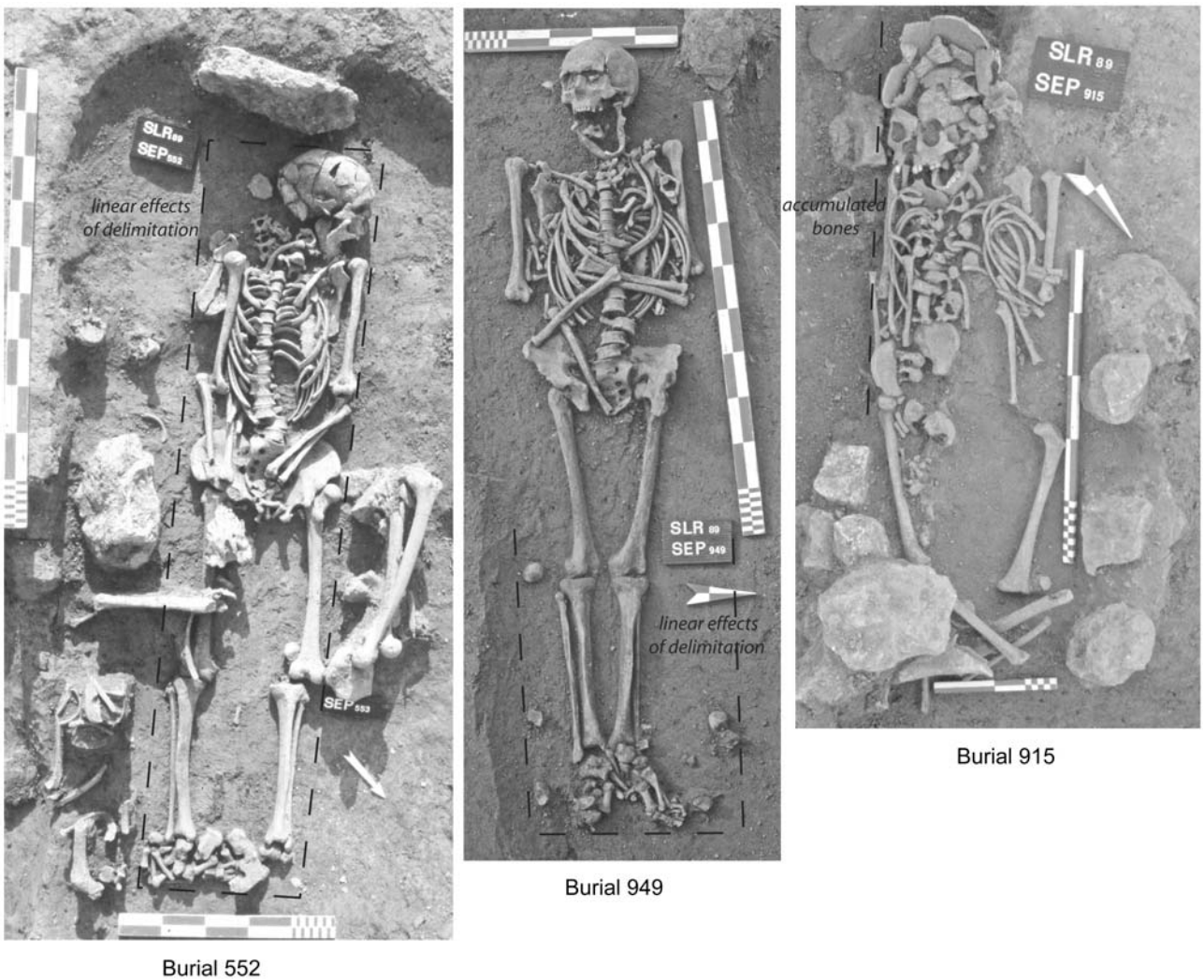

FIGURE 1. Linear effects of delimitation: rectangular coffins. Burials 552, 949, and 915. Photographs by F. Gentili.

not a relevant criterion for constraints, while the possible dispersion of hand bones mainly occurs in the volume of the body. Patella does not fall systematically, and when this is the case, they do not necessarily fall away from the knees. It was therefore difficult to evaluate the horizontal shape of the receptacles, which is mostly revealed by the stone blocks, provided that they are clearly in relation to the arrangement of its walls, i.e., they are lined up on the bottom of the pit against its walls. When the pits hosted successive burials, the bones of the previous ones are arranged between the walls of the pit and those of the coffin, and thus delimit the latter (burial 552, *Figure 1*).

Skeleton 552 shows three linear delimitations (*Figure 1*): the first is observed on its left side, where no part transgresses the limit given by the anterior side of the skull and the reversed left femur. The second delimitation effect is found on the right side, the lower angle of the scapula is reversed, indicating that the humerus was abducted before falling against the ribs, and aligned on the leg slightly laterally shifted in relation to the femur. Lastly, the third delimitation effect is on the feet where scattering reveals a wall placed N-E. The organization of the dislocated foot bones of skeleton 949 evokes three walls, on each side of the legs and at the end of the feet (*Figure 1*). The bones of skeleton 915 have accumulated on its right side, because of the underlying burial 916, which, by compacting, drew the coffin of 915 onto this side (burial 915, *Figure 1*). Bones collide with a rectilinear limit on the right side of the body, parallel with the stone alignment located on the left of the skeleton, giving an indication that the coffin was rectangular.

The arguments provided by different events in these three previous examples illustrate deposits in rectangular coffins.

In contrast, grave 384 illustrates a mode of dislocation of the feet which reflects walls forming a narrow space at the end of the pit (burial 384, *Figure 2*); the width being smaller than that found at the shoulder level, it is possible to consider a trapezoidal coffin.

In grave 789, the floor was disrupted because of the sharp gradient at the bottom of the pit starting from the shoulders (burial 789, *Figure 2*). This event explains the dispersion of vertebrae and ribs, and displacement of the cranium that occurred over the entire width of the coffin. In the upper half of the skeleton, the width is much greater than that measured at the feet level; the effects of constraints provide the side boundaries of the coffin (the bones of the hind tarsals being reverted; the fore tarsal and the left metatarsals fell forward inwards, while the right metatarsals are partly ploughed up on the left foot). Such observations suggest that the container was trapezoidal.

A small group of graves is characterized by stacks of two or three coffins directly on top of each other, the subsequent always being shifted a third upwards at one end. The collapse of the most recent coffin occurred within the boundaries of the previous, causing major disturbances to the skeleton it contained. By collapsing, the bones came up against the side walls of boxes, and the way they have been scattered shows that the shape of these coffins was trapezoidal.

Each time, the part overhanging and upwards of the boundaries of the oldest coffin collapsed partly inside the latter. For example, the collapse of the second coffin in grave 830 (830-A) caused a "shortening" of the trunk, and involved the displacement of the left side of the skeleton towards the median longitudinal axis of the body (burial 830, *Figure 2*). The remains of the first skeleton (830-B) have been collected at the N-E end of its own coffin, down from the feet of the most recent burial, and partially retained the anatomical connections of the lower limbs.

The trapezoidal shapes are, however, difficult to evaluate; an U-shaped shrinkage of the floor (in cross section), frequently generated by the softening of wood (Hunot 1996: 190–191, Fig. 7), or a limited rupture of the wood can move the lower limbs, or one of them, towards the medial line of the body, and thus, distort the interpretation of facts.

The question of a floor

The floors are, in theory, difficult to identify, unless they have themselves been in disequilibrium during their collapse, causing some bone displacement.

In some graves where the archaeological and anthropological data indicate the presence of a coffin, the thorax presents a particular position, since the ribs are "open", i.e., oriented perpendicular to the longitudinal axis of the body (burial 33, *Figure 3*). This position transcribes an elevation of the vertebral column, indicating that a floor collapsed laterally. This pattern was observed in burials of late Antiquity in the Rhône Valley, and has been interpreted as illustrating a floor consisting of two parallel boards (Blaizot *et al.* 2001: 284). These arguments, however, can not be retained for very young children: ribs are not arranged obliquely at this age, they are usually found open like a fan (Duday 2009: 58–61).

An imbalance of the floor is caused by the profile of the bottom of the pit, for example, a depression on the

longitudinal axis, a rounded cross-section, or an abrupt rise or fall at one end. In all these cases, specific anomalies occur as shown by the upper part of the skeleton 789 (*Figure 2*).

The first one can be described as "descent of the thorax", because the ribs are too low, those at the lower end being in contact with the hip bones. In grave 632, ribs are located down from the scapulae, completely uncovered, and the vertebrae have descended inside the pelvis, but without pushing the sacrum: the spine offsets pressure by twisting and by rejecting several vertebrae laterally, since TH12 is in contact with L5 (burial 632, *Figure 3*). The right humerus slipped downwards, but the left shoulder and the right clavicle, instead, were pushed upwards to the cervical level. This upwards movement reflects an aspiration that can be linked with a floor fracture occurring behind the scapulae, while the position of the forearm, behind the ribs, indicates rising of the central part of the floor.

The second anomaly is characterized by a "lengthening" of the trunk, which is stretched in the thoracic and lumbar areas. The lumbar and sacral spines of the skeleton 949 seen previously (*Figure 1*) slipped into the pelvis, and the femoral heads are separated from the acetabulae and pass behind the ischiums, reflecting occasional separation and lifting, caused by the abrupt

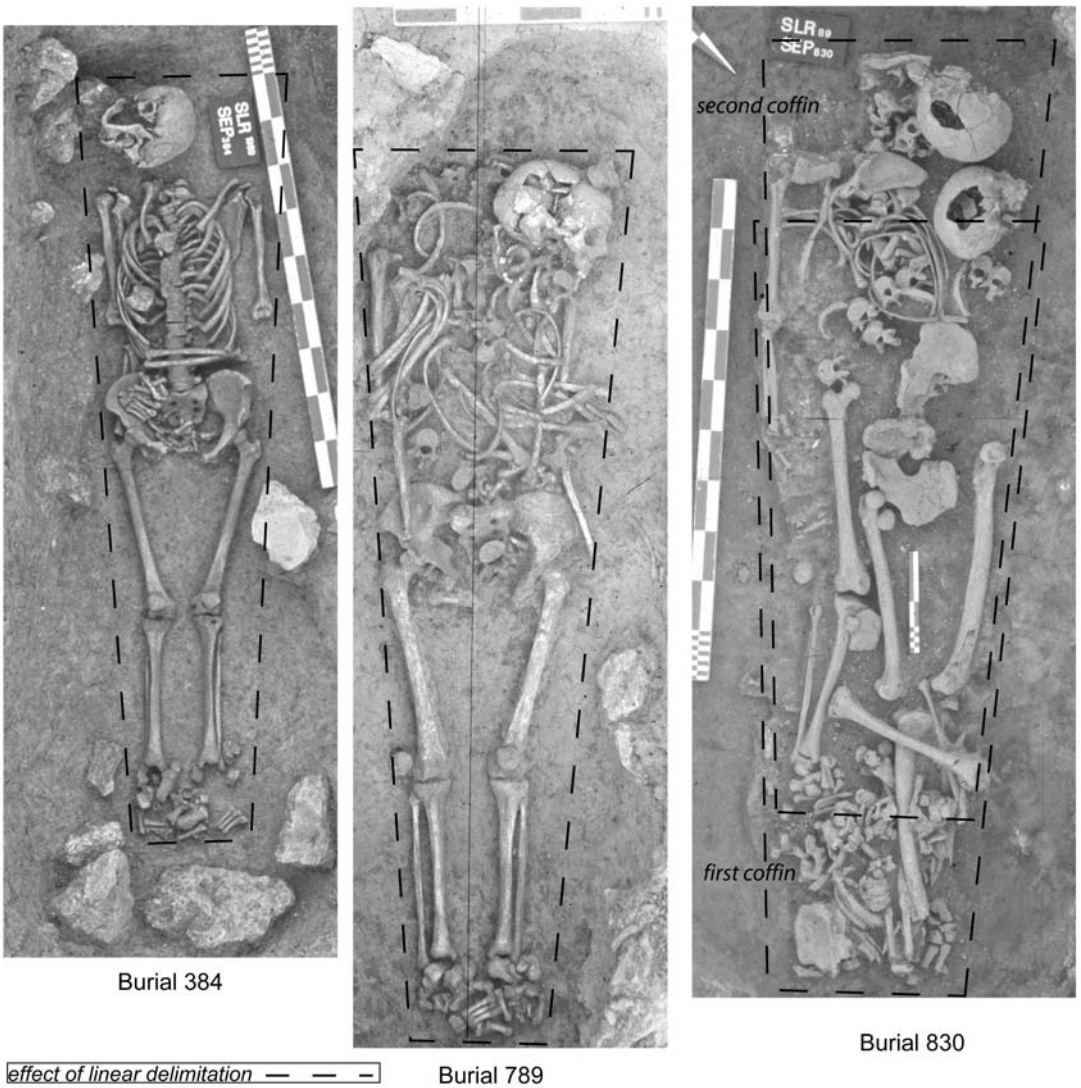

FIGURE 2. Linear effects of delimitation: trapezoidal coffins. Burials 384, 789, and 830. Photographs by F. Gentili.

rise of the bottom of the pit behind the shoulders of the skeleton.

The assumption of a raised floor has to be rejected in most cases, since the skeletons show no signs of collapse causing aspirations towards the bottom, nor displacements accompanied by gaps, contrary to what we will see later. Questions arise concerning some skeletons whose trunk is stretched in the direction of the bottom slope: a support could have been placed in the deepest part of the pit. In fact, the absence of such anomalies does not necessarily mean the absence of a minimal floor elevation, but only states that the burial does not provide the evidence for it. A wedge whose thickness is less than 5 cm causes, in theory, less disruption than a 10 cm high cross-piece, but the way floors decay and dislocate, whether or not there is some elevation, may vary according to a large number of parameters. Some of these parameters relate to random situations, for example, uncompacted sediment on the bottom of one part of the pit, or collapsing walls or stones that produced an impact of sufficient violence to destabilize the floor in the course of decomposition, and so on.

For this reason, depending on the construction and the decay of the void together with the irregularities of the pit's bottom, other anomalies appear less specific. For example, the floor of the coffin, in tomb 888 (*Figure 3*), broke transversely in two places, probably because of the slope at the bottom of the pit, and so caused the dislocation of the cranium, and a collapse in the abdomen (the right hip bone slipped downwards). The floor was fractured on the median longitudinal axis of the pit,

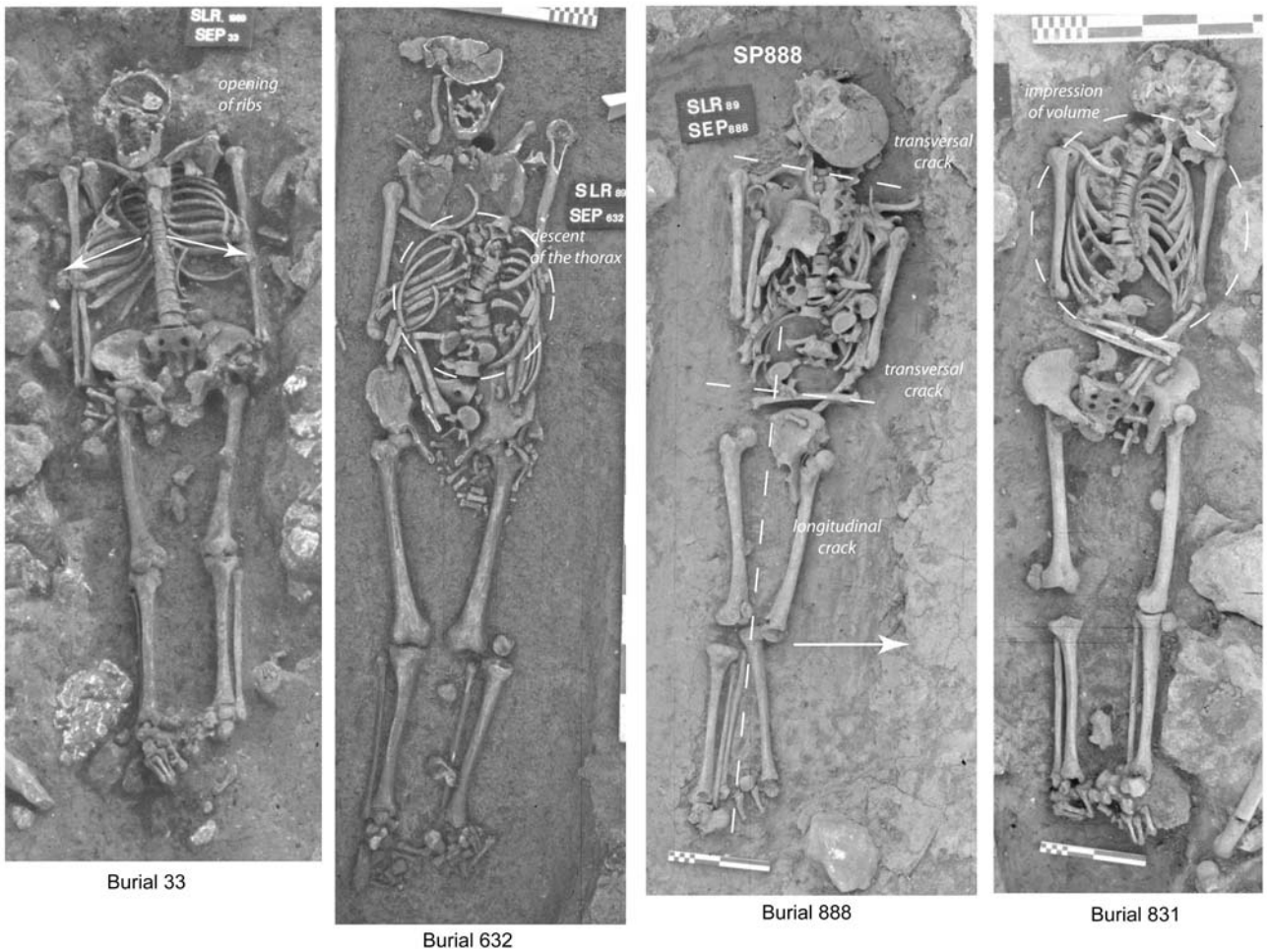

FIGURE 3. Evidence of a floor. Burials 33, 632, and 888. Absence of a floor (burial 831). Photographs by F. Gentili.

leading to a collapse, similar to that of drains, of the lower half of the skeleton. Downwards slips remain weak (the right ilium, the left femur, and the right leg), and are linked to the fall of bones into the deeper parts of the pit. The assumption of a U-shaped bottom of the coffin is rejected, because clavicles remained horizontal, scapulae rested flat on the ground and did not move behind ribs, and because the latter did not push back vertebrae. The position of the left calcaneus, the left hip bone, the sacrum and, undoubtedly, the lumbar vertebrae, is due to water stagnation in the pit.

Frameworks, demonstrated by low benches that held the boards at mid-height of the pit walls, or by stones which maintained them, were identified at Les Ruelles. Several of these frameworks do not seem to have been provided with a floor. However, the demonstration of the absence of a floor rests more on negative arguments (no evidence of floor) than on positive ones (the body is lying on the ground). Tight containers provide an effect that can evoke a lack of floor, because lateral pressures exerted on the ribs by the arms, combined with constraints on the shoulders, can maintain an impression of volume (burial 831, *Figure 3*). In this case, the characteristics of the bottom of the pit sometimes answer the question; for example, a sudden dip of the pit under the upper third of the trunk straightens scapulae, and no disturbance affects spine and ribs, contrary to what would have happened if there had been a floor. In theory, the body would sink into the ground as it decays, but the absence "of ground effect" may just as well reflect an absence of floor (sinking of the body in the sediment, or filling from the bottom), as a fast specific filling because of a leaky lid. It may also result from the decay conditions of the wooden floor, that are soaked with the

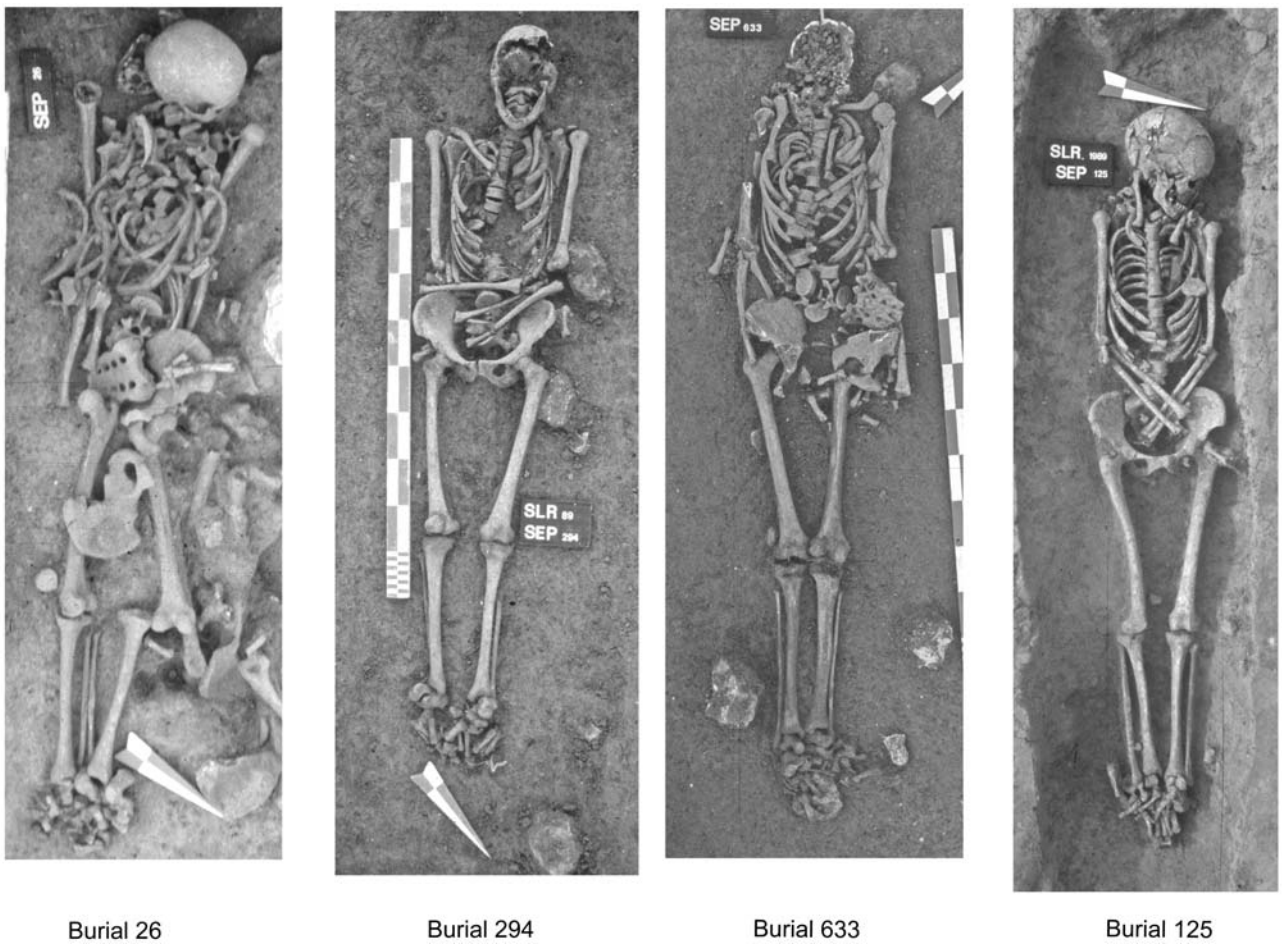

FIGURE 4. Tree trunk biers burials: 633, 294, 125, and 26. Photographs by F. Gentili.

juices of decomposition, and allow the body to sink as it would be in case of a deposit on the ground (Peressinotto 2007: 175).

Evidence of tree trunk biers

Some anomalies on skeletons demonstrate the presence of a narrow coffin, the floor frequently dug out in a gutter shape, evoking tree trunk biers. Blocks of stone, found in contact and sometimes behind bones, in the theoretical space of burial, also constitute a fairly reliable identification criterion; located at the base of the convex angle of the coffin, they were intended to prevent it from rolling, even raised it somewhat. The position of these stones is moreover the only argument in favour of a tree trunk bier whose bottom is flattened.

The consequences of the "U-shaped" morphology vary according to the narrowness of the bottom, its concavity, and the degree of spreading of its walls. The general characteristics of tree trunk biers were published by Duday (2009: 50–52, Duday *et al.* 1990). Here, we will just discuss the phenomena which can specify the shape of the hollow in the trunk.

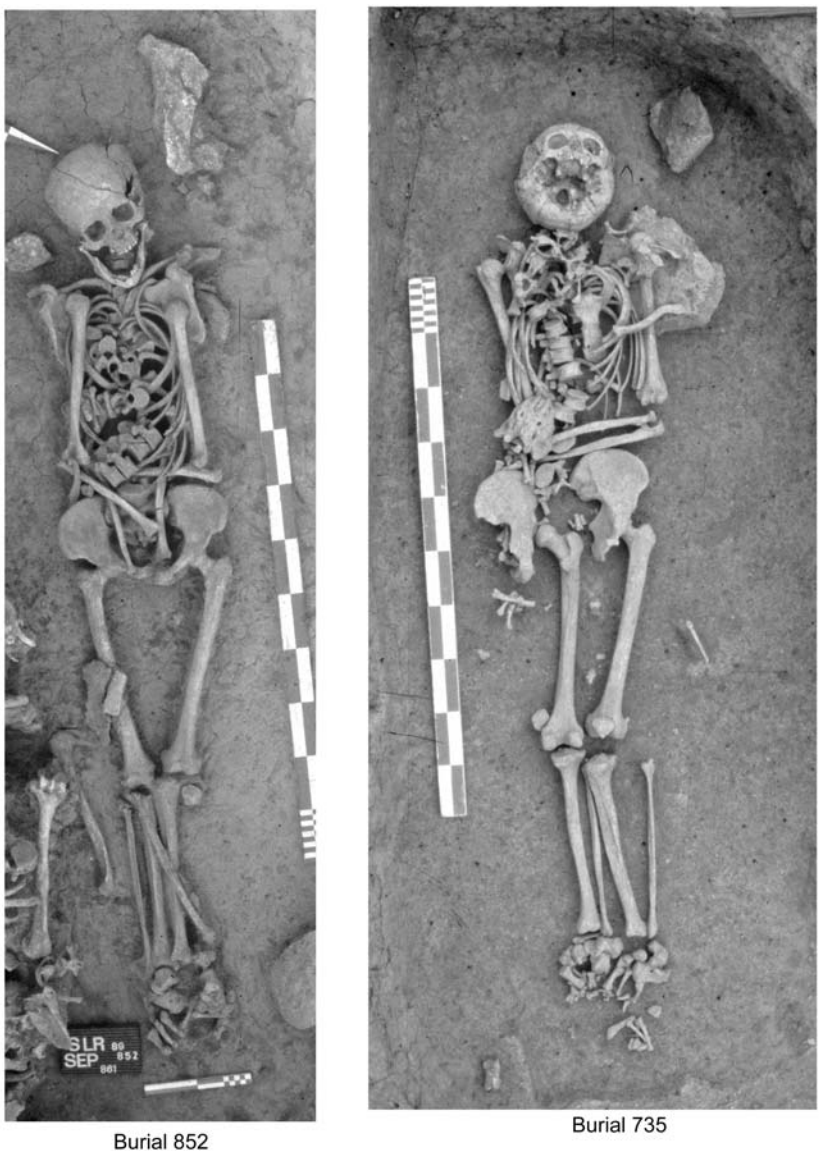

FIGURE 5. Tree trunk biers burials: 852 and 735. Photographs by F. Gentili.

The horizontal morphology of the inner space (hollowed part) is difficult to define. Narrowness and concavity of the bier force limb bones to move close to the median longitudinal axis of the body. The appearance of the body varies according to the cross section (*Figure 4*); in a widened trough, humerus appear in an internal position to the lateral boundaries of the hip bones; in a low trough, they rest at the same level as the vertebrae; when walls are slanted, they are raised, but in the case of vertical walls and a narrow section, they are found in front of the scapulae (*Figure 4*). When the cross section is broad with a deep concavity, they pass partly behind the ribs with the scapulae. The deeper the gutter is, the more the skeleton presents an effect of "transverse crushing":

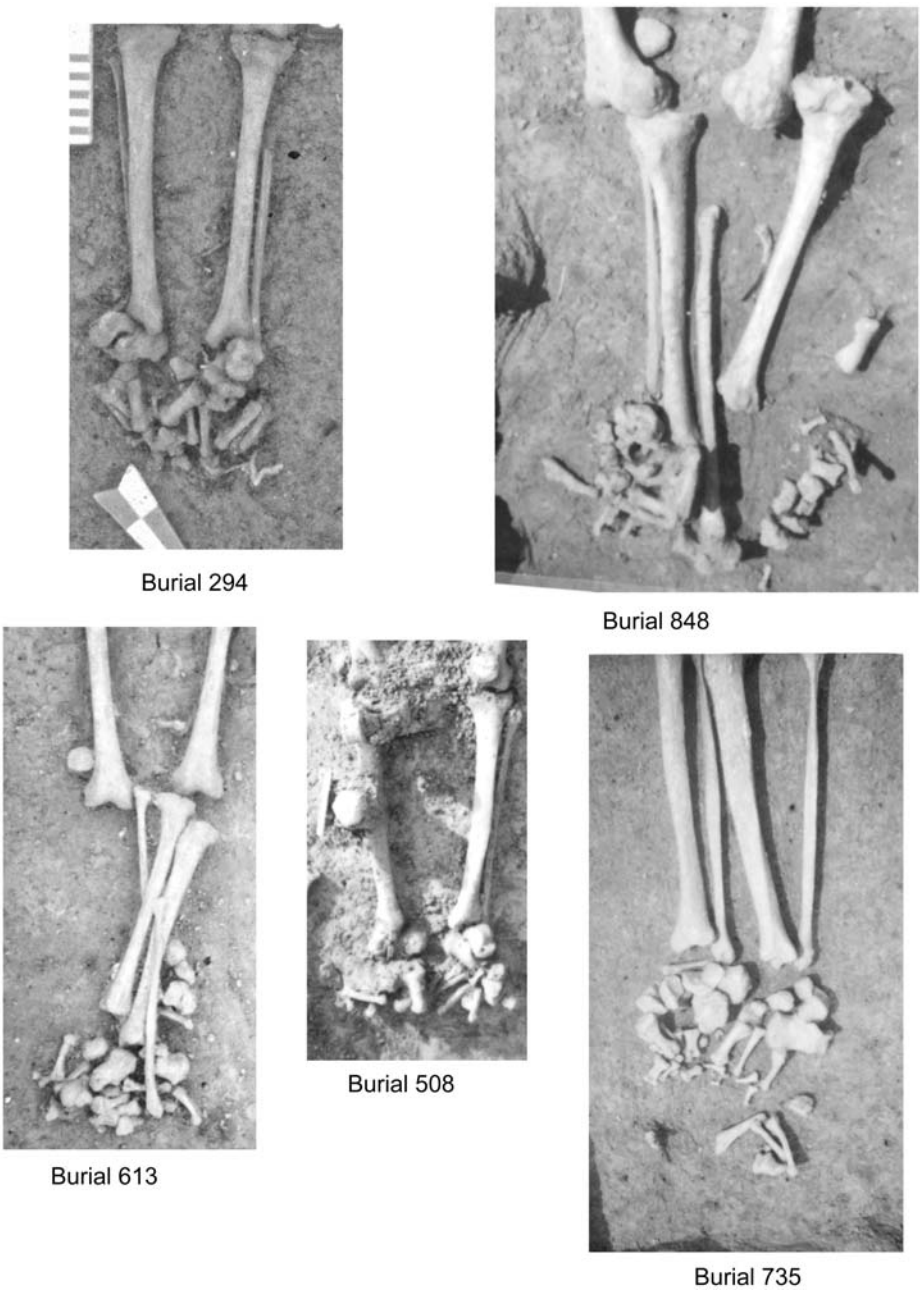

FIGURE 6. Behavior of feet in tree trunk biers. Photographs by F. Gentili.

scapulae move towards the median line of the body back to the ribs, in contact with one another, vertebrae are ejected forwards, ribs and femurs fall behind the hip bones that move towards one another (burial 26, *Figure 4*).

The U-shape, like a gutter, contributes to a slight descent of the skull and trunk downwards and towards the bottom of the bier. Whenever the slip affects the entire upper half of the skeleton, the bottom of the pit appeared generally irregular (one depression on the longitudinal axis, or an abrupt slope). In some cases, where the bottom of the pit is flat, lateral wedges holding the bier may also be involved (burial 852, *Figure 5*). The modifications of the anatomical relationships and the disarrays of the trunk area have thus been caused by a crumbling of the bier bottom, or by its transverse fracture. Lastly, one may also wonder whether the longitudinal profile of the bottom of the bier was necessarily horizontal; it could be sloping from the head to the pelvis, thus raising the upper half of the body. Indeed some graves show that the skull rests a few inches less deeply than the rest of the skeleton and sometimes feet bones slip upwards, while a part of them remains "trapped" at their initial location (burial 735, *Figure 5*), indicating that the floor could rise at this end too.

In the bier with a U-shaped section, the feet often fall on the bottom. The shape of the delimitations illustrated by the dislocated bones provides information on how the trunk has been hollowed at this end. The scattered bones might define a rounded shape, provided evidence that the wall was slanted towards the bottom and the feet were resting on its slope; they may be stretched in length too, when the bottom was flat at this point of the longitudinal axis and the wall was at a certain distance from the feet. In other cases, less common, the delimitation forms a straight line perpendicular to the longitudinal axis of the skeleton (*Figure 6*). Thus, trunks are sometimes hollowed by following the morphology of the material, or by cutting at right angles (*Figure 7*). Because the

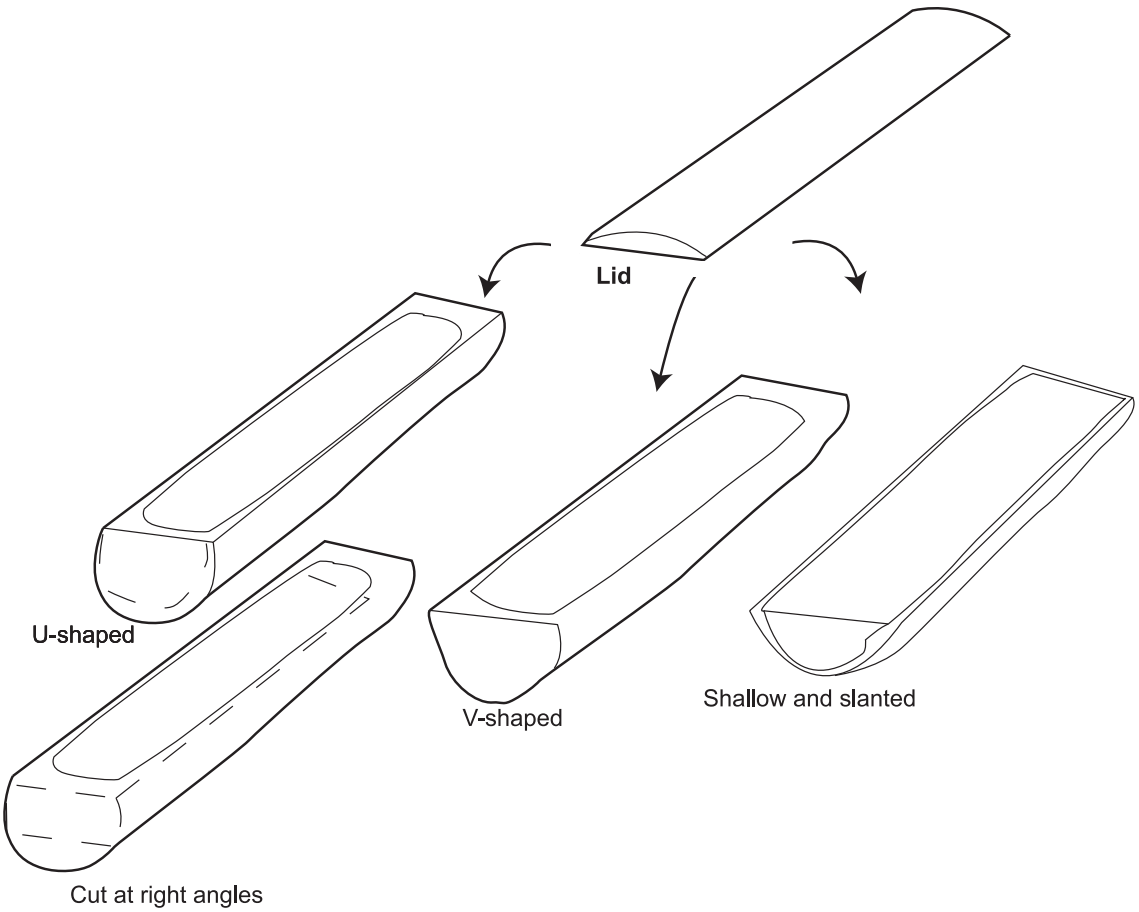

FIGURE 7. Reconstitution of the tree trunk biers. Drawing by F. Blaizot.

transverse concavity frequently leads feet towards the median longitudinal axis, one cannot often determine whether the tree trunk has been hollowed into a trapezoidal shape, of which we have examples from the site of Oberflacht, in the Baden-Württemberg, Germany (Schiek 1992: Pl. 111). The possible cases identified on the site Les Ruelles, come from graves where skeletons are not constrained at the shoulders, but this may indicate a trapezoidal shape, or less concavity behind the trunk than under the feet. We cannot thus answer this question.

The length of the tree trunk bier could be appreciated in some cases, which showed that they were relatively long. The arguments are different to those retained in the case of board coffins, since all the constraints recorded on the skeleton translate only the size of the space dug out inside the tree trunk. However, the internal space may be much less than the length of the tree trunk. In some graves, the wedge stones of the bier are located at rather a long distance from the skull and feet of the skeleton, indicating a certain length of tree trunk. Moreover, the strong slope of the pit of one grave required a support to keep the bier horizontal, and the fall of this to the bottom of the pit caused stretching of the upper part of the body. The delimitations recorded on

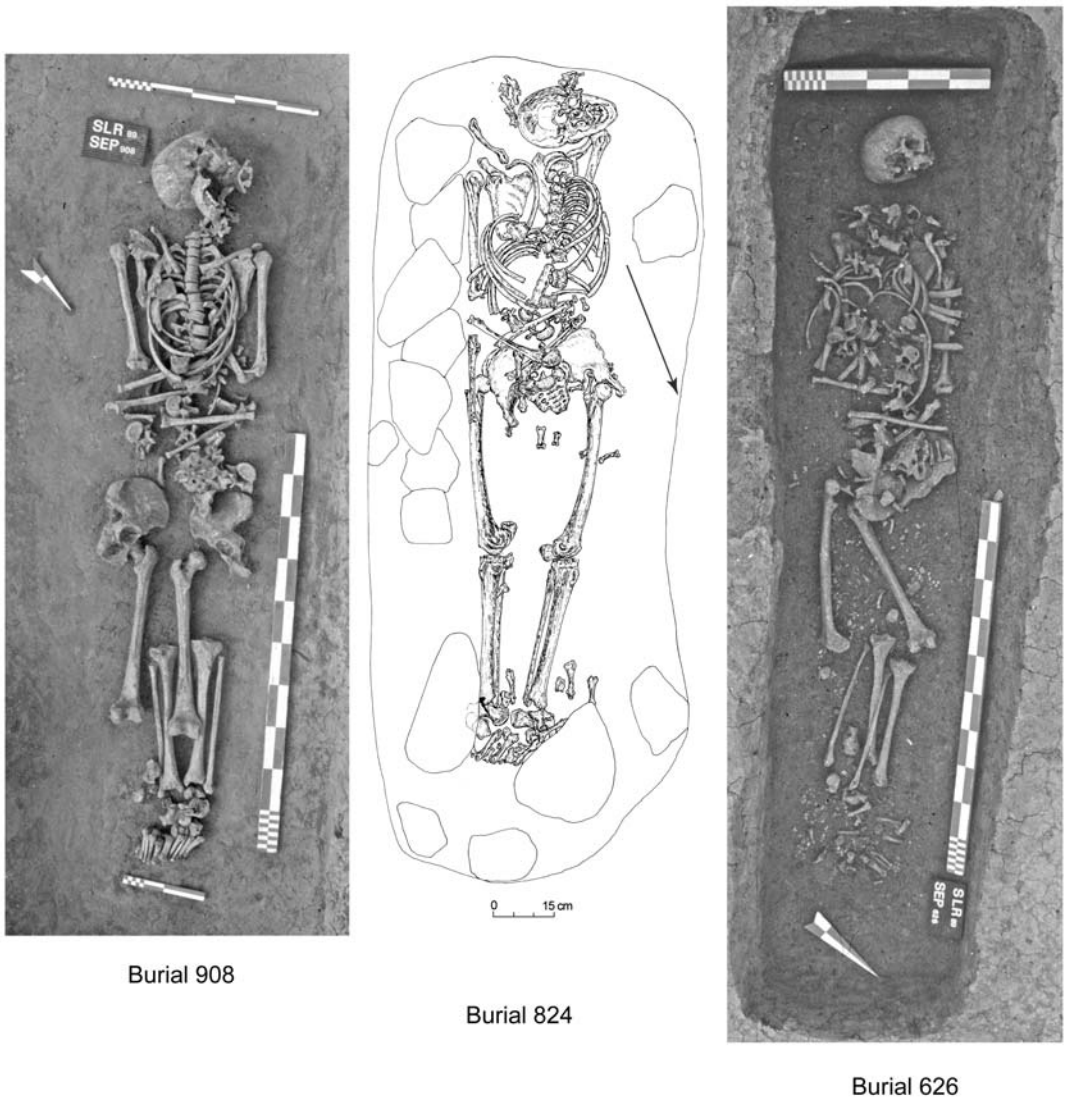

FIGURE 8. Effects of tectonic plates and lengthening of the trunk: burials 908, 824, and 626. Photographs by F. Gentili. Drawing by F. Blaizot.

the scattered bones show that this stretching occurred within the boundaries of the bier, and that the internal space could be longer than what the "stocky" appearance of the skeleton collapsed in the gutter leads to suggest. This is also what the downward displacement of small foot bones indicate in some graves.

THE CLASSIFICATION OF DISLOCATION PROCESSES OF THE SKELETON AND RECONSTRUCTION OF THE FITTINGS

Several anomalies recorded on skeletons, characterized by the relatively large amplitude of the displacements, indicate that these skeletons, or certain parts of them, have collapsed or slipped during the decomposition of the body. We tried to classify these anomalies logically in the hope of identifying particular fittings. It is of course impossible to show all the variants of the situations in each category, within the framework of this article; we will thus expose the most obvious examples.

"Lengthening" of the trunk

This phenomenon, mentioned previously in connection to coffin floors, is illustrated here in a more spectacular way. It is observed in tree trunk biers, and in board coffins where it is systematically accompanied by gaps and/or plate effects, namely by a segmentation of the anatomical areas usually split into three parts (the skull and/or the thorax, the pelvis, and femurs, and finally bones of the legs and feet). Generally, shoulders and arms remain more or less at their original location, whereas the whole trunk slips downwards, while there is often an overlap at the knees.

In the grave 908, the stretching of the trunk of the skeleton starts at the lumbar spine level, while hip bones and femurs moved downwards, the left femur was in front of the legs, indicating that a support broke and that its detached parts moved (effect of plate) (*Figure 8*). The widening of the intervertebral spaces of the lumbar and sacral vertebrae, and the position of hip bones give a stretched aspect to the abdomen.

The lengthening of the trunk of the skeleton 824 is illustrated by a significant gap in the area of the abdomen, and by the slip of the sacrum downwards, while a violent dislocation affects the bones of the head and the neck, at the base of which another gap is observed; the left shoulder girdle and humerus moved upwards, pushing into this space, partly back to the mandible. The stretching of the trunk and the downward slips occurred in the opposite direction to the slope of the floor (*Figure 8*).

Skeleton 626 was in a tree trunk bier, as shown by the slip of the lower limbs in the direction of the median longitudinal axis of the body, and the closeness of the scapulae (*Figure 8*). Two gaps are recorded, one at the neck and the other in the area of the abdomen. The cranium is isolated from both the mandible and the cervical vertebrae which form a heap below, while the lumbar spine is very distended. Humerus, pelvis, and femurs slid down, as did the left leg and most of the foot bones, obviously pushed to the end of the bier.

"Shortening" of the trunk

This anomaly, in contrast with the previous one, was found in many grave pits, but more rarely observed on skeletons that came from containers. These graves are characteristic in that the pelvis and lower limbs have not moved downwards and no tectonic plate effect in the area of knees was recorded. In any case, the space between the edge of the cephalic niche and the pelvis appears too short for the trunk.

The anomalies found on the upper part of skeleton 689 are the following (*Figure 9*): the spine is sinuous, with lateral displacements of vertebrae. The situation of the proximal end of the left humerus, separated from the scapula fallen to the bottom, proves that the body was raised above the bottom of the pit. The significant dip of the distal end of the humerus provides the information. The lower limbs of the skeleton are not affected by major disturbances, but the femur is displaced laterally to the leg.

Descent of the trunk

In several graves, only elements of the thorax slipped downwards. In the coffins, this movement is associated with plate effects and gaps. The movement of the trunk of skeleton 434 was followed by the right hip bone and the left femur (*Figure 9*). All the ribs are lower than the scapulae and all the vertebrae are dislocated. A gap has been created, from a point above the right hip bone to the base of the left. The forearms, engulfed in this space, are dip steeply, reflecting collapse. The covering of the feet by the distal ends of the tibias (plate effect) is the sign of another break. Lastly, the rotation of the cranium, the fall of the mandible appearing on its posterior side, and the scattering of the cervical vertebrae, illustrate a third break.

Descent of the upper half of the body with "tectonic plate" effects and/or gaps

These phenomena have occurred in pits where the bottom presented a depression on the median longitudinal axis, or in flat-bottomed pits, and they affected burials made in board coffins. In grave 423, which illustrates the first situation, the upper half of the skeleton slipped into contact with the upper edge of the hip bones, only the right scapula may have retained its original position (*Figure 10*). The stacking of clavicles, the position of the right first rib and the vertebrae at the base of the neck (including TH1–3), and the orientation of the upper ribs, reflect a collapse in this area. The skull slid down against the right scapula. In reality, the upper two thirds of the skeleton have descended, as shown by the plate effect on the knees.

In the flat-bottomed grave 761 (*Figure 10*), the position of two cervical vertebrae and the mandible, above the cranium, determines the initial position of the latter and that of the trunk, which have descended within the volume originally occupied by the body, into contact with the pelvis that remained in its initial position. The

FIGURE 9. Shortening and descent of the trunk. Burials 689 and 434.

preserved lower half is in its initial position, and the gap observed at knees may not be significant: it seems to have been caused by the digging of a later grave.

Stretching of the lower limbs

This phenomenon is observed several times, in grave pits and in board coffins, caused by various processes. Some skeletons are characterized by a mode of dislocation *in crescendo* of the pelvis bones and/or lower limbs.

In the grave 669 (*Figure 11*), a sliding movement starts from the thorax and humerus, and continue on the lower limbs with some of the bones remaining articulated (right leg and foot). The distance between the leg and the right femur is higher than the norm; this femur slipped downwards, as well as the sacral vertebrae (lateral position to the right femoral diaphysis) and the right ischium found at the distal end of the right femur.

The stretching is particularly important in grave 474, since tibias are located well away from femurs, and the

FIGURE 10. Descent of the upper half of the body: burials 423 and 761. Photographs by F. Gentili.

latter away from the pelvis bones which are spread out (*Figure 11*). Although the anatomical relationships of the trunk are globally preserved, the skeleton illustrates tripartite fractures occurring at the back: one in the neck area, one under the abdomen, and one under the knees. The effect of "abutment" observed on the skull (upright and swivelled right), and the position of one tibia, perpendicular to the longitudinal axis of the body, indicate that walls were initially present at a distance from the edges of the pit.

Spacing and unilateral plate effects

In grave 824 seen above (*Figure 8*), lateral dissociations were identified such as spacing of the femoral heads, medial slip of the left humerus and shoulder girdle behind ribs. In the case of skeleton 839,

FIGURE 11. Stretching of lower limbs: burials 474 and 669.

displacements particularly affect the median longitudinal part and the left part of the trunk (*Figure 12*). First, the trunk and the hip bones have slid downwards, because ribs are very close to the femurs, and pelvic bones are spread out between the thighs. Then, the right ribs and hip bone slant inwards, while the left ones have moved to cover them. Furthermore, the cranium has collapsed since the frontal bone is in contact with the right shoulder, the lumbar spine is stretched and the right leg has moved downwards in relation to the left one.

The trunk of burial 791 evolved independently from the rest of the skeleton. On the right side, humerus, elbow, hip bone, femur, and knee moved away from the median longitudinal axis of the body; the left trunk, hip bone, and the sacrum turned about 15° to the right side in their upper part, so that the ilium came to cover the forearm (*Figure 12*). The distancing of the left lower limb and the separation of the knee followed this movement, while the right scapula and humerus seemed to have been raised with the trunk, maintained laterally by the south-eastern wall of the coffin, slid against the postero-lateral side of the scapula.

In tree trunk biers, the gaps, signs of ruptures, are accompanied neither by mass displacements nor by tectonic plate effects. For example, in the upper half of skeleton 532, an empty area separates the left ribs, scapula, and forearm from the humerus (*Figure 13*). In the first section, the bones, completely reverted, were in

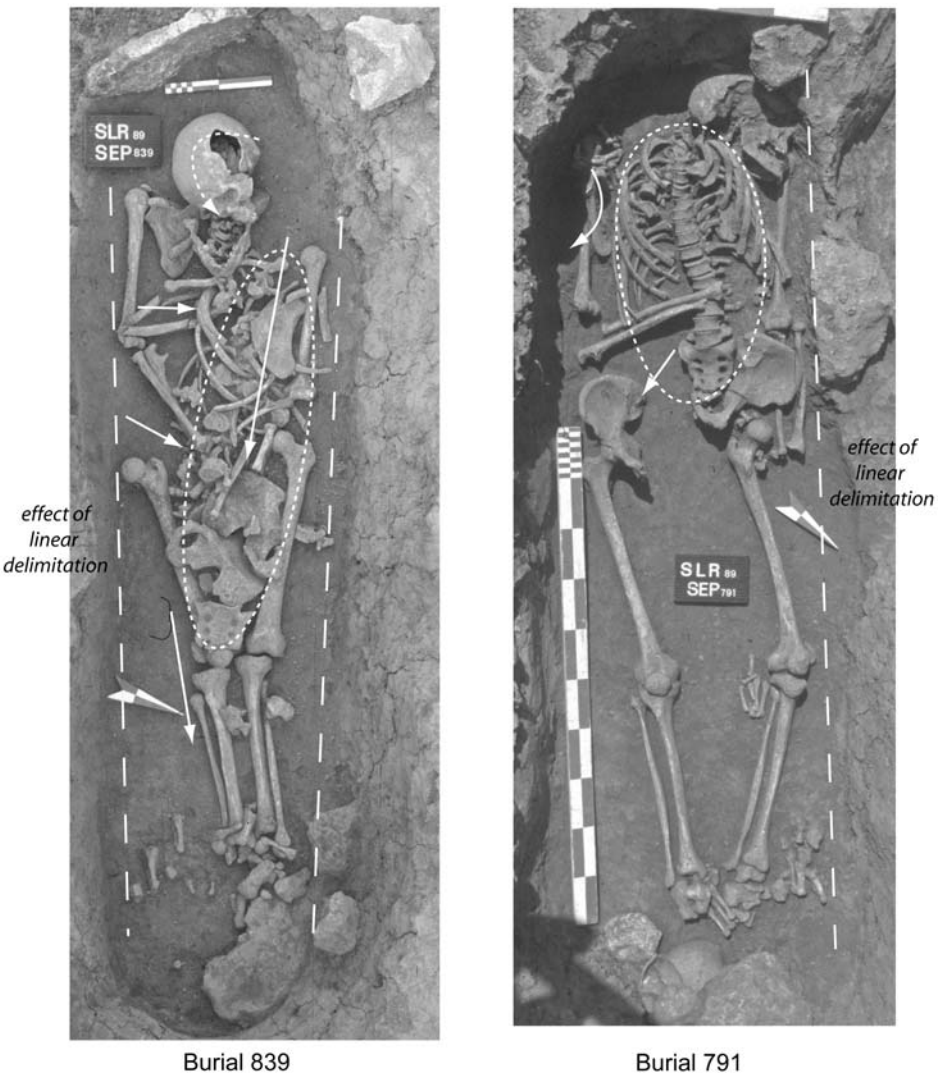

FIGURE 12. Spacing and unilateral effects of plates: burials 839 and 791. Photographs by F. Gentili.

unstable equilibrium, and in the second, the left humerus had posteriorly swivelled and was pressed against the dislocated vertebrae, in front of the partly reverted ribs compressed against the right upper limb. On skeleton 600, in addition to the transversal ones, there are two other fractures on the longitudinal axis of the body (*Figure 13*). The first draws a line from the right shoulder to the left elbow; this line separates a group of vertebrae and the left ribs reversed and upright in the right lower part of the trunk, from another section composed of left ribs whose heads are gathered toward the top and the right, in the upper part of the body. Dislocation of the hip bones and the last two lumbar vertebrae, as well as the upwards displacement of the left femur and tibia

FIGURE 13. Spacing and unilateral effects of plates: burials 532 and 600. Photographs by F. Gentili.

illustrate another collapse, with a probable second longitudinal fracture which explains the misalignment one from the other of the lower limb bones.

Anomalies of situation and reversal of elements in anatomical connection

Some skeletons are distinguished by the fact that a part (or all) of the trunk appeared in its posterior view, while other anatomical areas indicated that the body was originally buried on its back.

The thorax of skeleton 597 moved upwards and slightly to the right, as indicated by its position in relation to that of the upper limbs (*Figure 14*). Everything indicates that the upper half of the body was detached and reversed, while lower limbs have fallen in mass to the bottom (no plate effect neither slip of the whole body

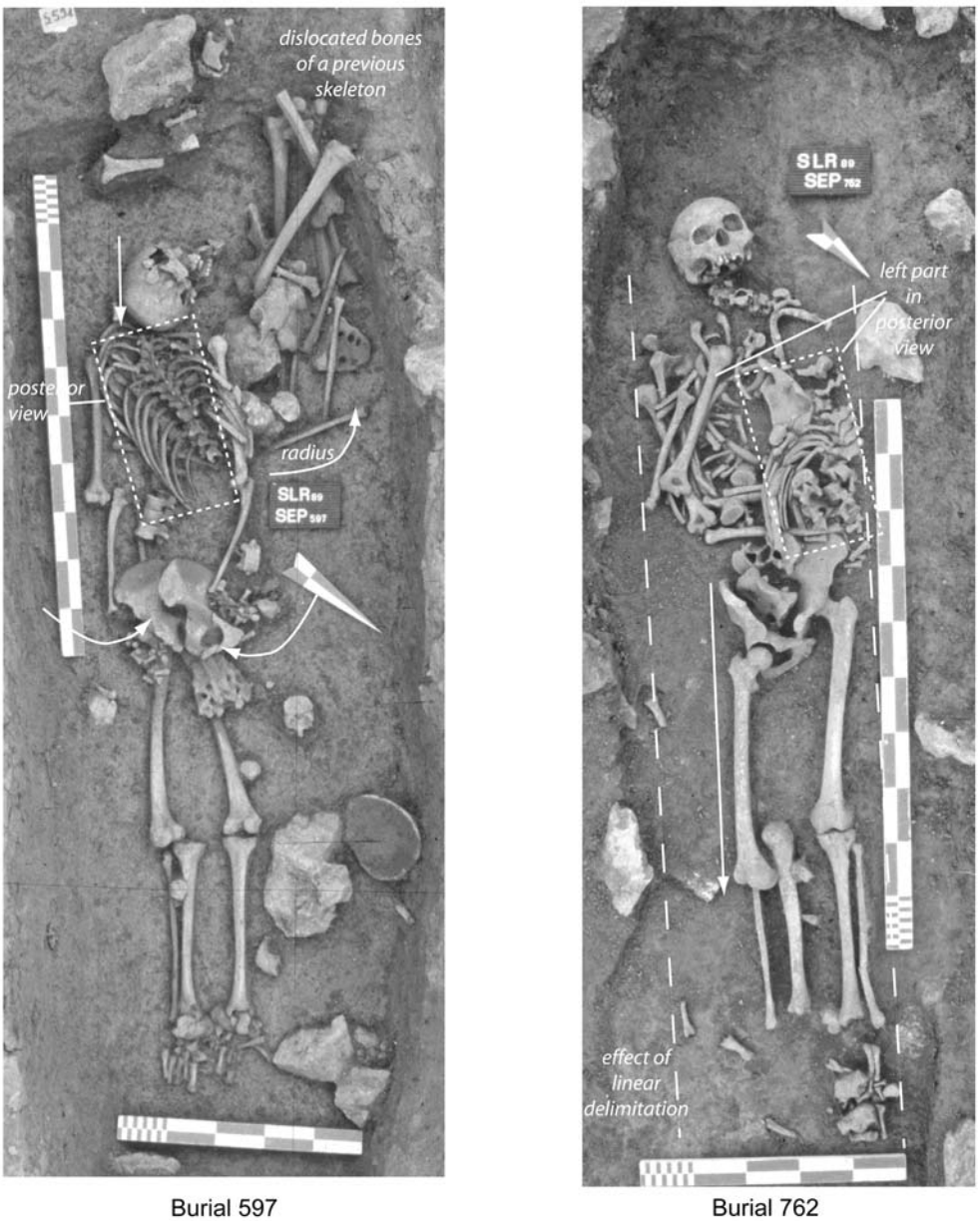

FIGURE 14. Anomalies of situation: burials 597 and 762. Photographs by F. Gentili.

were observed, the proportions between the femurs and humerus seemed correct). Scapulae and upper limb bones, except for the left radius which moved right, remained at their initial location. The cranium, remained articulated to the first cervical vertebra and slid with its front part facing up, while the area of the abdomen is stretched, because the hip bones collapsed in the area of the proximal quarter of the femurs.

In grave 762, only a part of the trunk has shifted (*Figure 14*); vertebrae between the third and twelfth row and the area of the mid and lower left ribs turned over, followed by the left scapula, clavicle, humerus, and radius. The trunk, the right hip bone, and femur have slid downwards, the latter in a correct anatomical relationship, and the distal end of the femur overlapped the proximal end of the fibula. The bones of the feet are too far away from the leg bones. The reversal of the left upper half and of the spine, as well as the partial slip of the right lower limb, indicate that dissociations occurred on the longitudinal axis.

DISCUSSION AND CONCLUSIONS

The examples discussed above illustrate collapses, and mass displacements of anatomical areas more often in adequate relationship indicating that the bodies of the deceased rested above the bottom of the pits. Indeed, bones remained perched several inches above the bottom of the pits or against its walls, or dipping steeply, and those that slid or pushed back ribs or shoulders, indicate a primary or secondary underlying void (for definition, see Duday 2009: 14). These cases raise the dual question of the nature of the item which supported the body and its layout. Furthermore, none of these categories, which rank taphonomic anomalies, illustrate a specific form of funerary fitting (Blaizot 2008); in other words, the analysis of anomalies only provides a theoretical framework prior to explanation, but in no case, a direct interpretation of the fittings.

Most of the skeletons show recurring phenomena, illustrated by their division into several sections: skull/trunk/pelvic bones and femurs/legs and feet, with some variations in anatomical associations. These sections are separated from one another by gaps, or by slipping or stretching of the trunk or lower half of the skeleton being upwards or downwards. Gaps clearly evoke a transversely fractured floor whose different parts slid, by intervals or occasionally by overlapping; they are necessarily a means to find the location of supports, while the lengthening of the trunk or of the lower limbs undoubtedly relates to the slope of the fractured part of the floor where supports were placed. It is possible, in most cases, to imagine cross-pieces such as wooden beams, on which boards oriented longitudinally in the pit were placed. This would explain both the transversal fractures, plate effect displacements and leaning bones (*Figure 15*).

However, many burials do not show any sign of fracture. This is the case, for example, of skeletons that are only characterized by a thrust of the trunk and/or the distal end of humerus against the hip bones, while the lower limbs remained in their original location. This is also the case when the lower limbs show minor dissociations, without any displacement on the longitudinal axis. Nevertheless, in the first case one is tempted to suppose that only the upper part of the body was raised, while in the second, the body seemed to have rested entirely on some support (*Figure 15*). Indications of raising limited to the head and the neck have been identified in several coffins, as shown by the dislocation of the skull bones relative to those of the cervical vertebrae (*Figure 16*). Sometimes, a "cushion" supported the head as far as the upper edge of the shoulders or even the sacrum; in the first case, scapulae are everted and upper ribs reversed, and shoulders are lifted upwards above the skull and cervical vertebrae which collapsed downwards. In the second case, scapulae and humerus slipped downwards to join the thorax.

Generally, "simple" collapses are difficult to interpret, knowing that boards do not necessarily fracture, but they can rot or fall in mass without moving, thereby jeopardizing their identification. When the trunk is shortened, it is possible to imagine that when scapulae and humerus follow the thorax, even on one side, and especially when scapulae are close to the medial longitudinal axis of the body or are reverted, we are faced with a device intended to raise the back. On the other hand, when scapulae remain perched while the trunk slides downwards, whether or not the humerus followed the ribs, we suppose that a wedge collapsed behind the abdomen forcing the upper part of the trunk to tilt, which implied the presence of a floor.

The morphology of the pit has a great influence on the dislocation conditions of the body support, and hence, on those of the skeleton. In other words, the anomalies caused par the decay of the body support are amplified or minimized according to these factors. A pit whose length is much greater than that of the raised coffin will bring down *in crescendo* the anatomical areas, whereas a shorter pit leads to a shortening of the trunk and to tectonic plate effects at the knees. The

position of wedges is constant only when the bottom of the pit is flat (three wooden beams). When the bottom is sloped, wedges are located at the lowest level, or two items rest on the slope. When the bottom is trough-shaped on the longitudinal axis, the wedge is in the deepest part. In a container, when the shortening of the trunk occurred, one can consider that there was no support in the central part of the pit, except perhaps, when some lumbar vertebrae overlap hip bones. However, fast decay of the support, if there is a weakness in this area, will create a secondary void causing the coffin to bend, followed by the trunk. If the coffins are long, such as those of tree trunk biers, the supports cannot always be located, insofar as those at the ends can be placed far from the head and legs: fractures do not occur at the back of the skeleton.

The ribs of some skeletons are horizontal (*supra*, *Figure 3*), and other burials show unilateral plate effects, or maintained articulated anatomical segments are separated and displaced. These displacements occurred on both the longitudinal axis and the transverse axis. The difficulty lies in distinguishing the longitudinal fractures which could have occurred on a single board, from those reflecting the dislocation of several parallel boards. Of the number of cases examined, related to burials in board coffins, the majority show that the median longitudinal

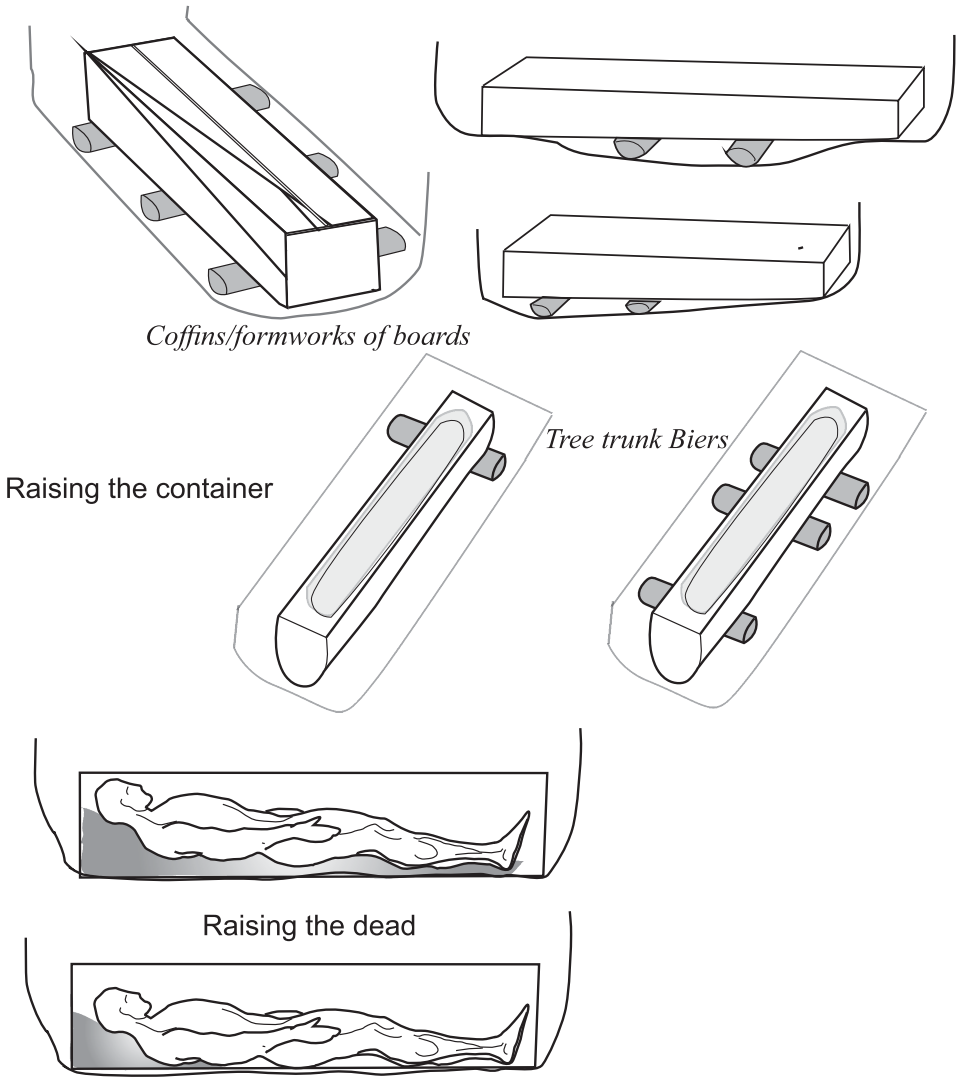

FIGURE 15. Placing of the coffins and tree trunk biers; placing of the bodies. Drawing by F. Blaizot.

part of the skeleton is more subjected to a particular type of movement; indeed, the trunk and/or the pelvic bones generally evolve independently of the rest of the skeleton, and seem to have been raised.

On the contrary, localized and unilateral slides are more likely to concern peripheral bones (scapulae and limb bones). Skeletons 839 (*Figure 12*), 791 (*Figure 12*), 761 (*Figure 10*), 762 (*Figure 14*), and 597 (*Figure 14*) seen previously illustrate these phenomena. Thus, longitudinal dislocations occur and isolate the median part of the floors. This observation leads us to consider that they were composed most often of three parallel sections (*Figure 17*). In graves 597 and 762 seen above, the medial board after having been raised was reversed. Longitudinal fractures occurring on elevated tree trunk biers, indicate that the bottom has cracked (burial 600, *Figure 13*).

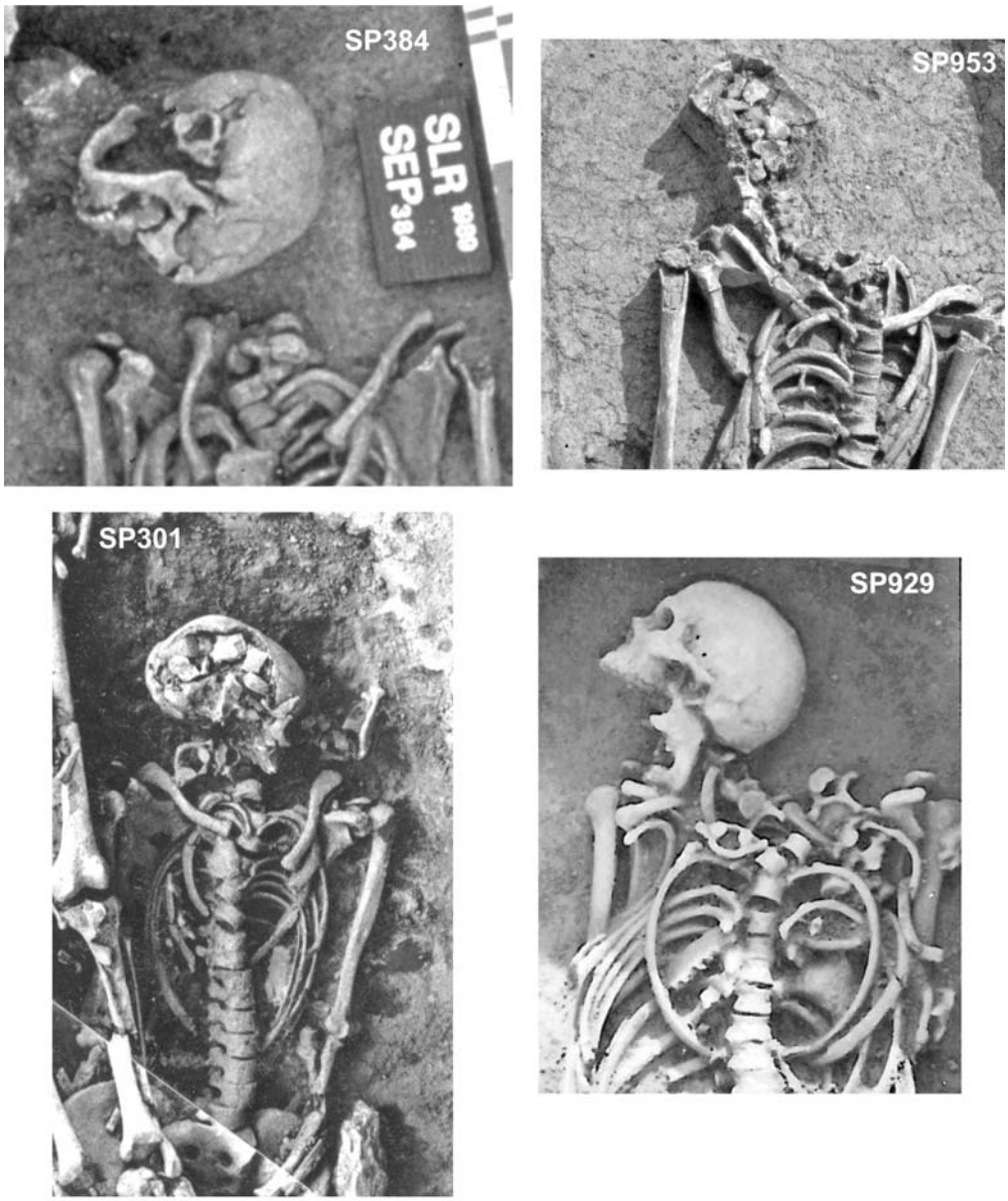

FIGURE 16. Bone dislocations of head and neck, implying a cushion; burials 953, 384 301, and 929. Photographs by F. Gentili.

Several phenomena suggest that many pits were not directly filled by soil. The first arguments to be given are falls of stones towards the bottom of pits or collapsed walls. However, other events indicate that coffins and biers evolved in a void, which implies that pits were closed by a lid. These are all examples where tree trunk biers have shifted, or in which fractures occurred on the bottom of biers or on floors of coffins; the latter have caused displacements of anatomically connected bones over great distances, downwards, upwards and/or outwards. Indeed, if the boards after being disjoined slipped a greater distance than the initial length of the receptacle as determined by the effects of "linear delimitations" raised on other parts of the skeleton, or by the location of any stones which stabilized it, then the pit was not filled. The opposite is more difficult to establish. In grave 839 discussed above for example, the slip of the right lower limb does not exceed the boundaries of the coffin defined by the scattered bones of feet. Does that mean that the pit was filled, or just that we do not have an argument in favour of a lid?

In conclusion, all these examples demonstrate in particular that recording the profiles of the pit is an essential tool for which the analysis of the skeleton alone can not compensate. The profiles help to understand how fittings have been laid out, and also make it possible to interpret why different events occur in cases where the fittings are identical. In addition to the profile of the pit, the taphonomic event depends on a certain number of circumstances, such as physical contact or not between the body and the architecture, the situation and original position of the body in the pit, as well as various hazards (collapse of stones or walls, pit flooding, etc.). Thus, some architectures will have no effect on the skeleton, or similar fittings will not produce the same archaeo-anthropological results. On the contrary, I was able to demonstrate that taphonomic consequences can be similar on skeletons buried differently, insofar as the constraints exerted by the morphology of the burial's space are identical (Blaizot 2008: 7, Figs. 7–8). Lastly, some taphonomic events may overshadow others. For example, if a cushion was under the head or behind the back of the deceased buried in a coffin placed on wooden beams, the consequences of the collapse of the floor can override the dislocations caused by the cushion.

Another difficulty is to imagine the whole system as accurately as possible using only archaeological and archaeothanatological data, having in mind that our restitutions are influenced by both our current technology and the few references delivered by the medieval iconography, which is often posterior to the series under study. That is why we must consider our proposals for

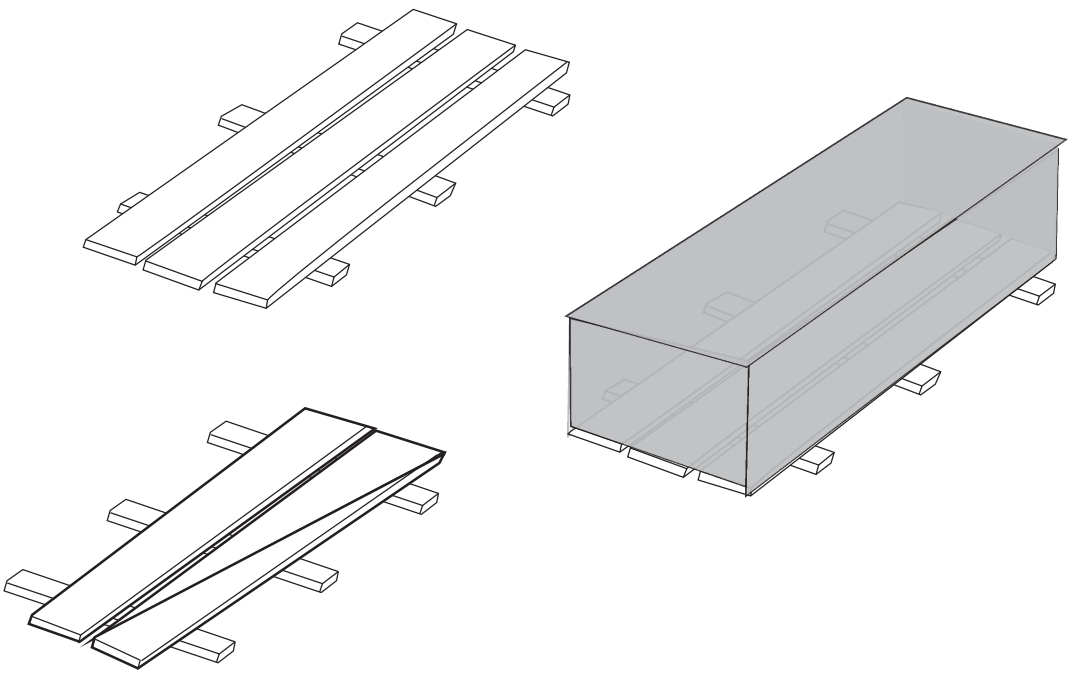

FIGURE 17. Construction of the floors. Drawing by F. Blaizot.

restitution as a plausible assumption, which we were able to make thanks to the repetition of similar anomalies within a single one series. Thus, studies carried out in contexts where organic materials are preserved, currently constitute a priority research topic.

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