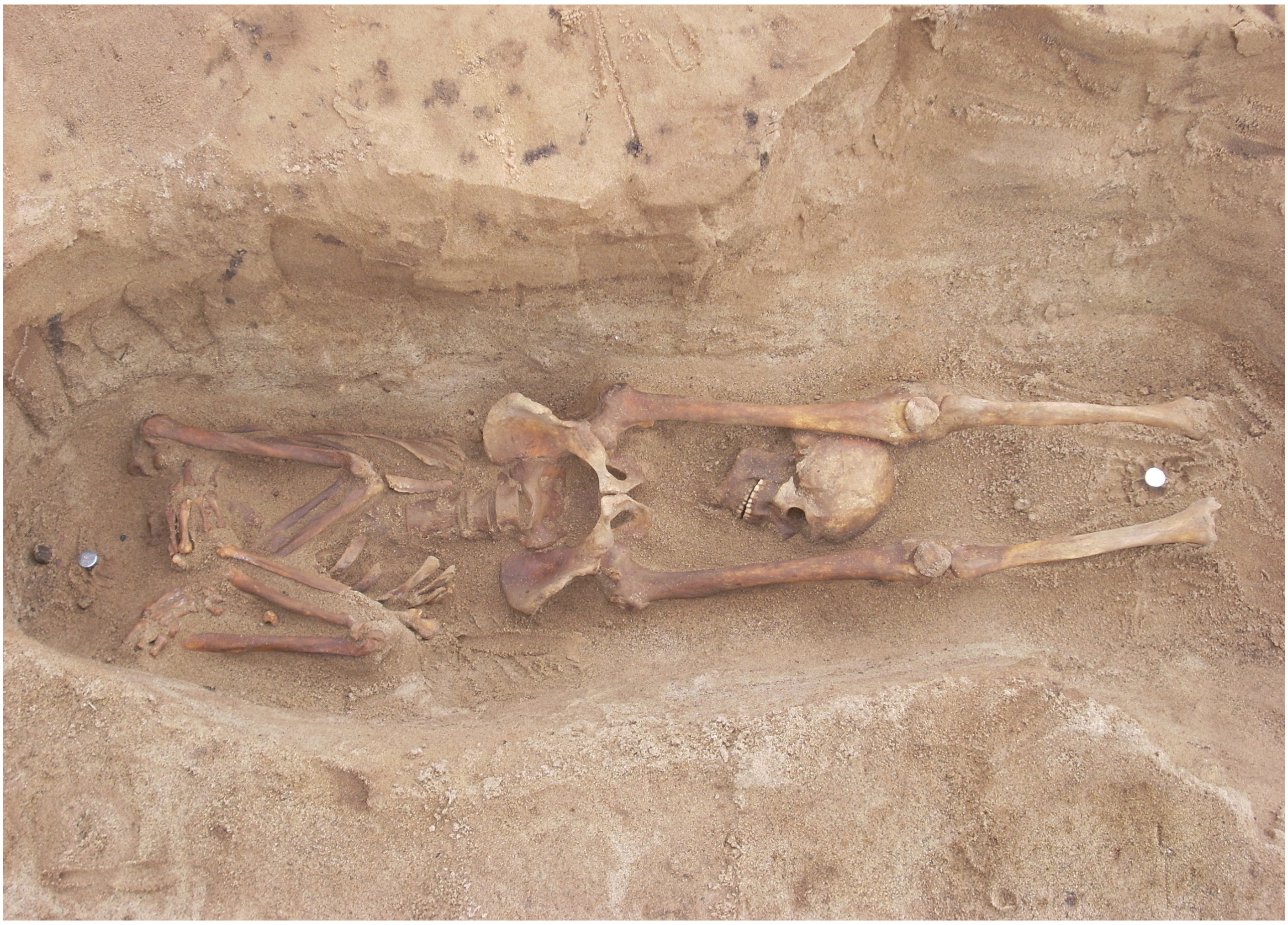
4. ROMAN-PERIOD BURIALS AND DISARTICULATED HUMAN BONE

4.1 Introduction

Six Roman-period inhumations (233, 315, 320, 326, 437 and 631) and one horse burial (648) were identified. Four of the human burials (233, 315, 326 and 631) contained skeletons that had been decapitated prior to deposition, and had the skull placed separately within the grave in a variety of locations. The human skeletons produced radiocarbon dates of cal AD 20–220 at 95% probability through to cal AD 80–240 at 95% probability. A radiocarbon date taken for the horse burial suggests that it was broadly contemporary with the latest of the Roman inhumations. The remains of four disarticulated skeletons were also recovered. These consisted of four skulls as well as small fragments of bone or articulating vertebrae which may belong to them (or could represent at least two further individuals). Three of the skulls came from the Roman-period midden deposits and a fourth came from the surface of a Roman-period pit. Their location overlying Roman-period ditches, but underlying Roman midden-rich deposits, would suggest that these remains are Roman in date.

4.2 The burials

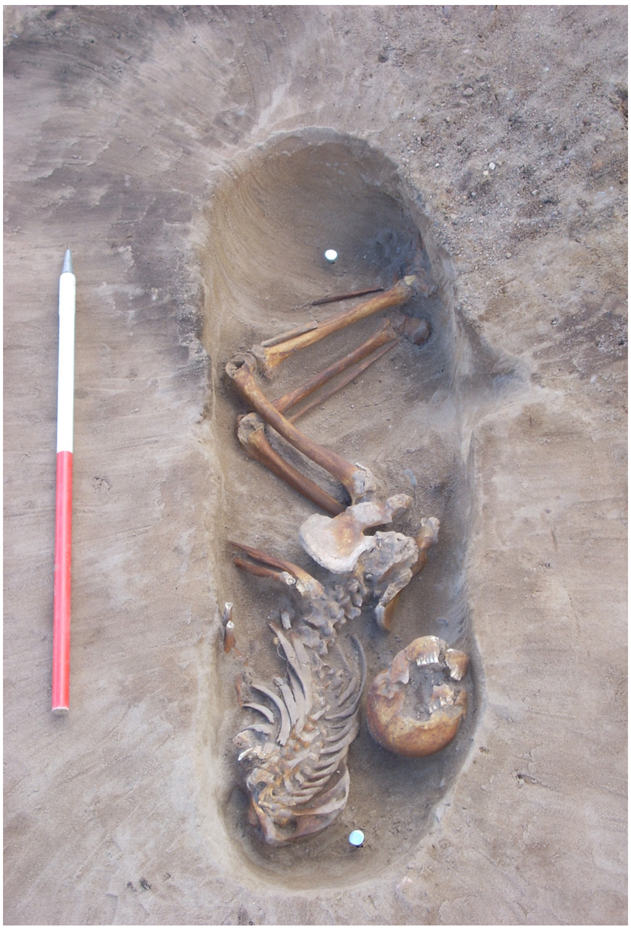
Burial Pit 233 was orientated west-north-west to east-south-east. It measured 1.8m in length by 0.64m in width and had been cut into the natural subsoil (002) to a depth of 0.6m. The burial (Sk 235) consisted of a decapitated extended inhumation, placed on its back with the skull located between its legs (Illus 4.1). Its arms had been crossed over the chest and the hands placed on the collar bones. The entire skeleton appeared to be in a remarkably good state of preservation, with all of the bones being present. There were no grave goods. Following deposition, the grave cut had been backfilled with light yellow-brown silty sand (234). A sample of bone from this skeleton produced a radiocarbon



Illus 4.1 Skeleton 235 (copyright CFA Archaeology Ltd)

date of cal AD 20–220 (95% probability; SUERC 38425), making it the earliest of the Roman inhumations.

Burial Pit 315 was orientated north-west to south-east. It measured 1.56m long by 0.58m wide and had been cut into the natural subsoil (002) to a depth of 0.29m. The burial (Sk 316) consisted of a decapitated inhumation, with the body placed lying on its side and the spine twisted so that the upper part of the torso was almost on its front (Illus 4.2). The skull had been placed behind its back, the knees drawn up towards the torso so that the legs formed an angle of *c* 90°, the right arm placed alongside the body and the left arm beneath the body. This skeleton was generally in a good state of preservation. There were no grave goods. Following deposition, the grave had been backfilled with dark greyish-brown silty sand (317), mottled mid-greyish-brown/pale yellow sand (318) and mottled orangey-brown silty sand (319).

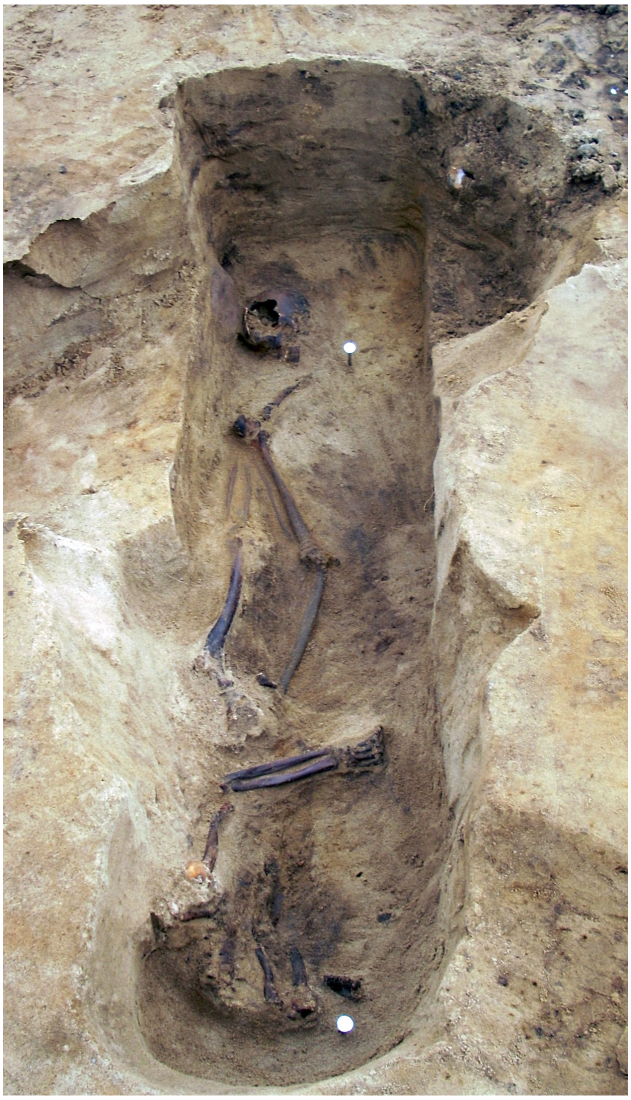


Illus 4.2 Skeleton 316 (copyright CFA Archaeology Ltd)

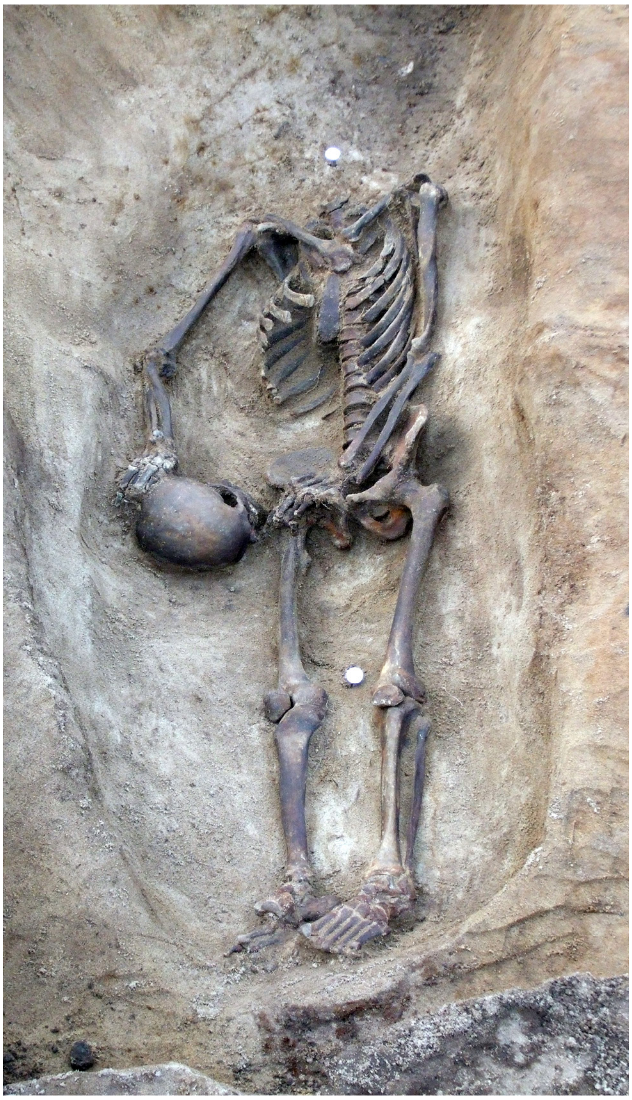
Burial Pit 320 was orientated north-east to south-west. It measured 2.1m long by 0.8m wide and had been cut into the natural subsoil (002) to a depth of 0.45m. The burial (323) consisted of an extended inhumation, lying on its back with the head tilted towards the right, the arms parallel with the body and the legs outstretched. This skeleton was also in a good state of preservation, although there was some evidence of decomposition in the hands and feet. Some sherds of Roman pottery were recovered from beside the skeleton, but there was no clear evidence that any formal grave goods had been placed with the body. Following deposition, the grave had been backfilled with light yellow-brown sand (321) and mid–dark brown silty sand (322). A sample of bone taken from this skeleton produced a radiocarbon date of cal AD 80–240 (95% probability; SUERC 38426).

Burial Pit 326 was orientated north-west to south-east. It measured 2.29m long by 0.54m wide and had been cut into the natural subsoil (002) to a depth of 0.63m. The burial (420) consisted of a decapitated inhumation, with the body lying slightly on its right side (Illus 4.3). The skull was located at the south-eastern end of the grave facing north-west towards the feet, the legs were extended with the feet crossed, the right arm was roughly parallel with the spine, and the left arm was flexed with the forearm across the lower torso. In comparison with the other skeletons, Sk 420 was in a poor state of preservation, possibly as a result of a modern land drain cutting across the southern end of the grave, which may have leaked into it. Some possible hobnails were recovered from around the area of the skull, possibly indicating that some kind of footwear had been placed at the end of the grave. Following deposition, the grave had been backfilled with dark brown/mottled light yellow sand (330) and mid-brown/mottled mid-grey sand (329). The lower fill (330) contained animal bone fragments, but these were not considered to be formal grave goods and were probably incorporated unintentionally with the backfill material.

Burial Pit 437 was orientated north to south. It measured 1.8m long by 0.8m wide and had been cut through a possible prehistoric ring ditch (508) and into the natural subsoil to a depth of 1m. At the base of the pit, an inhumation burial (451) was identified. The skeleton within this pit was lying



Illus 4.3 Skeleton 420 (copyright CFA Archaeology Ltd)



Illus 4.4 Skeleton 630 (copyright CFA Archaeology Ltd)

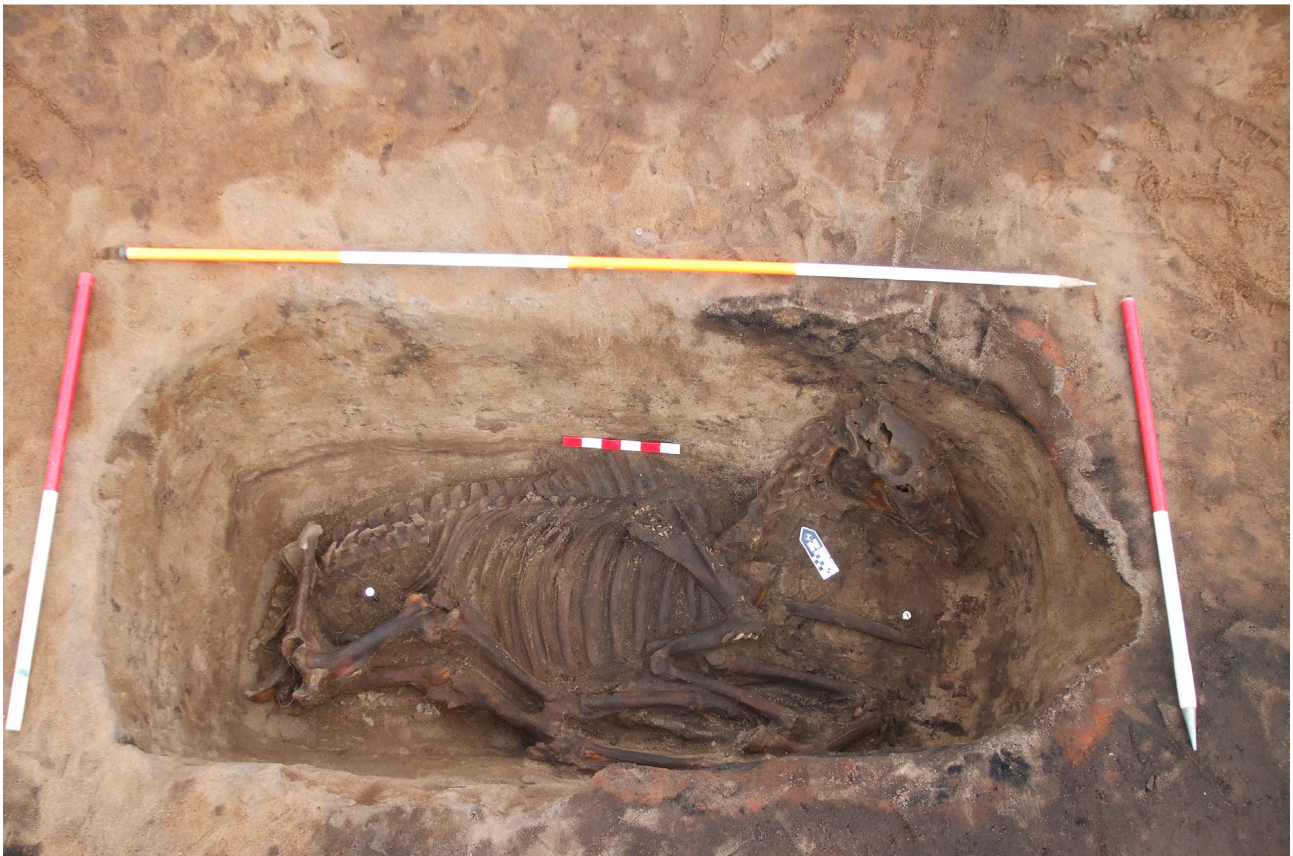
slightly on its left side, with the head inclined to the left, slightly raised above the rest of the body. The arms were flexed to the left-hand side of the body with the hands clasped together and the left leg was straight, whereas the right leg was flexed, with the knee slightly raised to the right. Generally, this skeleton was in a good state of preservation, with just some splitting of the ribs and mandible noted. Following deposition, the grave had been backfilled using mid–dark brown sandy loam (468) and light brown sand (467). The upper fill (467) of the grave had been cut by a later linear feature (435, see Section 6, Illus 6.1) associated with the field system. Items recovered from this grave consisted of a small potsherd and an iron buckle pin, but neither are considered to constitute grave goods. A sample of bone from this burial produced a radiocarbon date of cal AD 30–220 (95% probability; SUERC 38427).

Burial Pit 631 was orientated north-west to south-east. It measured 2.1m long by a maximum of 1.1m wide and had been cut into the natural subsoil (002) to a depth of 0.25m. The burial (630) consisted of a decapitated inhumation lying on its back with the feet and shoulders raised above the level of the torso (Illus 4.4). The head had been placed on the right side of the body, roughly level with the upper leg/pelvis. It was facing inward, with the top of the skull pointing towards the foot of the grave, and the right hand had been placed on the back of it. Both legs were straight and extended, and the left arm was flexed across the torso, with the left hand resting on the right-hand side of the pelvis. This skeleton was in a very good state of preservation, with just a few breaks in the ribs noted. Following deposition, the grave had been backfilled with mid-grey/brown sand (632). The grave had been cut by a later ditch (657) associated with the Roman field system, which was in turn sealed by midden-rich Context 003. No grave goods were identified with this burial. A sample of bone from this burial produced a radiocarbon date of cal AD 70–230 (95% probability; SUERC 38428).

Burial Pit 648 was orientated east to west. It measured 2m long by 0.96m wide and had been cut into the natural subsoil (002) to a depth of 0.77m. The burial (647) consisted of a fully articulated horse skeleton lying on its left side with the legs folded under to the south and the head to the east (Illus 4.5). Pit 648 appears to have cut a cremation deposit (539; see Section 3.2). A sample of bone from the horse produced a radiocarbon date of cal AD 80–260 (95% probability; SUERC 38418).

4.3 Disarticulated remains

Three disarticulated skulls (003/5, 003/6 and 514) were recovered from midden-rich Context 003 and a fourth (665) was recovered from the surface of the upper fill of Pit 618 (003/3). Pit 618 cut one of the field system ditches, but was sealed by the midden deposits. Both Skulls 003/5 and 514 were recovered from within close proximity to Skeleton 630 (Grave 631), with 514 almost directly overlying it, but no direct link was identified between these features. All of the skulls were located at the base of the midden deposits, indicating that they related to the early stages of the build-up of this feature. While these skulls could represent the remains of decapitated heads which had been displayed on the site, the presence of other disarticulated human bone within C003 tends to suggest that they relate to burials which were disturbed by the field system and simply disposed of amongst the accumulating midden material.



Illus 4.5 Horse Burial 647 (copyright CFA Archaeology Ltd)

4.4 Radiocarbon dates

Samples from four (235, 323, 451 and 630) of the six Roman-period skeletons were submitted for radiocarbon dating (Table 4.1), along with a sample of bone from the horse burial (647).

All of these dates are compatible with the Antonine occupation of the fort. Skeletons 235 and 451 could feasibly fall within a Flavian period of occupation, but the balance of evidence from the other skeletons and from the finds both here and elsewhere in Inveresk points towards them being contemporary with the *c* AD 142–165 occupation of the fort.

Table 4.1 Radiocarbon dates from the Roman burials. Calibration was conducted using OxCal v4.1, using the IntCal09 calibration curve

Lab no.	Context	Type	Date BP	68% probability	95% probability	$\delta^{13}C$	$\delta^{15}N$	C/N ratio
SUERC-38425 (GU-26287)	235	human bone: femur	1905±30	60–130 AD	20–220 AD	−20.7‰	10.8‰	3.2
SUERC-38426 (GU-26288)	323	human bone: right fibia	1845±30	130–220 AD	80–240 AD	−20.2‰	10.0‰	3.2
SUERC-38427 (GU-26289)	451	human bone: fibia	1895±30	70–140 AD	30–220 AD	−19.3‰	10.4‰	3.2
SUERC-38428 (GU-26290)	630	human bone: left fourth metatarsal	1870±30	80–210 AD	70–230 AD	−18.8‰	11.6‰	3.2
SUERC-38418 (GU-26283)	647	horse bone: left humerus	1830±30	130–220 AD	80–260 AD	−21.1‰	4.9‰	3.3

4.5 Finds from the burials

A few stray finds were recovered from the burials but are considered to be intrusive or residual in these contexts; none was in a position which would indicate intentional deposition as grave goods. Grave 320 contained a hobnail and three sherds of Roman pottery (BB1, samian and grey ware), and Grave 326 contained small fragments of animal bone (a cattle mandible and a pig maxilla). A small potsherd and a fragment of an iron ?buckle pin (SF162, see Section 7) was found in Grave 437. Horse Burial Pit 648 contained some hobnails and a ring mail fragment in the upper fill (see Section 3.4.1).

4.6 Roman human skeletal remains

Sue Anderson

Six articulated skeletons were recovered from discrete graves of Roman date. Nine contexts contained disarticulated remains which are undated but likely to be Roman, based on their condition in comparison with the Iron Age group and on their location underlying and within the Roman midden-rich deposit. A catalogue is included in the archive.

The bones were generally in relatively good condition and the inhumations were near-complete, with the exception of Sk 420, which appeared intact in the ground but which was in fact heavily fragmented.

4.6.1 Demographic analysis

The minimum number of individuals was ten. The disarticulated remains included four skulls, as well as small fragments of bone or articulating vertebrae which may belong to them (or could represent at least two further individuals). Table 4.2 shows the age and sex determinations for the ten individuals.

The skeletons comprised two young men and four middle-aged or older men. The disarticulated remains included a possible female and three males.

Table 4.2 Age and sex of Roman and undated skeletons

Period	Grave	Sk no.	Male	Female
Roman	233	235	*c* 35–50	
	315	316	*c* 35–50	
	320	323	*c* 20	
	326	420	*c* 25–30	
	437	451	*c* 35–50	
	631	630	*c* 35–50	
Undated	003/5			*c* 25–35 (?F)
	003/6		18–25	
	514		*c* 25–35	
	665		Adult	

4.6.2 Metrical and morphological analysis

Articulated skeletons were measured where possible and the results are included in the archive. Tables of systematically scored non-metric traits can also be found there.

The males ranged between 1.634m and 1.705m (5' 4"–5' 7") with a mean of 1.679m (5' 6"). The disarticulated ?female was the tallest individual in the group at 1.715m (5' 7") but her height was calculated from the radius length, which tends to provide an over-estimate in many groups. In the large Roman group from Trentholme Drive, York, the male average was 1.7m (5' 7") (Warwick 1968: 149), but the female mean was only 1.55m (5' 1"). At Cirencester (Wells 1982) the male mean was 1.691m (5' 6½") and the female 1.579m (5' 2"). This suggests that the male group was relatively short for the period, while the female was taller than her Roman counterparts in England.

Cranial length/breadth index could be calculated for five Roman males and an undated male, and the undated ?female. The ?female was just brachycranial at 80.5. One male was just dolichocranial at 74.9, four were mesocranial, and one was just brachycranial at 80.2. British Roman skulls tend to fall into the narrow (dolichocranial) or medium (mesocranial) ranges, so these individuals were within the expected range. The average of the seven skulls was 77.1. This is comparable with the male group from Trentholme Drive, for which 137 skulls had a mean of 76.5. The mean for Cirencester is not recorded, but the majority of skulls were dolichocranial (47.5%), followed closely by the mesocranial group (42.5%).

Non-metric traits were only partially scored in this group owing to the poor condition of three of the adult skeletons. A profusion of large wormian bones was present in the lambdoid sutures of Sk 316, Sk 451 and Sk 514, and large sagittal and coronal wormian bones were also present in Sk 514. While it is possible that wormian bones are genetically or environmentally determined, a proliferation of them in a single suture can sometimes indicate a pathological condition. Two individuals (Sk 235 and Sk 003/6) were metopic (the central suture in the frontal bone was retained into adulthood), a trait which is often found in adjacent burials and seems to have a genetic link. Two had small mandibular tori (Sk 235 and Sk 451). In the post-cranial skeleton, the relatively infrequent trait of atlas bridging was present in two individuals in the Roman group, Sk 323 and Sk 630. Plaque formation on the necks of the femora occurred in four individuals, but this condition may be acquired rather than genetically determined. However, femoral third trochanter, which is often assumed to be linked to robusticity, was present in only two of the six Roman males (Sk 316 and Sk 451), all of whom had robust bones and well-defined muscle attachments; both individuals had the additional trochanter on the left side only. While there may be genetic links between these individuals, none with similar traits were from adjacent graves and it may be that the traits were frequent in the population from which they derived.

4.6.3 Dental analysis

Complete or partial dentitions were present for all articulated skeletons and three of the four undated individuals. The group is too small for statistical analysis of disease prevalences, but a few general observations can be made.

All six of the Roman dentitions were complete, although a few teeth had been lost post-mortem from Sk 420 and Sk 451. Most of the teeth had a degree of calculus and alveolar resorption, but only those individuals with large amounts have been noted below.

Sk 235 had lost the upper left first premolar before death, but the root was still in place, suggesting that it may have been knocked or pulled out. He had an abscess of the upper left third molar and moderate to heavy deposits of calculus. When the mandible was articulated with the skull, it was clear that there was a gap between the upper and lower anterior teeth which was caused by attrition, suggesting that the teeth may have been used as tools. Enamel hypoplasia was present at *c* 2–4 years.

Sk 316 had carious lesions of the upper first molars, abscesses of both lower first molars and the upper left, and another abscess of the upper left canine, although the latter was not at the root tip. The origin of the caries could not be ascertained as both lesions were large and most of the crowns had been lost. The lower right first molar was lost before death. Several teeth were chipped in life, and there was moderate calculus and advanced alveolar resorption. Periodontal disease with resorption affected the upper canines.

Sk 420 had an abscess of the upper right first molar which drained on both sides of the dental arch. There were large chips of the enamel on the upper left second and third and the lower left third molars. Enamel hypoplasia had occurred at *c* 4 years.

Sk 451, like Sk 235, had only roots in the place of two of his first premolars (both lower) and again the crowns seem to have been broken off in life, perhaps due to trauma. Abscesses were present beneath both these roots, and also on the upper right first molar. Several teeth were chipped.

Sk 323 and Sk 630 had complete dentitions with no pathology, although all wisdom teeth of Sk 630 were congenitally absent. He also had a large diastema (gap) between his upper central incisors. In both individuals the upper left first premolar was slightly rotated in the alveolus.

Amongst the disarticulated remains, the young ?female had all her teeth with no pathology, but her first molars were heavily worn in comparison with all her other teeth, perhaps suggesting a change from a coarse to a softer diet at some time in her early childhood (between the eruption of the first and second molars at ages six and twelve respectively) or possibly that she used her teeth as tools but managed to avoid using the back molars. The young male Sk 514 also had all his teeth and no pathology. The slightly older male Sk 665 had only the upper teeth (the mandible was missing) and the second molar had been lost ante-mortem.

4.6.4 Pathology

Congenital and developmental anomalies

Apart from the systematically scored non-metric traits noted above and in the archive, a few other anomalies were noted in the skeletons of these men. Sk 235 had double proximal facets of both first metatarsals, and the corresponding joints of the first cuneiforms were also doubled.

Five males were assessable for spina bifida occulta, of which four had cleft arches of the lower segments only (S4 and S5 or S5 only). This part of the sacral spine is more frequently cleft than not, so this finding is as expected.

Other anomalies of the spine included the presence of six sacral segments (instead of the more usual five) in Sk 323, and possible lumbarisation of the twelfth thoracic and partial sacralisation of the fifth lumbar vertebrae in Sk 451. It is likely that the latter had only 11 ribs on each side, as the facets for the rib heads on the twelfth thoracic were replaced by small rounded protuberances. The body of the first sacral segment was unusually small, and it is unclear whether the fifth lumbar vertebrae was partially sacralised (a facet was present which articulated with the right sacral ala), or whether the first sacral segment was in fact lumbarised.

Sk 451 also had a slight asymmetry to the skull which had been caused by premature fusion of the left side of the coronal suture. Growth of the left parietal had been halted as a result and the bone was slightly smaller than the right parietal. While premature fusion of the cranial sutures (craniosynostosis) can cause problems in development of the brain, in this case the reduction in cranial capacity was minimal and was unlikely to have had much effect.

A group of disarticulated vertebrae from Sk 003/6 included a fifth lumbar vertebra with a detached neural arch. This lesion can be caused by trauma, but there was no evidence for this here and it is likely that the arch was separate due to a developmental deficiency in the formation of the spine.

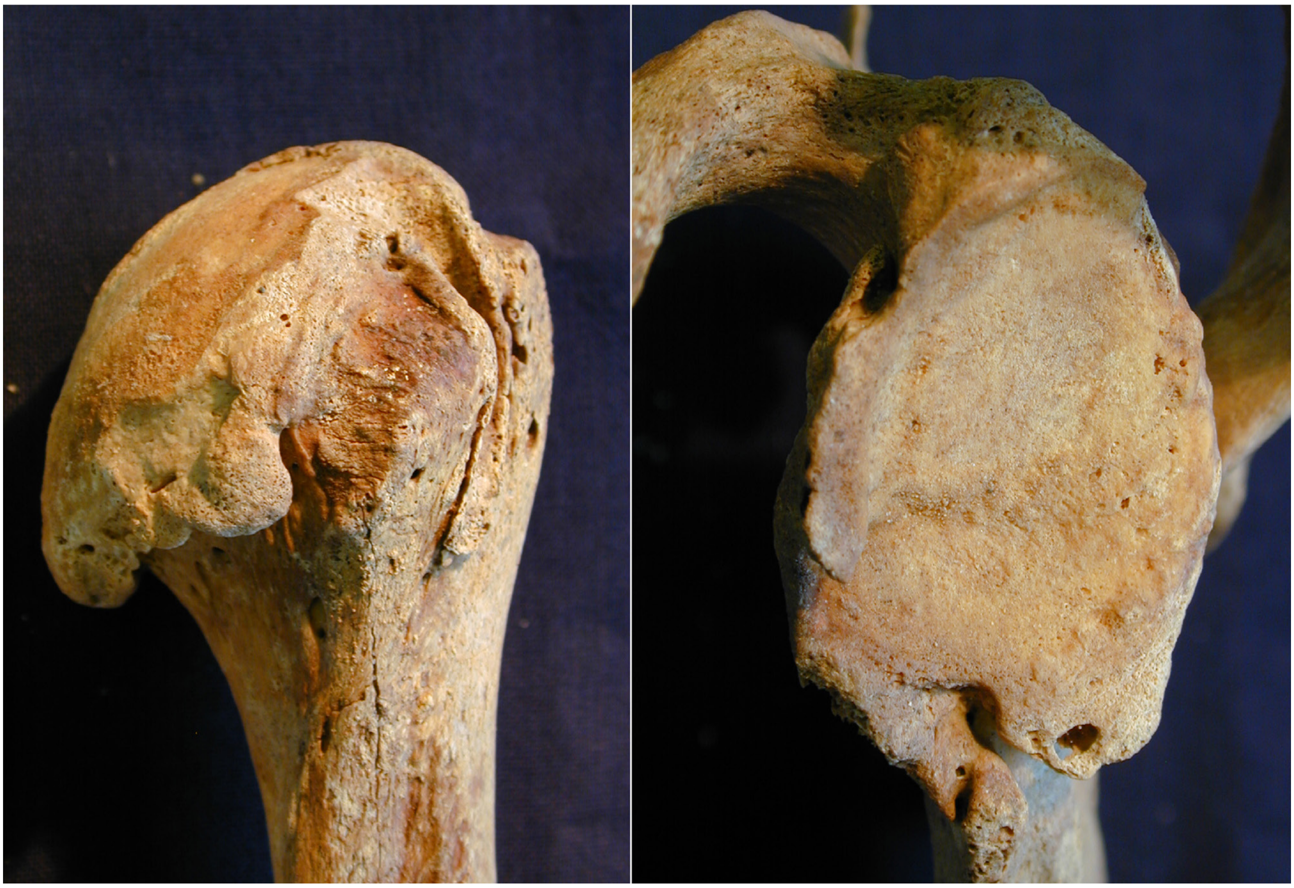
The young adult male skull Sk 514 had a mandible with an unusually large cleft chin, possibly a congenital or developmental anomaly.

Degenerative disease

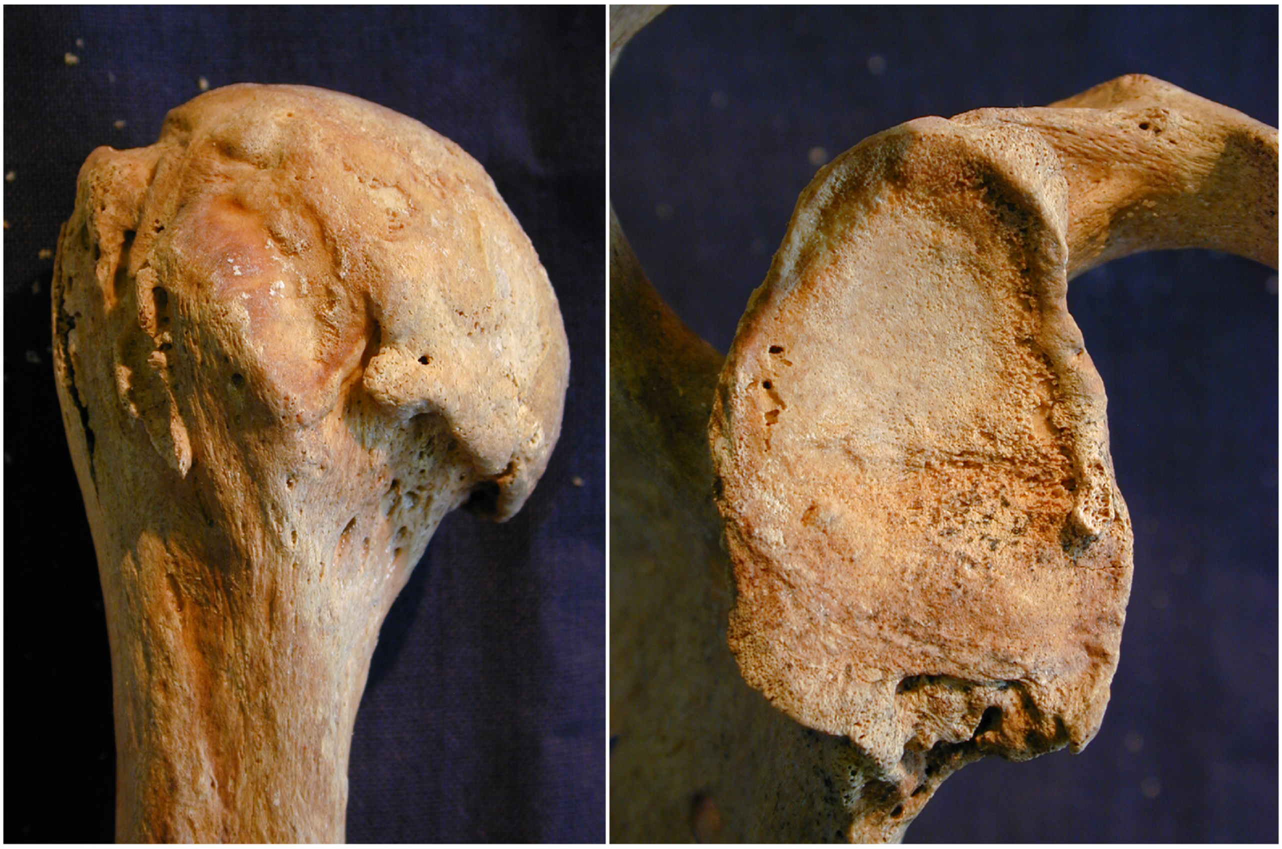
The four older men in this group all suffered from some degree of degenerative joint disease. The lesions present are described below for each individual as the group is too small for statistical analysis of prevalences. Full details of joints involved are available in the archive catalogue.

Sk 235 had osteophytes in both big toes, the right knee, both knee-caps, the wrists (pisiforms only), the right sacro-iliac joint of the pelvis, most upper and mid-rib heads and facets, and the T6–L4 vertebral bodies (large on the L3–4). There were small enthesophytes (ossified ligamentous attachments) on both calcaneums, but not on the patellae or proximal ulnae. The xiphisternum was calcified and the supraspinal ligament was also partly ossified in the lower part of the spine. There were osteoarthritic changes to both shoulder joints: very large osteophytes had formed bilaterally around the borders of the humerus heads, with enlargement of the scapula glenoids (Illus 4.6–4.7), new bone formation over the joint surfaces of the heads and down the bicipital sulcus, possibly with healed inflammatory changes on the left. Osteoarthritis was also seen in the cervical (C2–4 facets, grade III) and thoracic (T2–3 bodies and T4–6 right facets, grade II) spine.

Sk 316 had osteophytic bone growth in bones of the left ankle, both knees, the right hip, the left thumb, two distal finger joints, the wrists (pisiforms and greater multangulars), both elbows, and the left shoulder with enlargement of the glenoid (similar



Illus 4.6 Left shoulder of Skeleton 235 showing large osteophyte formation on humerus head and scapula glenoid border (copyright CFA Archaeology Ltd)

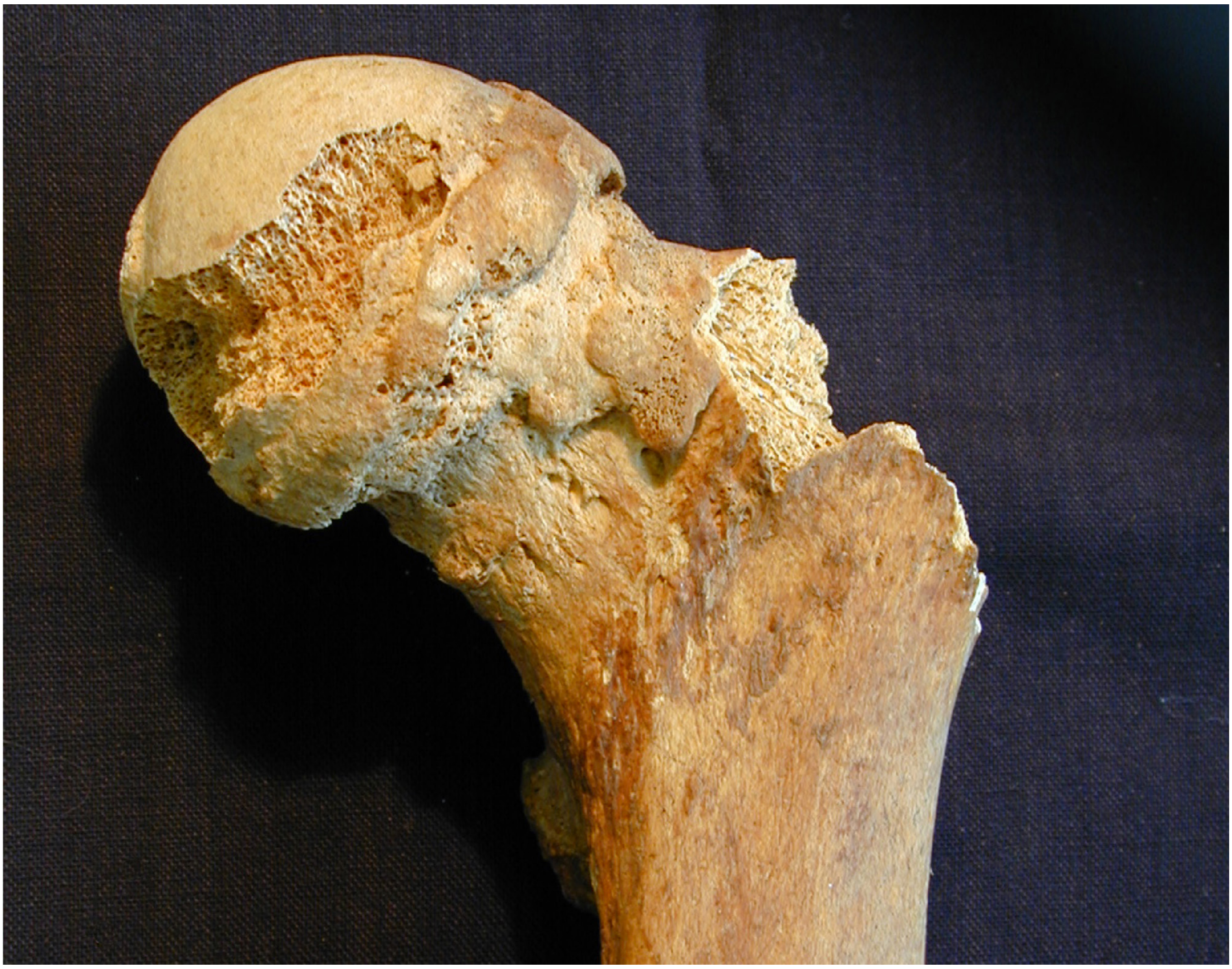


Illus 4.7 Right shoulder of Skeleton 235 showing large osteophyte formation on humerus head and scapula glenoid border (copyright CFA Archaeology Ltd)

to the changes seen in Sk 235 but less advanced; the right shoulder was damaged and not assessable). Osteophytes were present on most of the thoracic and lumbar vertebral bodies, and were large on the right side of the T5–10, L1–3 and L5 bodies. Calcified thyroid and costal cartilage were present, and there was new bone formation on the linea aspera of both femora and soleal lines of both tibiae. Again, the supraspinal ligament was partly ossified. Osteoarthritis affected a number of joints. In the feet, the right 4th–5th toes, the left 2nd toe, and the left cuboid to 4th/5th metatarsal were all affected with grade II lesions, while the left first metatarsal head and proximal phalange (big toe) had grade III lesions. The right knee also had grade III lesions on the lateral side, and in the left hip there was new bone growth over the joint surface and formation of large osteophytes at the border of the femoral head (Illus 4.8) and around the acetabular rim (Illus 4.9). Both sacro-iliac joints had grade II changes. In the hands, the right thumb had both grade III osteoarthritis (proximal inter-phalangeal) and osteophyte formation (metacarpo-phalangeal). The left acromial facet (grade III) and the right scapula glenoid (grade II) were affected in the shoulder girdle. There was osteoarthritis or osteophytosis of most rib heads and in the spine the vertebral bodies of the neck were all affected with grade II–III osteoarthritis and there were further grade II lesions within the thoracic and lumbar regions. The right temporo-mandibular joint had an enlarged facet on the temporal and the condyle also appeared enlarged (only a fragment survived), with suggestions of grade II lesions.

Sk 451 had small osteophytes of both shoulders, most rib heads, both hip joints, the right elbow, the right thumb and most of the vertebrae. Enthesophytes were present on the patellae, the calcaneums and the radial tuberosities. Grade II osteoarthritis was present on the lateral clavicles and acromial facets bilaterally, and there were lesions of the C7 and L4–5 vertebral bodies.

In Sk 630 there were osteophytes of the scapula glenoids, the medial left clavicle, the left elbow,



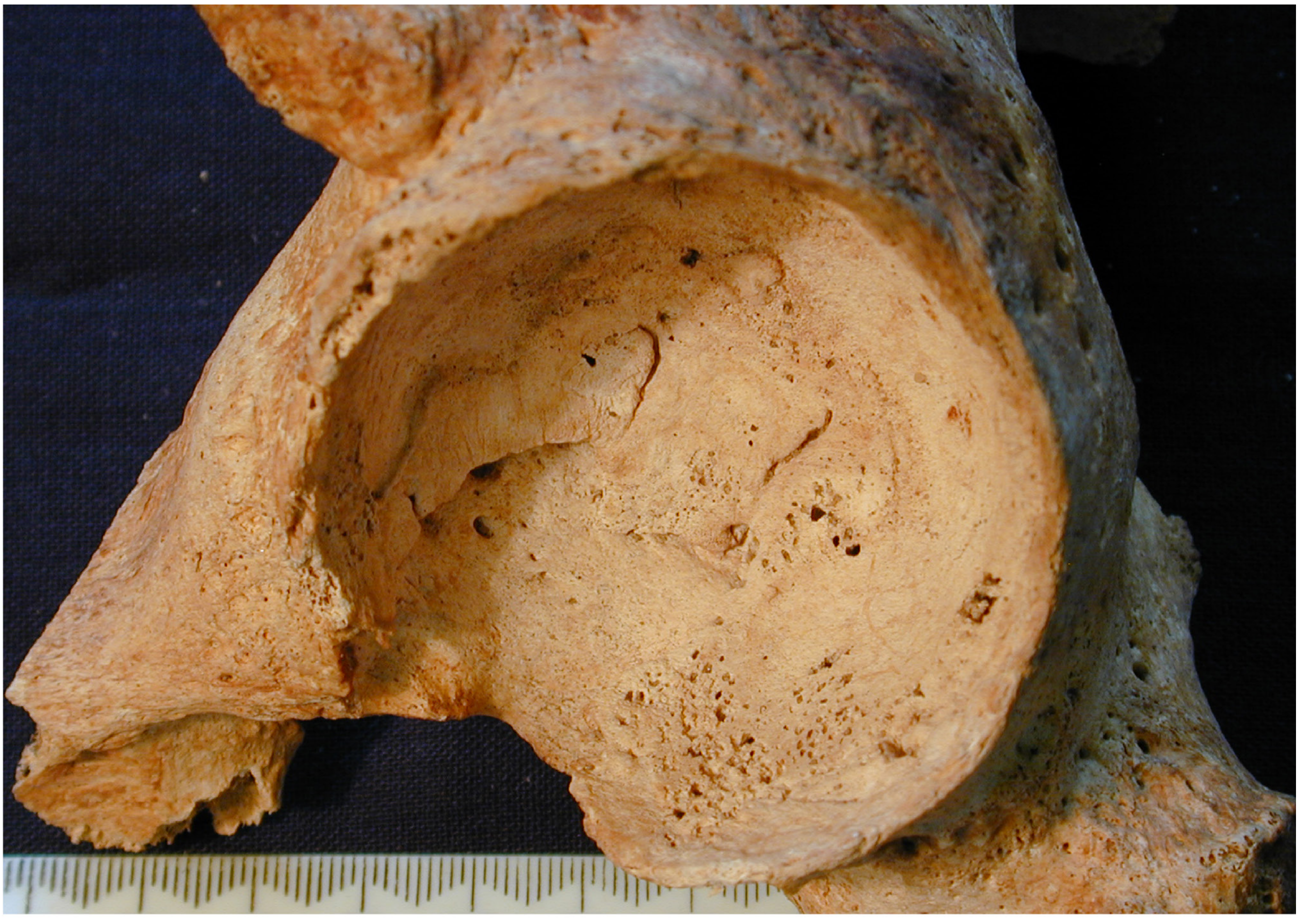
Illus 4.8 Left femur of Skeleton 316 with large osteophytes around the head (copyright CFA Archaeology Ltd)

the right wrist (mainly of the distal radius and ulna), both sacro-iliac joints, and the thoracic and lower lumbar vertebrae. Very large osteophytes were present on the distal interphalangeal joints of the right second and fourth fingers. Grade II osteoarthritis was present on the anterior body of the L2, and on the lateral facets for the ribs of the T8. The individual also had a large and well-preserved calcified thyroid cartilage, as well as costal cartilage and the xiphisternum. Enthesophytes were present on the calcaneums and patellae.

Small osteophytes were present on the right side of the mid-thoracic spine (T7–9) of the ?female from Sk 003/6, and there was osteophytosis of the C1–2 of Skull 665. Osteophytes were also present on the disarticulated vertebrae from Zone 6 (L2–3 and S1), and on a right mid-rib from Pit Fill 255.

Metabolic disorders and indicators of physical stress
Cribra orbitalia, a lesion thought to be associated with iron deficiency anaemia, was not found in any of the five assessable skulls belonging to the articulated skeletons. All three disarticulated skulls were assessable for cribra orbitalia, but it was only present in young/middle-aged male 665, who had the cribriotic form in both orbits.

Schmorl's nodes form when the spine is put under pressure and the intervertebral discs herniate, causing small lesions in the surfaces of the vertebral bodies. They usually occur between the third thoracic (T) to lumbar (L) vertebrae. In this group, nodes were present in Sk 235 (T6–7 and L4 only, all small), Sk 316 (T3?, T8, and large on T10–L1), Sk 323 (T6–L4, large on T7–12), Sk 420 (T8–L1, all large), Sk 451 (T8–10 and L1–3) and Sk 630 (T10 only). They were also present on the T7–L2



Illus 4.9 Left acetabulum of Skeleton 316 showing porosity and new bone growth (copyright CFA Archaeology Ltd)

vertebrae (mostly large) of the 003/6 ?female. Small nodes were present in the T9–11 vertebrae from 515, and large ones were present in the T8–L4 vertebrae from Zone 6.

Small 'stress' lesions were present on both proximal hallucial facets of the big toes of Sk 420. This is a relatively common position for lesions of this type.

Infections and inflammatory response

Several skulls were complete and not assessable for maxillary sinusitis. However, the right sinus of Sk 316 was thickened and pitted with areas of porous new bone growth in the right maxillary sinus on the anterior part of the malar. There was no evidence for the condition in Sk 420 or Sk 451. Patches of frilly new bone growth were present in both maxillary sinuses of disarticulated Skull 514.

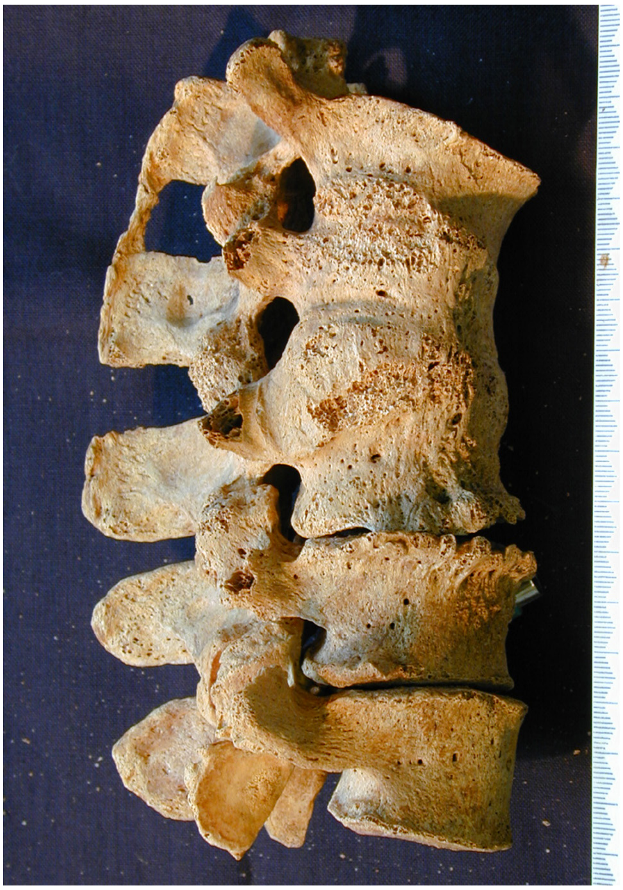
Slight pitting/porosity and thickening on the parietal bones of Sk 420 may be evidence for an infection or inflammation of the scalp, or possibly for healed porotic hyperostosis, another condition which may be associated with iron deficiency.

Trauma

As noted above, Sk 235 had symmetrical lesions to both shoulder joints. Bilateral osteoarthritis of the shoulders is an unusual form of degenerative change and there is a possibility that the lesions might originally have been caused by dislocations of the joints. However, bilateral dislocation of the shoulders is also a very unusual occurrence which would most probably be caused by holding onto something which suddenly pulled away at speed. Modern examples of causes include water-skiing or push-starting a car and not letting go in time, but potentially a bolting horse or perhaps chariot-driving in the Roman period might have had a similar outcome.

The same individual also had a crush fracture of the lower back. The first to third lumbar vertebrae were fused together at the bodies and arches with loss of joint space (Illus 4.10). There was some inflammation of the anterior bodies with pitting and new bone formation, and the supraspinal ligaments were ossified. This type of fracture is most likely to have been caused by a fall or jump from a height. In addition, small exostoses had formed on the linea aspera of both femora at the approximate point of insertion of the *adductor brevis* muscle, suggesting that the individual may have suffered from groin strains. Again, these could be caused by a fall, although today they are also commonly found in sports which involve kicking, running or rapid changes in direction.

Sk 316 had a false joint on the right clavicle which had formed at the insertion of the costo-clavicular ligament (Illus 4.11, lower). There was no evidence that the clavicle had articulated with the first rib, as sometimes happens. The medial end of the bone was missing, but possibly the new facet had formed as a result of a dislocation of the clavicle from the manubrium. The right facet of the manubrium was enlarged and thickened. The new joint had grade III osteoarthritic changes. A sternoclavicular dislocation is most commonly caused by a blow to the shoulder. A similar lesion was also present at the *lateral* end of the left clavicle (medial end lost) in the area of attachment of the trapezoid ligament (Illus 4.11, upper).



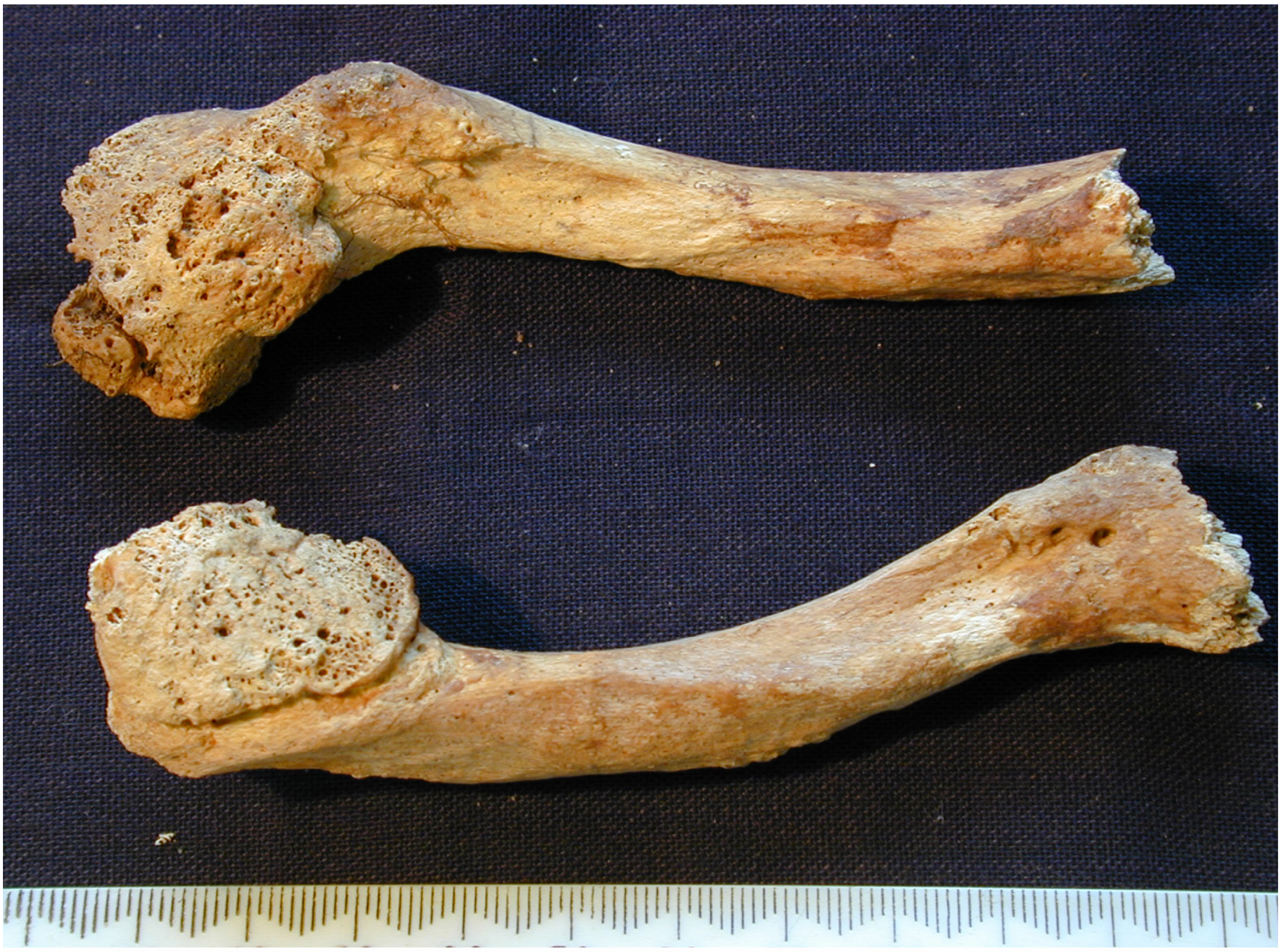
Illus 4.10 Lumbar vertebrae of Skeleton 235 showing ankylosis of L1–3 and osteophytes of L3–4 (copyright CFA Archaeology Ltd)

Young male Sk 323 had large exostoses on the superior edges of both talus joints for the navicular in his ankles. Osteophytes had formed around the navicular joint for the talus on the right (the left was damaged) with possible porotic new bone anterior-inferiorly. There was another large exostosis on the lateral side of the anterior joint for the cuboid of the right calcaneum, and a fragment of the cuboid had osteophytes of the joint border. Sk 630 had exostoses or osteophytes on the tarsal naviculars at the joints with the second cuneiforms on both sides, as well as an exostosis with cyst formation on the superior left fifth metatarsal just above the proximal facet.

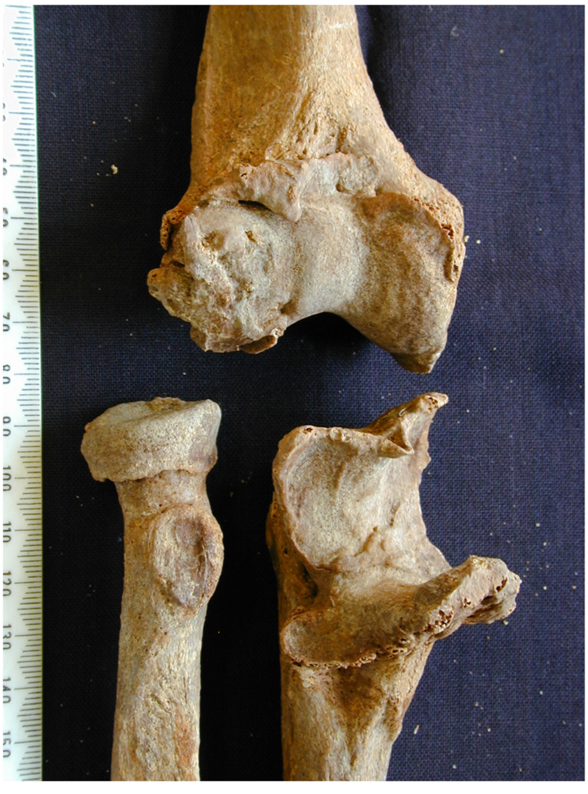
Sk 451 and Sk 630 had almost identical fractures of the tenth rib – Sk 451 on the right and Sk 630 on the left. Both had occurred close to the angle and had large callus formations. In Sk 630 there was a large exostosis on the superior edge of the callus formation. Rib fractures are most commonly caused by a blow to the chest, and those of the tenth rib may be associated with damage to the kidney. However, in both cases the callus formation indicates that the individuals survived the trauma and lived for some time afterwards.

Sk 630 had an injury to the right elbow joint which had resulted in secondary osteoarthritic changes (osteophyte formation, new bone growth, deformation and enlargement; Illus 4.12). The cause was indeterminate but a fracture of the joint seems likely. The individual also had an exostosis at the superior edge of the left femoral greater trochanter at the insertion of the *piriformis* muscle, a strain which may occur as an injury during running.

Thickened bone on the palmar surface of the proximal finger phalange (2nd?) found with the ?female in 003/6 was possibly an exostosis or growth following a wound.



Illus 4.11 Left and right clavicles of Skeleton 316 showing new bone formation at the lateral and medial ends respectively (copyright CFA Archaeology Ltd)



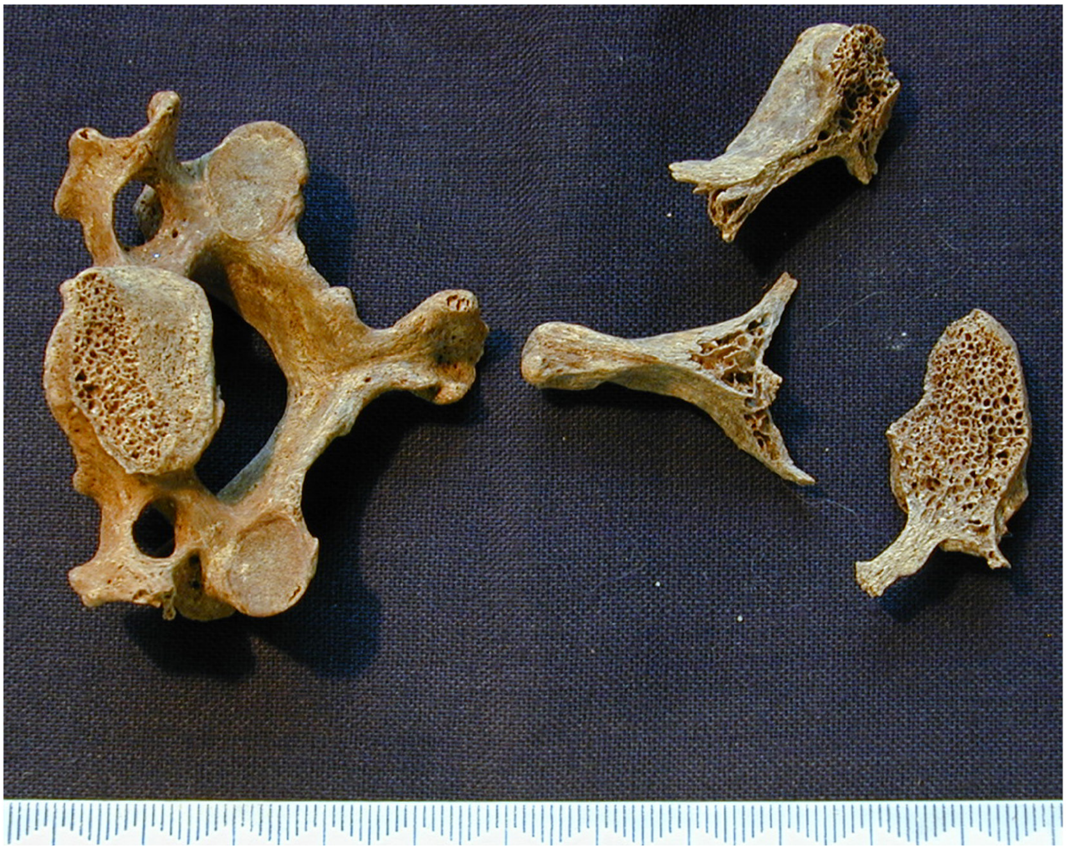
Illus 4.12 Right elbow of Skeleton 630 showing osteophyte formation secondary to trauma

4.6.5 Evidence for decapitation

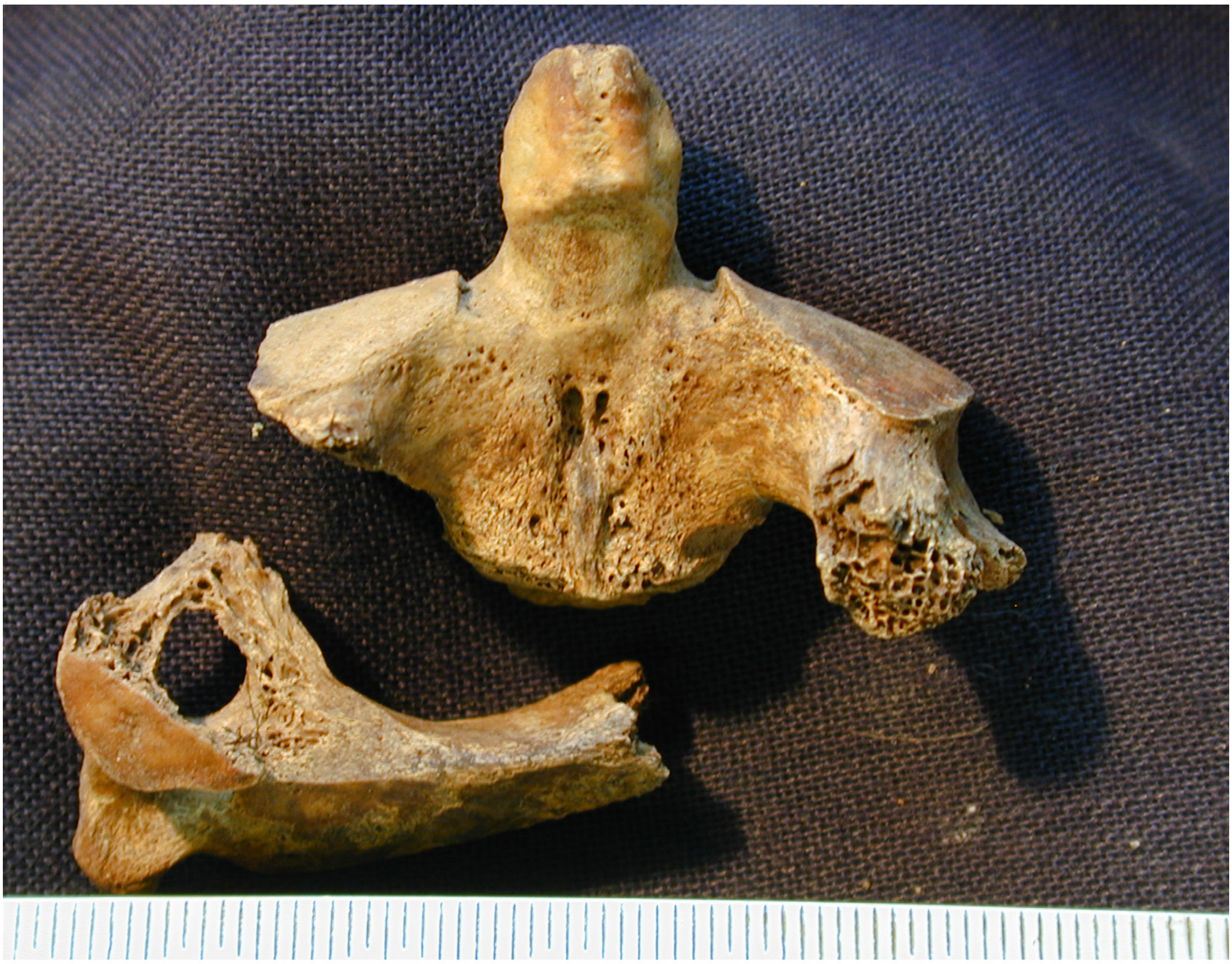
Based on the position of their skulls in the graves, four of the six Roman individuals had been decapitated. All surviving cervical vertebrae of the six skeletons were examined for cut marks. None was identified in the two individuals whose heads were in the proper anatomical position. The two best-preserved examples were in Sk 235 and Sk 630.

In Sk 235, whose head was buried under his thighs, the C1–5 vertebrae were found with the skull. Most of the C5 was missing apart from a fragment of arch and the left side with part of the zygapophyseal facet. This bone appears to have been cut through both superior and inferior parts. The C4 had a shallow diagonal cut across the anterior of the body (Illus 4.13). The C6 was buried with

Illus 4.13 C4 of Skeleton 235 showing knife cut across the body (copyright CFA Archaeology Ltd)



Illus 4.14 C5–6 of Skeleton 630 showing knife cut across the lower body of the C5 and through the arch and body of the C6 (copyright CFA Archaeology Ltd)



Illus 4.15 Cut through the arch of the axis of disarticulated remains from Skeleton 003/6 (copyright CFA Archaeology Ltd)

the rest of the skeleton, but this too had a diagonal cut across the anterior of the body and also across the left zygapophyseal facet. At least three to four cuts had been made in the attempt to sever the head.

Sk 630 was decapitated through the C6 vertebra, which survived in four fragments with cut marks (Illus 4.14). The C5 had a cut through the lower anterior edge and there was a small cut in the right side of the C7. At least three cuts had been made.

In Sk 316, there was no evidence of cut marks on any of the vertebrae, but very little of the C3 survives and it is possible that the cuts were made at this point and did not affect the surrounding bones. The cervical vertebrae of Sk 420 were in poor condition and no cut marks were identified.

Two disarticulated skulls had cervical vertebrae associated with them, but in both cases only the C1–2 were present. No cut marks were present on those of Skull 665, but Sk 003/6 ?female had a cut across the arch of the axis on the left side below the facet (Illus 4.15). It was cracked across to the anterior side, but the cut did not continue right through the bone. This cut was made from behind. The mandible also had a possible unhealed cut on the right side from the lower margin running anteriorly across to the centre. The mentum was lost and the left side of the mandibular body was cracked. Although these ‘lesions’ had certainly occurred in antiquity based on the staining of the bone, it is possible that they could have happened during re-deposition of the skeleton (assuming it was originally buried in a formal grave).

4.7 Summary of the isotopic analysis of the human remains

Joanna Moore, Alice Rose, Jane Evans, Geoff Nowell, Darren R Gröcke, Vanessa Pashley and Janet Montgomery

Six male individuals dating to the Roman-period, four of whom appeared to have been decapitated, and one Iron Age individual of unknown sex were subjected to a range of isotopic and trace element measurements to investigate residential origins (Moore et al forthcoming).

Carbon and nitrogen isotope analysis of their dentine collagen (childhood) and rib bone collagen (later life) produced a small (*c* 2‰) range of values for the Roman-period burials ($\delta^{13}C$: dentine mean –20.6‰ ± 0.8‰ (1σ), bone mean –20.4‰ ± 0.9‰ (1σ); $\delta^{15}N$: dentine mean +10.7‰ ± 0.8‰ (1σ), bone mean +11.1‰ ± 0.9‰ (1σ)) indicating a largely terrestrial omnivorous diet in childhood and adulthood, despite the proximity of Musselburgh to the coast. The Iron Age individual also falls within this terrestrial range. One decapitated individual, Sk 630, has the highest $\delta^{13}C$ values in both dentine and bone (–19.2‰ and –19.3‰ respectively), which along with relatively high $\delta^{15}N$ may indicate some consumption of marine protein in line with other Roman-period populations in England (Müldner & Richards 2007; Müldner 2013). However, this apparent similarity of diet is not supported by the other isotope and elemental data obtained from the tooth enamel; these strongly suggest the Roman individuals are neither of local nor geographically similar residential origins.

The Iron Age individual has, in all cases, isotope ratios that are consistent with origins in the Musselburgh area: this is the only $^{87}Sr/^{86}Sr$ and $\delta^{18}O$ that in combination and allowing for measurement uncertainty could be consistent with local origins; this individual also has a very low lead burden, which is inconsistent with exposure to the anthropogenic lead pollution of the Roman Empire and in line with prehistoric lead levels (Montgomery et al 2010). The lead isotope ratios of this lead are also comparable with other prehistoric individuals from Scotland, indicating low-level natural exposure via the food chain from ancient rock sources (Montgomery et al 2010). This individual thus provides a good baseline against which to compare the intrusive Roman burials.

The Roman-period individuals exhibit extremely variable enamel isotope characteristics. One male with no evidence for decapitation, Sk 323, has the lowest $^{87}Sr/^{86}Sr$ in the group, which is indicative of origins in limestone or basalt terrains (Evans et al 2010) – both of which are found in the Lothian region of eastern Scotland. The low $\delta^{18}O$ value would support origins in eastern Scotland (Evans et al 2012) and the lead isotopes, which in combination with the very low lead burden, indicate natural exposure to lead from young or marine rocks (Montgomery et al 2010) also support origins in a region of limestones or basalts with no childhood exposure to Roman sources of lead pollution. Similar lead isotope ratios have been found in male individuals from the Roman decapitation cemetery at Driffield Terrace, York who appear to be migrants to Britain, although these individuals have higher levels of lead indicative of anthropogenic rather than natural exposure so may not provide a valid comparison (Montgomery et al 2010). The strontium concentration is relatively high and in line with Scottish coastal or island populations (Montgomery et al 2007) but the $\delta^{18}O$ value would not support origins in the Western or Northern Isles or on the western seaboard.

Sk 630, the decapitated male with some evidence for marine protein consumption, is clearly not of local origin. Although the $^{87}Sr/^{86}Sr$ value of 0.7098 is relatively common, and therefore undiagnostic, amongst archaeological individuals in Britain and Europe and indicative of origins in regions of young sedimentary silicate rocks such as Mesozoic sandstones, the $\delta^{18}O$ value is too high for origins in eastern Britain. However, given the large uncertainty on the measurement, the $\delta^{18}O$ value is not high enough to indicate certain origins outside Britain, especially as cultural practices such as boiling and brewing drinks may artificially elevate human $\delta^{18}O$ values (Brettell et al 2012); such values are consistent with western and southern Britain. This individual has a high lead burden of 6.5mg/kg, the highest amongst the Musselburgh group, and coupled with lead isotope ratios that put this individual firmly in the centre of Roman-period burials from England and in the English ore field, it is clear that origins should be sought within the Roman

Empire, and all the data would be consistent with southern Britain.

The remaining four male individuals have high $^{87}Sr/^{86}Sr$ values that are not commonly found amongst Roman-period burials in Britain, where the majority are below 0.7120. Such values are indicative of origins in regions of granites or ancient silicate rocks of Palaeozoic Age or older (Evans et al 2010). When coupled with the mostly low $\delta^{18}O$ values of these four, it is clear that such combinations of values are even rarer, with only two comparable individuals reported, at Catterick in North Yorkshire (Chenery et al 2011). The lack of direct comparisons is also clear when the Musselburgh individuals are compared to all published data for archaeological humans across all periods and may be a direct result of the bias in the dataset: there is far less data for archaeological humans of any period from Scotland, where there is a preponderance of older geology than from England, where the geology is relatively younger and biosphere $^{87}Sr/^{86}Sr$ values are expected to be lower.

Three of these high $^{87}Sr/^{86}Sr$ individuals (Sk 235, Sk 420 and Sk 451) are also linked through their similar strontium concentrations, lead burdens which provide evidence for low-level childhood exposure to anthropogenic lead pollution, and the lead isotopes which are inconsistent with English ore lead sources and suggest exposure to older lead ores such as those found in Scotland. Nonetheless, such lead isotope ratios are not exclusive to Scotland and the decapitated male Sk 235 has a very similar lead and strontium isotope and concentration profile to a *c* eight-year-old child (BGB98–400) excavated in Roman London with $^{87}Sr/^{86}Sr$ inconsistent with southern England and a high lead burden that was found to be consistent with the lead isotope field of German ores and artefacts (Shaw et al 2016). Although Scottish origins were not considered for this child (although the data does not rule them out), it suggests that Sk 235 would also be consistent with German lead sources and his origins may lie outside Britain in a granitic terrain, such as occurs in the Rhineland. Skeleton 420 and Sk 451 have identical lead isotope ratios which are similar to other Long Iron Age humans from elsewhere in Scotland; it is thus possible these two males originate from elsewhere in mainland Scotland in a region of older geology. They are inconsistent with origins in England, but a homeland overseas elsewhere in the Roman Empire cannot be ruled out, although their $\delta^{18}O$ values indicate this is unlikely to be in southern Europe unless at higher altitudes.

Finally, Sk 316, a decapitated burial, has a low $\delta^{18}O$ consistent with origins in eastern Britain or northern Europe and a high $^{87}Sr/^{86}Sr$ value indicative of origins in a region of granites. However, in contrast to the three above, the lead burden is low and the lead isotope ratios are not consistent with Scottish ore or rock sources; together they indicate exposure to natural lead sources from younger rocks such as those found in England. It should be noted, however, that isotopes are not unique to any one place and that virtually identical lead isotope ratios were obtained for 3DRIF-26, a male burial from Driffield Terrace whose $\delta^{18}O$ value and aDNA point fairly conclusively to origins in the Levant (Martiniano et al 2016). Such an origin is highly unlikely for Sk 316, however, due to the high $^{87}Sr/^{86}Sr$ and low $\delta^{18}O$, but it demonstrates the equifinality of the data and, along with this highly variable dataset, the multitude of origins present in this small group of individuals excavated from Musselburgh. A broader understanding is needed of the isotopic variation amongst people who grew up on the old, silicate rocks of northern Scotland in all periods before these isotope profiles from the individuals subjected to intrusive burial rites at Musselburgh can be concluded to be non-British, but for four of the individuals examined they are clearly unusual amongst what is a highly variable dataset for Roman-period burials in Britain.

It is apparent from the isotopic data that the decapitation burials at Musselburgh do not represent the continuation of a native Iron Age population as none of them are of local origin and they do not share a common geographical origin, suggesting that something more complex than simply a shared ethnicity unites the individuals. The Musselburgh decapitation burials represent the earliest known examples of Roman inhumation and decapitation in Britain, and their apparent ethnic diversity coupled with a shared burial rite reflects the cosmopolitan nature of the Roman army.

4.8 Summary and discussion of the human remains

4.8.1 Articulated burials

Sue Anderson

Six individuals are certainly or probably of Roman date, all male. Four were in middle to old age at the time of death, and two were younger. Few Roman burials have been excavated previously in Scotland. A summary of the main groups is included in Collard & Hunter (2000), and there are few if any additions since then (F Hunter, pers comm). A couple of poorly preserved skeletons were recovered from a double grave at Camelon fort (Breeze et al 1976), but both were unsexed and not closely aged. One other skeleton has been recovered from the former wireworks at Musselburgh (Bruce 1993; Gallagher & Clarke 1993), another young adult ?male. Consequently the only geographically closely comparable material available for this group is from the north of England, the largest group being the Trentholme Drive, York, burial ground (Warwick 1968).

The Inveresk men were below the average height for large groups recorded in England, but their cranial indices were in the normal range for the period. Some rare non-metric traits were relatively frequent in this group, but individuals with specific traits were not buried in the same part of the site so no familial relationships could be suggested.

Dental disease in the form of carious lesions or ante-mortem tooth loss was not marked in this group, although four individuals were affected with abscesses. Two individuals appeared to have lost the crowns of their teeth through trauma, and a number of chips in the enamel suggested either a diet which contained a high proportion of grit (such as poorly milled cereals) or other hard foods, or possibly the habitual use of the teeth for some occupational purpose. The wear pattern on the teeth of Sk 235 in particular may indicate a practice which involved holding something in the teeth.

The two younger individuals in the group had few signs of bony pathology, although both had large Schmorl's nodes which indicated stress on their backs. The youngest male, Sk 323, also had changes to both ankles which are suggestive of some form of repetitive strain.

The four middle-aged or older males all had evidence of major trauma and osteoarthritis. Fractures to the spine or ribs were present in three individuals, and there was possible evidence of dislocation in two. Osteoarthritis appeared to be secondary to joint injuries in at least two cases, but there were also degenerative joint changes, particularly of the spine but also affecting the feet and hands in all four individuals, as well as other joints in some. However, the older men were less affected by Schmorl's nodes than the younger ones, perhaps suggesting that their spines were less affected by the physical stresses which are suggested by their other injuries. While osteoarthritis cannot be directly linked with specific occupations or activities, as its presence involves a number of other factors such as genetic predisposition, age and systemic factors (Rogers & Waldron 1995: 33), the widespread nature of the degenerative joint disease seen in these individuals does suggest considerable wear and tear on their bodies in life.

Evidence for post-mortem decapitation was noted on site in four of the six Roman burials, although only two had surviving evidence in their bones. The occurrence of this rite in such a high proportion of the burials is exceptional. Philpott (1991: 81) notes that the frequency varies between 1.6% and 31.4% in individual cemeteries in England, with an overall frequency of around 2.5% of all the 4th-century Roman burials known at the time of writing. Most of the decapitations with secure dating evidence in England can be placed in the 4th century, the only exceptions being a burial from Cuxton, Kent (dated AD 50–100 from pottery) and a group of infants from Temple IX at Springhead, Kent (dated to the mid-2nd century AD). If the Roman burials at Inveresk were associated with the fort, then they must be of 2nd-century date and are therefore one of the earliest manifestations of this rite in Britain. It has been suggested that the 4th-century rite spread from rural communities to urban ones in England (Philpott 1991), and that it may have been a revival of Iron Age pagan practices (Watts 1998: 89). Although there is a great deal of data on age, sex and possible social status of the 4th-century decapitations (all of which is diverse and not suggestive of a single 'type' of person being involved), this may not be directly comparable with the earlier Inveresk group. In this area, Roman influence was less well developed than it was in 4th-century Britannia to the south, and Iron Age traditions of inhumation burials appear to have continued here, as in Northumbria (Philpott 1991: 57), into the 3rd century and beyond, although some cremation burials are also known (Collard & Hunter 2000; Lelong & McGregor 2007). Potentially here the rite of decapitation might represent a continuation of a Celtic tradition of belief in the power of the severed head, rather than a revival, and it may be related to the beliefs of the particular group of Roman soldiers who were posted here, even though isotopic analysis suggests that they may have originated in different parts of the empire. Although no definite evidence for decapitation has been identified amongst the few Iron Age burials in the area, a single cervical vertebra from the Lochend cist, Dunbar, showed evidence of a possible sword cut (Brothwell & Powers 1966: 197).

4.8.2 Disarticulated burials

Sue Anderson

The disarticulated remains were generally well preserved and it seems most likely that these were contemporary with the Roman, rather than the Iron Age, group. If so, they add a further four individuals to the Roman burials, of which one may be female and the others were male. These four were either young, young/middle-aged, or unaged adults. If contemporary, they change the demographics of the group slightly, producing a younger average age at death and adding a woman to the group. The latter was approximately as tall as the average Roman male at English sites and determination of sex is less than certain as a result. Cranial indices for two of the four were within the normal range for a Roman group, although again the ?female was above average. The presence of a metopic suture in the ?female skull may indicate a familial relationship between her and Sk 235, but as the skull was disarticulated in Midden 003, it is uncertain where her original burial place might have been located. Little dental pathology was present in this small group, although the oldest male had lost one tooth before death.

Degenerative joint disease was also found in this group, affecting the spines of three individuals. However, no osteoarthritis was present in this younger group. Three individuals, like the younger Romans, had very large Schmorl's nodes. One individual had cribra orbitalia, which was not present in any of the articulated burials.

Evidence for decapitation was also found in this group, although only the ?female individual was involved. In this case the single cut to the axis vertebra had been made from behind. However, this blow did not sever the head and it is likely that the crucial lesion was on a vertebra which had been lost following disarticulation of the body. The lesion on the axis was suggestive of a wider blade than had been used in the Roman group, and the position on the back of the neck suggests that it may have been the result of an execution, rather than post-mortem decapitation, in this case.

4.9 The horse burial

Jennifer Thoms

C647 contained the burial of a complete horse (in Pit 648), intact apart from the skull, which was heavily fragmented. The post-cranial bones did not show any signs of injury or trauma that might have resulted in death, nor did they show signs of old age, or of age-related disease such as arthritis. The skull was too fragmented to allow any sign of cause of death from a blow to the head to be detectable. The age at death evidence obtained from the fusion of the bones indicated the animal had been aged between four and six years at death, suggesting that the animal was at peak maturity, not showing any signs of lameness or infirmity. The bones displayed no signs of butchery or dismemberment, which, together with its apparently deliberate burial, indicates that it was not killed for economic or practical reasons. Thus we have a large, young, fit, active animal that has died and has not been disposed of in a similar manner to the many other dead horses on the site.

Data relating to the horse burial is further considered as part of the overall animal bone report (Section 8.2).