Clough S. 2006. The Human Remains. Llanthony Secunda Priory, Gloucester (GLLSP 05). Unpublished archaeological evaluation report. Oxford Archaeology: Oxford.

Skeletal Report - Gloucester Llanthony Priory GLLSP05 & GQG05
NB- digital photographs available of the pathologies

The Human Remains

By Sharon Clough

Articulated remains

Introduction

A total of nine inhumation burials were recovered from the site of Llanthony Priory, Gloucester. These were all adult male individuals, but for one child of 9-11 years. Three of the graves are dated to 12th-13th century, contemporary with the Priory, the remainder are currently undated. The positioning of the body within the grave ranged from supine to prone, which is unusual for a religious medieval cemetery.

Methodology

The skeletal remains were subjected to full osteological analysis (as recommended by Brickley and McKinley 2004) and recording. The level of completeness of skeleton was each recorded as a percentage of the whole skeleton. The condition of the bone was recorded visually taking into account the degree of fragmentation of the bone and damage to the joint surfaces and cortical bone. The following scores were assigned:
Poor (cortical bone completely eroded, cancellous bone small and infrequent and extremely fragmented)
Fair (some cortical bone, though eroded in places, cancellous bone present and frequent fragmentation)
Good (complete cortical bone with occasional damage, cancellous bone complete and occasional fragmentation)
Excellent (cortical bone undamaged, cancellous bone complete and rare fragmentation)

The dentition was recorded using the Zsigmondy system (Hillson 1996). Age of the skeleton was determined using epiphyseal fusion (Scheuer and Black 2000), dentition eruption (Moorees *et al* 1963) and attrition (Miles 1962), cranial suture closure (Meindl and Lovejoy 1985), the sternal end of ribs (Iscan and Loth 1984; Iscan et al 1985), the auricular surface (Lovejoy *et al* 1985) and the pubic symphysis (Brooks and Suchey 1990). Age categories were assigned to each individual to ease comparison, theses were:
1 - Neonate - 36 weeks - 1 month
2 - Infant 1.1 month - 2 years
3 - Young child - 2.1 - 5 years
4 - Older child - 5.1 - 12 years
5 - Adolescent - 13-17 years
6 - Young adult - 18-25 years
7 - Prime adult - 26-35 years
8 - Mature adult - 36-45 years
9 - Older adult - 46+ years

Determination of sex was established using morphological changes of the skull and pelvis on adult skeletons (<18 years) (Ferembach *et al* 1980; Schwartz 1995). As is current accepted practice no attempt was made to sex subadults.
Measurements were taken, where possible, to determine stature (calculated using Trotter 1970), aid sex determination and examine biological relatedness. Non-metric traits (cranial,

dental and postcranial; Schwartz 1995, Berry and Berry 1967, Hillson 1996) were recorded to examine familial relationships and environmental factors. Palaeopathology was recorded by a detailed description of the lesion and then diagnosis. As this was a small assemblage, prevalence rates were not determined, as any results would over-inflate the actual level of the pathology.

Results

Completeness and condition

All the skeletons were in excellent condition and very complete (Table 1). All nine skeletons were rated as in excellent condition, with complete skulls in some cases, little or no damage to the cortical bone and low levels of fragmentation. Most of the skeletons (6) were 90% or more complete. This included recovery of the small finger and foot bones, all the ribs and vertebrae as well as the long bones. Of the skeletons who were less complete, skeleton 3399's left leg was absent, but the remainder of the skeleton was very complete. Skeletons 1602 and 1606 were about 75% complete, they came from more disturbed graves. Skeleton 1606 the left side of the skull and the left pelvis and lower legs and feet were absent and skeleton 1602 the left of the skull, left ribs and pelvis and most of the spine were absent, though all the long bones were represented.

Table 1: Skeletal condition and completeness

SKELETON NUMBER	CONDITION	COMPLETENESS
3315	Excellent	99%
3316	Excellent	90%
3327	Excellent	99%
3381	Excellent	90%
3399	Excellent	80%
3415	Excellent	85%
3429	Excellent	99%
1602	Excellent	75%
1606	Excellent	75%

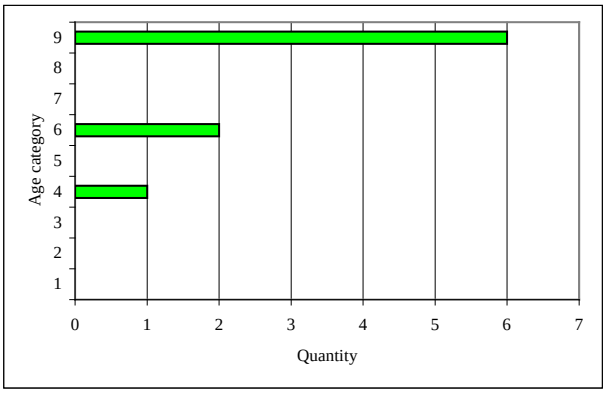
Age

The majority of the individuals (6 individuals or 54%) are in the older age group (45+ years). The age estimation for each of the individuals is given in Table 2 and the distribution across age groups is plotted in Figure 1. There are two individuals in the young adult age group and one individual in the older child group. Though this was a small assemblage, there was a noticeable grouping of the ages into those over 45 years, 18-25 years and 9-11 years.

Table 2: Skeletal age estimation

SKELETON NUMBER	AGE	AGE CATEGORY
3315	50 years	9
3316	40-50 years	9
3327	45 years	9
3381	9-11 years	4
3399	45-59 years	9
3415	40-60 years	9
3429	20-25 years	6
1602	45+ years	9
1606	18 years	6

Figure 1: Age categories



Sex

Sex was determined for 8 of the 9 skeletons. They were all male. The undetermined individual was subadult, therefore sex estimation was not attempted. There are currently no macroscopic methods that are considered reliable for estimating sex in subadults.

Stature

Stature is predetermined by genetics, but without adequate diet throughout infancy and childhood people do not achieve their maximum potential. From the measurements of long bones (the femur) it was possible to determine stature for 8 of the individuals (all the adults) from Llanthony Priory. The stature estimations are presented in Table 3 and range from 1.62 m - 1.77 m (5' 3 8/10in - 5' 9 7/10in). The mean height for the medieval period based on several excavated sites for males was 1.71 m (5' 7 1/4in) (Roberts and Cox 2003, 248). This is the same for this assemblage whose mean is 1.71 m.

Table 3: Stature

SKELETON NUMBER	HEIGHT IN METRES	HEIGHT IN FEET & INCHES
3315	1.72	5' 7 7/10in
3316	1.74	5' 8 5/10in
3327	1.63-66	5' 4 2/10in - 5' 5 4/10in
3399	1.62	5' 3 8/10in
3415	1.77	5' 9 7/10in
3429	1.73	5' 8 1/10in
1602	1.74-6	5' 8 5/10in - 5' 9 3/10in
1606	1.74-9	5' 8 5/10in - 5' 10 5/10in

Non-metric traits

The discontinuous morphological traits of the cranium and postcranium were recorded in order to determine familial clustering within the cemetery as some of these traits have a strong hereditary inclination. Those recommended by Schwartz (1995), Berry and Berry (1967), Hillson (1996) were selected for scoring.
At the Priory 6 (out of 9) individuals had a number of ossicles within the lambdoid suture. Of the skulls available for full examination there were 8, as skeleton 1602 had the left side missing and the occipital bone badly damaged. This indicates a very high prevalence of the ossicles in the lambdoid suture. Therefore it is possible to suggest that these individuals represent a closely related group.

Table 4: Summary of ossicles

SKELETON NUMBER	NUMBER OF OSSICLES AT LAMBDOID SUTURE
3315	2
3316	7
3327	3
3399	1
3429	5
1606	3

There were other non-metric traits observed on the skeletons. There was a large septal aperture on the left humerus of skeleton 3316, and exotosis in the right femora trochanteric fossa. Skeleton 3399 had several traits, right anterior calcaneal double facet and right talus inferior talal articular surface, first right metatarsal accessory facet medial side of proximal end, first lumbar vertebrae rib facet bilateral, left scapula absent suprascapula notch and double mandibular foramina bilaterally. Skeleton 3415 also had a bilateral calcaneal double anterior facet. Skeleton 1602 had a vastus notch on the left patella. These non-metric traits indicate that skeleton 3399 and 3415 may have a familial relationship. Skeleton 3415 does not have ossicles in the lambdoid suture unlike Skeleton 3399. The fact that all these individuals are buried in the same area of the cemetery may indicate a possible familial grouping, though post-cranial traits are influenced by inheritance to a lesser degree than cranial traits.

Table 5: Non-metric traits

NON-METRIC TRAIT	NO. BONES PRESENT LEFT	NO. BONES PRESENT RIGHT	INCIDENCE LEFT	INCIDENCE RIGHT
Septal aperture	8	8	1	0
Exotosis in Femora trochanteric fossa	6	8	0	1
Vastus notch	4	7	0	1
Calcaneal anterior double facet	6	6	1	2
Talus inferior articular surface	6	6	0	1
1st metatarsal accessory facet	5	4	0	1
Lumbar rib facet	7	7	1	1
Scapula absent notch	4	5	1	0
Double mandibular foramina	7	8	1	1

Pathology

As there are a low number of skeletons within this assemblage their pathologies are discussed on an individual level. Prevalence rates for disease and fractures have not been calculated due to the small quantities available for study.

Skeleton 3315
This individual suffered multiple fractures to the left ribs. The fractures were all well healed, well aligned and involved the midshaft. The fractures ran from rib 2 to 5 in a vertical alignment. Marginal osteophytes were observed on the heads of the first, second and third ribs, this may have arisen secondary to the fractures. Rib fractures are common and can be caused by many traumatic events, such as a fall, or a blow to the chest (Roberts and Manchester 1995, 77).
This individual had pathology of the spine also. Whether the rib fractures and the spinal injuries are related it is not possible to say. There were osteophytes around the body of the

vertebrae from cervical vertebrae 3 to sacral vertebrae 1, becoming more severe around the lower thoracics. There were also Schmorl's nodes (herniation from intervertebral discs) from thoracic vertebrae 5 to lumbar vertebrae 2. Thoracic vertebra 1, on the left articular process, had large osteophytes, associated with the corresponding ones on the 1st rib.

This individual also displayed large muscle markings, indicative of ligament/muscle strain, on the ilium, anterior patellae and plantar calcaneus. These were observed as enthesophytes at muscle/tendon insertion points.

Skeleton 3316
This individual possibly had osteomyelitis of the right tibia (awaiting radiograph to confirm diagnosis). Osteomyelitis is the inflammation of the bone and bone marrow caused by pus producing bacteria (Aufderheide and Rodríguez-Martin 1998). The tibia was thickened midshaft with occasional bony protrusions. The slight angulation of the bone anterior may indicate a healed fracture of the upper midshaft. The distal fibula on the right had small exotoses that may be associated with the pathology of the tibia.
The spine displayed Schmorl's nodes intermittently from thoracic 8 to lumbar 4. There were marginal osteophytes on the bodies from thoracic 8 to thoracic 12, though only slight.
This individual had several skeletal changes that are associated with degeneration due to increasing age. The first right rib at the costal end had ossified costal cartilage. The xiphoid had fused to the sternum and had an aperture in the centre. There was an additional facet on the left side of the xiphoid. The posterior of the xiphoid had raised spidery bone growth and increased porosity, similar to that seen in sinusitis, perhaps an indicator of chest infection.
There were also several musculo-skeletal stress markers. The right humerus had a groove for the triceps muscle, indicator of strain during extension of the arm. The left calcaneus had enthesophytes for the achilles tendon and the left talus head on the superior surface medial side had exotosis (bony protrusion) which may indicate more strain on the ankle joint, though this individual could also be a bone former.

Skeleton 3327
This individual was suffering from iron deficiency anaemia in the form of cribra orbitalia type 4 (Stuart-Macadam 1991, 109) (left and right orbits) and severe porotic hyperostosis on the left and right parietal and occipital bones. Anaemia may be caused by many factor including an iron deficient diet, parasitic infestation, chronic and acute blood loss (Roberts and Manchester 1995, 166-67, Stuart-Macadam 1991, 101-33).
The vertebrae of this individual had slight marginal osteophytes on the thoracic vertebral bodies (T2-10) and Schmorl's nodes on the lower thoracic vertebrae (T11-L1).
The right ankle exhibited curved bone from hyper-inversion which damaged the lateral ligament and developed a lip of bone growth (exotosis) and groove for the ligament. The left calcaneus also displayed a similar but more minor development.

Skeleton 3381
This subadult did not display any signs of pathology affecting the skeleton.

Skeleton 3399
There was no skeletal pathology in evidence on the remains of this individual. There were however signs of activity-related changes. The left and right clavicles had a groove or sulcus for *subclavius*, the clavicle forms a strut which supports the scapula against medial pull of the arm muscles. The right fibula had a spicule of bone, or an enthesophyte, at the proximal end just below the head orientated distally. This is from *tibialis* posterior that helps invert the foot. Enthesophytes have been found to occur from increased development of muscles as they are continually used to perform a task (Knüsel 2003). However, they have also been found to increase with age on otherwise healthy individuals.

Skeleton 3415

This individual had iron deficiency anaemia, though not as severe as skeleton 3327. The orbits had type 1 cribra orbitalia (Stuart-Macadam 1991, 109). The cranium in the centre of the frontal bone had a 6 mm diameter circular depression and the right parietal bone had a sub rectangular depression 25 x 16 mm on the side of the head just above the external auditory meatus (ear). There was no endo-cranial surface damage observed. It is concluded that these are well-healed blunt instrument traumas.
The right fifth metatarsal of the foot had irregular bone growth (osteophytes) on the lateral shaft, this is associated with the corresponding fourth metatarsal whose shaft is twisted and has an extended medial facet. This is evidence of trauma through injury to the lateral right foot.
The spine had marginal osteophytosis throughout, from cervical vertebrae 2 to sacrum 1. The osteophytes were quite severe at the thoracic 10 and 11 level, where the bony growth extends distally to cover the space between them completely. There are also Schmorl's nodes on 13 vertebrae from thoracic 5 to sacrum 1.
The skeleton has several musculo-skeletal stress markers. The left femur had an enthesophyte on the lesser trochanter. The left and right calcaneii had enthesophytes for the achilles tendon. The plantar surface also exhibited remodelling. The right humerus had much larger entheses cortical defects than the left, suggesting much more use. The left clavicle at the lateral end had osteophytes and porosity, changes diagnostic of osteoarthritis (Rogers and Waldron 1995).

Skeleton 3429
There is slight porotic hyperostosis involving the occipital bone in the region of the lambdoid suture. This indicates iron deficiency anaemia (Macadam, 1991, 101).
The vertebrae had Schmorl's nodes on six of the bodies, from thoracic vertebrae 9 to lumbar vertebrae 2.
The right wrist bone, the hamate, was not fully developed. The 'hook' projection was absent. This is possibly a developmental abnormality and does not appear to have had any affect on the surrounding bones.

Skeleton 1602
This individual had lateral deviation of the great toe, which is also known as hallux valgus. On the medial aspect of the first metatarsal head were bony outgrowths, where a bursa had developed, commonly known as a bunion. There were indications of lateral subluxation of the sesmoids as there was erosion and lipping of the intersesmoid ridge. Associated with the hallux valgus was ankylosis involving the interphalageal joint of the first left metatarsal. Although both sides of the joint were aligned, the phalanges were angled mesially by approximately 45°. There was also bony growth on the medial aspect of the joint, which may reflect a second bunion formation. Osteoarthritic changes are a recognised complication of hallux valgus (Mays 2005), this finding is perhaps an extreme example of this. The right foot also has pathology involving the 1st metatarsal in the form of osteophytes on the superior margin of the articular surface.

Skeleton 1606
This young adult had Schmorl's nodes on 7 thoracic vertebrae. He was also suffering from iron deficiency anaemia in the form of type 2 cribra orbitalia in both orbits and porotic hyperostosis on the right parietal (left was absent) and upper part of the occipital bone.
The dentition indicates a possible facial paralysis. There is a considerable amount of dental calculus (plaque) on the left mandibular and maxilla teeth, in contrast to the right that has none. Inactivity of the facial muscles used to chew food, would result in food remaining in the area. The facial bones are absent, so it is not possible to identify further evidence of paralysis. It would be unusual to have Bell's palsy in an individual of this age (18 years), though not impossible. As the calculus is of a large quantity, the paralysis may have been longstanding.

Discussion

In an average cemetery with a wide catchment area, one would expect to see more of a range of ages. This dominance of males within the assemblage suggests some kind of restriction on who was buried in this cemetery or area of this cemetery. As these graves are associated with the Llanthony Priory, it would be possible to suggest that they are members of the religious community, which barred women from its membership. Although, cemeteries associated with religious communities do often have women and children buried in the lay part of the cemetery or in the church, as they were often high ranking benefactors.

The extra or supernumerary bones (ossicles) which were observed are most commonly sited along the sutures of the skull. The Lambdoid suture in particular is a frequent location and ossicles here are under a degree of genetic control in that they have been described as 'tending to run in families' (Torgersen in Mays 1998, 108). As 6 individuals had this trait there may be some degree of familial relationship between this group.

This group of individuals displayed skeletal pathologies consistent with those of advanced age. There is a high level of spinal joint disease, which increases with age, but may also be occupationally related. However inheritance and sex are among other factors that play a part in the manifestation of these conditions. Several individuals had Schmorl's nodes on the vertebral bodies. Schmorl's nodes are where the intervertebral disc containing a capsule of gelatinous substance has been ruptured and the disc contents exert pressure on the body surfaces. Their aetiology is unspecified but most likely associated with trauma to the spine, from over-exertion during heavy lifting (Roberts and Manchester 1995, 107).

There are also four individuals with anaemia, which suggests a lack of red meat in their diet (or another source of iron) or parasitic infestation (intestinal worms) or chronic blood loss through injury or disease. Adult lesions most probably reflect childhood episodes of anaemia (Stuart-Macadam 1991, 101). Prohibitions on the consumption of meat in monasteries were only lifted after the later Middle Ages. Fish was a large part of the diet as well as bread and ale. Cheese, eggs, dried fruit and vegetables also played a part in the diet (Roberts and Cox 2003). Monastic levels of anaemia are often lower than the general population, however where the cemetery includes lay population and those from the infirmary there is a higher incidence reflecting a more mixed group (Gilchrist and Sloane 2005).

There was no pathology evident on the bones of subadult 3381. This is not unusual for individuals of this age.

Skeleton 3316 it is possible that his musculo-skeletal stress markers are a result of the pathology affecting the right leg, indicating that this individual used a crutch or stick on the right arm and put the weight on the left foot. A study by Stirland (1993) inferred occupational activity from left and right humerii from the skeletal series Norwich and Mary Rose. The Mary Rose individuals were professional archers and showed little asymmetry of the humerii, whereas the Norwich males showed a clear right dominance. It must be emphasised however that many activities can result in the markers observed on skeleton 3316.

The hallux valgus observed on skeleton 1602 is principally a biomechanically created pathology, specifically from the habitual use of footwear which constricts the toes (Mays 2005). In the study by Mays (2005) he found that it was restricted to the population dating from the 13th-16th centuries, which appears consistent with the rise in popularity in this period (at least amongst the richer social classes) of narrow, pointed shoes. He also found there was no sex difference in the frequency of this pathology and that it was frequently unilateral. As footwear was handmade in this period, it is quite likely that the fit of the left and right shoes should have differed.

Dental pathology

Dental pathology can tell us about dental hygiene, treatments, general health of the individual and diet. There were a large number of teeth available for analysis, 221 in total with an average of 24 per person (out of a total 32).

Dental calculus is formed by mineralised plaque which accumulates at the base of living plaque deposits on the teeth (Hillson 1996, 225). One individual (skeleton 1606) as previously mentioned had extremely heavy calculus on the left dentition, in contrast to none for the right. Four individuals had evidence for calculus, though it was much slighter than that observed on skeleton 1606. Calculus was scored using Brothwell's (1981) variations in the degree of calculus formation ranging from slight to considerable. Calculus is a common pathological condition and is generally related to poor oral hygiene. The deposits are generally seen on the teeth nearest the saliva glands.

Periodontal disease is commonly caused by the accumulation of calculus between the teeth and the soft tissue causing inflammation of the soft tissue, gingivitis, which may lead to inflammation of the surrounding bone. There was only one individual with periodontal disease, this was skeleton 1606 who had vertical bone loss of the alveolar margin surrounding the left mandibular molars. These changes were probably related to the high level of calculus here. Vertical bone loss is localised around an individual tooth or a pair of teeth. This would create a narrow deep pocket (Hillson 1996, 264-65).

Dental caries appears as opaque spots on the dental enamel or large cavities. It is caused when acid is secreted by bacteria present in dental plaque and is therefore considered to be an infectious disease (Hillson 1996, 269). There were 19 carious lesions in total, which is about 3 per person, as they were distributed across 6 individuals. These were mostly approximal or occlusal, with a few along the cemento-enamel junction (CEJ). There is enormous variation in the medieval period for the rate of caries per person, from 7% to 74% (Roberts and Cox 2003, 259). The cavities are commonly found in areas where food is likely to be trapped, such as on the occlusal surface of premolars and molars, between the teeth and along the CEJ. Cavities present at the CEJ, often predispose individuals to periodontal disease (Hillson 1996, 275). Caries rates are strongly linked to the consumption of carbohydrates whereby they are low for populations whose diets comprise a small amount of starch rich plants and high , particularly amongst children, where sugars have been introduced into the diet (Hillson 1996, 278).

There was a low level of attrition observed across all the adult individuals, given their advanced age. The ageing methods devised by Miles (1962) consistently under-aged the adults compared with other methods.

There were 11 teeth lost ante-mortem in total. This is quite a low number, given the advanced age of most of the individuals. The aetiology of ante-mortem tooth loss is multifactoral in its origin (Lukacs 1989, 265). Accumulation of calculus may lead to periodontal disease, eventually leading to the loss of the tooth. The formation of a peri-apical abscess (caused by severe attrition or caries) may also cause premature exfoliation. Trauma is another cause of tooth loss. However, as teeth are often lost due to dental caries, the low level of this is reflected here.

Hypoplastic lines, grooves or pits on the enamel surface are formed during periods of growth arrest in the development of the tooth crown. This growth arrest has been linked to periods of childhood diseases, weaning and malnutrition (Hillson 1996, 166-67). There was a low level of dental enamel hypolasia (DEH), with four individuals having at least one line on one tooth affected. There is a correlation between those with more defects and a low age at death as

found in a detailed study (Roberts and Cox 2003, 264). At the priory three of the four individuals with DEH died before the age of 25 years.

There were 7 abscesses contained in 3 dentitions. These abscesses were all small and located at the end of roots on the buccal side. The route to the development of an abscess may have many starting points. Bacteria may enter the pulp cavity through dental caries, excessive attrition or trauma to the crown. An abscess can also occur when a periodontal pocket is formed. When bacteria accumulates in the pulp cavity an inflammation starts which can track to the apex of the root. As the pressure builds from the continuous accumulation of pus, a hole (sinus) forms on the surface of the jaw allowing the pus to be expelled (Roberts and Manchester 1995, 50). It is at this advanced stage that the abscess is osteologically visible.

A variety of dental anomalies may be found within the human dental arcade. These include impacted teeth, congenitally absent teeth (agenesis), supernumerary teeth and the rotation of teeth. Only 1 individual was observed to have had an absent 3rd molar, this was not however confirmed radiologically. Two individuals had one rotated tooth each.

Discussion

These levels of caries and other dental pathologies are to be expected for a medieval population. The fairly low level of caries, abscesses and calculus indicate a diet low in refined carbohydrates. The low level of antemortem tooth loss is partly explained by the low level of caries, but also the low attrition displayed on the dentitions. This would indicate a diet that consisted of soft foods, or higher processed foods. The periodic episodes of childhood illness indicated through dental enamel hypoplasia, show that childhood health was interspersed with acute illness, or malnutrition.

Disarticulated skeletal remains

Methodology

The disarticulated human skeletal remains were examined by context in order to determine the minimum number of individuals (MNI). The bones were identified and coded by type and side and any pathology noted. The MNI was calculated using the most frequently represented skeletal element for each age or sex per archaeological context.

Results

The results show that there was a minimum of 30 further individuals represented by the disarticulated bone. The pathologies observed were osteophytic vertebrae and tibial periostitis. Skeletal element and siding information for each context is displayed in the appendix.

Table 6: MNI

CONTEXT NUMBER	MNI
3416	1 adult, 1 young adult
3400	1 adult, 1 older child
3431	1 adult
3274	1 adult
3027	1 adult
3348	1 adult
3320	1 adult
3382	1 adult, 1 older child
3159	1 adult, 1 older child
3351	1 adult
3325	2 adult, 1 child

3326	1 adult
3419	1 adult, 1 child
1	1 adult
2	1 adult
3	1 adult
4	1 adult
5	1 adult
6	1 adult
7	1 adult
8	1 adult
1604	2 adults
Total	30 individuals

Discussion

The reuse of cemetery space is frequent in the medieval period, commonly resulting in disturbed graves, whose contents are then reburied, as either backfill, or in purposefully dug charnel pits. Information about the archaeological contexts from which these disarticulated bones have been retrieved will aid in determining the extent of the cemetery.

Funerary practice

Body position

There was great variation in body position amongst this small assemblage (Table 7). The most common position in the medieval period for a grave within a cemetery was supine with the head to the west (Gilchrist and Sloane 2005, 152). This is so that at the time of resurrection the individual is more prepared to see Christ come out of the east (Gilchrist and Sloane 2005, 152). There are only two of the individuals from this site in this position, one had the head facing north and one had the head facing south.

There were three burials whose body was prone (west-east). This type of burial has been perceived to be for a deviant individual (Daniell 1997, 118). However, in this context of a Priory cemetery, with more than one individual in this position, this explanation seems unlikely. Burial of a person prone may have been a penitent act, related to expiation for their own or others sins (Gilchrist and Sloane 2005, 154). There are other monastic sites with prone burials of a similar period. There were two males at St Mary's Merton (1300-1390) (Miller *et al* in prep), 3 males at St Saviour's, Bermondsey, Surrey (12th-14th century) (Steele in prep), 5 skeletons at St Mary Blythe, Nottinghamshire (Fairweather 1926, 39), and 1 male at St Mary Stratford Langthorne (14th century) (Barber *et al* 2004). These adult male burials at Llanthony Priory are therefore not unique, but nonetheless quite rare.

There are three adult males on their right sides, slightly flexed at the knees, two orientated west-east, one east-west. These burials rarer than those that are prone. There is only one other known adult burial on their side at Dunfermline Abbey (14th-15th century) (Coleman 1996, 79-80). This individual was disabled and so was laid in this fashion, supposedly because of his condition. The three lain on their sides at Llanthony priory all had an obvious ailment, if the diagnosis is correct. Skeleton 3316 had osteomyelitits involving the right leg and may have walked with a crutch, skeleton 1602 had an ankylosed left big toe, which would have affected his gait, and skeleton 1606 had facial paralysis. It is possible that these ailments led to their unusual burial position.

The remaining individual was a child of 9-11 years. He/she was buried on his/her left side, flexed with arms bent into the chest, in a 'sleeping' position. At other sites young children and infants have been found in this position, it must be deliberate as it is seldom seen in adults. This arrangement has been poignantly interpreted as a natural sleeping position (Gilchrist and Sloane 2005, 155).

Table 7: Summary of body positions

SKELETON NUMBER	AGE	SEX	BODY POSITION	GRAVE ALIGNMENT	HEAD DIRECTION	COFFIN	GRAVE GOODS
3315	50 years	Male	Prone	east-west	West	Possible Fe object	Lead
3316	40-50 years	Male	On right side, slightly flexed	east-west	East	Possibly. Fe nail on scapula	
3327	45 years	Male	Supine - head looking south	east-west	West	Possible, Fe oject	
3381	9-11 years		On left side, flexed	east-west		Possible, Fe object	
3399	45-49 years	Male	Prone	east-west	West		
3415	40-60 years	Male	Prone	east-west	West		Circular fe object
3429	20-25 years	Male	Supine - head looking north	east-west	West		
1602	45+ years	Male	Right side, flexed knees	east-west	West		
1606	18 years	Male	On right side	east-west	west	Possibly. Fe nail in grave	

Further investigation through artefactual and stratigraphic analysis will assist in the interpretation of the funerary practice at Llanthony Priory. Evidence for coffins in the form of iron nails and soil stains or ecofactual evidence will enable a more in-depth examination.

Conclusion

Though this is a small assemblage of nine skeletons, due to their excellent condition and high level of completeness it has been possible to establish an age and sex for each individual. It has also been possible to examine skeletal and dental pathology to a full extent and establish that these are possibly a related group from their non-metric traits. The burial practice for these individuals on initial examination seems to be unusual. However further investigation into religious houses burial practices may shed light in this area.

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Skeletal Catalogue

Key to dental notation

/ - lost PostMortem

X - Lost AnteMortem

B - Broken

C - caries

A - Abcess

NP- Not present

R- Root only

U - Unerupted

E - Erupting

PE - Partial eruption

PU - Pulp exposed

=- - Jaw not present

H - Hypolasia

Ca - Calculus

P - Periodontal disease

Skeleton Number 3315

		R															L
Preservation	99%, excellent	-	-	X			H								X	/	NP
Dentition		8	7	6	5	4	3	2	1	1	2	3	4	5	6	7	8
		8	7	6	5	4	3	2	1	1	2	3	4	5	6	7	8
Stature	1.74m (5'7")	C	C	R											A	C	
Femur length (L)	477mm			A											C		

Pathology summary

Left ribs 4 healed fractures midshaft. Vertebral osteophytes (C3-S1) and schmorl's nodes (8 bodies). Coccyx fused to sacrum.

Enthesophytes and cortical defects.

Posterior ilium left and right marked linear exotoses. Left and right patella anterior enthesophytes. Left and right calcaneus plantar enthesophytes.

Non-metric traits

2 Lambdoid ossicles.

Skeleton Number 3316

		R															L
Preservation	90%, excellent		-	X	/	C	C		/	/	/	C	C				
Dentition		8	7	6	5	4	3	2	1	1	2	3	4	5	6	7	8
		8	7	6	5	4	3	2	1	1	2	3	4	5	6	7	8
Stature	1.72m (5'6")			C											X		
Femur length (L)	465mm																

Pathology summary

Right tibia osteomyelitis secondary to a fracture. Distal right fibula (associated with tibia) exotoses.
Posterior sternum lesions. Very slight osteophytes on thoracic vertebrae. Slight schmorl's nodes on 5 vertebrae.

Enthesophytes and cortical defects.

Right humerus groove for *pectoralis* major muscle. Left calcaneus enthesophytes for achilles tendon. Left talus head superior surface, osteophytes.

Other

Xiphoid process fused to sternum with aperture.
Left and right first rib costal cartilage ossification.

Non-metric traits

7 ossicles at lambda. Left distal humerus septal aperture, large.

Skeleton Number 3327

		R			L
Age	45 years				
Sex	Male	A	A		

Preservation	99%, excellent		X	C	C				/	/	/				C a	C a	R	C A
Dentition			8	7	6	5	4	3	2	1	1	2	3	4	5	6	7	8
			8	7	6	5	4	3	2	1	1	2	3	4	5	6	7	8
Stature	1.63-1.66m (5'3"-5'4")								Ca	Ca	Ca	Ca				X	X	C
Femur length (L)	439mm																	

Pathology summary Cribra orbiltalia type 4 L & R orbits. Porotic hyperostosis, severe, occipital, L& R parietal. Osteophytes on thoracic vertebrae, slight. Schmorl's nodes lower thoracics and L1.
Enthesophytes and cortical defects. Right calcaneus lateral side long bony groove for ligament of peroneus longus.
Non-metric traits 3 ossicles at lambda

Skeleton Number 3381

Age	9-11 years																	
Sex	undetermined		R															L
Preservation	70%, excellent		U		H										H	H	U	
Dentition			8	7	6	5	-	-	-	-	/	/	/	4	5	6	7	8
			8	7	6	e	4	3	2	/	1	2	3	d	5	6	7	8
Stature	N/a		U			5	X							4	U			U
Femur length (R)	274mm					U								pe				

Non-metric traits -1 accessory foramina left mandible

Skeleton Number 3399

Age	45-59 years																	
Sex	Male		R															L
Preservation	85%, excellent		-	/	c	c	h	h	h	/	/		h	c		ca		
Dentition			8	7	6	5	4	3	2	1	1	2	3	4	5	6	7	8
			8	7	6	5	4	3	2	1	1	2	3	4	5	6	7	8
Stature	1.77m (5'7")		X	/				H	H			H	H			c	/	np
Femur length (R)	484mm																	

Pathology summary. Manubrium fused to sternum (age-related).
Enthesophytes and cortical defects left and right clavicles, slight groove for subclavius. Right proximal fibula enthesophyte (bony spur) on medial posterior side, just below styloid process.
Non-metric traits 1 ossicle at left lambda. Righth anterior calcaneal double facet. Right talus inferior talal articular surface. Left scapula notch absent. 1st lumbar vertebrae rib facet bilateral. 1st right metatarsal extra facet on medial side of proximal end.

Skeleton Number 3415

Age	40-60 years		R															L
Sex	Male																	
Preservation	95%, excellent		-	-	X	P U	P U	P U	P U	P U	P U	P U	P U	P U	P U	P U	-	-	--
Dentition			8	7	6	5	4	3	2	1	1	2	3	4	5	6	7	8
			8	7	6	5	4	3	2	1	1	2	3	4	5	6	7	8
Stature	1.74-1.79 m (5' 6 -8")			P U	P U	P U	P U			/	/				A C P U	X	-	
Femur length (L)	485mm																	

Pathology summary. Cribra orbitalia bilateral type 1. Frontal bone centre 6mm diameter rounded indentation (fossa) and on right parietal 25x16 mm. Healed cranial trauma, no internal damage observed. Left clavicle at lateral end osteophytes and porosity. Left femur enthesophyte on lesser trochanter.Left and right calcaneii enthesophytes for achilles tendon, plantar surface also bone remodelling. Right 5th metatarsal lateral surface osteophytic growth irregular 5mm diameter. 4th metatarsal shaft twisted and an extended medial facet. Osteophytosis on spine from C2-7, T3, T5-11, L1-S1. Schmorl's nodes on 13 vertebrae.
Non-metric traits -Left and right double calcaneal anterior facet

Skeleton Number 3429

Age	20-25 years																	
Sex	Male		R															L
Preservation	99%, excellent										/							PE
Dentition			8	7	6	5	4	3	2	1	1	2	3	4	5	6	7	8
			8	7	6	5	4	3	2	1	1	2	3	4	5	6	7	8

Stature 1.62m (5'3")			C			H	H	Ca H	Ca H	H	H					C

Femur length (R) 443mm

Pathology summary. Right lower 1st incisor rotated 45° to the right. Slight porotic hyperostosis, occipital bone at lambda. Right hamate, 'hook' is not fully formed. Sacrum, S1, spinous process poor alignment. 6 vertebral bodies schmorl's nodes, L2-T9.
Enthesophytes and cortical defects left and right clavicles, groove for subclavius.
Non-metric traits 5 ossicles at lambda

Skeleton Number 1602

Age 45+ years

Sex Male

Preservation 75%, excellent

Dentition

R															L
Ca	Ca	Ca	Ca	-	-	-	-	-	-	-	-	-	-	-	-
8	7	6	5	4	3	2	1	1	2	3	4	5	6	7	8
8	7	6	5	4	3	2	1	1	2	3	4	5	6	7	8
NP	Ca	Ca	Ca	Ca	-	-	-	-	-	-	-	-	-	-	-

Stature 1.74-1.76 m (5' 6 -7")

Femur length (L) 470mm

Pathology summary. Left scapula glenoid fossa slight osteophytic lipping on anterior margin. Right clavicle lateral end porosity where articulates with scapula. Left foot; 1st metatarsal distal head medial side has enthesophytes, large rounded bone growth. The 1st proximal and distal phalanges are ankylosed in a straight alignment, however the join is everted (raising the distal phalanx) 45°. This is a possible bunion with associated osteoarthritis. There is also new bone growth on the superior surface of the cuboid and 3rd cuneiform. The right foot exhibits bone growth (enthsophytes) on the superior margin of the proximal articular surface, extending 5mm towards the 1st metacarpal.
Non-metric traits -Left patella slight vastus notch on lateral side, articular surface continues on to anterior surface.
Green stain medial side left fibula, distal third of shaft.

Skeleton Number 1606

Age 18 years

Sex Male

Preservation 75%, excellent

Dentition

R															L
														C	
					H	H	H	Ca	Ca	Ca	Ca	Ca	Ca	Ca	Ca
8	7	6	5	4	3	2	1	1	2	3	4	5	6	7	8
8	7	6	5	4	3	2	1	1	2	3	4	5	6	7	8
	C	C						Ca	Ca	Ca	Ca	Ca	Ca	Ca	Ca
													P	P	P

Stature 1.73 m (5' 6")

Femur length (R) 472mm

Pathology summary. Cribra orbitalia both orbits, type 2. Porotic hyperostosis right parietal and upper occiptal, medium. Schmorl's nodes on 7 thoracic vertebrae. Possible facial paralysis indicated by contrasting levels of calculus on dentition.
Non-metric traits -3 ossicles at lambda on right side (left side not available)

Disarticulated human remains catalogue

Cxt No.	Age	Bone	side	Sex	Pathology or notes
3416	AA	QC	L		
	AA	IL	R		
	YA	IP	L		
	AA	QR	L		Osteophytes articular facet
	AA	VT	M		adjoining with below
	AA	VT	M		
	AA	UM	R		
3400	I2	TT	L		
	AA	VC	M		C1
	AA	VC	M		C2. L, inf articular facet osteophytes
	AA	VC	M		C3. L sup artic facet osteophytes & eburnation. Inf osteophytes.
	I2	ZM	R		
	AA	MM	M	MALE	wear on buccal/labial side more- overbite of maxilla?
3431	AA	TD	L		
	AA	IS	R		
3274	AA	QR	L		
	AA	QR	R		
	AA	RM	L		
	AA	UM	L		
	AA	VL	M		5th
3027	AA	ZM	L		4th
3348	AA	QC	L		
	AA	BM	R		Periostitis
3320	AA	IL	R	MALE	
	AA	IS	L		
	AA	HD	L		
	AA	QR	R		
	AA	RP	R		
	AA	HM	R		
3382	AA	YM	R		3rd
	AA	YM	R		2nd
	AA	YP	L		
	AA	QR	R		
	AA	QR	L		
	AA	QR	R		1st
	I2	QM & QS	M		5 centres ossification
3159	AA	QR	L		
	AA	QR	R		
	AA	QR	L		
	AA	QR	R		
	AA	QR	L		
	AA	CP	R		
	AA	UM	L		
	AA	ZM	L		
	AA	ZM	L		
	AA	ZM	L		
	AA	YM	L		3RD
	AA	YP	L		
	AA	IA	R	MALE	
	AA	FP	L		small 3rd trochanter
	AA	SG	L		
	AA	FM	L		
	I2	YM	R		
	I2	HD	L		

3351	AA	MD	R	MALE	Calculus
	AA	MC	M		
	AA	CT	L	MALE	
	AA	CF	R		
	AA	CO	M		
	AA	CO	M		
	AA	CZ	L		
	AA	IS	L		
	AA	ZM	R		
	AA	QR	R		
	AA	RM	L		
	AA	RD	R		
	AA	QR	L		
	AA	UP	R		
	AA	VT	M		Large osteophytes sup & inf body
	AA	FP	L	FEMALE??	43mm
	AA	FM	L		
	AA	CX	L		
	AA	TM	R		periostitis
3325	AA	HH	R		
	AA	RP	R		
	AA	QC	R		
	AA	RR	L		
	AA	SS	L		
	AA	FF	L		
	AA	LL	L		
	AA	QR	R		
	AA	QR	L		
	AA	QR	R		
	AA	QR	L		
	AA	QR	R		
	AA	QR	L		
	AA	QR	R		
	AA	QR	L		
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	AA	QR	R		
	AA	QR	L		
	AA	QR	R		
	AA	QR	L		
	AA	QR	R		
	AA	QR	L		
	AA	QR	R		
	AA	VL	L		5th
	AA	VL	R		4th
	AA	VT	L		
	AA	VT	R		
	AA	M1	L		
	I2	HM	R		
	AA	ZA	L		small
	AA	ZM	R		small
	AA	ZM	L		small
	AA	ZP	R		
	AA	ZP	L		
	AA	ZP	R		
	AA	ZP	L		
	AA	ZP	R		

	AA	ZM	L		
3326	AA	HH	L		
	AA	SS	R		
	AA	VT	M		lower
3419	AA	HH	R		
	AA	CZ	R		
	I2	QR	L		
1	AA	TP	R		
	AA	CF	R	M	
	AA	ZP	L		1st
	AA	VT	R		
	AA	IA	L		
	AA	RM	R		
	AA	UM	L		
2	JU	IS	L		
3	AA	ZM	L		1st
4	AA	FP	L		
		TD	R		
5	AA	CT	R	M	
	AA	YP	L		
	AA	QR	R		
	AA	QC	R		
	AA	VL	M		
	AA	VL	M		
6	AA	HD	L		
	AA	UP	L		
7	AA	HP	L		
	AA	FM	R		
	AA	YM	R		3rd
8	AA	HH	L		
1604	AA	TM	R		
	AA	QC	L		
	AA	TP	R		
	AA	TM	L		
	AA	BD	R		
	AA	UM	R		
	AA	RM	L		
	AA	QR	L		1st
	AA	QR	R		
	AA	VT	M		Sup body osteophytes. Schmorl's nodes inf & sup
	AA	VT	M		Schmorl's node superior body
	AA	VT	M		Schmorl's node superior body
	AA	VT	M		Schmorl's node superior body

Key to Anatomical codes:

Skeletal Parts Two Letter Anatomical Codes (After Chamberlain 2000)

Code	Part	Code	Part	Code	Part
AA	**Auditory Ossicle**	**II**	**Hip Bone (Innominate)**	**UU**	**Ulna**
AI	Auditory:Incus	I?	?Innominate	U?	?Ulna
AM	Auditory:Malleus	IA	Acetabulum	UD	Ulna(distal)
AS	Auditory:Stapes	IL	Ilium	UM	Ulna (midshaft)
BB	**Fibula**	IP	Pubis	UP	Ulna (proximal)
B?	?Fibula	IS	Ischium	**VV**	**Vertebrae**

BD	Fibula (distal)	IX	Hip bone fragment	VC	Cervical vertebrae
BM	Fibula (midshaft)	**KK**	**Skeleton**	VL	Lumbar Vertebrae
BP	Fibula (proximal)	**LL**	**Patella**	VS	Sacrum
CC	**Cranium**	LS	Sesmoid bone	VT	Thoracic vertebrae
CD	Demicranium	**MM**	**Mandible**	VX	Vertebrae fragment
CE	Endocast	MC	Mandibular body	VY	Coccygeal fragment
CF	Frontal	MD	Demimandible	**XX**	**Maxilla**
CH	Ethmoid	MR	Mandibular ramus	XD	Demimaxilla
CL	Lacrimal	MS	Mandibular symphysis	XP	Premaxilla
CN	Nasal	MY	Mandibular condyle	X1	Upper I1
CO	Occipital	M1	Lower I1	X2	Upper I2
CP	Parietal	M2	Lower I2	X3	Upper C
CS	Sphenoid	M3	Lower C	X4	Upper P3
CT	Temporal	M4	Lower P3	X5	Upper P4
CV	Calvaria	M5	Lower P4	X6	Upper M1
CX	Vault Fragment	M6	Lower M1	X7	Upper M2
CZ	Zygomatic	M7	Lower M2	X8	Upper M3
DD	**Deciduous Tooth**	M8	Lower M3	**YY**	**Hand Bone**
D?	? Deciduous tooth	PP	Permanent tooth	YA	Capitate
DR	Deciduous tooth root	PR	Permanent tooth root	YC	Carpal
DX	Deciduous crown frag	PX	Tooth crown fragment	YD	Trapezoid
D1	upper dI1	**QC**	**Clavicle**	YH	Hamate
D2	upper dI2	QH	Hyoid	YI	Pisiform
D3	upper dC	QM	Manubrium	YL	Lunate
D4	upperdM1	QR	Rib	YM	Metacarpal
D5	uipper dM2	QS	Sternum	YP	Phalanx (hand)
E1	Lower dI1	**RR**	**Radius**	YQ	Triquetral
E2	Lower dI2	R?	?Radius	YS	Scaphoid
E3	Lower dC	RD	Radius (distal)	YZ	Trapezium
E4	Lower dM1	RM	Radius (midshaft)	**ZZ**	**Foot bone**
E5	Lower dM2	RP	Radius (proximal)	ZA	Talus
FF	**Femur**	**SS**	Scapula	ZC	Calcaneus
F?	?Femur	S?	?Sacpula	ZE	Medial Cuneiform
FD	Femur (distal)	SA	Acromion	ZI	Intermediate Cuneiform
FM	Femur (midshaft)	SC	Coracoid	ZL	Lateral Cuneiform
FP	Femur (proximal)	SG	Glenoid cavity	ZM	Metatarsal
HH	**Humerus**	**TT**	**Tibia**	ZN	Navicular
H?	?Humerus	T?	?Tibia	ZP	Phalanx (pedal)
HD	Humerus (distal)	TD	Tibia (distal)	ZT	Tarsal bone
HM	Humerus (midshaft)	TM	Tibia (midshaft)	ZU	Cuboid
HP	Humerus (proximal)	TP	Tibia (proximal)	??	Unknown

Age	AA	Adult	age unspecified
	FE	Fetus	
	NE	Neonate	
	I1	Infant stage 1	1-5 yrs
	I2	Infant stage2	6-11 yrs
	JU	Juvenile	12-17 yrs
	YA	Young adult	18-29 yrs
	PA	Prime adult	30-45 yrs
	MA	Mature adult	45-85 yrs