

II. ANIMAL AND BIRD BONE

Animal Bone Pathology

Cattle

Dental

Dental anomalies were occasional. In one case (Period III) the corner incisor (I₄) has been shed ante-mortem, the alveolus being partly filled with bone. In Period III absence or ante-mortem loss of P₂ occurred four times, mostly in old animals (Grant's numerical value 45, 46 and 50); twenty-one jaws were normal. Variation in the morphology of M₃ was not common; in one the posterior cusp was absent, in one it was much reduced and in two there was no bovine pillar; in twenty jaws M₃ was normal. In two maxillae the posterior half of M₃ was worn unevenly; they probably match a M₃ with absent posterior cusp. For Period IV, P₂ was absent once (n.v.48), present sixteen times; M₃ was normal in nineteen jaws, abnormal in two: in one the tooth lacked the posterior cusp, in the other the posterior cusp was joined to the rest of the tooth normally at the root and the tip of the crown (the tooth is unworn) but is separate from the rest of the tooth for a 10 mm length (31).

A lower first or second molar (Period VI, 874) was unusual in having a very large bovine pillar, arising from a supernumerary root (Plate XXXIII).

Periodontal disease: two cases in a total of forty-three jaws (III), none from Period IV.

(III, 3012): alteration of bone on buccal and lingual side by P₄/M₁, and less severely by M₁/M₂;

(III, 2115): bone swollen buccally by P₄/M₁; gap 2 mm at occlusal surface between P₄ and M₁, interdental attrition on M₁ distally. The posterior root of M₁ is pitted.

Vertebral column and rib cage

Rib fracture: (Period III, Bag 844) Remodelling of the bone is well advanced but no fusion of the two parts has occurred. Either the condition has stabilised as a false joint or death occurred before fusion was complete (Plate XXXI).

Healed rib fracture: (III, 387)

Healed rib fracture: (IV, 1324): a section 6x2 cm has been pushed in, healing completely but leaving two holes through the rib. (Radiographed).

Thoracic vertebra (V, 2635): apparently a healed fracture of the spinous process, plus degeneration and pitting of one articular facet suggesting an infected lesion.

Lumbar vertebra (VII, 2621): extra bone growth on side of the centrum with lipping round the articular surface.

Lumbar vertebra (V, 2529): 4 cm² area of spongy periosteal bone growth at base of spinous process.

Large foramina in a lumbar vertebra: the foramina on the ventral aspect of the centrum are 6x3.5 mm and 5x4 mm and enter the spinal column through a single hole 5.5x3.5 mm. These foramina are discussed in Baker and Brothwell (1980, 35, 36) and occur in 1-2% of modern cattle (Baker p.c.).

Main limb bones

Scapula: (IV, 564) large area of periosteal extra bone up to 3 mm thick along both sides of the spine.

Radius: (IV, 861) small raised oval lesion 18x8 mm near the ulnar groove.

Femoral head: (III, 2352) area 3x1 cm of enburnation on posterior aspect. The animal was probably lame.

Tibia shaft: (III, 2186) a rounded swelling 4x1 cm on the medial edge, with thickening of the compact bone and new bone almost filling the marrow cavity. It is likely the swelling originated with a blow, with osteomyelitis resulting from infection, and subsequent healing.

Hock and feet

Fusion of tarsal bones: (VII, 2146) tarsal II and III fused; no extra bone growth.

Astragalus: (IV, 454) proliferation of extra bone around articulations with some lipping around but no degeneration of the joint surfaces. Probably a lame animal.

Metacarpal: (V, 2616) developmental irregularity in proximal lateral articulation.

Metacarpal: (V, 561) ossification of the tendon at the proximal lateral edge of the shaft; probably age and/or stress-related.

Metacarpal: (IV, 407) a grossly deformed bone; the medial part of the bone (i.e. metacarpal III) is thickened, occupying 2/3 instead of 1/2 the bone. Most of the bone surface is smooth but there are three knobby outgrowths on the posterior of the shaft. Radiography reveals that the bone cortex is thickened and less dense than normal (the cortex mid-shaft on the medial side is c. 16 mm thick) and there is bone growth within the medulla (GL 174, Bp 58.9, SD 42.5, Bd 67.6) (Plate XXXII).

Phalanges: there is evidence of osteoarthritis (as defined in Baker and Brothwell 1980, 115) in only two cases, one Period III, one Period IV, with a total sample size of sixty-three and seventy-six.

Two further phalanges showed exostoses around the periphery of the bone (III, 978 and VI, 2314).

Osteoarthritis: (IV, 2664) 1st phalanx with marked grooving of the proximal joint and some pitting; and a 2nd phalanx, probably from the same individual, with a 1x1 cm area of eburnation over two slits of irregularly formed bone on the proximal joint surface; and (III, 978): the proximal articulation is pitted and there is much extra growth of bone round the proximal half of the bone shaft.

(III, 385A): a developmental anomaly on the distal articulation comprising a slit 11x1 mm; cf. Baker and Brothwell 1980, 110, fig.3, type 1.

Sheep

There were a few cases of disease and anomalies. Fairly frequent pathologies observed were periodontal disease in mandibles and a bony outgrowth on the side of the elbow joint. The only pathology almost certain to have been the cause of death was an infection within a cranium.

Head region

Horn core: (IV, 1030) with two 'thumb prints' - oval depressions near the base; and there is an area 3x1 cm of porous additional bone. (max. basal diameter, c. 38, min. b.d. c. 28).

Horn core: (III, 2538) very small, with three depressions near the base. (Loc 56, b.circ. 51, max/min. basal diam. 20/15.6).

Skull: (V, 2638) the right upper part of the skull survives and there is a large abscess cavity at the base of the (missing) horn core 36x32 mm and extending as much as 17 mm into the cranium. The sheep was immature, the frontal suture being unfused and the frontal/parietal partly fused. Infection may have gained access through damage to the

horn. The horn core base is quite small suggesting a ewe not a ram (Plate XXXV).

Skull: (IV, 466) probably also resulting from an infection; the occiput and part of the parietal has an exceptional amount of roughening at the suture point externally; a 13x12 depression 4.5 mm deep at the midline has resulted in thinning of the cranial wall to 3 mm, whereas at its thickest it is 14 mm.

Dentition

Maxilla: (VI, 2353) very elderly sheep (or goat) (infundibula, the islands of enamel, of M¹ and M² erased) with unusual amount of pitting of palatine bone and destruction of parts of the roots and, near the gingival border, of the crown of M¹ and M².

Mandibles: periodontal disease is summarised using Levitan's stages (1985), with Payne's age stages in parentheses.

Incidence	No.mds. (M3 erupted)	Periodontal 1 slight	Disease 2 widening of bone	3 tooth loss ante-mort.	4 infilling of alveolus
Phase					
III 5.8%	52	2 (G,G/H)	-	-	1(-)
IV 9.5%	63	2 (G,-)	4 (G,G,G/H,-)	1(I)	-
V 7.9%	63	2 (G,G)	2 (E,H)	-	-
VI 3 cases	8	1 (G)	2 (H,I)	-	-
VII 5 cases	14	3 (G,H,I)	2 (F,I)	-	-

Absence of the anterior premolar occurred in 14 cases and may be more common in the later periods; III 1 case (N41, i.e. present in 40 cases) IV 4 (N49), V 7 (N56), VI 0 (N7), VII 2 (N8). Radiographs of two examples (IV, 441, V, 2357) revealed no unerupted P₂. In both of these there is filling of the alveoli in this area but since P₃ and P₄ are at early wear stages, it is thought that the alveoli are of the deciduous tooth and that P₂ is congenitally absent.

Mandible: (IV, 412) the ventral border has a wasted appearance; there is a fold of bone along the lingual ventral edge; and the occlusal plane is abnormal with the posterior part of M₃ much less worn than the rest; (wear stages M₂ g, M₃ g).

(V, 2581 high residual tenth-twelfth century pottery) M₃ with very small posterior unit.

(IV, 2608) The anterior edge of P₂ (unerupted) is rotated lingually by 80 degrees. P₃ is erupting. (The first incisor (lost) was erupted and I₂ is present well below the alveolar border).

Post-cranial bones

Atlas vertebra: (IV, 29) The entire cranial half of the bone is asymmetrical. It is fully fused and there is no exostosis, so the vertebra must have functioned adequately and the occiput of the skull must also have been abnormal.

Ribs: (III, 2150) a healed fracture (radiographed); (IV, 3061) periosteal spongy bone around a rib; a radiograph showed no discontinuity in the bone structure; in both ribs more new bone was formed medially than laterally.

Scapula: (V, 947 10-14thC) with foramen on the neck at the base of the spine.

Humerus: (III, 2676) fairly smooth periosteal lesion mid-shaft, posteriorly.

Elbow joint: exostosis on the proximal lateral corner of the radius. A total of seven cases were observed, giving a frequency, in each of Periods III, IV and V respectively, of 3 of 30, 2 of 45 and 2 of 28 (6.8% overall tenth-fourteenth century) (III, 2671) (Plate XXXIV). In some the extra bone was confined to the lateral proximal edge (III, 644, 2671, IV, 1190) (Plate XXXIV). In III, 782 the medial articular surface is slightly polished and pitted and there is some alteration of the articular edge. In IV, 1190 there is bone lysis (destruction) on the medial articulation. In V, 34 and 994 there is slight alteration, again around the medial articulation.

Similar lesions have been observed in modern sheep from injuries sustained in handling pens, and their occur-

rence may indicate close handling, e.g. through folding or use of sheep cotes (Baker p.c.).

The degree of lameness is uncertain but would have been more severe in the cases with degeneration of the joint surfaces.

Metacarpal: (XI, 2195) ossification of a section of tendon 14 mm long mid-shaft, posteriorly.

Metatarsal: In four cases there was evidence of disease in the hock joint, varying in severity from simply exostosis around the proximal anterior end (present in all four) (IV, 453), with intermediate cases where there is also some roughening and damaged to the medial joint facet (V, 2776, VII, 724) and a more severe case where most of this facet shows degeneration and pitting (V, 2356).

Possible causes include bacterial infections from injury to the hock, and spread through the blood by an infection in another part of the body, e.g. foot-rot (Baker and Brothwell 1980, 123).

Pig

Dentition. Overcrowding of the teeth was observed:

Maxilla: (III 2355) P₄ rotated by 15 degrees; (III 488) P₃ slightly rotated; (III 400) upper four premolars overlap each other a little; (IV 2669) P₂ rotated by c. 110 degrees; (IV 455) P₄ rotated somewhat; (V 11) P₃ and P₄ slightly rotated, with interdental attrition on M₁.

Mandible: (IV 844) M₁ was lost ante mortem and the alveolus filled with new bone formation; M₂ at stage h, but worn below the crown on anterior buccal corner, M₃ at stage c.

Lower limbs

Pigs were unusual in being the only species where pathology was more frequent in immature than mature bones, but perhaps that is to be explained simply by the much higher proportion of immature bones found in pig.

Calcaneum: (IV, 2629) enlargement of shaft region.

Immature metapodials: four bones showed an abnormal thickening of the shaft. In a case from Phase IV, 509 the whole metacarpal III is enlarged in the anterior/posterior plane; the distal metaphysis is somewhat flared and the metaphyseal plate is abnormal. A metatarsal IV (Period VII, 2340) is thickened, again involving the shape of the whole bone; radiography revealed that the distal part of medullary cavity is filled with bone. Both are enteric disorders not localised lesions, and show abnormal development of the skeleton. The first example (509) may be a case of rickets. Vitamin D deficiency being a contributory cause of rickets, the case may indicate confinement indoors, and it is of course likely that pigs were kept within the town. Two abaxial immature metapodials showed localised swelling of the bone mid shaft (IV, 245, V, 1180), perhaps from an injury due to tethering (see also Bourdillon and Coy 1980, 112).

Metacarpal IV: (III, 2150) depression 7 mm long near periphery of proximal joint facet.

Metatarsal: (V, 34) there is complete degeneration of the proximal articulation with surrounding exostosis suggesting a severe infection: a painful and probable unuseable hock joint.

Metatarsal: (III, 470) exostosis around the proximal end with some alteration at periphery of joint facets.

2nd Phalanx: (V, 2337) almost complete destruction of the proximal joint surfaces with extensive surrounding new bone.

Disorders in the foot region appear to be commoner than in the other species.

Horse

Thoracic vertebra: (VII, 3020) spondylosis; there is destruction of the lower part (12x5 mm) of the cranial facet

of the centrum; and gross bone proliferation ventrally extending a maximum of 3 cm below the normal ventral margin and abutting onto but not fused to the adjacent (missing) two vertebra; and there is a transverse slit right across the caudal facet.

Lower limbs

Metacarpal: (III, 257) complete fusion of the abaxial metacarpal II to the bone with periosteal extra bone obliterating the line of fusion; perhaps an inflammatory reaction to an injury; the articulation of the cannon bone is normal.

Tarsals: (IV, 31) fusion of central and third tarsals.

Metatarsal: (VI, 2193) fusion of central and third tarsals to metatarsal and growth of extra bone around the bone.

The spavin would be visible in the live horse as an enlarged hock joint. As with the ring-bone described below, so long as the horse was rested while the lesion healed and fusion was completed, it could have returned to normal work (S. Day, p.c.).

Phalanx 1 and 2: (IV, 2526) the two bones are fused with much exostosis (ring-bone).

Dog

Pathology in the dog was confined to one partial skeleton with two cracked or broken healed ribs (III, 2124) and, interestingly, three examples of vertebrae with the spinous process bent over. In two it is quite slight (lumbar vertebra IV, 39; sacrum V, 945) and in one (lumbar vertebra III, 844) the tip of the spinous process is bent 6 mm out of true to the left and there is an extension of the left cranial articular facet (Plate XXXVI). The cause is uncertain but it seems possible that they result from being beaten.

Bird

One goose metacarpus (III, 2765), the only pathological bird bone, had extra nodules of bone at both ends.