



Case Study

Healed mid-shaft fracture of an Early Roman bovine femur

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ABSTRACT

We evaluated a healed fracture that was observed in the shaft of a bovine femur from an Early Roman settlement context at the site of Wange, Belgium. Using external observation and X-ray images, the specimen is described, paying particular attention to displacement of the bone ends, shortening of the bone, and callus formation. Similar fractures seen in femora of a modern Derby's antelope (*Taurotragus derbianus*) and of a modern eastern lowland gorilla (*Gorilla gorilla graueri*) are described, and we discuss why the incidence of healed femur fractures is so limited in large mammals.

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1. Introduction

Healed fractures observed in long bones of mammals, in particular the domestic species, are reported regularly in the archaeozoological literature. Besides the description of individual cases in numerous site reports, information about these and other paleopathological conditions has been summarized by a number of scholars, e.g., Siegel (1976, p. 359–360), Wäslé (1976, p. 64), Baker and Brothwell (1980, p. 92) and Bartosiewicz (2013, p. 60). These overviews show that long bone fractures are rare in large ungulates (equids and cattle), compared to small ruminants (sheep and goats), and particularly pigs. Of the 85 healed fractures of long bones listed in Bartosiewicz (2013, Table 3), 19% were observed in equids and cattle, 34% in sheep/goats, and 47% in pigs. It appears, moreover, that healed fractures of the mid-shaft femur have not been reported thus far from cattle or equids. For this reason, the newly discovered mid-shaft fracture of a bovine femur is described in detail below. Observations of the external morphology of the bone and X-ray images are provided, and compared to two modern cases of mid-shaft fractured femora in large African mammals.

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2. Materials and methods

The archaeological specimen, a right femur, was found in a context from the multi-phased site of Wange, located in northern Belgium, where excavations and archaeozoological work have been ongoing since the late 1980s (Van Neer and Lodewijckx, 1992). Animal bones have been found that date to the Late Iron Age, the Roman period, and the late medieval period. The bone that is described here was found, together with faunal remains of other domestic animals, in a ditch that was dated to the second half of the first century BC (Early Roman, Augustan period), on the basis of the associated ceramics (Opsteyn and Lodewijckx, 2001, p. 211). The ditch, which is over 200 m long, is comparable in shape to ditches that have been found at other sites in Belgium, where they were always related to Roman roads and believed to be an indication of Early Roman military presence. During Roman times, animal food production was based on pigs, sheep/goats, and cattle, with the latter being the main provider of meat. Besides a source of meat and dairy products, cattle also were used as draught animals, as shown by the high incidence of traction-related pathologies (Bartosiewicz et al., 1997; De Cupere et al., 2000). Such deformations, mainly on the phalanges, also occur in the context from which the healed femur is derived.

The extensive skeletal collections of the Royal Museum of Central Africa (Tervuren, Belgium) include numerous postcranial skeletons of mammals, some of which show pathological conditions. Two modern femora with a healed shaft fracture are of interest in view of the archaeological find we report, because they pertain to (wild) species of very large size. A first specimen is a right



Fig. 1. From left to right: lateral, caudal, medial and cranial view of the bovine femur from Wange. The scale bar is 3 cm.

femur of a Derby's eland *Taurotragus derbianus* (Gray, 1847), which is the largest antelope on the African continent. Shoulder heights in this species vary between 140 and 175 cm, and weights have been recorded between 300 and 900 kg (Kingdon, 2007). The pathological specimen (with register number KMMA/MRAC 36211) is a young adult that was added to the museum collection in November 1971, after it had died in a zoo (Planckendael, Belgium). The second modern specimen of interest is a right femur of an eastern lowland gorilla (*Gorilla gorilla graueri* Matschie, 1914) which is the largest subspecies of this primate. This individual, with register number KMMA/MRAC 1000, is an adult specimen, shot in the wild in the Sibatwa forest (southern Kivu, Democratic Republic of Congo; 3.8° S 28.9° E), that was added to the museum collections in 1912.

Of all three femora, traditional photographs have been taken with a digital single-lens reflex camera (Canon EOS 600D), and X-ray images were obtained with Visi x v0.1 equipment using Maestro v 2.1.0 software, both developed by Medex Loncin S.A.

3. Results

3.1. The bovine femur (Figs. 1 and 2)

The right bovine femur from the Early Roman context at Wange has its epiphyses nearly fused, suggesting that the animal died when it was about 3.5 years of age (Silver, 1963), if we accept that the trauma did not influence the closure of the epiphyseal sutures. The fracture was healed by a rough and abundant callus. It is estimated that the bone is shortened approximately 100 mm and that the proximal fragment was displaced about 30° with respect to the longitudinal axis of the bone. The oblique plane of the fracture is visible on the radiograph.

3.2. The Derby's antelope femur (Figs. 3 and 4)

The right femur of this antelope had a complete mid-shaft fracture that was healed with shortening of about 10%, compared to the left femur of the same individual. The radiograph shows the oblique direction of the fracture. The proximal fragment is displaced about 25° with respect to the longitudinal axis. The amount of callus is small. This and the fact that the fracture line can no longer be seen externally, indicates that the trauma must have occurred early in life. The animal was still a young adult when it died: its dentition

was complete, but the cheek teeth were only slightly worn. It is unclear if this zoo animal was a wild captured individual or if it was born in captivity. The protected environment in which the animal lived, and the treatment that it may have received after the injury, may explain why it survived this severe trauma.

3.3. The gorilla femur (Figs. 5 and 6)

The second modern case is a right femur of a modern eastern lowland gorilla (Udrescu and Van Neer 2002, p. 26). It has a complete fracture in the proximal third of the shaft. Compared to the left femur of the same individual, the bone is shortened about 15%

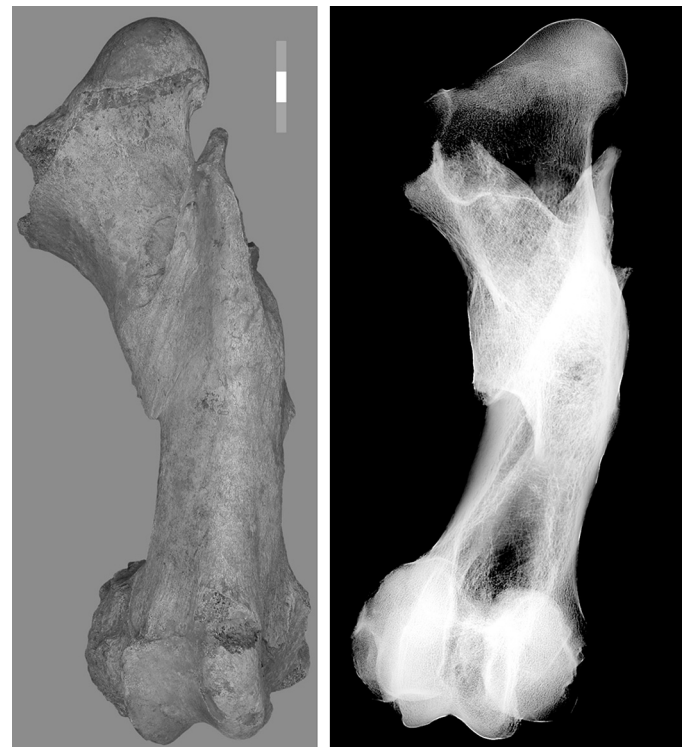


Fig. 2. Cranial view of the bovine femur from Wange and X-ray taken in the same direction. The scale bar is 3 cm.

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