Sonographic characterization of the prenatal development of the elephant

Summary

Elephants have the longest pregnancy of all mammals, with an average gestation of around 660 days (Meyer *et al.* , 2004). The processes involved in prenatal development are therefore of special interest.

In the past, research on the prenatal development of the elephant relied mainly on foetal specimens collected during culling actions in South Africa, which took place in the period between 1964 - 1995. Observations concerning implantation, placentation, development of the extraembryonic organs and foetal growth could not be correlated to foetal age. Foetal age was estimated on the basis of foetal weight according to the formulas of Huggett & Widdas (1951) and Craig (1984).

With the establishment of transrectal ultrasonography by Hildebrandt *et al.* (1998), the longitudinal monitoring of elephant pregnancies in vivo is now possible. In this study, the pregnancies of 19 elephants (9 African and 10 Asian elephants) with known date of ovulation were assessed by ultrasound. Gestational age could be exactly calculated at all times. Furthermore, biometrical measurements (crown - rump - length and mass) of 22 preserved African elephant specimens and data of 3 aborted fetuses were included to describe prenatal growth.

Transrectal sonography was feasible in the first third of pregnancy (until day 240 p.o). For the first time, important events such as implantation, placentation and organogenesis could be depicted in the living foetus. The embryonic period comprised only approximately one sixth of the entire gestation. The foetal period is supposedly elongated due to extensive cerebral maturation in utero.

Growth graphs were developed on the basis of sonographic measurements of foetuses of

known age in utero. The mathematical description of these graphs resulted in the development of new formulas for foetal age determination. To compare the newly developed formulas with those according to Huggett & Widdas (1951) and Craig (1984), the known foetal age of the sonographically assessed foetuses was compared with the age of the preserved specimens, which was calculated on the basis of foetal mass. The comparison showed that the formula of Huggett & Widdas underestimated true foetal age by 20 days. In contrast, the formula of Craig overestimated foetal age by up to 65 days.

To describe prenatal growth over the whole length of pregnancy, the growth models according to Gompertz (1825) and von Bertalanffy (1960) have been adapted to crown - rump - measurments of foetal elephants.