ABSTRACTS

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Pregnancy characterization in African lioness by 2D and 3D ultrasound

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OBJECTIVES AND METHODS: The African lion (Panthera leo) is the largest feline species. Besides long historical relationship between lions and human beings there is not much known about the embryogenesis in these large predators excepted basic facts such as pregnancy length (110 days), average size of litter etc. Ultrasound as a non-invasive tool is ideally to study detailed embryonic development and to determine partial or complete embryonic failures (1). Especially, 3D ultrasonography allows a complex analysis of the embryo and the extra embryonic structures during different gestational stages (1, 2). A total of 12 investigations in 7 pregnant African lionesses were performed under full anaesthesia. The patients weighted between 150 to 180kg and were anesthetised by dart gun using a drug combination of 3 mg Ketamin/kg bodyweight (BW), 30µg Metetomedin/kg BW, 0.1 mg Butorphenol/kg BW plus 5 mg Midazolam. The ultrasound assessments were part of necessary clinical interventions (Europe) or management procedures (South Africa). Due to the 3mm thick skin most of the high resolution ultrasound scans were performed transrectally using the Voluson i (GE HealthCare, Zipf, Austria, equipped with 5-9 MHz volume transducer) or the CS 9100 Oculus (Hitachi Inc., Japan, equipped with 7.5 MHz fingertip probe). All data were stored during the examinations and analysed with laptop based imaging software named 4D-VIEW (GE HealthCare, Zipf, Austria) or CELL (Olympus Soft Imaging Solutions GmbH, Germany).

RESULTS AND DISCUSSION: The transrectal approach allowed the ultrasonographic visualization of the entire female reproductive tract. The frequent and deep breathing in anesthetized lions made the use of 3D ultrasound challenging. However, the post-exam analysis of the datasets allowed a very detailed visualization of regions of interest and helped to minimize the total downtime of the animals. The image quality in 4D mode was poor due to frequent moving of all abdominal structures. On day 6 p.c., transrectal ultrasound allowed the visualization of pregnancy associated structures such as large active corpora lutea and highly proliferated endometrium. The pregnancy itself could not be detected because the late morulla stages (size 0.2 mm) were still coated by the zona pellucida and therefore with about not detectable by ultrasound. On day 17, the 1 mm embryonic mass was detectable inside the 10 mm x 7 mm sized embryonic vesicle. On day 24, the typical hammock-like embryonic fixation combined with wavelike endometrium formation was found. The “membrane-wrapped”; partially differentiated embryos had detectable heartbeats and in average a length of 12 mm. The yolk sacs measured also around 12 mm in diameter. The impressive fixation of the embryos is clearly a different design to many other feline species. In contrast to foetusses of domestic cats the 52 day old lion foetus showed well develop musculature in the head, neck and shoulder regions. The uterine space was quite narrow and differed therefore dramatically to the “large space” cat pregnancies. Among our patients there were two lionesses which had a partial and a complete resorption around day 25. The uterine integrity was not affected in these two individuals so that they both got pregnant again in less than a month.

CONCLUSION: Ultrasound is an ideal tool to monitor embryonic development in lions. However, due to always necessary anaesthesia frequent pregnancy examinations are not indicated which makes future calculation of embryonic growth equations difficult. In pregnant lioness a unique embryonic suspension system has evolved which allows the embryos to shock-resorb even heaviest foot kicks of prey without damage or loss. Partial or complete embryonic resorptions do not cause any problems for the lioness and seemed to be a part of the natural adaptation to resource constraints or male associated hierarchy changes.