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Reproductive ultrasound for assessing sperm quality and predicting future fertility
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A breeding soundness examination is commonly performed to examine the breeding potential of dogs. The procedure includes clinical examination of the reproductive tract, observation of libido, examination of semen quality, and in some cases ultrasound examination of the reproductive tract, and endocrine testing. Our work to date has utilised B-mode ultrasound to characterise the normal appearance of the testes and prostate gland and how these are disturbed in cases of pathology. Recently, we described digital image analysis of testicular and prostatic ultrasonographic echogenicity and heterogeneity in dogs and their relation to semen quality, and we characterised differences of testicular artery blood flow measured using Doppler ultrasonography in pre and post pubertal dogs and in dogs with established infertility. In these and other studies, measures have been related to semen quality at the time of ultrasound examination, rather than future semen quality as would be expected based upon the time taken for spermatogenesis and sperm maturation. In this clinical study we performed detailed testicular artery blood flow measurements in normal fertile dogs, and evaluated whether these could predict future characteristics of semen quality. Thirty one fertile dogs of two breeds (21 Labradors and 10 Golden retrievers) were used included. Three waves of a cardiac cycle were used to measure mean testicular artery values for peak systolic velocity (PSV), end diastolic velocity (EDV), and these were used by the machine software to calculate resistance index (RI) and pulsatility index (PI). Additionally, total testicular volume (TTV) was calculated by combining the volume of each testes which was determined using the formula for an ellipse; volume = length x width x height x 0.5236. Between one and four semen collections were made between 62 and 183 days later, and total sperm output (TSO), percentage of sperm with normal live morphology (TLNS), and percentage of sperm with normal motility (TM) were measured in each individual assessment and then the mean TSO, mean TLNS and mean TM were calculated for analysis. All data were examined for normality and are described as mean ± one S.E. Relationships between RI, PI, TTV and TSO, TLNS and TM were investigated using linear regression with TSO, TLNS and TM as dependant variables. Data were analysed using XLStat (Addinsoft, USA) and results were considered significant when P<0.05. All 31 dogs were fertile with normal semen quality at the time of ultrasound examination. At subsequent evaluations semen quality was stable for 18/31 dogs but declined for 13/31 dogs; of the latter four dogs had poor quality semen (TM<60%, TLNS<60%). Mean TSO for dogs during the study period ranged from 122.5 to 2750.0 x 10⁶ (mean 849.2 ± 86.5), mean TLNS ranged from 15.5 to 93.0% (mean 71.8 ± 3.4%) and mean TM ranged from 20.0 to 85.0% (mean 71.0 ± 2.5%). There was however no relation between TTV, RI or PI at ultrasound examination and subsequent mean semen TSO, TLNS or TM (P>0.05). B-mode and Doppler ultrasound examination of the reproductive tract provides important and useful information about the state of the testes at the time of the examination. However from this preliminary investigation we were unable to detect any relationship between detailed measurements of either testicular size or testicular artery blood flow and future semen quality, although we note that the study was limited since semen quality was relatively unchanged in 18/31 dogs and changed (declined) in only 13/31 dogs. Further studies investigating the link between current ultrasonographic appearance and future quality of the ejaculate are warranted.