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Colour-coded and Pulsed Doppler Sonography of Testicular and Prostatic Artery in Dog

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ABSTRACT

The present study was conducted to measure the various indices of Testicular and Prostatic Artery in Dogs at Different Age using Colour-coded and pulsed Doppler Sonography.

Colour-coded and pulsed Doppler sonography was used to study the blood flow of the testes and prostate gland in a total of 6 mongrel male dogs at different age starting from 4 weeks of age. After detection of the vessels by colour-coded Doppler sonography, the blood flow patterns were determined by pulsed Doppler sonography and measured the Peak systolic Velocity (Vmax) , the end-diastolic velocity (Ved), the pulsatile index (PI) and resistance index (RI) in relation to their age.

Results: The physiological testicular flow pattern was monophasic with a high diastolic flow While the prostatic blood flow pattern was biphasic. Vmax, Ved, PI and RI of testicular artery show variation with age of mongrel dogs.

The results of the present investigation demonstrate that the colour-coded and pulsed Doppler sonography give additional valuable information which improves the andrological diagnostics in the dog.

Keywords: Doppler Ultrasound, Testicular Artery, Prostatic Artery, Dog

Ultrasonography is a non-invasive method by which examination can be carried out quickly and easily (Peter *et al;* 1992). Ultrasonography is based on the ability of reflection of transmitted high frequency sound waves by tissue. Ultrasound waves are generated by the piezoelectric effect in a suitable medium such as Lead Zirconate and Echoes of ultrasound depend on relative density of tissue (Pierson and Adams, 1995). Colour Doppler ultrasound has become a method of choice to evaluate vasculature of various organs, including testes and prostate gland (Kutzler *et al.*, 2011). The vessels of the scrotum were divided into three categories; the supra-testicular, capsular and intra-testicular arteries. The blood flow in the looping testicular artery in the supra-testicular region could be displayed significantly better than the flow in the capsular and intra-testicular arteries. The ability to demonstrate normal vascular anatomy as well as the presence or absence of the flow in various pathologic conditions has improved not only diagnosis of various scrotal disorders but also the therapeutic outcome following treatment (Dubinsky *et al;* 1998).

MATERIALS AND METHODS

The present study was carried out on six mongrel male pups for measurement of various indices of Testicular and Prostatic artery in the Department of Veterinary Gynaecology and Obstetrics, LLRUVAS, Hisar. All the pups were kept under similar management and dietary conditions at the kennel. None of the dog is suffering from reproductive problems affecting testes and prostate gland. General health of all pups was in a satisfactory condition during the entire period of study. Colour Doppler examination was studied on testicular and prostatic artery and by using pulse Doppler ultrasonography, Vmax, Ved, PI and RI were calculated. Scanning was started at the age of 4 weeks and subsequent scanning was performed at 15 days interval till 24 weeks of age and then on 26, 32, 40 and 50 weeks of age.

During the scanning the efforts were made to keep the transducer in transverse and longitudinal plane to avoid the oblique imaging of the testes and prostate gland. After locating the testicular and prostatic artery, various indices of respective artery were noticed.

RESULTS AND DISCUSSION

Testicular artery and Prostatic artery were identified at 18 weeks and 12 weeks of age respectively by pulse and colour Doppler ultrasonography. The Vmax (cm/s), Ved (cm/s), PI and RI of testicular artery are presented in Table 1. The Vmax increased from 18 weeks to 50 weeks of age, with a significant ($p<0.05$) increase from 26 weeks of age to 50 weeks of age as compared to the increase from 4 weeks to 24 weeks of age. The Ved was increased significantly ($p<0.05$) on 20 weeks of age, and after that a non-

significant fluctuation was observed between 20 to 24 weeks and again between 26 to 50 weeks of age. The PI showed a significant ($p<0.05$) increase on 20 weeks of age and after 20 weeks of age, the increase was non-significant. The RI increased significantly ($p<0.05$) at 20 weeks of age. After that from 26 weeks of age till 40 weeks of age, the changes were non-significant. However, it increased significantly ($p<0.05$) at 50 weeks of age in comparison to the other stages.

The Vmax (cm/s), Ved (cm/s), PI and RI of prostatic artery are presented in Table 2. The Vmax was variable and significant ($p<0.05$) increase was observed between 12 weeks to 50 weeks of age. The increase in Ved was statistically non-significant between 14 to 18 weeks; 20 to 24 weeks and 26 to 50 weeks of age, whereas significant ($p<0.05$) increased was observed at 16; 20 and 26 weeks of age. The PI showed significant ($p<0.05$) increase on 20 and 50weeks of age. Statistically the increase in PI was non-significant between 12 to 18 weeks; 20 to 32 weeks of age. The RI increased significantly ($p<0.05$) from 12 weeks to 50 weeks of age during period of study.

The development of color flow imaging has made ultrasound the primary imaging modality for the evaluation of vasculature of testes and prostate gland. In our study, PI and RI of testicular artery show variation with age While Gumbsch *et al.,* (2002) reported that Pulsatile index (PI) and Resistive index (RI) both side testes were independent of age, bodyweight, pulse rate and testicular volume. Carrillo *et al.*, (2012) performed a study to characterize the normal blood flow of the canine testis months in five healthy Beagles and to measure the peak systolic velocity (PSV), end-diastolic velocity (EDV), resistive index (RI) and pulsatile index (PI) of testicular arteries weekly. Souza *et al.*, 2012 also studied PSV, EDV, RI and PI of testicular artery in a dog. Color doppler ultrasonography accurately predicted the arterial anatomy of the prostate. Our findings were supported by Neumaier *et al.*, 1995. Urethral arteries were seen in all cases as a number of straight longitudinal vessels that were parallel to prostatic urethra, pointing from the bladder base to the rectum around the midline of the prostate. Bigliardi and Ferrari,2011 evaluated the ability of ultrasound contrast agent to provide additional

Table 1. Showing Peak systolic velocity (Vmax), End diastolic Velocity (Ved), Pulsatile index (PI) and Resistive index (RI) of testicular artery in relation to age.

Age in weeks	Vmax (cm/s)	Ved (cm/s)	PI	RI
	Mean± SE	Mean± SE	Mean± SE	Mean± SE
18	16.00±0.43^{a}	4.87±0.27^{a}	1.02±0.09^{a}	0.51±0.03^{a}
20	17.38±0.61^{ab}	5.80±0.23^{b}	1.51±0.13^{b}	0.67±0.03^{b}
22	19.18±1.71^{abc}	5.93±0.21^{b}	1.52±0.11^{b}	0.70±0.03^{bc}
24	18.57±1.72^{ab}	5.85±0.16^{b}	1.52±0.16^{b}	0.71±0.02^{bc}
26	20.43±1.63^{abcd}	8.08±0.27^{c}	1.52±0.12^{b}	0.75±0.04^{bc}
32	21.82±2.03^{bcd}	7.62±0.33^{c}	1.68±0.16^{b}	0.74±0.04^{bc}
40	24.45±2.01^{d}	8.07±0.41^{c}	1.60±0.14^{b}	0.80±0.07^{bc}
50	23.78±1.39^{cd}	7.85±0.29^{c}	1.80±0.14^{b}	0.83±0.06^{c}

Table 2. Showing Peak systolic velocity (Vmax), End diastolic Velocity (Ved), Pulsatile index (PI) and Resistive index (RI) of prostatic artery in relation to age.

Age in weeks	Vmax (cm/s) Mean± SE	Ved (cm/s) Mean± SE	PI Mean± SE	RI Mean± SE
12	13.63±0.43[a]	3.72±0.14[a]	0.84±0.03[a]	0.57±0.02[a]
14	14.58±0.47[a]	4.00±0.26[ab]	0.84±0.03[a]	0.61±0.02[ab]
16	15.00±0.34[ab]	4.57±0.19[b]	0.90±0.05[a]	0.60±0.02[ab]
18	16.00±0.45[bc]	4.77±0.25[b]	1.00±0.07[a]	0.56±0.02[a]
20	17.30±0.36[cd]	5.80±0.26[c]	1.52±0.05[b]	0.65±0.02[abcd]
22	19.23±0.48[ef]	5.92±0.25[c]	1.51±0.05[b]	0.70±0.04[bcde]
24	18.55±0.45[de]	5.80±0.27[c]	1.51±0.05[b]	0.72±0.05[cde]
26	20.32±0.35[fg]	8.08±0.35[d]	1.51±0.05[b]	0.75±0.05[de]
32	21.42±0.51[g]	7.50±0.37[d]	1.70±0.09[bc]	0.73±0.05[de]
40	24.42±0.47[h]	8.07±0.24[d]	1.62±0.08[bc]	0.80±0.03[e]
50	23.78±0.77[h]	7.93±0.27[d]	1.74±0.08[c]	0.81±0.03[e]

information about the vascularity of the canine prostate gland. Newell *et al.*, (1998) identified three vessel types (prostatic artery, capsular artery and parenchymal artery) and the resistive index and maximum and minimum velocities were measured with pulsed wave Doppler. He also established normal Doppler ultrasound parameter for the intact male canine prostate gland.

CONCLUSION

Colour doppler and pulsed ultrasonography is a useful tool to study the normal vascular anatomy and helpful in evaluating the deviation in the flow in various pathologic conditions.

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