also other virus-induced tumors.

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Study on the analysis of canine renal hemodynamics using Doppler ultrasonography as a non-invasive diagnostic method

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Renal blood flow is closely linked to physiological and pathological changes in the kidney. It is therefore important to examine the blood flow under various conditions. In veterinary medicine, methods available for the estimation of kidney function include blood and blood chemical examinations, urine examination, clearance methods, diagnostic imaging and renal biopsy. Although these methods provide useful information, they also have some clinical limitations such as lack of sensitivity and the complexity or invasiveness of the method. Doppler ultrasonography can be used to estimate renal hemodynamics non-invasively. In veterinary medicine, ultrasonography is an important diagnostic method however, it is mainly used for morphological evaluation. Acute renal failure is one of the diseases encountered frequently in veterinary clinics, and it is important to detect it early in order to be able to provide suitable treatment. The ability to evaluate renal blood flow as a index of renal functions in a clinical setting using Doppler ultrasonography can contribute to the diagnosis, treatment, and prognosis of renal disease.

The purpose of this study is to establish basic data on canine renal hemodynamics using Doppler ultrasonography, and to evaluate the usefulness of Doppler ultrasonography as a new diagnostic method of renal function in comparison with other diagnostic methods under experimentally induced abnormal renal hemodynamics.

1. Estimation of the accuracy of the quantitative measurement of renal blood flow using non-invasive method Doppler ultrasonography. First, a method of approach to the renal artery was determined in order to detect the rate and pattern of the renal blood flow, using 8 adult beagles under general anesthesia. The dogs were placed in dorsal recumbency to visualize the celiac and cranial mesenteric arteries as they branched from the abdominal aorta by scanning the left paramedian in the longitudinal direction. Next, in transverse and coronal sections, the renal artery branching from the abdominal aorta caudal to the cranial mesenteric artery was visualized. Coupled with a color Doppler method, the renal artery was easy to visualize and identify. Second, the renal arterial blood flow was examined using the Doppler system and an electromagnetic flowmeter using 7 mongrel dogs in various experimentally induced hemodynamic states ranging from high to low flow under laparotomy, and evaluated the accuracy of the Doppler system. A significant correlation ($r=$

0.879; $p<0.01$) was found between the two methods, though the Doppler system tended to show higher values than the electromagnetic flowmeter. This study suggests that the Doppler method is a significantly accurate, non-invasive technique for measuring renal blood flow in the dog.

2. Establishment of the basic data on renal hemodynamics and analysis of them by the Doppler method. Normal data from conscious and anesthetized dogs were calculated and compared. The measurement with the Doppler method included systolic maximal velocity (Vmax), diastolic minimal velocity (Vmin), mean velocity (Vmean), pulsatility index (PI), resistance index (RI) and renal blood flow (RBF) in the renal artery as well as in theinterlobar artery. The following results were obtained in conscious dogs: Vmax=71.34 cm/sec, Vmin=19.38 cm/sec, Vmean=34.33 cm/sec, PI (main renal artery)=1.52. PI (interlobar artery)=1.13, RI (main renal artery)=0.72, RI (interlobar artery) =0.65, RBF=136.27 ml/min. In dogs under anesthesia, the results were as follows: Vmax= 46.49 cm/sec, Vmin=25.02 cm/sec, Vmean= 32.21 cm/sec, PI (main renal artery)=0.67, PI (interlobar artery)=0.62, RI (main renal artery) =0.44, RI (interlobar artery)=0.44, RBF= 136.27 ml/min. Under anesthesia, significant decreases of the Vmax, PI and RI were seen, while the Vmin significantly increased. The values of PI and RI in the main renal artery tended to be higher than in the interlobar artery. Even though the values of the RBF and Vmean did not change, the values of Vmax, Vmin, PI and RI changed significantly. Therefore, it is important to evaluate each parameter comprehensively to apply them to the diagnosis of renal diseases.

3. Examination of renal hemodynamics in the hypovolemic and recovery phases in two different hypovolemic shock models using Doppler ultrasonography, and evaluation of the utility of the Doppler method. In experiment 1, the hypovolemic phase was induced in 6 mongrel dogs by removing arterial blood at 30 ml/kg for 60 min. In the recovery phase, this blood wasreinfused at 30 ml/kg over 60 min. In experiment 2, hypovolemia was induced in 12 beagles by rapidly removing blood until the blood pressure decreased to 40 mmHg, which was maintained for 30 min. Six of the dogs were then infused with 20 ml/kg hydroxyethyl starch over 5 min, and the other 6 were infused with 60 ml/kg lactated Ringer's solution, also over 5 min. Parameters for systemic and renal hemodynamics were measured using a polygraph and the Doppler method, respectively. The decrease of diastolic blood flow resulted in an increase of vessel resistance, which was detected in the hypovolemic kidney by the Doppler method. The rapid and large-volume infusion of resuscitation fluids was effective for the recovery of both systemic circulation and renal blood flow; however, this induced an increase of kidney vessel resistance, a result of the autoregulation mechanism of the kidney. The changes in the main renal artery and interlobar artery were similar. It was possible to evaluate renal abnormal hemodynamics in real-time using the Dopper method.

4. Analysis of renal hemodynamics under acute renal failure using Doppler ultrasonography. A canine experimental tubular necrosis model was induced and the Doppler findings on renal hemodynamics were compared with the results obtained from the conventional examination methods for renal function. Unilateral nephrectomy was performed in 5 dogs. After 14 days, a selective renal catheter was placed in the renal artery under fluoroscopic guidance from a femoral artery. Then acute tubular necrosis was induced by intrarenal epinephrin infusion (1g/kg/min) for 6 hr. Acute tubular necrosis led to a decrease of the Vmin and an increase of PI and RI in the main renal artery and interlobar artery. The increase of the vessel resistance measured by the Doppler method may suggest a

decrease of the glomerular filtration rate, because the renal blood flows were comparatively well maintained. The Doppler method was useful as a diagnostic method, together with blood and blood chemical examinations, urine examination, clearance methods, diagnostic imaging and renal biopsy, for the evaluation of the acute tubular necrosis.

It is thus concluded that in the evaluation of renal hemodynamics, the Doppler method offers a new diagnostic technique for the evaluation of renal function.

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Pathological studies on skin lesions caused by Marek's disease virus in chickens

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Marek's disease virus (MDV) is an avian alpha-herpesvirus which induces malignant transformation of T lymphocytes. As a result of this event, Marek's disease (MD) lymphomas develop at many organs and tissues including the viscera, skin, peripheral nerves, and musculature. Since the inspection system was carried out from 1992 in Japan, skin leukosis has been encountered frequently at the poultry processing plants. The same problem occurs in other countries. However, the disease entity of MD skin leukosis is unknown in many respects including the developmental processes, classification, and nature of the lesions. In addition, relationships among the skin, visceral and feather pulp lesions (FPL) or between these and nuclear inclusion (NI) formation in the feather follicle epithelium (FFE) have not been studied. The purpose of this study was investigated to elucidate the pathogenesis of skin lesions in MD, especially the developmental processes of the lesions.

The sequential skin biopsies from the experimental birds infected with MDV revealed two patterns of perifollicular cutaneous lesions, tumor-associated and non-tumor-associated. The tumor-associated pattern was subdivided into two types, progressive and regressive. The former type was manifested by a continuous increase of lymphoid cell aggregates (LCA) in the skin, resulting in the development of gross skin tumors with or without visceral tumors. The latter type was characterized by initially increased and finally regressed LCA in the skin, associated with the development of visceral tumors. The non-tumor-associated pattern was manifested by initial transient inflammatory lesions without development of MD tumors in any organs and tissues. The initial perifollicular small LCA, especially in those with the progressive type, consisted mainly of inflammatory reactive small lymphocytes and a few tumorous lymphoblasts. Thereafter, the tumorous lymphoblasts increased more rapidly in number and finally, occupied almost all large LCA. The developmental processes of MD skin lesions were closely related to the dynamics of NI