Ultrasound-Guided Techniques for Biopsy of the Kidney of the Medium-Sized Dog

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Renal biopsy in the dog, described as the laparotomy and keyhole technique [7], is an effective method for the evaluation of dogs with renal disease [8]. For getting a reliable diagnosis and keeping the dog safe, selective renal biopsy with an adaptive needle was required [6, 11]. Recently, ultrasound (US)-guided renal biopsy in the large-sized dogs [2, 3] and human beings [5, 11, 12] have been described as the selective biopsy method. With respect to the biopsy needle, the modified Silverman needle was widely used for renal biopsy [7, 9] and currently, a disposable biopsy needle has been chosen for the biopsy [1, 2, 4, 12, 13] in any organ.

The purpose of this study was to establish the technique for selective renal biopsy in the medium-sized dog, and to compare the modified Silverman biopsy needle and the Tru-cut-type disposable needle (1.8 mm outside diameter and 10 cm length, Top Co., Tokyo, Japan) in point of the practical value of the specimen and the complications of the dog.

The technique for renal biopsy was as follows: The dog was placed in left lateral recumbency under general anesthesia and a suitable cushion was put between the body and the table. The longitudinal axis of the right kidney was scanned by ultrasonography (USG) to determine the insertion point for the biopsy needles. After 3 mm of skin incision, the needle was inserted in parallel with the body surface into the caudal pole, and was advanced in the renal cortex along the longitudinal axis (Fig. 1). Using both needles, renal tissue was cut according to the ordinary technique [10, 12]. No suture of skin incision was needed after biopsy.

In order to compare the modified Silverman biopsy needle with the Tru-cut needle, 6 dogs were divided into two groups (group A—with Silverman needle, 8–11 kg body weight, and group B—with Tru-cut needle, 9–13 kg body weight). In all dogs, renal biopsy was performed on 3 occasions at intervals of 3–5 days. In group A, two consecutive attempts were made on each occasion. In group B, three consecutive attempts were made. For the indications of the practical value of the specimens, renal tissue presenting ratio, and the length, contents and adequacy of samples were evaluated. For the indications of complications of the dog, pre-and post- operative physical and laboratory examinations were performed. Furthermore, necropsy after euthanasia was done.

Results of biopsy by using both needles are summarized in Table 1 and 2. The average length of specimens was longer in group A (A: 10.9 mm, B: 9.6 mm). Both the renal tissue presenting ratio (A: 61.1%, B: 85.2%) and the renal cortex/medulla ratio of obtained samples were higher in group B than in group A. From the physical and laboratory findings, visual hematuria after biopsy was detected in 4 cases of 9 biopsies in group A and 3 cases of 9 biopsies in group B. Two cases of group A showed continuous hematuria for over 24 hrs. In group B, however, hematuria disappeared within 24 hrs.

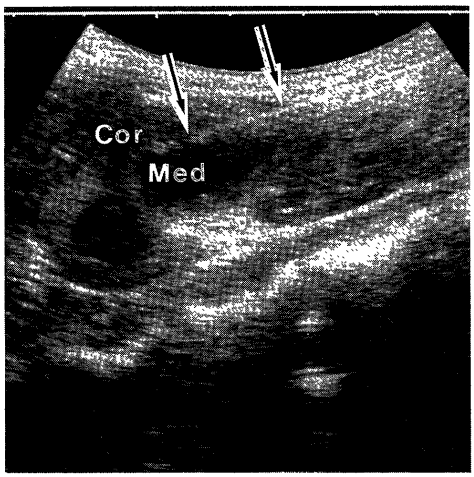

Fig. 1. Ultrasonogram of the longitudinal axis of the right kidney. A biopsy needle (arrows) is penetrated into the renal cortex along the longitudinal axis. The minor axis of the kidney is too narrow for the biopsy.
Cor=renal cortex, Med=renal medulla.

In the necropsy findings, hemorrhage around the right kidney and in renal parenchyma were observed in all dogs. On the cut surface, the modified Silverman needle tended to penetrate deeper than the disposable needle in the renal tissue.

Visual or occult hematuria is the most common complication of renal biopsy [9]. Nash *et al.* [6] reported that the appearance of hematuria was closely related to the content of obtained samples which included major renal vessels or renal medulla. In this study, it was suggested that deeper penetration into the kidney by using the Silverman needles resulted in getting more renal medulla which had a relation to prolonged hematuria.

USG could visualize the sectional structure of the kidney and the motion of the inserted needle. However, sometimes, the top of the Silverman needle could not be scanned because of a gap between the direction of the ultrasound beam and the top of the needle. This was

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Table 1. Results of renal biopsies: Comparison of specimens obtained by using the modified Silverman needle (S) and the Tru-cut-type disposable needle (D)

Group	Needle	No. of biosies	Total No. of insertions	Renal tissue present	Average length of samples (mm)	Average No. of glomeruli (/specimen)
A	S	9	18	11	10.9	19.6
B	D	9	27	23	9.6	24.1

Table 2. Results of renal biopsies: Comparison of hematuria after biopsy with the modified Silverman needles (S) and the Tru-cut-type disposable needle (D)

Group	Needle	No. of biopsies	Hematuria after biopsy	Hematuria continuing over 24 hrs
A	S	9	4	2
B	D	9	3	0

attributed to the complicated motion of the Silverman needle to cut tissue. The deeper penetration of the Silverman needle might have a relation to this problem.

Usually, in the large-sized dogs, the left kidney was penetrated along the minor axis for US-guided biopsy. The right kidney is, however, attached more firmly to the dorsal body wall than to the left kidney [7], and in the medium-sized dogs, the minor axis of the kidney is so narrow for the biopsy that we penetrated the right kidney across the minor axis.

Even in the medium-sized dogs, US-guided renal biopsy was effective method as selective biopsy. Compared with the Silverman needle, it was suggested that biopsy with the Tru-cut-type needle offered more practical value and less invasion.

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