

Complications of Upper Urinary Tract Surgery in Companion Animals

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KEYWORDS

- Upper urinary tract • Ureters • Kidneys • Endoscopy
- Interventional radiology

SURGERY OF THE KIDNEY

Renal Biopsy

Renal biopsy is indicated for the diagnosis of primary or metastatic neoplasia of the kidney or for treatment planning in animals with protein-losing nephropathy secondary to glomerular disease. In guiding the location for biopsy, it is important to note that protein-losing diseases are typically characterized by glomerular lesions, which are located in the renal cortex. Medullary tissue is less useful for histopathologic interpretation and biopsy of this area increases the chance of injury to the renal pelvis and/or renal vascular pedicle. Therefore, the ideal renal biopsy contains only cortical tissue and has several (>5) glomeruli to allow adequate interpretation of morphology, but debate continues on the best method to obtain safe and interpretable biopsy samples. Wedge kidney biopsy may be obtained through an open abdominal approach to the kidney. The cortex is incised with a scalpel and the defect is then closed by placing sutures in the renal capsule, aiding in hemostasis by creating tamponade. Although wedge biopsy is highly successful in obtaining diagnostic samples of renal cortex, the requirement for animals to undergo general anesthesia and open abdominal surgery was a major deterrent to obtaining diagnostic biopsy samples. Percutaneous needle biopsy of the kidney has now been available for several decades and is one of the first examples of minimally invasive procedures used in veterinary medicine.¹ Original publications suggested that complications included hematuria (>80% of dogs), gross hematuria (10%), and hydronephrosis (only 3 of 82 dogs and 1 of 19 cats) due to temporary obstruction by a blood clot in the renal pelvis/ureter.¹ Although there was some concern regarding the ability to achieve diagnostic samples through use of this technique, more recent studies have confirmed that percutaneous needle biopsy was of diagnostic quality in 87% of dogs

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Vet Clin Small Anim 41 (2011) 869–888

doi:10.1016/j.cvsm.2011.05.015

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Fig. 1. This sagittal section of a kidney depicts the ideal course of a renal biopsy needle (*arrow*) placed longitudinally through the renal cortex to gain the maximal number of glomeruli for histologic interpretation, while avoiding injury to the deeper interarcuate vessels and renal pelvis.

and 86% of cats.² The complication rate was 13.4% in dogs and 18.5% in cats, with severe hemorrhage being the most common complication.

Avoidance

Factors that have been shown to increase the complication rate of percutaneous renal biopsy are body weight (<5 kg), species (cat>dog), and serum creatinine level greater than 5 mg/dL.² Quality of the biopsy sample was increased by general anesthesia, and chances of obtaining pure cortical samples were improved in surgically obtained biops samples.² Although a large clinical study² showed that percutaneous ultrasound-guided samples were equal in quality to those obtained using laparoscopy, an experimental study in dogs suggested that laparoscopic-guided needle biopsy increased the chances of a obtaining a diagnostic sample.³ In summarizing these findings, it would be reasonable to consider using laparoscopic guidance to increase the chances of obtaining a diagnostic sample when obtaining renal biopsy specimens in animals cats or dogs less than 5 kg. Regardless of the technique used to access the kidney, proper insertion of the needle must be performed to maximize the chances of diagnostic biopsy while avoiding injury to the renal pelvis, ureter, and renal vasculature (**Fig. 1**).

Nephrotomy

Historically, access to the renal pelvis was performed using a technique termed "bisection nephrotomy." The kidney is freed from the retroperitoneal space and renal blood flow is temporarily occluded using digital compression of the entire pedicle or, preferably, with atraumatic vascular clamps placed on the renal artery. Access to the renal pelvis is obtained by making a sagittal incision in the renal capsule; then blunt dissection of the parenchyma is performed using the scalpel handle. After urolith removal, the renal parenchyma and capsule are apposed with large mattress sutures to aid in hemostasis. A landmark publication by Gahring in 1977 demonstrated that dogs undergo a 20% to 40% decrease in glomerular filtration rate (GFR) by 6 weeks after bisection nephrotomy using this technique.⁴

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