

Evaluation of the utility of point-of-care ultrasound in detecting ureteral obstruction in cats

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Introduction

Ureteral obstruction is a common cause of abdominal pain, azotaemia, anuria and associated life-threatening electrolyte imbalances in cats that appears to be increasing in prevalence (Kyles *et al.*, 2005; Segev *et al.*, 2013). History and clinical signs associated with ureteral obstruction are often non-specific. A tentative diagnosis of ureteral obstruction on ultrasound can be based on the presence of unilateral renomegaly, renal pelvis dilation, proximal dilation of the ureter or visualisation of a ureterolith on ultrasound when performed by board-certified radiologists (Lamb *et al.*, 2018). Whilst previous literature has relied on board-certified radiologists for diagnosis, there is little reported on utility of ultrasonography when performed by non-radiologists.

Aims and Objectives

- > To evaluate the use of point-of-care ultrasound for detection of ureteral obstruction in azotaemic cats.

Materials and Methods

The electronic medical records of the Queen Mother Hospital for Animals were searched using a computerised search of cats presenting to the emergency and critical care service with a diagnosis of acute kidney injury (AKI) or ureteral obstruction between January 2007 and December 2019.

POCUS criteria used for diagnosis of ureteral obstruction was the presence of one or more of the following:

- > Pyelectasia
- > Renal asymmetry
- > Ureteral dilation
- > Visualisation of calculi

Hospital records searched for cases of ureteral obstruction and AKI

Cases included if azotaemic and had both POCUS and formal ultrasound

Data collected including signalment, history, physical exam findings, bloodwork, urinalysis, POCUS findings at the hepatorenal and splenorenal site

Calculation of sensitivity, specificity, positive and negative predictive values for renal POCUS compared to formal ultrasound

Results

One hundred forty cats met the inclusion criteria. Cats with ureteral obstruction (100/140 [71.4%]) were placed in the obstructed azotaemic (OA) group, and cats with acute kidney injury without evidence of ureteral obstruction (40/140 [28.6%]) were placed in the non-obstructed azotaemic (NOA) group.

POCUS Findings	Obstructed (n = 100)	Non-Obstructed (n = 40)
Pyelectasia	72 (72)	3 (7.5)
Gross renal asymmetry	29 (29)	0 (0)
Ureteral dilation	24 (24)	0 (0)
Visualisation of calculi	11 (11)	0 (0)
Number of Findings		
One	40 (40)	3 (7.5)
Two	34 (34)	0 (0)
Three	8 (8)	0 (0)
Four	1 (1)	0 (0)

Table 1 – POCUS findings consistent with ureteral obstruction at the hepatorenal and splenorenal site. Data are presented as N (%).

- > Our POCUS criteria for diagnosis of ureteral obstruction were fulfilled in 83/100 (83%) cats in the OA group and 3/40 (7.5%) cats in the NOA group.
- > **POCUS had a sensitivity of 83%, specificity of 82.5%, positive predictive value of 92.2% and negative predictive value of 66% for diagnosis of ureteral obstruction when compared to formal ultrasound.**
- > Documentation of two or more POCUS findings increased the positive predictive value of POCUS to 100%.
- > Median creatinine did not significantly differ between OA and NOA groups ($P = 0.0135$).

Discussion

Veterinary POCUS performed similarly to human emergency doctor POCUS which has previously been reported to have a sensitivity of 85.7% and specificity of 65.9% for diagnosis of ureteral obstruction when compared to formal ultrasound (Pathan, 2018). The most common POCUS finding in our study was pyelectasia, in line with previous human literature on ureteral obstruction whereby hydronephrosis is considered the most specific indicator of ureteral obstruction on POCUS (Wong, 2018; Southgate, 2020).

Conclusion

Renal POCUS had a high specificity and positive predictive value demonstrating the utility of POCUS in expediting further diagnostics to minimise ongoing renal injury. Absence of POCUS findings does not rule out ureteral obstruction, and further renal imaging is warranted if clinically indicated.

References

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