ULTRASONOGRAPHIC IMAGING OF KIDNEYS IN MALE BUFFALO CALVES

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ABSTRACT

The study was conducted on 24 male buffalo calves aged 4-8 months weighing between 55 and 75 kg to document the ultrasonographic imaging and measurements of kidneys. Both kidneys were entirely assessed through right paralumbar fossa. Cranial pole of right kidney was visible by placing probe at proximal part of last intercostal space. Cranial pole of left kidney was observed percutaneously through right paralumbar fossa in all calves while caudal pole was invisible due to rumen and intestinal loops. Horizontal diameter of right kidney was higher than the vertical diameter. Convex probe (5.0 MHz) was better for percutaneous examination of left and right kidney. Images formed by percutaneous examination of right kidney through right paralumbar fossa using 6.5 MHz linear rectal probe were of higher magnification and better resolutions as compared to convex probe (3.5 and 5.0 MHz).

KEY WORDS: Buffalo calves, Kidney, Ultrasonography, Urinary system

INTRODUCTION

Ultrasonography has become a routine diagnostic tool in medical practice. In recent times, this modality is being used to study the organs. The morphometric measurements have a great potential in the disease diagnosis and have a lot of regards (Satish *et al.*, 2012). However, limited work has been done in male buffalo calves. Hence, the present study was undertaken with the objective to document the ultrasonographic imaging and measurements of kidneys of male buffalo calves.

MATERIALS AND METHODS

The work was conducted on 24 healthy buffalo male calves of University farm aged 4-8 months, weighing 55-75 kg. Amongst them, in 14 calves ultrasonography was done for getting expertise and hands on practice. After that in 10 male buffalo calves ultrasonographic scanning of both kidneys were performed following verifying normal health status of animals by evaluating haemato-biochemical profile and measurements were recorded. Percutaneous ultrasonography was carried out for assessment of both kidneys from right paralumbar fossa between last intercostal space and 5th lumbar transverse process by using convex (2.5-5.0 MHz) and rectal (5.0-8.0 MHz) probes. For visualization of cranial pole of right kidney and liver, convex probe was placed transversally at the last intercostal space. For scanning of whole right kidney probe was placed longitudinally and transversally just below the 1st and 2nd lumbar transverse process on right flank. Rectal probe was also used transcutaneously for visualization of magnified image of right kidney in 3 calves. For the visualization of left kidney the convex probe was placed downward from 3rd to 5th lumbar transverse process on right flank. Convex probe was also placed at left paralumbar fossa below 3rd to 5th lumbar transverse process for scanning of left kidney. Echogenicity and USG measurements of different parts of both kidneys were recorded.

RESULTS AND DISCUSSION

According to the results of present ltrasonographic study 5.0 MHz convex probe was found better

was found better for visualization of internal structures of right kidney (Fig. 1). Appearance of renal cortex and medulla was better with 5.0 MHz as compared to 2.5 and 3.5 MHz and renal sinus could also be differentiated from renal medulla and renal pyramids. However, Floeck (2009) opined that 5.0 MHz or lower frequency transducer was needed for percutaneous ultrasonographic scanning of right kidney from right paralumbar fossa, while in the present study 5.0 MHz frequency had better images as compared to lower ones. This difference could be due to difference in species, breed, and age of animals studied.

Renal hilus was visible in transverse view of right kidney in one calf when 5.0 MHz transducer was placed between the 1st and 2nd lumbar transverse process and rotated around its longitudinal axis (Fig. 2). Similar findings were also reported by Floeck (2009). When rectal probe (6.5 MHz) was placed percutaneously at right paralumbar fossa below 1st and 2nd lumbar transverse process in three calves, it was found that ultrasonographic images of right kidney were of better resolutions than the convex probe used with 3.5 and 5.0 MHz frequencies (Fig. 3). However when reviewed the literature, none other scientist had used rectal probe percutaneously on right paralumbar fossa for scanning of right kidney, hence no comparative information was available for this type of observation.

Ultrasonographic examination of right kidney revealed indistinct renal capsule in all calves and renal cortex was hyperechoic as compared to renal medulla. Whereas, Han and Canpolat (2002) reported that during percutaneous ultrasonography of right kidney normal renal capsule, cortex and medulla were hyperechoic, echogenic and hypoechoic, respectively. In three calves, renal medullary pyramids were found less echogenic than renal cortex (Fig 1). Braun (1991) reported that medullary pyramids could be visualized when transducer was placed in the right paralumbar fossa. Renal sinus was hyperechoic as compare to renal medulla (Fig. 1). In all calves dorsal and ventral diameter of renal cortex-medulla along with horizontal and vertical diameter of medullary pyramid of left

Fig. 1 Right kidney with convex probe (5.0 MHz) showing renal sinus (red arrow), renal cortex-medulla (yellow and pink arrow) and renal medullary pyramid (green arrow)

Fig. 2 Transverse view of right kidney (red arrow) with convex probe (5.0 MHz) showing renal hilus (yellow arrow)

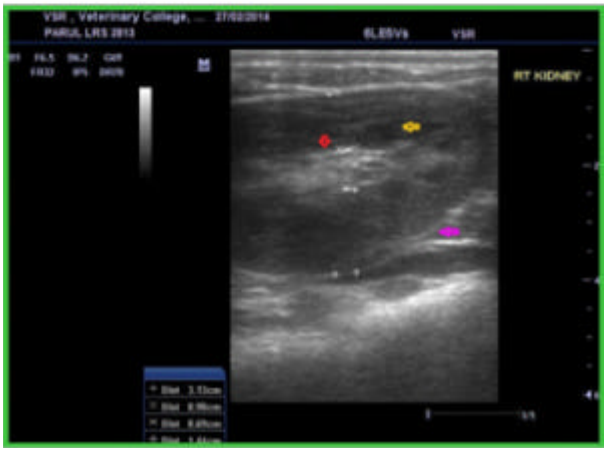

Fig. 3 Longitudinal view of right kidney using rectal probe (6.5 MHz) percutaneously showing renal sinus (red arrow), renal cortex (pink arrow) and renal medulla (yellow arrow)

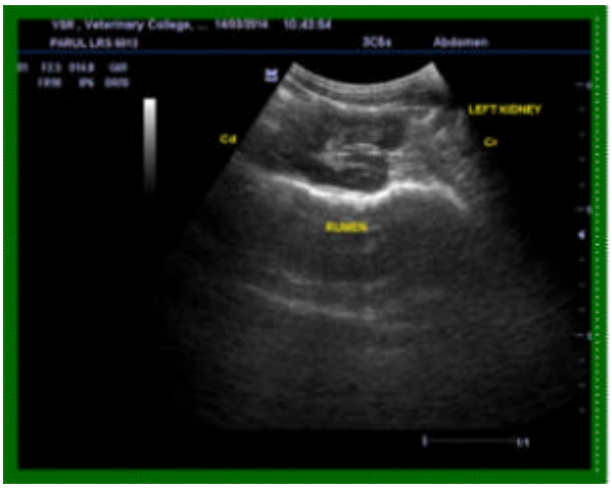

Fig. 4

Fig. 5

and right kidneys were recorded (Table 1). On comparison, it was noticed that horizontal diameter of right kidney was higher than the vertical diameter. Similarly, Braun (1991) reported that the vertical and horizontal diameter of right kidney was 5.1 ± 0.47 cm and 9.4 ± 0.98 cm in adult cattle.

In all animals hyperechoic rumen wall was noticed just below the left kidney (Fig. 4 to 6). Vertical diameter of left kidney was observed as 3.90±0.27 cm (Table 1) while horizontal diameter was not possible to measure because the caudal pole was not seen ultrasonographically due to presence of rumen and intestinal loops. The dorsal and ventral diameter of renal cortex-medulla was measured. The vertical diameter of renal sinus along with horizontal and vertical diameter of medullary pyramid could be recorded (Table 1).

Fig. 4 - 6 Images of left kidney by convex probe (2.5, 3.5 and 5.0 MHz) showing appearance of cranial pole (Cr - cranial, Cd - caudal)

Table 1: Ultrasonographic measurements of right and left kidney of male buffalo calves

Observations (n=10)	Age (months)	Body Wt. (kg)	Horizontal Diameter (cm)	Vertical diameter (cm)	Dorsal diameter of renal cortex and medulla (cm)	Ventral diameter of renal cortex and medulla (cm)	Vertical diameter of renal sinus (cm)	Horizontal diameter of renal pyramid (cm)	Vertical diameter of renal pyramid (cm)
Right Kidney	5.95 ±0.38	71.20 ±4.64	6.62 ±0.32	3.27 ±0.26	1.01 ±0.06	1.32 ±0.16	0.95 ±0.15	0.76 ±0.06	0.48 ±0.09
Left Kidney	5.95 ±0.38	71.20 ±4.64	-	3.90 ±0.27	1.25 ±0.10	1.12 ±0.08	1.49 ±0.21	1.15 ±0.32	0.90 ±0.36

The left kidney was tried to scan ultrasonographically through left paralumbar fossa but in none of the calf it was visible hence, in the present study, the left kidney could be entirely assessed through right paralumbar fossa between the levels of 2nd to 5th lumbar transverse process by convex probe (2.5-5.0 MHz). Cranial pole of left kidney was easily identified during ultrasonographic examination by convex probe (with 2.5, 3.5, & 5.0 MHz) in all animals, while caudal pole couldn't be observed in any animal in the present study due to presence of rumen and intestinal loops. In all calves renal capsule was not distinctly imaged while renal cortex was hyperechoic than renal medulla. Renal medullary pyramids were seen in four calves and on comparison they were found hypoechoic than renal cortex. Further renal sinus was found hyperechoic than renal medulla in all calves (Fig. 7). Whereas, other scientists (Braun,1991; Durgut et al., 2003; Ozturk et al., 2005 and Floeck, 2009) carried out transrectal examination of left kidney in adult cattle by using rectal probe with satisfactory results. Though, transrectal assessment of left kidney was not performed in the present study the percutaneous assessment was performed satisfactorily due to small size of calves.

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