Needle gauge size increases the diagnostic quality for cystocentesis in West African Dwarf goats

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Needle gauge size increases the diagnostic quality for cystocentesis in West African Dwarf goats

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SUMMARY

Cystocentesis in goats is a diagnostic and sometimes therapeutic tool which can be used to determine urethral obstruction and urolithiasis which is common in goats. Cystocentesis is usually carried out with small gauge needles to prevent the contamination of the urine sample by large bore needles. The use of ultrasound guided cystocentesis is likely to improve the safety and quality of urine collected for diagnosis. This study aimed to investigate the impact of the needle gauge on the diagnostic quality of urine. Seven male adult West African Dwarf (WAD) goats of an average weight of 8.7 ±2.3kg were used in this study and multiple samples were taken in each animal over a period of ten days. Three needle of different sizes with 18, 21 and 23 gauges respectively were used to collect 2mls of urine with the aid of a 3.5-5 MHz Ultrasound machine. The samples were immediately taken to the laboratory for evaluation of colour, odour, pH, specific gravity, protein, glucose, ketones, blood, erythrocytes, leukocytes, epithelial cells, casts, crystal, and micro-organisms. Out of 40 attempts, there was 30% (12) success rate for 18 and 21 gauge needles whereas 18 gauge needles had more success but also had more red blood cells. Sample collection with 23 gauge needles was not successful. Thus,21gauge needles appear to be the ideal needles for cystocentesis in goats. The average dimensions of goat bladder appeared to be 4.6cm by 3.2cm (n=7) and average urine yield was 1-2mls (n=7). The result from the current study indicates that, ultrasound-guided cystocentesis can be carried out in goats using 18 and 21 gauge needles. However, the 21-gauge needle appears to be better suited than the 18-gauge needle as the latter is likely to cause more trauma during sample collection.

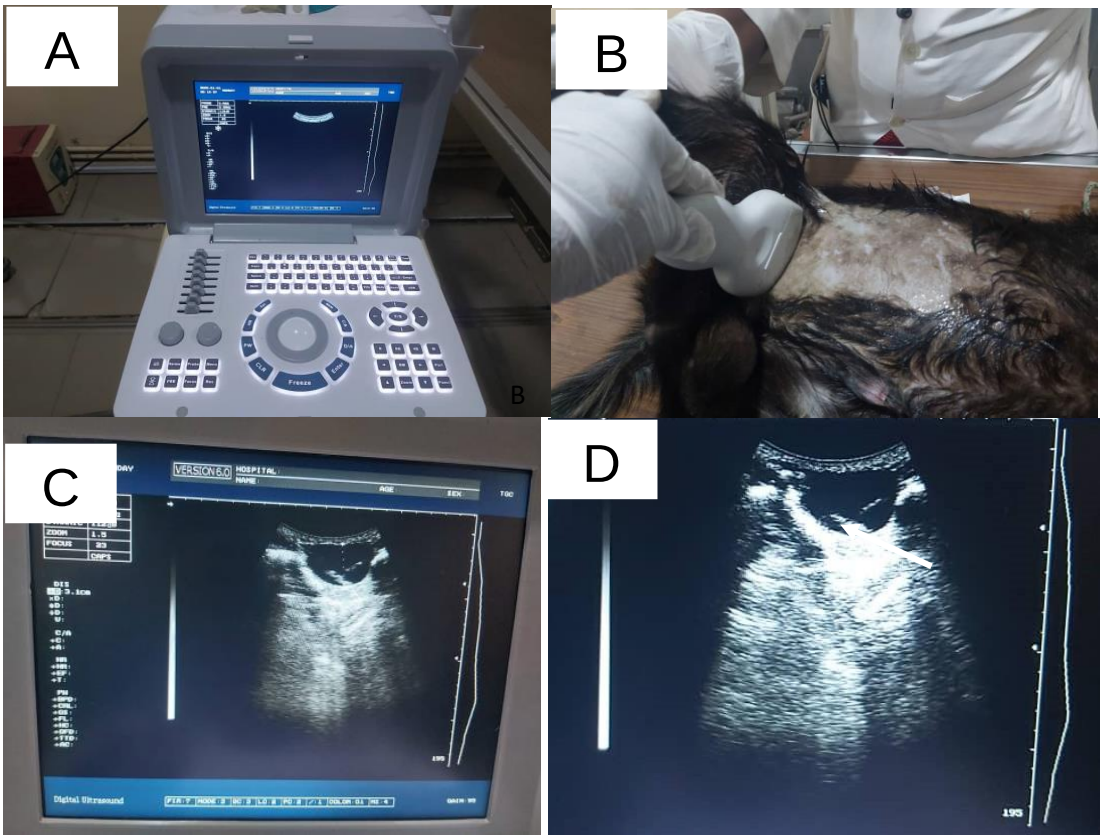
Keywords: Needle gauge, cystocentesis, urolithiasis, goats

INTRODUCTION

The household keeping small ruminants as a veritable source of income and savings in many West African homes (Adeyinka and Muhammed, 2006). It represents a way of ensuring access to wealth and as a means for improving protein consumption (Kosgey, 2004). In addition, the practice of keeping goats as pets is increasing probably due to increased awareness of welfare concerns (Scully, 2021). The West African Dwarf (WAD) goat is the hardiest when compared to other Sahelian breeds like the Red Sokoto goat and the commonest indigenous breed of goats found in West African region. Their resilience is linked with their ability to adapt in harsh conditions while producing throughout the year (Adeloye and Daramola, 2004; Chiejina*et al*., 2015; Oseni*et al.*, 2017). Goat production is considered to be one of the ways to solve world hunger due to the short reproduction period and growth to maturity, especially with the ever growing population of most developing countries (Omontese*et al*., 2016; Mejia *et al*., 2022). For this reason and others, intensive management system is becoming popular as a way to increase production in order to address current food crisis (Abu *et al*., 2013). However, increased intensification of goat farming may also increase the risk to health challenges that would otherwise not be minimal such as urolithiasis, a condition whereby solid matters also known as kidney stones occurs anywhere along the course of the urinary tracts that can result into the rupture of urinary bladder and kidney disease (Mejia *et al*., 2022). Diagnosis and treatment of urolithiasis in goats may require cystocentesis and urinalysis. The cystocentesis is the aseptic procedures of collecting urine using needles, usually the urine is intended for laboratory examination also known as urinalysis. Treatment of urolithiasis requires acidification of urine

which is best done by injecting acidifiers into the bladder (Videla and van Amstel, 2016). Cystocentesis in goats is difficult to implement and usually perfommed aided with ultrasound imaging due to the location and size of bladder as well as urine output (Stowell, 2019). In dogs, routine collection of sterile urine from the bladder is more ventral and hardly anyone with expertise can miss the bladder. In goats however, the bladder is just below the rectum and very far into the pelvic region. Therefore, it can easily be accessed via the right paralumbar fossa or right inguinal region with the needle angled backwards towards the caudal region. Therefore, the size of the needle and length matters a lot. In practice, paucity of information exists on the effect of needle gauge and length on diagnostic quality of cystocentesis in WAD goats, hence the reason for this research.

RESULTS AND DISCUSSION



Figures 1: A- showing the 3-5MHz Digital Veterinary Ultrasonic Diagnostic ultrasound machine (EUS-3, China). **B-** showing ultrasound probe on the bladder with the goat on dorsal recumbency. C- Ultrasound monitor displaying the needle (white arrow) within the bladder. **D-** closeup view of C showing the needle within the bladder. The permission to carry out this study was granted by UI-ACUREC under the rules and regulation of animal care and use of 2023. Seven male adult WAD goats weighing between 8.7±2.3kg were used for the study. Goats were acclimatized for about a month and fed grass and concentrates and water *ad lib*. Daily physiological parameters were taken to monitor the health status of the animals and blood sampling was conducted at the end of the acclimatization period. All the animals were judged to be in good health condition before the commencement of the experiment based on laboratory findings from normal haemogram and physical examination. On the day preceding sample collection, goats were fed with glucose in water to increase their water intake. During the experiment, goats were sedated with 0.05mg/kg of Xylazine HCl (Bioveta, a.s. Komenského 212/12, Czech Republic) injected intramuscularly (IM) to facilitate handling. A 3-5MHz Digital Veterinary Ultrasonic Diagnostic ultrasound machine (EUS-3, China) employing a convex array probe was used together with water soluble gel (Mandy gel, Turkey EKG and Ultrasound gel) applied on the shaved skin surface (Figure 1A-D). Sample collection was done only after the needle is seen within the bladder with the aid of an ultrasound machine screen (Figure 1C, and D, white arrow).

Table 1: Urinalysis findings from the ultrasound guided cystocentesis

	Needle size		
	18	**21**	**23**
Number of samples	4	7	1
Ease of collection	Difficult	Relatively easy	Very Difficult
Colour	Cloudy green	Cloudy cream	-
Volume average	1.4	1.2	0.2
pH	7.5	7.1	-
Specific gravity	1.02	1.01	-
Protein	+4	+2	-
Glucose	+	+	-
Ketones	-	+	-
Blood	+3	+	-
Erythrocytes	+	-	-
Leucocytes	-	+	-
Epithelial cells	-	+	-
Casts	+	+	-
Crystal	+	+	-
Organism	-	-	-

Table 1: Samples collected were immediately sent to the pathology laboratory where the Pathologist was blinded to the groupings, and the urinalysis was carried out to determine urine colour, odour, pH, specific gravity, protein, glucose, ketones, blood, erythrocytes, leukocytes, epithelial cells, casts, crystal, and organisms. Statistical analysis of samples and evaluation was done using ANOVA at a level of significance of $p< 0.05$.

Out of the more than 40 sample collection attempts, we had about 30% (12) success rate (18 & 21 gauge needles) and zero success with 23 gauge needles, 18gauge needles 10%(4) but also had more red blood cells, 21gauge needles18%(7) appear to be the ideal needles for cystocentesis in goats. Average dimensions of goat bladder (n=7) was 4.6cm by 3.2cm and average urine yield was 1-2mls. The quality of the urine sample from the cystocentesis was well preserved with the 21-gauge needle than 18 gauge and least preserved with the 23-gauge needle (because the volume was very minimal). The volume (1-2mls) of urine aspirated was adequate with the 18 and 21 gauge needles respectively but very minimal (0.2mls) with 23 gauge. Most of the urine analytes are within acceptable range except for the increased protein and blood observed with the 18-gauge needle (Table 1). Goats are easy to handle for US-guided cystocentesis but some may require minimal sedation (Stowell, 2019). However, the low xylazine dose is provided to effectively facilitate humane handling. The anechoic bladder is located deep in the pelvis and so, angling the probe towards the tail will be beneficial. The inguinal area on the right side was reliable approach to this technique. There were instances where the anechoic bladder was seen and the needle visualized but no urine was collected, this led to the assumption that the viscosity of the urine prevented aspiration. Both the 18 and 21 gauge needles yielded predictable quantity of urine enough to carry out urinalysis and yield meaningful results of diagnostic values contrary to the23 gauge needle. Ultrasonography guided cystocentesis may assist in the detection of early changes in the urine that is paramount for the diagnosis of kidney diseases in goats. In conclusion, Ultrasound-guided cystocentesis may be safely done in goats using 18 and 21 gauge needles. While, both have good yield of urine, the 21-gauge needle appears to be less traumatic compared to the18G needle which caused unnecessary bleeding. Sterile urine for urinalysis aids early diagnosis which may make the difference in saving goats from permanent damage that may occur due to obstructive urolithiasis and kidney disease.

CONFLICT OF INTEREST

Authors have no conflict of interest to declare

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