PILOT STUDY ON CAUDAL VENA CAVA SIZE BY FAST ULTRASONOGRAPHY THROUGH DIFFERENT VIEWS IN HEALTHY CALVES

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INTRODUCTION Raising **calves** from birth to one year without excessive mortality is an important and economic challenge for breeders. Hence, there is an interest to improve treatment of calves suffering from **diseases** possibly accompanied by **severe changes in circulating volume status** (diarrhea, intestinal obstruction). **Ultrasonographic measurements of the caudal vena cava** (CVC) and aorta (Ao) are known as reliable tools to assess intravascular volume status in humans and companion animals.

AIM OF THE STUDY: To evaluate the **feasibility** of obtaining ultrasonographical measurements of **CVC** and Ao in two different views, assess **intra- and interobserver variability**, and study the **effect** of **sex**, **age, body weight**, and **breed** on measurements in healthy calves.

MATERIALS AND METHODS:

Healthy calves
2 phases

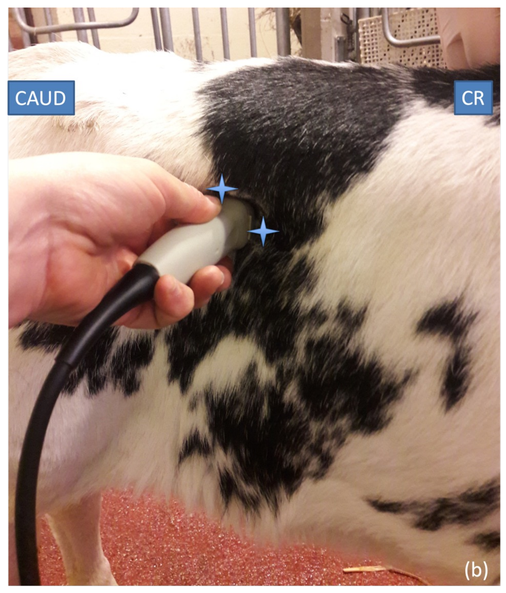
- t1: Aged < 60 days
- t2: 2.5 months later

SUBXIPHOID

2 anatomical sites

Fig. 1 a and b: probe placement site. The blue star shows the position of the probe marker in transversal and longitudinal view. CR: cranial; CAUD: caudal.

PARALUMBAR



ULTRASOUND IMAGES

SUBXIPHOID VIEW (SV)

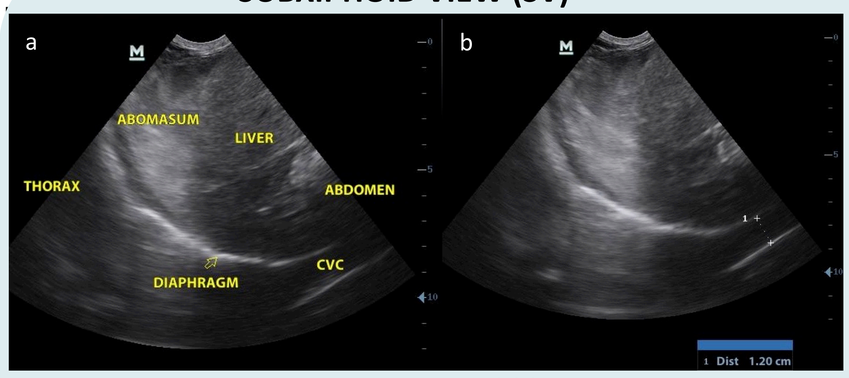


Fig. 2: Subxiphoid view, anatomic description (a) (CVC: caudal vena cava) and measurement of caudal vena cava diameter (b)

PARALUMBAR VIEW (PV)

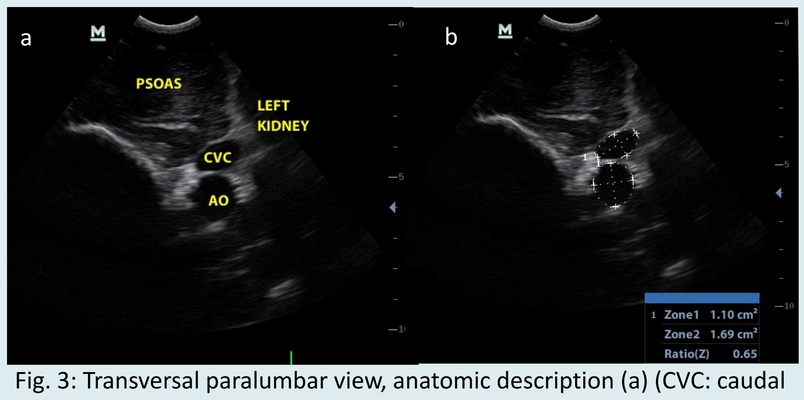


Fig. 3: Transversal paralumbar view, anatomic description (a) (CVC: caudal vena cava, Ao: aorta), and measurement of caudal vena cava and aorta area and ratio (b)

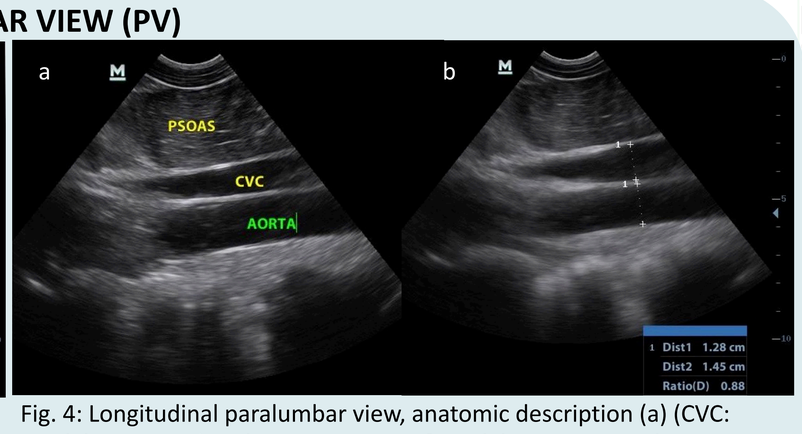


Fig. 4: Longitudinal paralumbar view, anatomic description (a) (CVC: caudal vena cava) and measurement of caudal vena cava and aorta diameter and ratio (b)

RESULTS:

t1
48 calves
Age 21 days (range 1-41)
Weight 67 kilos (range 33-98)
26 ♂
22 ♀
PV + SV

Paralumbar site

- CVC and Ao measurements **easily obtained**
- **High** repeatability and reproducibility
- CVC and Ao measurements **increase with the AGE** of the calf

t2
17 calves
Age 112 days (range 100-126)
Weight 134 kilos (range 103-170)
10 ♂
7 ♀
Only PV

	POCUS View	r	p-Value
PV-long	Ao diameter (cm)	0.65	<0.001
	CVC diameter (cm)	0.32	<0.05
	CVC/Ao diameter index	0.58	<0.001
PV-trans	Ao diameter (cm)	0.70	<0.001
	Ao area (cm^2)	0.66	<0.001
	CVC area (cm^2)	-	-
	CVC/Ao area index	0.47	<0.01

Table 1: Correlation coefficient (r) between **age** and **caudal vena cava** (CVC) and **aorta** (Ao) diameter and area and ratio in paralumbar view (PV), and p-values showing significant correlations except for aortic area in transversal PV.

	POCUS View	t1	t2	p-Value
PV-long	Ao diameter (cm)	1.09 ± 0.10	1.24 ± 0.14	0.0004
	CVC diameter (cm)	0.92 ± 0.14	1.25 ± 0.24	0.00005
	CVC/Ao diameter index	0.84 ± 0.09	0.97 ± 0.19	0.009
PV-trans	Ao diameter (cm)	1.13 ± 0.12	1.28 ± 0.13	0.00001
	Ao area (cm^2)	0.99 ± 0.23	1.05 ± 0.3	0.3269
	CVC area (cm^2)	1.04 ± 0.35	1.55 ± 0.6	0.002
	CVC/Ao area index	1.05 ± 0.26	0.97 ± 0.19	0.002

Table 2: Ultrasonographic measurements and calculated variables (mean ±SD) obtained on images from the paralumbar view in 17 calves for the first part of the study (t1) and the second part of the study (t2). PV-long = longitudinal paralumbar view, PV-trans = transversal paralumbar view, Ao = aorta, CVC = caudal vena cava. P-value < 0.01 indicates significant difference between measurements in t1 and t2.

CONCLUSION **Caudal vena cava** size assessment by **point of care ultrasound** can be easily performed at a paralumbar site in **calves under 4 months** of age and could be used **to assess intravascular volume status.** Further studies could compare CVC and Ao measurements in healthy calves to those in calves suffering from **diarrhea** or **surgical digestive disease** to see if CVC and Ao measurements are related to dehydration or state of shock and could complement other shock evaluation parameters such as L-lactates or arterial blood pressure measurements.

Refers to

veterinary sciences MDPI

Article

Ultrasonographical Assessment of Caudal Vena Cava Size through Different Views in Healthy Calves: A Pilot Study

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