PILOT STUDY ON CAUDAL VENA CAVA SIZE AND CAUDAL VENA CAVA TO AORTIC RATIO AT THE RIGHT PARALUMBAR VIEW IN HEALTHY BELGIAN BLUE CALVES

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INTRODUCTION

Belgian Blue Calves (BBC) are double-muscled beef cattle, representing a valuable investment to the farmer. Little is known about volume status assessment in bovine medicine. In human and companion animal medicine, ultrasonographic assessment of the inferior/caudal vena cava diameter (CVC_D) is used as an inexpensive, rapid and noninvasive marker to evaluate intravascular volume status. The objective of this study was to perform a pilot study on the feasibility to obtain ultrasonographical measurements of the caudal vena cava diameter (CVC_D) and area (CVC_a), aortic diameter (Ao_D) and area (Ao_a) via the longitudinal right paralumbar (PV) and subxiphoid (SX) view in awake healthy calves, as previously described in dogs. Secondly, we wanted to assess whether those values change with the calf growth .

METHODS:

We performed a single observer prospective observational study in standing healthy calves at t1 (calves 1 month old) and at t2 (2,5month later) using a microconvex curvilinear (5-7MHz) probe. BBCs were deemed healthy based on history and clinical evaluation excluding diseases potentially influencing intravascular status.

t1: first data collection: CVC_D, CVC_a, Ao_D and Ao_a were recorded by ultrasonography in a transversal and longitudinal plane at the PV and SX view in calves one month old.

t2: second data collection: CVC_D, CVC_a, Ao_D and Ao_a were recorded by ultrasonography in a transversal and longitudinal plane at the PV view in the same calves 2,5 months after the first data collection.

Fig. 1: subxyphoidal view

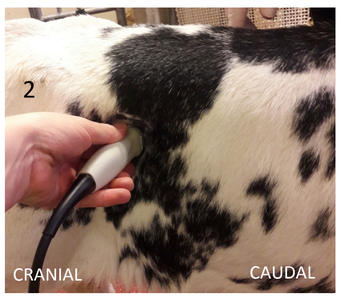
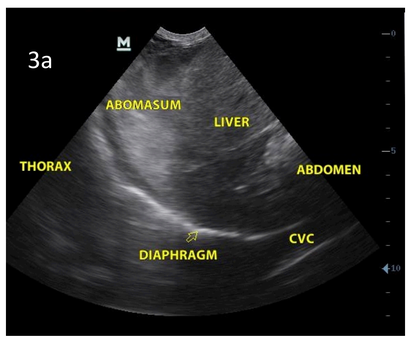


Fig. 2: paravertebral view

ULTRASOUND IMAGES:



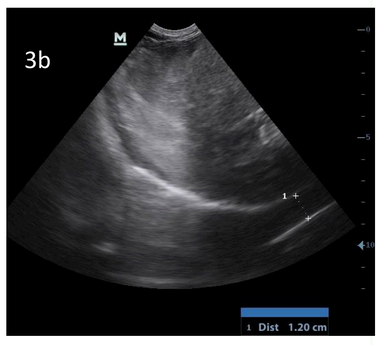
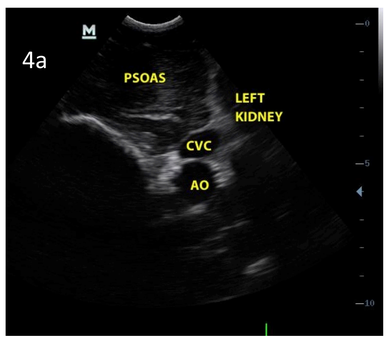


Fig. 3: longitudinal paravertebral view, anatomic description (3a) (CVC: caudal vena cava) and measurement of caudal vena cava diameter (3b)



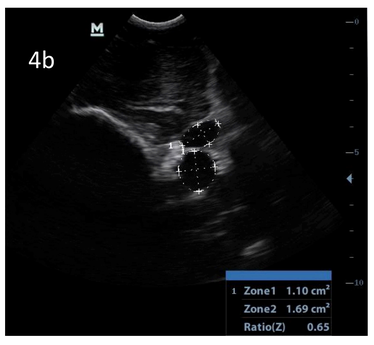
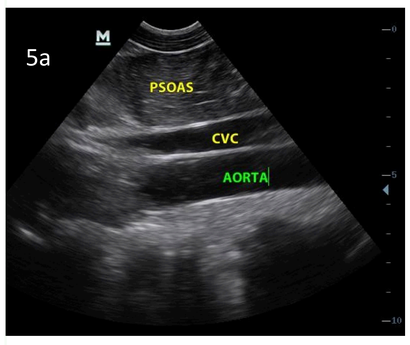


Fig. 4: transversal paravertebral view, anatomic description (4a) (CVC: caudal vena cava, Ao: aorta), and measurement of caudal vena cava and aorta area and ratio (4b)



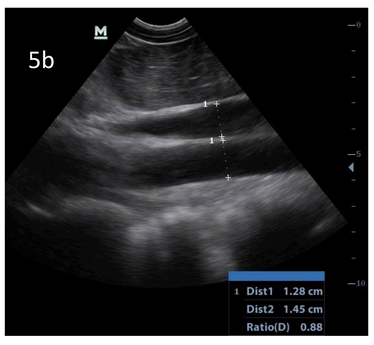


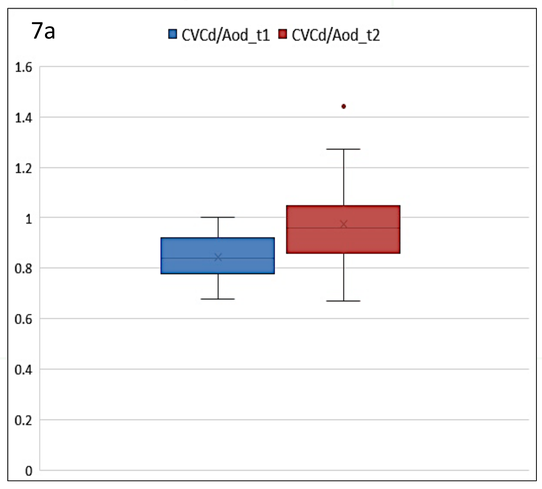
Fig. 5: longitudinal paravertebral view, anatomic description (5a) (CVC: caudal vena cava) and measurement of caudal vena cava and aorta diameter and ratio (5b)

RESULTS:

17 BBC were enrolled, 10 male and 7 female, with a median age of 36 days (range 33-41 days) at t1, 114 days (range 100-136 days) at t2. The median weight was 70kg (range 51 to 90 kilos) at t1, and 134kg (range 103 to 170) at t2. Measurements were obtained in all 17 BBC at the PV view in t1 and t2. The subxiphoid view was performed in 14 calves in t1 and interpretable ultrasound images were obtained only in one. SX view appeared too difficult to perform, it was no longer attempted in heavier calves in t2. Statistical analysis of paired data (t-test paired and Wilcoxon) for each calf showed significant differences between CVC and Ao diameter and area in t1 and t2, excepted for aorta area in transversal PV view (Fig.6). CVC and Ao ratio showed also significant differences (Fig 7a and b).

		Sonographic measurement in t1	Sonographic measurement in t2	*P value (significant < 0.05)*
Transversal PV View (Fig. 4)	Aod (cm)	1.13 ± 0.12	1.24 ± 0.14	0.00001
	CVCa (cm^2)	1.04 ± 0.35	1.55 ± 0.60	0.00133
	Aoa (cm^2)	0.99 ± 0.23	1.06 ± 0.30	0.3269
	CVCa/Aoa	1.06 ± 0.26	1.48 ± 0.44	0.00218
Longitudinal PV View (Fig. 5)	CVCd (cm)	0.93 ± 0.14	1.25 ± 0.24	0.00005
	Aod (cm)	1.09 ± 0.10	1.28 ± 0.13	0.00024
	CVCd/AOd	0.84 ± 0.09	0.98 ± 0.19	0.00939

Fig.6: Mean values (± sd) for caudal vena cava (CVC) and aorta (Ao) diameter (d) and area (a) and ratio in t1 and t2, and Pvalues showing significant differences between t1 and t2 group except for aortic area in transversal paravertebral (PV) view.



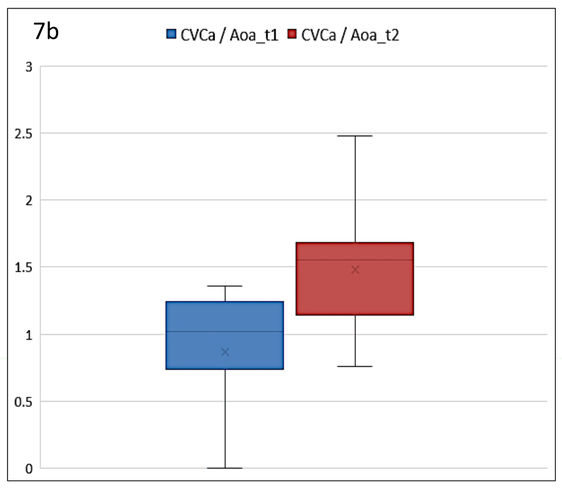


Fig.7 : Box plot of data of caudal vena cava diameter (CVCd) to aorta diameter (Aod) ratio in longituginal PV view (Fig. 7a) and of caudal vena cava area (CVCa) to aorta diameter (Aod) ratio in transversal PV view (Fig. 7b) showing significant differences between t1 and t2.

CONCLUSION

CVC and Ao assessment were easily performed at the PV view, yet only rarely achieved at the SX view in awake healthy calves. This pilot study also showed that caudal vena cava and aortic size (mean or median) seem to increase when calves grow, except for aorta area in transversal paralumbar view. Against expectations, both caudal vena cava and aorta ratios seem to increase with growth.