Pulmonary vein to pulmonary artery ratio in healthy and cardiomyopathic cats

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ABSTRACT

Recognition of congestive heart failure (CHF) in dyspnoeic cats is crucial for correct intervention. The pulmonary vein (PV) to pulmonary artery (PA) ratio (PV/PA) has been proposed as an index that might help discriminate dogs in CHF but has never been studied in cats. We sought to determine reference intervals for various, previously published, PV and PA variables in healthy cats. We then examined these variables in cats with subclinical and clinical (CHF) cardiomyopathies to determine the diagnostic utility in identifying CHF.

We prospectively enrolled 99 cats: 51 healthy cats, 24 subclinical cardiomyopathic cats and 24 cardiomyopathic cats with CHF. PV and PA were measured at the minimal and maximal diameters from M-mode images obtained from a modified right parasternal long axis view. Aorta and left atrium were measured in 2-D from the right parasternal short axis view just after the end of systole.

Median PV_{min}/PA_{min} in healthy cats was approximately 0.51 and PV_{max}/PA_{max} was 0.67. The median distensibility of the vessels was 23% for ΔPA and 41% for ΔPV. Several variables (PV_{max}/PA_{max}, PV_{max}/Ao and PV_{min}/Ao) increased incrementally between all 3 groups ($p<0.0001$). Cats with CHF had a larger PV_{min}/PA_{min} than subclinical and healthy cats ($p<0.0001$). When evaluating diagnostic performance of these variables (using only cardiomyopathic cats with or without CHF), PV_{min}/PA_{min} and PV_{min}/Ao had 100% specificity and 84% and 80% sensitivities, respectively. By comparison, LA/Ao had 71% specificity and 88% sensitivity.

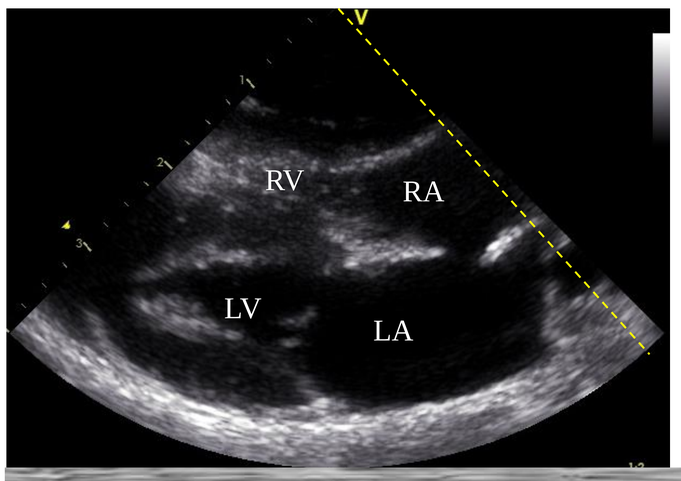
Our study provides reference values for PV and PA variables in cats. Moreover, PV/PA variables performed better than LA/AO in discriminating cardiomyopathic cats with and without CHF.

BACKGROUND

- **PV/PA ratio has been previously described in dogs and helps identify dogs with CHF.**
- **PV/PA has never been described in healthy cats and cats with cardiomyopathy.**

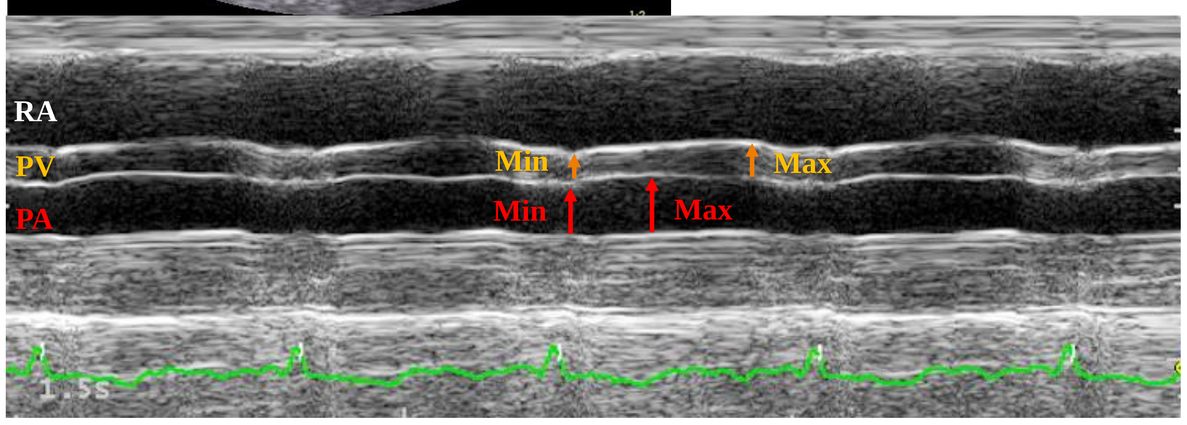
METHODS

- **51 healthy cats**
- **24 subclinical cardiomyopathic cats**
- **24 cardiomyopathic cats with CHF**



2D-guided M-mode of the PV and right PA from the right parasternal long axis four chamber view

M-mode cursor bisected perpendicularly the PV where the venous walls were reasonably parallel



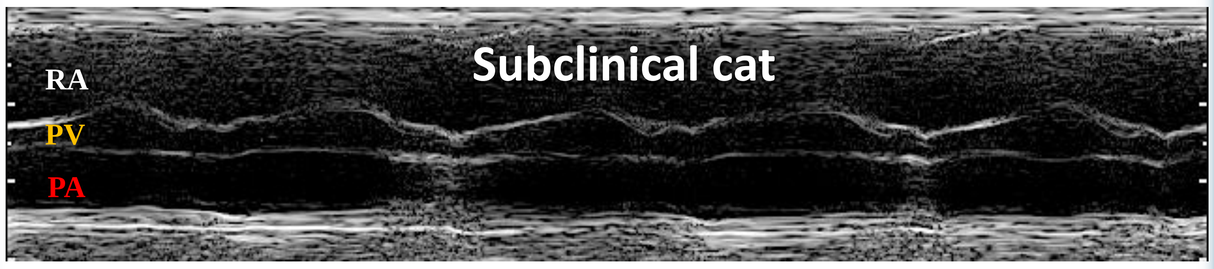
PV and PA measured in M-mode at the minimum and maximum diameters

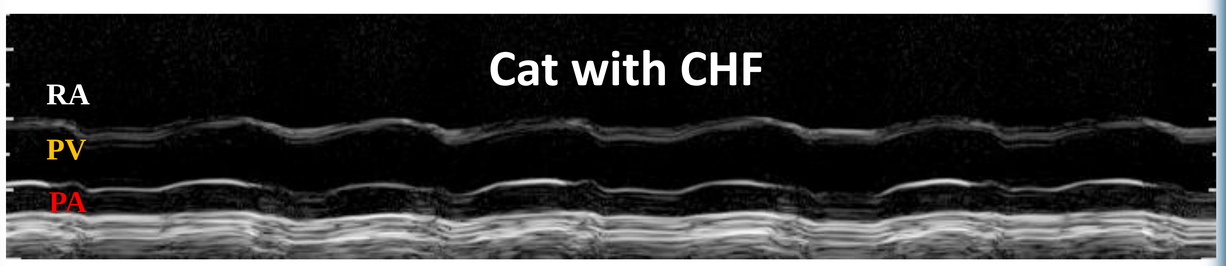
- **Calculated variables : PV_{max}/PA_{max}, PV_{min}/PA_{min}, PV_{max}/Ao, PV_{min}/Ao, PA_{max}/Ao, PA_{min}/Ao, ΔPV, ΔPA**
- **Reference interval in healthy cats**
- **Sensitivity and specificity in detecting CHF**

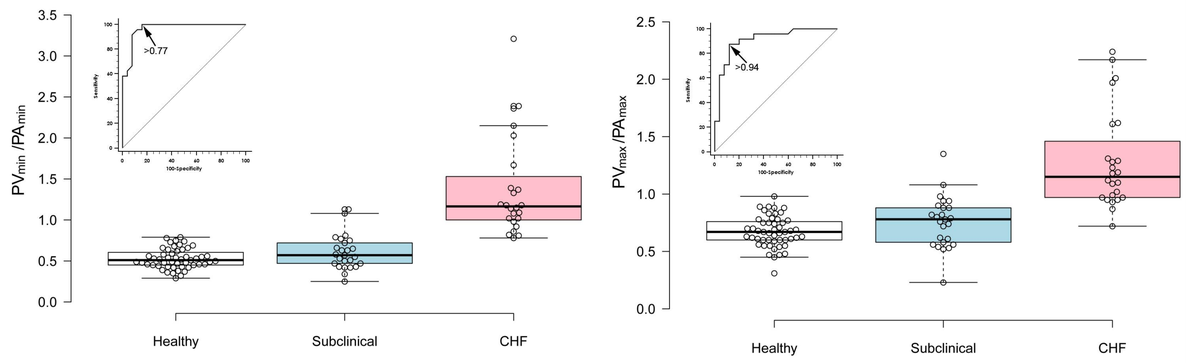
Reference intervals

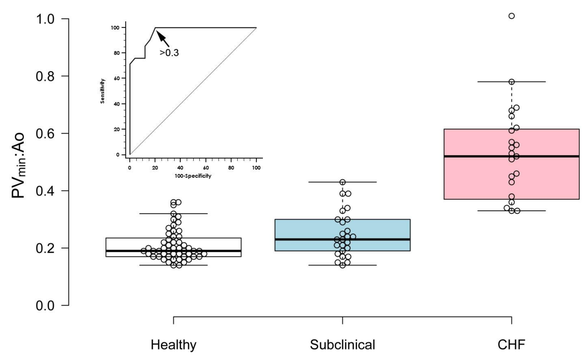
Variables	Lower limit (90% CI)	Upper limit (90% CI)
PV_{min}/PA_{min}	**0.30** (0.29-0.35)	**0.79** (0.75-0.79)
PV_{max}/PA_{max}	**0.35** (0.31-0.48)	**0.96** (0.88-0.98)
Pv_{max}/Ao	**0.20** (0.18-0.26)	**0.51** (0.48-0.51)
Pv_{min}/Ao	**0.14** (0.14-0.15)	**0.36** (0.31-0.36)
ΔPV	**0.14** (0.13-0.19)	**0.62** (0.58-0.63)
ΔPA	**0.05** (0.02-0.16)	**0.44** (0.35-0.45)

PV/PA increases in cats with CHF









Variable	Cut-off value	Sensitivity (95%CI)	Specificity (95%CI)
PV_{min}/PA_{min}	**>0.77**	**100** (86-100)	**84** (64-85)
Pv_{max}/PA_{max}	**>0.94**	**88** (68-97)	**88** (68-98)
PV_{min}:Ao	**>0.30**	**100** (84-100)	**80** (59-93)
LA:Ao	**>1.80**	**71** (48-89)	**88** (69-98)

CONCLUSIONS

- **The present study provided PV/PA reference range in healthy cats**
- **PV/PA ratio might help the clinician in discriminating subclinical cats from cats with CHF**
- **PV/PA performed better than LA/Ao in diagnosing CHF in cats**

ACKNOWLEDGEMENTS

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The investigators have no conflicts of interest to declare.

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