ESAVS
European School for
Advanced Veterinary Studies

Case Report Instructions
EMSAVM / MASVM Diagnostic Imaging

General instructions

- Case reports, written in prose, must be in a problem-oriented approach and include a complete presentation of the case, illustrations where available and a short discussion of the case with the current literature with references. You must demonstrate a comprehensive understanding of the topic with assessing all obtained diagnostic test results.
- A case report should contain 2000 words +/- 10%, excluding tables, references and appendix. Case reports > 2400 words will automatically be denied (0 points) or sent back for rewriting.
- The 10 cases must be a mixture of various species, problems and diagnosis, all pertaining to the selected master's program. Master students are required to keep a table of the already submitted cases which shall be send with each new case report submission. The ESAVS Office will provide an Excel template for the table below:

Case Nr.	Species	Problem/s	Diagnosis

- Master students are advised to submit cases shortly after beginning and throughout the program and not all cases at the end of the program.
- ESAVS cannot guarantee the evaluation of more than 3 case reports per semester. To ensure an evaluation in a specific semester, reports should be submitted no later than the given deadline for the respective semester (please see Important Dates on the ESAVS website).

Cases should be set out under the following headings:

- Title
- Signalement
- Case History and physical Examination
- Case assessment including complete problem list, differential diagnosis with likelihood of what is possible for the case, tests performed and interpretation of these in relation to the case – do not use bullet points but write in prose
- Diagnosis
- Treatment (drugs need exact dosages) and adequate follow up
- Discussion of case in relation to current literature (no repetition of literature but a discussion why the case fits or does not fit what is known)
- References
- Appendix with laboratory results and diagnostic imaging pictures including interpretation (the examination board member reserves the right to see the original results (laboratory, diagnostic imaging) of selected cases)

Each case report is viewed by one member of the Examination Board and graded on a 0-20 scale (<10= fail, 10-11.9 = sufficient, 12-13.9 = fair, 14-15.9 = good, 16-17.9 = very good, 18-20 = excellent).

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Evaluation of a case report

Step 1: Is the case report acceptable?

Is the case described in the report suitable at all? Reasons to reject a case are:

- A case is too simple
- Lack of adequate state of the art clinical tests to arrive at a diagnosis (or at least a presumptive diagnosis). The case could be resubmitted when the lacking information can be retrieved.
- The animal's life was endangered by excessive/unnecessary diagnostic tests or treatments (including surgery). Such a case cannot be resubmitted.
- A case that falls not within the specified master program
- Most diagnostic tests and interpretation are done by referring veterinarian
- Inadequate follow-up of case (e.g. diagnosis reached after euthanasia with no follow-up available)
- Multiple cases all with same problems or diagnosis
- Cases not seen during the enrollment in the program of the master student or where the master student is not the primary responsible clinician.
- More than 2400 words.

If a case is rejected the case report is assigned 0 points. The reason will be stated in the evaluation.

Step 2: Grading of the accepted case report

The case report will be evaluated based on a check sheet

An accepted case can reach a maximum of 20 points. A minimum of 10 points is required to pass.

The check sheet (see below) contains a list of 12 potential inadequacies. For each one the examiner can allocate a number of points. At the end a total number of points are given.

Recommendations for the candidate to avoid deduction of points:

- Make sure the history is sufficient
- Give all details of the physical exam
- Reported tests need to be relevant for the animal and interpretation needs to be concise and also relevant.
- Do not just give a list of all potential differentials, but explain why a differential might be more or less likely. Explain why you rule-out some differentials. The assessment of the case is very important, in order that the examiner can follow your thoughts and why you chose which further diagnostic steps
- Discuss your case – do not just repeat text book knowledge. If something has not been done or is abnormal and does not fit, try to explain this with pertinent literature.
- Show all results – missing graphics generally lead to points deducted.
- Treatment must be correct for the dog or cat
- Give information about outcome and therapy. Be specific.

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Case Report Evaluation Check Sheet / Neurology

Grading Criteria:

For students who have enrolled in a Master of Advanced Studies in Veterinary Medicine (MASVM) or European Master of Small Animal Veterinary Medicine (EMSAVM) program **before the winter semester 2024-2025**, the following grading criteria apply:

- The grades of the individual case reports are averaged to obtain one single grade. When this average grade is **below 10**, candidates are requested to resubmit revised versions of the failed case reports or new cases.
- A case report may not be acceptable and may be rejected if critical concerns in one (or several) areas result in a fail, regardless of whether all other required criteria are adequately met.

For students who have enrolled in a Master of Advanced Studies in Veterinary Medicine (MASVM) program for the first time **from the winter semester 2024-2025 onwards**, the following **new** grading criteria apply:

- 1. Pass = 10 points and more
- 2. Fail (case report insufficient) = below 10 points
  - modifications required - resubmission possible
  - case report insufficient - 0 points resubmission of this case report not possible - a new case report needs to be submitted
- **IMPORTANT:** the **average grade** for the module must be **13 points or higher** and none of the case reports must be graded below 10 points.
- A case report may not be acceptable and may be rejected if critical concerns in one (or several) areas result in a fail, regardless of whether all other required criteria are adequately met.

The maximum grade of a case report is 20 points. The second column indicates the maximum number of points that can be reached.
In the third column the examiner indicates the number of achieved points, half points may also be allocated.

	Maximum points	Allocated points
Complete signalment, history and physical examination *Comments:*	1	
Complete problem list *Comments:*	2	
Adequate differentials/ assessment for the problem list- the candidate tailors the differentials to this case and not every possible differential for each problem *Comments:*	2	
Adequate and/or appropriate tests (not too few or too many) *Comments:*	2	
Adequate assessment of test results (available results must be assessed for the submitted case) *Comments:*	2	
Diagnostic tests adequately graphically presented (radiographs, ECG, endoscopy, etc. **must** be shown in adequate quality and size) *Comments:*	2	
Correct and/or justified diagnosis *Comments:*	3	
Adequate or appropriate therapeutic management including generic drug names and dosages *Comments:*	1	
Adequate follow-up for the case report to be meaningful *Comments:*	1	
Discussion pertaining to submitted case, adequately referenced *Comments:*	2	
Language and word count adequate *Comments:*	1	
Special features not covered above *Comments:*	1	
TOTAL POINTS/ GRADE	20	

There is no "perfect" case and thus the attached example should be viewed more as how to present your case. If you have questions, please ask them during one of the courses early on – the course masters are ready and willing to help.

A Case of Segmental Aplasia of the Caudal Vena Cava (CVC) with Azygos Continuation in a 2-year-old Labrador Retriever

CVC – Caudal Vena Cava
CT – Computed Tomography
CFD – Color Flow Doppler
PSS – Portosystemic Shunts
PTE – Pulmonary Thromboembolism
RR – Reference Range

SIGNALEMENT

This case report describes a segmental aplasia of the CVC with azygos continuation in a 2-year-old, intact female Labrador retriever with a weight of 21,4kg.

CASE HISTORY

The patient was presented at the clinic for a confirmation of pregnancy via abdominal ultrasound. At the day of presentation, the dog was calculated at day 39 of pregnancy. The owner noticed that her dog was hungrier and showed swollen mammary glands. Otherwise, the patient was described as healthy and actively used in hunting. The dog was vaccinated according to country recommendations and regularly dewormed. Appetit, urination and defecation were without any remarks.

PHYSICAL EXAMINATION

With first presentation the patient was responsive and alert but stressed. Heart frequency showed 116 bpm and respiratory frequency 36 per minute. Auscultation of the heart and lung were within normal limits. Mucosal membranes were pink and moist with a capillary refill time of 1-2 seconds. The patient was soft and pain free on abdominal palpation. Body condition score was determined at 5/9.
Otherwise, dermatological, musculoskeletal, ocular, neurological and peripheral lymph node examination was within normal references.

DIAGNOSTIC TECHNIQUES Part 1

Abdominal Ultrasound

An abdominal ultrasound was performed with a Logiq E9 ultrasound machine and CD-2-9-D convex probe as well as 11L-D linear probe (GE Healthcare Technologies Inc., Chicago Illinois, USA).
Initially, the patient was presented for a pregnancy check in the clinic. Under abdominal ultrasonographic examination no fosters could be visualized in the uterus. Uterus was normal in size (maximal 0.5 cm in diameter, reference range (RR) 0.3-0.8 cm[1]) with a smooth wall and empty lumen. Cervix measured 1.0 cm in diameter and showed a normal appearance. The right ovary was 1.4 x 0.9 cm in size and no cystic structures could be seen. The left ovary measured 1.2 x 0.8 cm with no cystic structures visible. However, several tubular structures with positive Doppler-Sign could be shown around the left ovary (Fig.1.).

Furthermore, a long, tubular, thin-walled and fluid-filled structure could be seen medial of the right kidney (Fig. 2). The structure had a direct communication with the caudal prerenal part of the CVC, which was normal in size (0.7 cm in diameter) and showed a negative doppler shift with color flow doppler (CFD) (Fig. 3). In the area of the dilatation, a turbulent flow could be proven during doppler examination. It was difficult to visualize the prehepatic part of the CVC.

PROBLEM LIST

- Focal dilated CVC with turbulent blood flow on CFD
- Dilated vessels around the left ovary

DIFFERENTIAL DIAGNOSIS

A focal dilated CVC with turbulent blood flow could represent an aneurysm as well as pathology which causes a stasis in the vessel cranial of the dilatation like a thrombus, or another cardiovascular pathology. Neither a thrombus could be visualized during abdominal ultrasonography nor were there any signs for a cardiovascular pathology during anamnesis and clinical examination. A congenital pathology called segmental aplasia of the CVC with azygos continuation is described in literature and could cause the described changes. Especially as this pathology causes often no clinical signs and the prehepatic part of the CVC is missing, which corresponds with the difficulty to visualize this segment on abdominal ultrasound in the current patient. A portosystemic shunt (PSS) could be another differential diagnosis, however patients with PSS have almost always typical changes in anamnesis and clinical examination.

Any external focal compression of the CVC cranial to the dilatation, which could cause a secondary stasis could not be shown during ultrasonography and is therefore an unlikely differential diagnosis.

Dilated vessels around the left ovary can be seen secondary to pathologies which cause a focal or general hypertension for example in portosystemic shunts. Furthermore, a congenital deformation of these vessels cannot be excluded as differential diagnosis. An acute vasculitis could possibly also lead to the described changes but no signs for e.g. steatites were found in the surrounding mesentery.

In conclusion the most likely pathologies which could explain the presented changes in the CVC are segmental aplasia of the CVC with an aneurysmal dilatation, aneurysm of unknown origin and less likely portosystemic shunt.

DIAGNOSTIC TECHNIQUES Part 2

After physical examination and abdominal ultrasound, it was decided to proceed with bloodwork and an abdominal computed tomography (CT).

Bloodwork

Only mild changes could be seen in the bloodwork. Chemistry revealed a mild increase in alanine amino transferase (ALAT) with 149 U/L (RR 10 – 125 U/L) and a mild decrease in globulins (22 g/L, RR 25 – 45 g/L) and alkaline phosphatase (ALP, <10 U/L, RR 23 – 212 U/L). Otherwise, chemistry and hematology were within normal limits.

Blood Pressure

Blood pressure was measured on the front leg with the doppler method. On the average of 5 measurements systolic pressure was 100-110 mmHg.

Computed Tomography Abdomen

The CT examination of the abdomen was conducted with a 128-slice CT scanner (CT Philips Ingenuity Core 128 powered by iPatient, scanner V4.1.7.10503, Philips Healthcare Netherland B.V, PC Best, Netherlands). Slice thickness was 1.00 mm, and the study included soft tissue reconstructions with pre- and post-contrast studies (arterial, venous and delayed, Iodine based medium with 300 mg/mL and 2 mL/kg BW IV).

The anatomical structues of the portal vein where within normal limits.

The hepatic veins normally drained into the cranial part of CVC, which passed through the diaphragm and drained into the heart (the final portion was not included in the CT examination) (Fig 4c).

The left branch of the CVC in the caudal abdomen merged with the right branch just to the right of the midline at the level of caudal L5. Immediately thereafter, CVC diameter expanded significantly in a cranial direction over a distance of approximately 12 cm and reached a diameter of up to 2.9 cm. The CVC continued in a mildly craniodorsal direction and merged with the azygos vein at approximately the level of T13 (Fig.4).

The renal veins were bilaterally dilated and drained into the CVC. The renal arteries arising from the aorta were unremarkable. Caudal to the left kidney, a contrast-enhancing vascular bundle was visible. A larger vessel with a diameter of up to approximately 1 cm could be traced from this area to the CVC. This vessel was seen at the level of the renal vein from the left kidney just before draining into the CVC, suggesting that it likely drains into the renal vein prior to its entry into the CVC and is most likely the left gonadal vein.

In the arterial and early venous phases, there was clear turbulence in the CVC, and contrast enhancement was gradually increasing from the ventral part of the vessel. In the delayed phase, uniform contrast enhancement was observed in the entire dilated portion of the CVC.

DIAGNOSIS

In the presented case report a segmental aplasia of the CVC with azygos continuation was diagnosed. This is a congenital anomaly where a portion, the prehepatic segment, of the CVC is absent.

TREATMENT AND CASE MANAGMENT

No acute treatment was necessary in the reported case. However, given the focal diameter of the CVC and the turbulent flow in this area a risk of thrombus formation was diagnosed. Therefore, a prophylactic antithrombotic treatment with Clopidogrel was started.

Additionally, further dilation of the vessel with a potential risk for rupture could not be excluded. Hence, it was recommended to perform a follow-up CT for a new measurment of the CVC diameter after 6 months. Furthermore, it was recommendend to pause hunting season to minimize the risk for rupture at least until follow-up measurements were available. Because of the congenital nature of this pathology and increased pressure in the abdomen during pregnancy it was recommended to not use the presented patient for breeding.

PROGRESS AND OUTCOME

The described patient remained healthy without any clinical symptoms at least 1 year after the first visit. A follow-up CT was declined by the owner.

DISCUSSION

Segmental aplasia of the CVC (in human medicine called inferior vena cava) with azygos continuation is a rare congenital vascular anomaly in human and veterinary medicine with an incidence of less than 1% in human medicine [2–4]. The defect involves the prehepatic segment of the CVC which is laying between the kidneys and the liver. The abnormal communication between the renal segment of the CVC and the vena azygos enables the body, despite the missing part of the CVC, to transport the blood from the caudal part of the CVC to the right atrium [5].

As in the presented case this condition is often diagnosed incidentally during laparatomy, necropsy or diagnostic imaging due to another pathology [2–4,6]. In majority the patients show no clinical signs. However, there are some reports describing patients presenting with clinical signs like intermittent exercise intolerance, heart murmur, dynamic blood pressure changes or signs for renal pathology [7–10].

In accordance with the presented case the patients are predominantly of young age and female. However, it is discussed if the predominance of female cases is due to a higher prevalence in bitches compared to male dogs or due to a higher rate of performed laparotomies and abdominal diagnostic imaging in bitches (because of e.g. spaying, cesarians, check for pregnancy or pyometra). Even in the presented case the CVC pathology was detected incidentally while checking for pregnancy with abdominal ultrasound. Furthermore, no predisposition in breed or dog size are described, although Dobermans and Dachshunds seem to be slightly over presented [3].

Segmental aplasia of the CVC is most often the solely vascular anomaly in the patient. However, several cases are described with concomitant PSS, which presents one of the most common systemic venous anomalies in dogs. PSS, unlike to segmental aplasia of the CVC, are often accompanied by severe clinical signs like hepatic encephalopathies. In these cases of both PSS and segmental aplasia of the CVC the affected patients show often typical clinical signs for PSS and diagnosis of segmental aplasia of the CVC is an incidentally finding during abdominal ultrasound or CT [3,11–15].

Schwarz et al. defined seven different types of segmental aplasia of the CVC: 1. Right lateral cavo-right-azygos shunt 2. Right medial cavo-right-azygos shunt and small blind ending CVC cranial to left kidney 3. Large aneurysmal right medial cavo-right-azygos shunt with an isthmian connection to the azygos vein 4. Split CVC and right medioventral cavo-right-azygos shunt 5. Dorsal cavo-right-azygos shunt 6. Aneurysmal cavo-left-azygos shunt with connecting completely shunting portal vein 7. Split CVC, aneurysmal cavo-left-azygos shunt and connecting portal vein shunt vessel. The presented case can be classified as cavo-right-azygos shunt of type 3 [3].

Embryological the CVC is formed through a complicated process of development, regression, anastomosis and replacement of different embryogenic vessels. Several different models for CVC genesis are described in literature which cause 3 different models for the genesis of the here described vascular anomaly. The first theory is that a segmental aplasia of the CVC is caused by a failed fusion between the right subcardinal vein and the hepatic veins. Another explanation is a persistence of the right caudal cardinal vein. The third theory describes a failed anastomosis of the right subcardinal vein and the vitelline veins. However, all three theories lead as a result to the aplasia of the prehepatic segment of the CVC. The posthepatic, hepatic, renal and prerenal segment of the CVC are often without any pathological findings despite a possible aneurysmal dilatation of the renal and sometimes the prerenal segment as seen in several case reports including the current [3,5,16]. Interestingly, to the authors knowledge there

are no reported cases of segmental aplasia of the CVC in cats despite the same embryologic development.
A segmental aplasia of the CVC with azygos continuation has often no clinical relevance. There are several cases of older animals incidentally diagnosed with segmental aplasia of the CVC reported supporting this circumstance. In most cases no medical or surgical treatment is needed [3–5]. However, in human medicine segmental aplasia of the caudal CVC is associated with deep vein thrombosis and pulmonary thromboembolism (PTE) [2,17]. To the authors knowledge only one case of segmental aplasia of the CVC most likely causing PTE is described in veterinary medicine [9]. However, there are several cases reported with an aneurysmal dilation of the renal and prerenal segment of the CVC with or without thrombus formation. A prophylactic antithrombotic treatment is prescribed on a regular basis in these cases [3,4,7,8,10,12].
The here described patient showed an aneurysmal dilatation of the CVC with distinct signs for a turbulent flow both in abdominal ultrasound and CT but without signs for a thrombus. Nevertheless, the patient received a prophylactic treatment with Clopidogrel after diagnosis.
In veterinary medicine surgical treatment of segmental aplasia of the CVC is only published in one reported case. The patient presented with signs of chronic renal insufficiency and a stent was placed, which improved the patient's wellbeing significantly [8].
In the presented case the vascular bundle caudal to the left kidney identified as left gonadal vein may indicate a focal increased pressure within the vessel. Additionally, both the left and right renal vein were distended. Similar changes could be seen in other described cases with segmental aplasia of the CVC which showed additionally thrombus formation and venous return obstruction. The dilation is most likely caused by the increased blood flow resistance in the CVC [8,10]. Neither a thrombus formation nor a severe narrowing of the CVC or azygos vein could be seen in the current case report. Nevertheless, the proven changes in the left gonadal and left and right renal vein are most likely due to the same pathophysiological mechanisms. Other possible reasons for the seen changes like an acquired PSS (splenogonadal PSS) could not be confirmed with CT [11,18,19].

In conclusion the presented case of segmental aplasia of the CVC with azygos continuation showed several classical signs described in literature regarding anamnesis, clinical examination, diagnostic imaging features and pathophysiology and could be classified as cavo-right-azygos shunt of type 3.

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APPENDIX

Fig. 1a

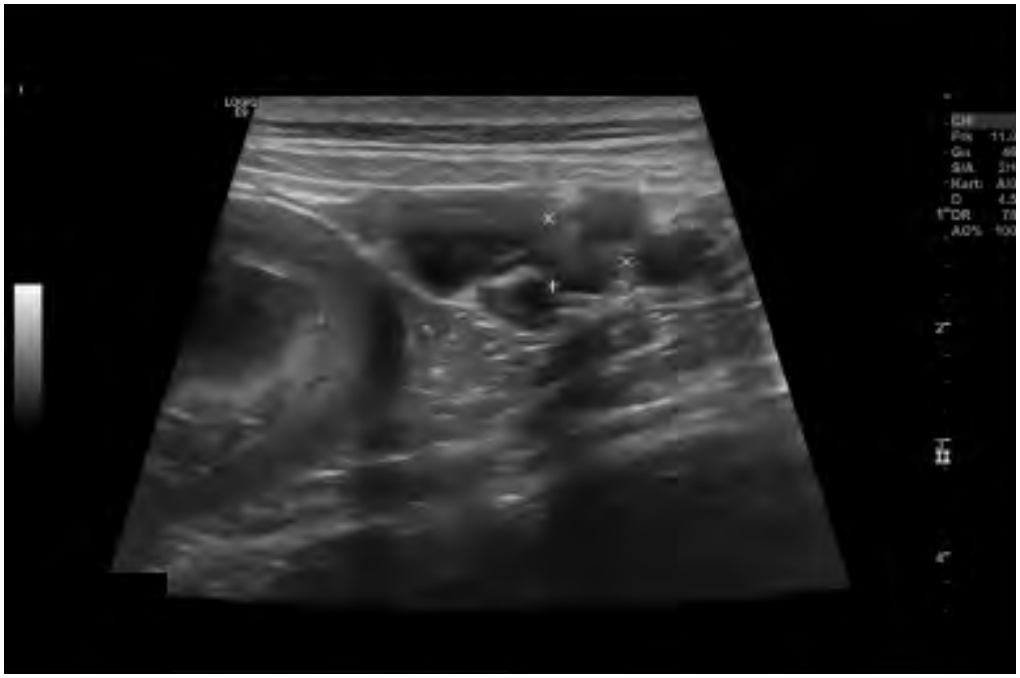

Fig. 1b

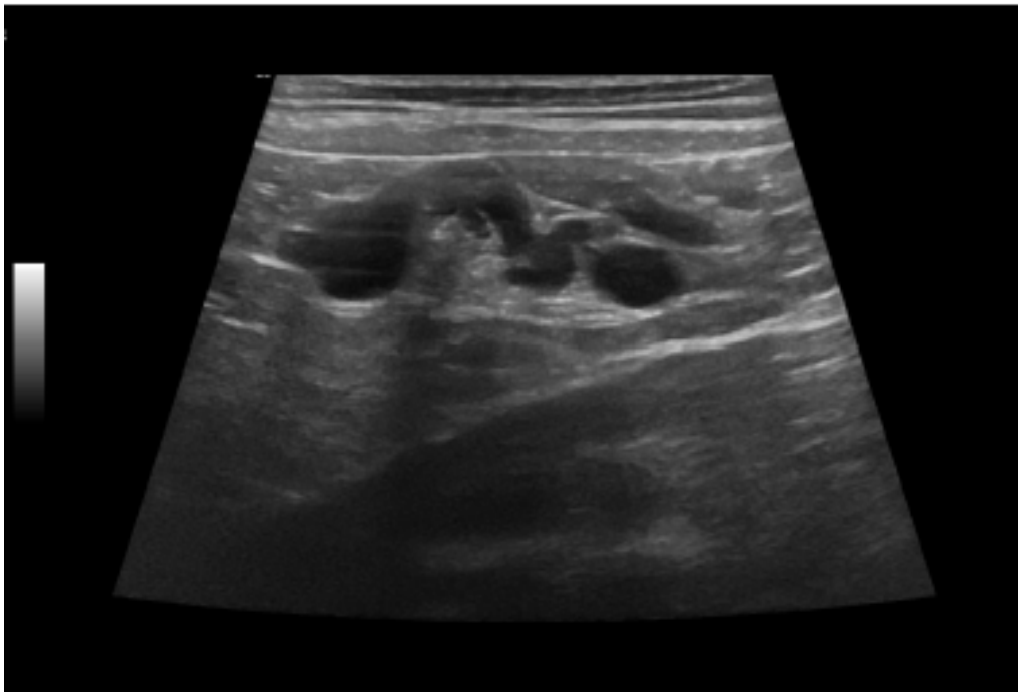

Fig. 1
Ultrasound images of the left ovary in longitudinal (Fig. 1a) and transversal (Fig. 1b) projection. The left ovary is normal in size (1.2 x 0.8 cm), but several tubular structures could be seen around the ovary which showed a positive doppler-sign during examination.

Fig. 2a

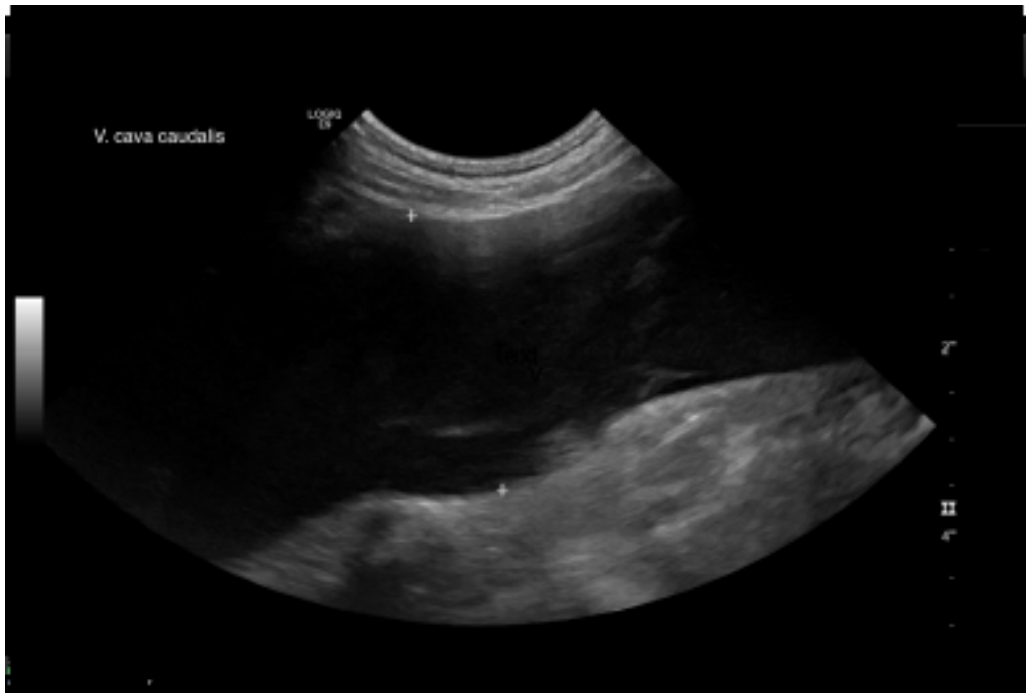

Fig. 2b

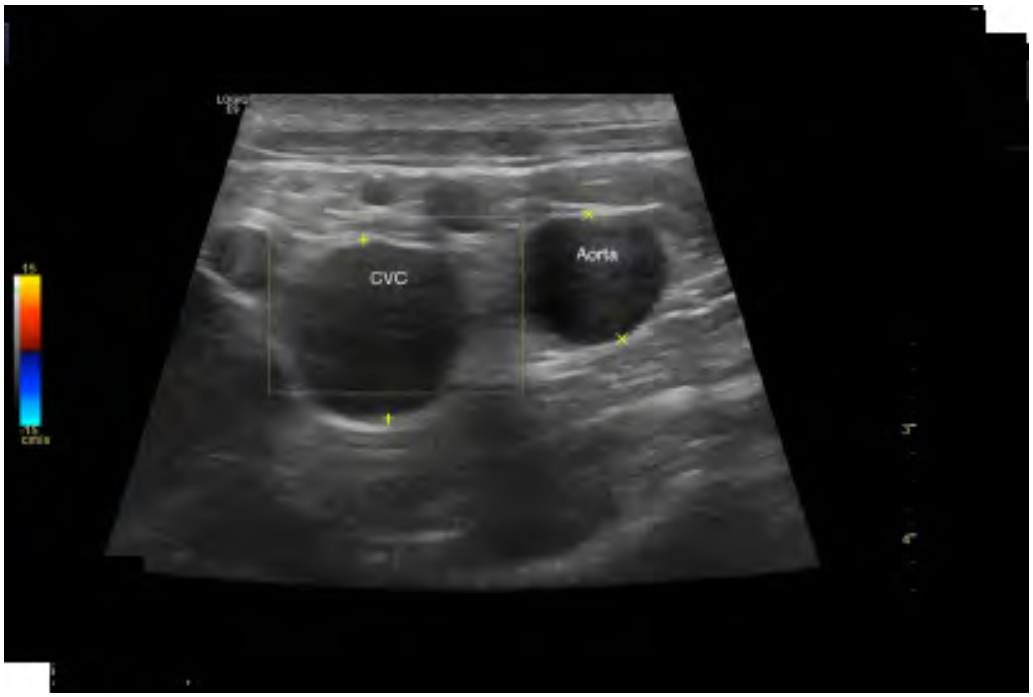

Fig. 2

The dilated segment of the CVC in longitudinal (a) and transversal (b) projection. (Fig. 2a) The seen CVC is up to 3cm in diameter without typical signs for a thrombus formation, however a turbulent flow could be shown during Doppler examination. (Fig. 2b) Comparison of the diameter between CVC and Aorta.

Fig. 3

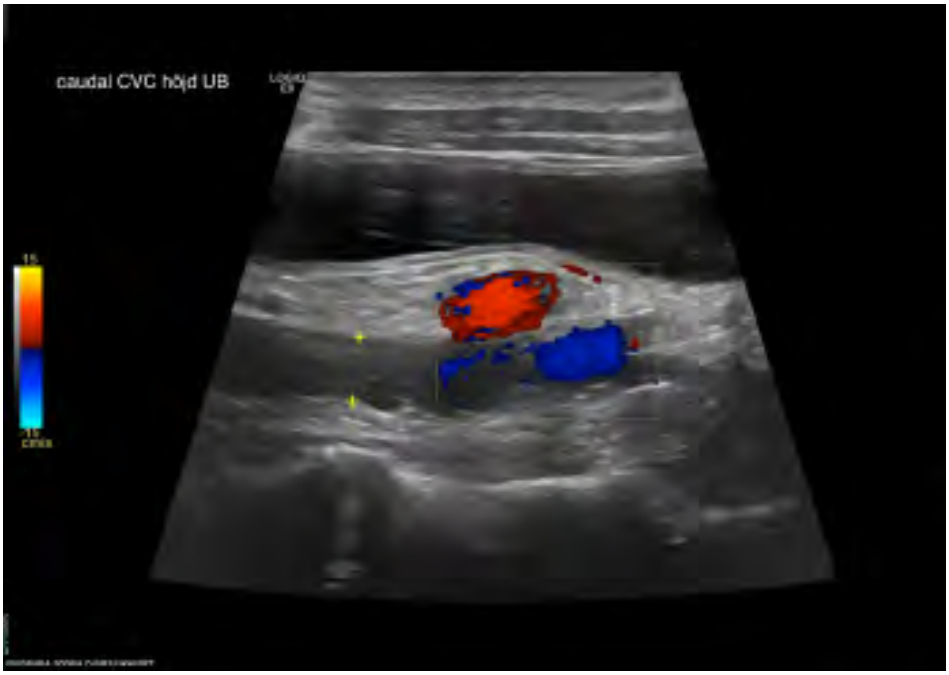

Fig. 3
The caudal prerenal segment of the CVC is normal in size with a normal Doppler Flow.

Fig. 4a

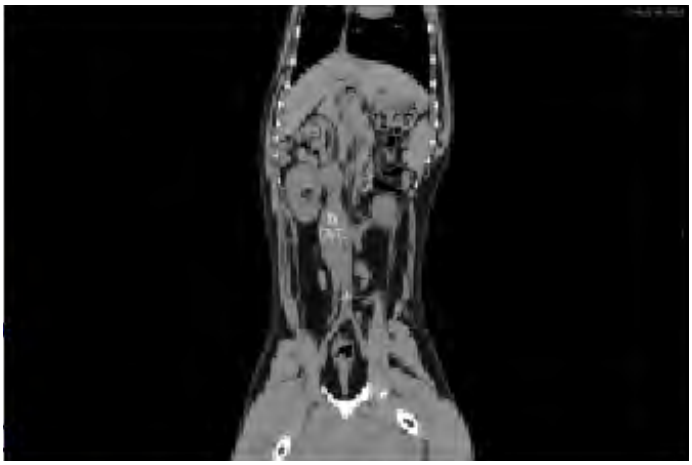

Fig. 4b

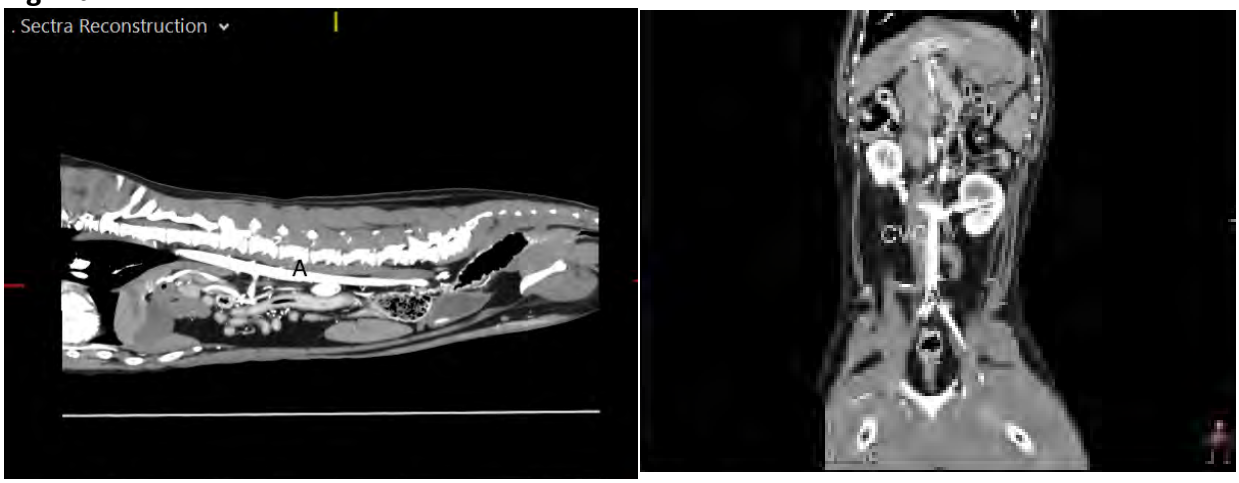

Fig. 4c

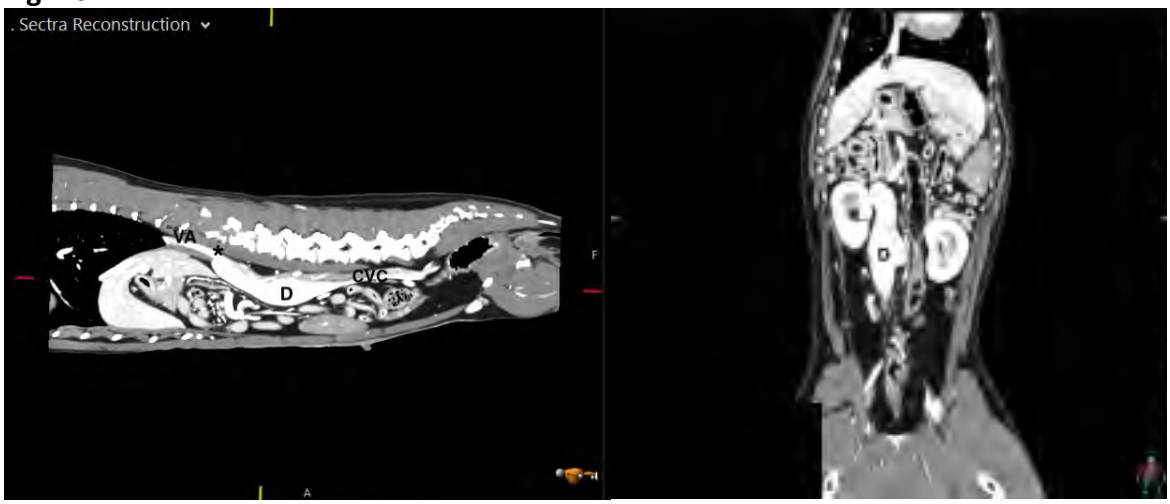

Fig. 4

CT soft tissue reconstruction (a) pre contrast (b) arterial phase (c) late venous phase in sagittal and coronal view. (a) Dilatation of the prerenal and renal segment of the CVC is already visible pre contrast. (b) Arterial phase with high concentration of contrast in Aorta (A) and kidneys. (c) Venous phase – the caudal part of the prerenal segment of the CVC is normal in diameter followed by an aneurysmal dilatation (D) of the CVC. The prehepatic segment of the CVC missing, however a direct connection (*) with the vena azygos (VA) can be seen. Cranial of the contrast enhanced liver a normal posthepatic segment of the CVC (#) is seen.