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CASE REPORT

Congenital isolated cleft mitral valve leaflet and apical muscular ventricular septal defect in a Holstein calf☆

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Abstract A 5-week-old Holstein heifer calf presented for emergency treatment of signs referable to gastrointestinal disease and hypovolemic shock. Fluid resuscitation uncovered clinical signs of primary cardiac disease and echocardiography revealed multiple congenital cardiac defects. Malformations included a cleft anterior mitral valve leaflet resembling an isolated cleft mitral valve and an apically-located muscular ventricular septal defect. The echocardiographic and postmortem findings associated with these defects are presented and discussed in this report.

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Abbreviations

AVSD	atrioventricular septal defect
GI	gastrointestinal
LV	left ventricle|left ventricular
MR	mitral regurgitation
MV	mitral valve
PFO	patent foramen ovale
RV	right ventricle|right ventricular
VSD	ventricular septal defect

A 5-week-old, approximately 45 kg, Holstein heifer calf was presented to The Ohio State University Veterinary Medical Center for severe lethargy and anorexia of one-week duration. One week prior to presentation, the calf was treated on the farm for bloody diarrhea attributed to coccidiosis. No other animals were reported as ill.

On presentation the heifer had a body condition score of 2/5, was recumbent, obtunded, and febrile (39.4 °C). Clinical signs of hypovolemic shock were observed, including tachycardia (200 beats/min; reference range, 90—110 beats/min), tachypnea (64 breaths/min; reference range, 10—30 breaths/min), marked eyeball recession, decreased skin turgor, slow jugular refill, slow capillary refill time (2 s), and tacky, pale mucous membranes. Palpation of the limbs revealed cool extremities with weak pulses. Dehydration was estimated at 10%. Initial cardiac auscultation revealed a regular rhythm and loud heart sounds without an audible murmur. Pulmonary auscultation revealed crackles and wheezes, most prominently in the cranioventral lung fields. Borborygmi were present on abdominal auscultation and abdominal contour was unremarkable. Watery diarrhea was present and positive for blood on hemoccult assay.[c] Venous blood analysis revealed hyponatremia (126.6 mmol/L; reference range, 133—143 mmol/L), hypochloremia (96.2 mmol/L; reference range, 98—108 mmol/L), hyperlactatemia (4.3 mmol/L; reference range, <2 mmol/L) and hypocarbia (bicarbonate 20.9 mmol/L; reference range, 23—31 mmol/L).

Initial treatment included nasal oxygen, fluid resuscitation with hypertonic saline (7.2%, 100 ml bolus), Ringer's solution (1 L bolus, followed by a constant rate infusion of 250 ml/h), ceftiofur sodium[d] (2.2 mg/kg IM) for potential septicemia, and sucralfate (3 g PO) for suspected gastrointestinal (GI) ulceration.

[c] Hemoccult II SENSA, Beckman Coulter, Brea, CA, USA.
[d] Naxcel, Zoetis, Kalamazoo, MI, USA.

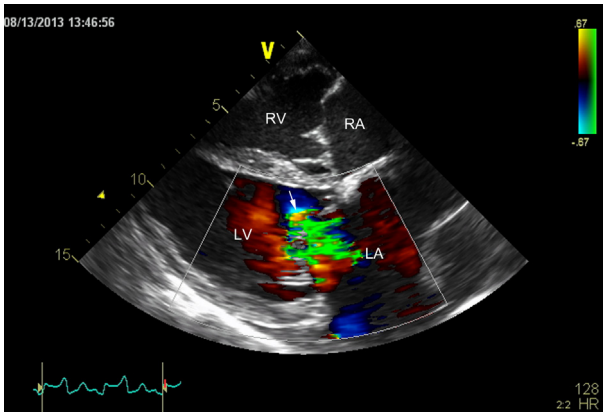

Figure 1 A right parasternal long axis image showing an eccentric jet of mitral regurgitation (arrow) originating from the anterior mitral valve leaflet. RA, right atrium; RV, right ventricle; LA, left atrium; LV, left ventricle.

Initial clinical improvement was evidenced by a brighter mentation, ability to stand, and a decrease in respiratory and heart rates. However, within 10 h and upon re-evaluation the clinical status of the calf deteriorated. Mentation declined progressively as tachycardia and respiratory distress developed. Bilateral jugular venous distension, a prominent S3 heart sound, and a grade II/VI left apical systolic murmur were also apparent.

A transthoracic two-dimensional and Doppler echocardiographic study[e] was performed using a 2—5 MHz transducer.[f] Images were acquired from the right side of the thorax only, with the calf in left lateral recumbency. Two-dimensional images obtained from the long-axis image plane revealed moderate to severe right ventricular (RV) enlargement, a mildly thickened mitral valve (MV), and moderate to severe left atrial dilatation (Video 1). Left ventricular (LV) end-diastolic size was approximately 60 mm, compatible with LV dilatation for a calf of this age.[1] There was interventricular septal flattening, consistent with RV volume/pressure overload (Video 2). Color flow Doppler imaging of the MV showed an eccentric jet of mitral regurgitation (MR) with turbulence arising from the anterior leaflet (Fig. 1; Video 3). Close inspection of the MV from the short axis plane revealed an apparent division or cleft of the anterior MV leaflet (Fig. 2) resembling an isolated MV cleft, a malformation described in humans.[2—6] Additionally, a large, apical, muscular ventricular septal defect (VSD) was observed (Fig. 3; Video 3).

[e] Vivid 7 Dimension with EchoPac software package, version BT09, GE Medical Systems, Milwaukee, WI, USA.
[f] M4S (2—5 MHz) transducer, Vivid 7 Dimension, GE Medical Systems, Milwaukee, WI, USA.