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Surgical correction of dysembryogenetic defect of peritoneo-pericardial diaphragmatic hernia (PPDH) IN A cane corso puppy

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Abstract

A five-month-old Cane Corso male dog was reported with the history of respiratory distress and exercise intolerance for past one week. Clinical examination revealed cardiac murmur, tachycardia with tachypnea. Survey and contrast radiograph revealed cardiac effacement and gas filled intestinal loops in pericardial sac. Echocardiography revealed ventricular septal defect and intestinal loops in the pericardial sac. Plain Computed Tomography confirmed the condition as PPDH. Animal was premedicated with Inj. Butorphanol 0.2 mg/kg, Inj. Diazepam 0.25 mg/kg, induction with Inj. Propofol 3mg/kg and maintained with Isoflurane and 100% oxygen supplementation in circle system. Cranial celiotomy revealed a ventral diaphragmatic malformation through which the intestinal loops passed into the pericardial sac. Herniated contents were repositioned and the defect was closed by ford interlocking pattern using non absorbable suture polyamide no 1. Celiotomy was closed as per the standard surgical procedure. Immediate postoperative survey radiography revealed mild pneumopericardium and resolved spontaneously without any complications.

Keywords: Cane Corso, PPDH, Exploratory celiotomy

Introduction

Peritoneopericardial diaphragmatic hernia (PPDH) is a dysembryogenetic defect observed in small animals due of the failure of the lateral pleuroperitoneal folds and the ventromedial pars sternalis to unite or, as a result of a defect in the development of the dorsolateral septum transversum (Evans SM & Biery, DN. 1980) [1]. Persistent communication between the peritoneal and pericardial cavities allows the abdominal organs to herniate into the pericardial sac without involving the pleural space (Berry *et al.*, 1990, Evans *et al.*, 1980, Nelson *et al.*, 2014) [4, 1, 3]. Most common predisposed breeds are Weimaraners and cocker spaniels among dogs and Persian cats. Clinical signs depend on the degree of defect and observed at any age. In case of small defects animals are asymptomatic. Only a peritoneal fat may be herniated through the defect. In large defects abdominal organs such as liver, intestinal loops, gall bladder and spleen may be herniated causing respiratory, cardiovascular and gastrointestinal signs like dyspnea, tachypnea, exercise intolerance, exertional cyanosis, respiratory distress, vomiting, diarrhea, poor weight gain and abdominal pain (Evans SM, Biery, DN. 1980) [1]. Animals with PPDH often have other concurrent congenital abnormalities such as midline defects (e.g., umbilical hernia, cleft palate, sternal abnormalities) and cardiac defects (e.g., ventricular septal defects, subaortic stenosis, pulmonic stenosis, atrial septal defect) (Bellah JR *et al.*, 1989) [5]. PPDH is incidental finding only. Surgical correction of the defect is the only solution. Most common post-operative complications pneumopericardium, pericardial effusion and wound dehiscence. Pneumo pericardium is usually asymptomatic and resolves spontaneously (Eyster GE, Evans AT, Blanchard GL *et al.* 1977) [1]. In some cases, it affects the respiratory and cardiac function requires pericardiocentesis. In this case study we describe the presentation, diagnosis, treatment and complications of the PPDH in Cane Corso puppy.

Material and Methods

A five-month-old Cane Corso puppy was presented with the history of dyspnea and exercise intolerance after a meal for past one week. On the day of presentation animal was active and alert. Physical examination revealed cardiac murmur, tachycardia and tachypnea. Hematobiochemical values were within the normal range. Thoracic survey radiograph showed dorsal displacement of thoracic trachea, enlarged cardiac silhouette in both height and width, effacement of ventral diaphragmatic border and heterogenous density structure around the heart (fig-1). In contrast radiograph intestinal loops were found only in the pericardial sac not involving the pleural space (fig-2, fig-3). In Echocardiograph cardiac chambers were not clear and intestinal loops noticed around the heart. Transthoracic right parasternal short axis view of Doppler Echo showed perimembranous defect just below the right border of the aorta which resulted in left to right shunting signifying the mosaic pattern of ventricular septal defect. Plain CT revealed ventral defect in the diaphragm and intestinal loops around the heart. Based on the history, age of the animal and diagnostic tools condition was diagnosed as PPDH (fig-4).

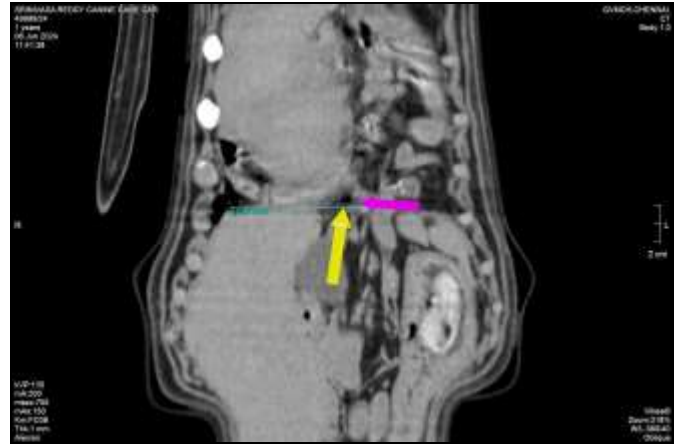


Fig 4: Plain CT - defect in the diaphragm and intestinal loops around the heart

Animal was premedicated with inj. Butorphanol and inj. Diazepam at the dose rate of 0.2 mg/kg I/V, 0.25 mg/kg I/V respectively and pre-operative antibiotic inj. Cefotaxime @ 20mg/kg was given intravenously. Induction with inj. Propofol @ 3mg/kg intravenously. After intubation animal was maintained with isoflurane anesthesia in a rebreathing circuit and supported with a positive pressure ventilator. The cranial celiotomy confirmed as PPDH. An approximately 7-8 cm ventral diaphragmatic muscular defect was found, allowing intestinal loops enter the pericardial sac (fig-5). The herniated intestinal loops were repositioned and the hernia ring was found to be a free of adhesions. The edges of the defect were debrided and closed by Ford interlocking suture pattern using non absorbable monofilament suture polyamide no 1 (fig-6). At the final stage of closure, a rubber tube was inserted, and the air was removed from the pericardial sac (fig-7). Celiotomy wound was closed as per the standard surgical procedure. Post-operative radiograph revealed iatrogenic pneumopericardium. Post-operative antibiotics, anti-inflammatory, opioids and supplements were given for 7 days to avoid postoperative pain and infection.



Fig 1: Left lateral thorax radiography of Cane Corso. Presence of heterogenous density structure around



Fig 2: Contrast radiography. Intestinal loops in the pericardial sac.



Fig 3: Ventrodorsal view – Contrast radiography. Intestinal loops confined to pericardial sac.

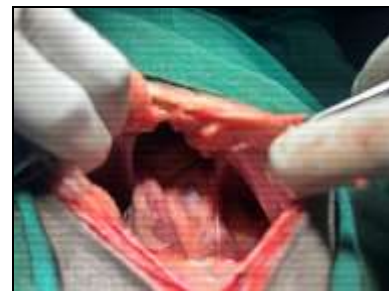


Fig 5: Ventral diaphragmatic defect allowing the intestinal loops into the pericardial sac.



Fig 6: Closure of defect by Ford interlocking pattern using polyamide no.1.



Fig 7: Air removed from pericardial sac by using rubber tube.

Results and Discussion

The animal was normal after the surgical correction. Immediate postoperative survey radiography shows pneumoperitoneum (fig-8a&8b). On the third post operative day showed mild degree of pneumopericardium (fig-9a&9b). However, this condition resolved spontaneously within 12 days without any surgical intervention, and the animal made an uneventful recovery (fig-10). No signs of infection at the site where the surgery was performed. PPDH is usually a congenital condition associated with others defects always need surgical correction. Whereas, (Mcclaran, 2013) [7] suggested reconstruction of diaphragm with pericardial grafts in cases of large defects or in agenesis of the diaphragm. Prognosis following surgical repair of PPDH is usually good with 81-87.5% of the dogs recovering within 10- 15 days postoperatively with a short-term postoperative mortality of 5-12.5% among dogs (Banz and Gottfried, 2010) [8]. In this particular case, the associated ventricular septal defect was small with minimal shunting. Usually, spontaneous closure of a congenital peri membranous septal defect took place in a young adult age. Therefore, owner was advised to monitor the animal and do not breed.



Fig 8a: Immediate postoperative lateral thoracic radiography - Pneumopericardium



Fig 8b: Immediate postoperative ventro dorsal thoracic radiography -Pneumopericardium



Fig 9a: Day 3 postoperative ventro dorsal thoracic radiography – mild degree of Pneumopericardium



Fig 9b: Day 3 postoperative lateral thoracic radiography – mild degree of Pneumopericardium



Fig 10: Day 12 postoperative lateral thoracic radiography – pneumopericardium completely resolved

Conclusion

This case study explains the clinical signs, diagnosis and treatment for PPDH in dogs. Prompt presentation, early diagnosis and surgical intervention favors good outcome.

Conflict of Interest: None

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