CASE REPORT | SMALL ANIMAL SURGERY

Investigação

 COLÉGIO
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ANESTESIOLOGIA
VETERINÁRIA
REVISTA OFICIAL
CBCAV
 THORACOSCOPY FOR CORRECTION OF
PERSISTENT AORTIC ARCH IN A BEAGLE DOG

 TORACOSCOPIA PARA CORREÇÃO DA PERSISTÊNCIA DO ARCO
AÓRTICO EM CÃO DA RAÇA BEAGLE

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RESUMO

Anomalias do anel vascular são resultados da diferenciação anormal do arco aórtico embrionário em grandes vasos. A persistência do 4o arco aórtico direito é a causa mais comum de dilatação congênita do esôfago em cães e gatos. No presente trabalho, foi realizada cirurgia por toracoscopia em um cão, da raça Beagle, três meses de idade, com persistência do 4o arco aórtico direito. Optou-se pelo tratamento cirúrgico e o paciente foi pré-medicação com meperidina, induzido com propofol e mantido com vaporização de isoflurano. Intubação seletiva foi feita para ajudar a exposição da região a ser trabalhada. Os acessos foram realizados através dos espaços intercostais, em triangulação, sendo todos de 5mm. O primeiro portal serviu para a passagem do endoscópio. Os demais portais foram utilizados para a passagem de pinça Kelly e contra porta agulha, empregados para divulsão. Um quarto acesso foi realizado para introdução de pinça Kelly de 3mm, para afastar o pulmão e aumentar o campo de visão do cirurgião. Poliglecaprone de diâmetro 3-0 foi utilizado para sutura em nó de *endolooping* para hemostasia das extremidades do ducto, o qual foi posteriormente seccionado com tesoura romba-romba. Durante os procedimentos, aferiram-se as frequências respiratória e cardíaca, a saturação de oxigênio e a pressão arterial média. Aos 60 dias de pós-operatório, a paciente encontra-se estável, com raros episódios de regurgitação, e a alimentação continua sendo fornecida em plano inclinado. Concluiu-se tratar de uma técnica segura e sem complicações trans e pós-operatórias.

Palavras chave: videocirurgia, megaesôfago, cão.

ABSTRACT

Vascular ring anomalies result from abnormal differentiation of embryonic aortic arch in great vessels. The most common type that leads to congenital esophagus dilation in dogs and cats is the persistent right aortic arch. In this article, a thoracoscopy was performed in a 3 months old Beagle dog, diagnosed with persistent right aortic arch. Premedication was performed with meperidine, and anesthesia was induced with propofol and maintained with isoflurane. Selective intubation was performed to help in the exposure of the surgical field. All accesses were performed through intercostal spaces, forming a triangulation. Three 5mm access were used, being the first one used for the endoscopic entering and the other ones for a Kelly clamp and a needle holder, used for divulsion. A fourth access was performed to introduce a 3mm Kelly clamp, used to manipulate the lung and increase the surgeon's view. A 3-0 poliglecaprone was used for endlooping suture, for hemostasis of the duct, which was subsequently transected with a blunt scissor-clamp. Throughout the entire procedure, cardiac and respiratory rates, oxygen saturation and arterial pressure were measured. 60 days after surgery, the patient was stable, with rare episodes of regurgitation, and is still fed in an upright position. The authors concluded that the technique used in this case is safe and without trans- and postoperative complications.

Keywords: video surgery, megaesophagus, dog.

INTRODUÇÃO

Vascular ring anomalies result from abnormal differentiation of embryonic aortic arch in great vessels. This anomaly occurs when the fourth right aortic arch persists instead of the left one. The vascular ring is formed by aorta that comes out from left ventricle towards the right side, crossing the esophagus dorsally, and by the ligamentum arteriosum, that connects the aorta to the pulmonary artery. Venous ductus develop itself on the left side, and by doing this, forms a ligamentum that passes over the esophagus, trapping it dorsally, leading to extraluminal compression of the esophagus at the base of the heart. This esophageal constriction leads to a secondary megaesophagus (RICARDO et al., 2001).

Because of these changes, patients usually develop clinical signs that may include stunted growth, besides polyphagia, regurgitation within a few days of weaning, and recurrent episodes of aspiration pneumonia, associated with bad corporal score, due to these digestive disturbances. In a few cases, food content may be palpated on caudal cervical area (JOHNSON, 1994).

To achieve diagnostics, a positive esophagography is an easy and effective method, exhibiting, besides megaesophagus, esophageal constriction at the base of the heart. The chosen treatment for these cases is surgery, which consists by the correct identification of which kind of vascular anomaly the patient presents, followed by isolation and section of ligamentum arteriosum, esophageal liberation, and correction of surrounding fibrotic alterations. Early correction favors prognostics, avoiding permanent damage of the esophagus, with

irreversible megaesophagus and lost of esophageal motility (TWEDT, 1997).

Unfortunately, surgeons cause tissue injuries, looking for several treatments of different diseases, and better life conditions to patients. The tireless search for minimization of tissue injury walks side-by-side with surgery history, with an attempt to obtain accesses and methods every time less traumatic than others (BRUN, 2014). Considering this, the evolution of video surgery techniques is notorious and it is in constant growth, with endless possibilities, already being highly performed on medicine and, constantly used as a tool in veterinary medicine.

Thoracic surgeries, besides the fact that they are usually considerably bloody, presents restrict accesses and a small visual field. Video surgery access for these procedures is a resource that brings great benefits to the patient, minimizing surgical trauma and providing better visual field (TEIXEIRA et al., 2014).

The aim of this article is to report a case of persistence of fourth right aortic arch in a Beagle dog, addressing its health history, clinical signs, methods for diagnostic, besides the surgical technique performed and results.

APPROACH

A 6-week-old, 13 kg, female Beagle dog, was referred to São Paulo State University, "Governador Laudo Natel" Veterinary Hospital, in Jaboticabal, SP, arriving from Animal Nutrition Laboratory from same University. According to the handlers, the dog had a history of regurgitation after beginning a solid diet, soon after weaning. Clinical examination showed good corporal condition, once its

diet was changed for a pasty one and offered with the animal in a vertical position, once the first clinical signs began. Other general aspects noticed were reddish pink oral mucosa and animal presented itself alert and active. Red blood cells (RBC) count, serum biochemistry and urinalysis did not show alterations, neither did the cardiorespiratory system.

Contrasted esophagography was performed with barium sulfate 3 mL.kg⁻¹ PO (Bariogel, Cristália, Itapira – SP), revealing thoracic megaesophagus, with constriction of the esophagus at the base of the heart. A presumptive diagnosis was made as vascular ring anomaly based on clinical signs presented and on the radiographic image obtained. In the same images there was lack of pulmonary alterations. Early surgical procedure was recommended.

Surgery was performed when patient reached 8-weeks-old. The dog was premedicated with meperidine 4 mg.kg⁻¹, IM (Dolosal, Cristália, Itapira – SP). Anesthesia was induced using propofol 5 mg.kg⁻¹, IV (Propovan, Cristália, Itapira – SP) and maintained with isoflurane (Isoforine, Cristália, Itapira – SP). A selective intubation was performed with a flexible 6.0 mm endotracheal tube, to help in the exposure of the surgical field. For that, a 5 mm endoscope was used to assist the intubation. The thoracic left wall was widely clipped and asepsis was performed with alcohol (70%), chlorhexidine (2%) and alcohol again.

To correct the anomaly, the approach was performed by thoracoscopy on left chest wall. Four accesses were performed through intercostal spaces, ranging from the 4th to the 7th one, forming a triangulation (Figure 1a). Three of them were of 5 mm each, with the first one used for the endoscope introduction. The

second and the third ones were used to insert a Kelly clamp and a needle holder, respectively, used for tissue divulsion and biopsy. The fourth access was performed at the 4th intercostal space and through which was inserted a 3mm Kelly clamp to manipulate the lung and increase the surgical field. After identification of the ligamentum arteriosum (Figure 1b), hemostasis of both ends of the ductus was performed with endolooping knots using, a 3-0 USP poliglecaprone suture. After that, the ductus was transected with a blunt/blunt scissor-clamp. Posteriorly, a 22G 2-way silicon Foley's catheter with inflated balloon with saline solution was inserted in the stenosed esophagus, aiming to open esophageal lumen and undo fibrosis.

Figure 1. (a) Picture showing the portal's positioning to access the thoracic cavity (white arrows). (b) Picture showing the ligamentum arteriosum location (yellow arrow).

After the end of the procedure, muscular wall suture was performed with 0 USP nylon using a simple interrupted stitch pattern. The subcutaneous space was closed with 3-0 USP poliglecaprone using a "zigzag" pattern, and for skin closure, it was used a 3-0 USP nylon, with simple interrupted stitch pattern. During the entire procedure, respiratory and cardiac rate, oxygen saturation, end-tidal carbon dioxide at the end of exhalation (EtCO₂) and invasive arterial pressure were measured, remaining within normal range for the specie.

For post-operative analgesia, it was used tramadol 4 mg.kg⁻¹, BID, SC (Tramadon, Cristalia, Itapira-SP), associated with meloxicam 0,2 mg.kg⁻¹, SID, SC (Maxicam, Ouro Fino, Cravinhos-SP), in the first day and then 0,1 mg.kg⁻¹ in second and third days. Stitches were removed 10 days after the procedure. Patient was fed in vertical

position with a semi-solid diet, in small amounts during the first month after surgery. However, the vertical position was sustained after this period, because even presenting stability, the dog kept regurgitating when submitted to solid food.

A new contrasted esophagography was performed and no constricted areas were visualized. However, because of the persistent regurgitation, an endoscopy was performed, but no esophageal anomalies were observed.

DISCUSSION

Vascular ring anomalies must be considered with any patient with a history of regurgitating food shortly after eating. Most of them seem to have a hereditary basis (HOLMBERG & PRESNELL, 1979) Surgical correction is advised. In this context, an endoscopic approach could be an option. the present report describes a thoracoscopy performed in a dog for correction of a vascular anomaly, specifically, a persistent fourth aortic arch.

Late clinical signs have been reported on literature, with dogs achieving 8 years old without any regurgitation episode (FINGEROTH e FOSSUM, 1987). This fact may lead veterinarians to consider this condition even in older patients.

Buchanan (2004) proposed a new approach for vascular ring anomalies diagnosis. The author suggests that a contrasted esophagography would be unnecessary, once trachea generally is positioned at midline or slightly to the right in healthy patients submitted to ventrodorsal radiography. It would be moderate to highly dislocate to the left antimer in cases of vascular ring anomalies, close to the frontal border of the heart. This shift is not visualized in cases of megaesophagus that do not have vascular ring anomalies as a cause, being this way, a reliable tool

for differential diagnosis. He still reports a histological examination performed in 1-day-old patients, where tracheal compression at the level of aortic arch was present, with thin tracheal rings, low cartilage density, borders superposed and thick mucous membrane, justifying respiratory sibyls found in a few patients.

Currently, video surgery is a resource broadly used on Medicine. In Veterinary Medicine, it has been used more each day, not only as a diagnosis resource, but as well as an option for treatment of many diseases. Thoracoscopic surgery is among the techniques that shows great advances with excellent results, once that thoracic surgeries, besides the fact that are considerably bloody, present restrict accesses, being hard to visualize the surgical field in a variety of procedures. Video surgical access, for thoracic procedures, is a resource that brings great benefits to patients, providing better visual fields, minimizing trauma, reducing trans-operative hypothermia and discomfort after surgery (MACPHAIL et al., 2001; TEIXERA et al., 2014). Several studies proved a marked reduction in pain killers use in acute post operative pain, as well as in chronic pain associated with open surgeries, providing a faster recovery to the patient, and minimizing time and costs of hospitalization (MACPHAIL et al., 2001).

Thoracoscopy may also be called pleuroscopic surgery or Video-assisted Thoracoscopic Surgery (VATS), which consists in the evaluation of pleural cavity and its organs through an endoscope (BECKER et al., 2004), opens new horizons for minimally invasive procedures in Veterinary Medicine, because it decreases trauma without reducing the surgical field and the quality of the

procedure, being associated with low mortality rates (SAVIO et al., 2005). The safety of the procedure is closely related to the surgeon's ability and an effective anesthetic monitoring throughout the procedure. Its major contraindication is when there is no possibility to establish enough space inside thoracic cavity, as when there are too many adhesions empyema or previous thoracic surgery, and moreover, when there are coagulopathies or any disease that may reduce gas exchange (BASSO, 2014). In the present case, despite the small size of the patient and, consequently, little space for a thoracoscopy, it was possible to identify and correct the Persistent Right Aortic Arch (PRAA).

It is extremely necessary to maintain a careful anesthetic management. The agents to be used will vary with the primary disease. Establishing selective intubation is important to provide an optimum optic cavity where surgeons can work. To accomplish that, promoting pulmonary collapse is more indicated, but there is a higher probability for hypoxia to develop. Therefore, great attention to pulmonary ventilation must be given, and, in some cases, to institute controlled ventilation. Besides routine monitoring with electrocardiography, oxyhemoglobin saturation, capnography and urine output, hemogasometrics samples may be required to confirm respiratory acidosis, which is a common issue in thoracic procedures (BASSO, 2014). In the present case, selective intubation was performed with the assistance of an endoscope. This procedure allowed the surgeon to work in a clean visual field allowing to be performed the whole procedure, as the PRAA ipsilateral lung was not inflated throughout the procedure.

After induction of pulmonary collapse, the major concern is to perform the best surgical access, which is closely related with the primary anomaly and the thoracic anatomy of each patient. There are three different thoracoscopic accesses, the intercostal, the transdiaphragmatic paraxiphoid, and the transcervical (BASSO, 2014). In the present case, the first one was chosen.

The intercostal access is the most commonly used, especially because it is easily performed and it provides good visualization of the whole thoracic lateral surface, lungs, heart's lateral and great vessels. Rotating the endoscope caudally, it is still possible to visualize diaphragm, and cranially, the intern thoracic artery and vein (TWEDT, 2002). In lateral recumbency, as it was performed in the present case, is the best option when only one hemithorax is involved, however, a dorsal recumbent is preferable when a wider exploration is necessary (BASSO, 2014).

For this procedure, the three-portal technique was used. The camera is positioned through the first portal, and, posteriorly, the other two portals were introduced and used as working channels. When the procedure involves the cranial region of the thorax, the first portal ideally should be positioned in the sixth or seventh intercostal space, between costochondral junctions. The other two portals should be positioned at the fourth or fifth intercostal space, one at dorsolateral region and the other one at ventrolateral region, with the three portals forming a triangulation between them. The portals should be positioned far enough from the operation field, allowing the surgeon to have a panoramic view and enough space to tissue manipulation (BASSO, 2014).

To introduce the three portals, it was performed conventional incisions through skin until the pleura, using a scalp and hemostatic clamps, minimizing iatrogenic injuries. Thereafter, the first portal was introduced and, as recommended, a complete exploration of the thoracic cavity was performed. After that, the remaining portals were introduced with video assistance and thus, avoiding major vessels from the thoracic wall as well as intrathoracic structures.

Thoracic wall was closed with single interrupted suture, as indicated on literature (BASSO, 2014). The knots were properly tied right after artificial pulmonary hyperinflation. With this maneuver, the negative pressure inside the thoracic cavity was reestablished.

This could be also achieved by placing a thoracic drain or by thoracocentesis at the seventh intercostal space.

Thirty days after treatment, a new contrasted esophagography was performed, which was noticed a reduction of the megaesophagus, when compared to the image obtained for the diagnosis. However, regurgitation persists. Muldoon et al. (1997) studied 25 cases of persistence of the 4th right aortic arch correction, reporting that 32% of patients stopped to regurgitate immediately after surgery and that 92% of the cases did not regurgitate anymore after 6 months. The 8% left kept presenting sporadic regurgitation episodes, averaging once a week, although they all did not present any signs of esophageal constriction.

CONCLUSION

It was concluded that surgical thoracoscopy to treat cases of persistent fourth right aortic arch is a safe technique and free from trans- and post-operative complications, achieving the same results that a conventional open surgery would achieve. Also, endoscopic procedures tend to be less painful and less invasive than a regular intercostal thoracotomy.

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