

Cervical esophagostomy using indwelling catheter for analysis of gastric physiology in dogs¹

Esofagostomia cervical com cateter de demora para o estudo da fisiologia gástrica em cães

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ABSTRACT

Purpose: To describe the technique of cervical esophagostomy with indwelling catheter for the collection of secretions and study of gastric emptying. **Methods:** Esophagostomy was performed in 14 dogs, and a tube was introduced into the animals' stomachs and maintained pervious for eight weeks. The technique consisted of opening the left lateral surface of the neck for insertion of the tube, with the aid of a Mixer forceps, and the subsequent subcutaneous tunneling and exteriorization of the catheter on the dorsum of the animals. **Results:** Successful use of the tube and its total permeability were observed in 13 animals (92.8%). In one animal, the tube was obstructed by hair, and it was replaced. Formation of a small abscess occurred in 3 animals (21.4%), followed by spontaneous drainage. No accidents occurred, and the bleeding was minimal. No deaths were registered. **Conclusion:** The described technique can be used in similar researches, as well as for animal feeding in investigations of the upper digestive tract, after esophageal resection and in major neck surgeries. **Key words:** Esophagostomy. Digestive physiology. Dogs.

RESUMO

Objetivo: Descrição da técnica de esofagostomia cervical em cães com cateter de demora, para coleta de secreções e estudo de esvaziamento gástrico. **Métodos:** A esofagostomia foi realizada em 14 animais, e os catéteres foram introduzidos até o estômago e mantidos perves durante oito semanas. A técnica consistiu de abertura na região lateral esquerda do pescoço para introdução do catéter, com auxílio de uma pinça tipo Mixer e a sua posterior tunelização no subcutâneo, com exteriorização na face posterior do dorso. **Resultados:** A permeabilidade total e a utilização do catéter foi possível em 13 animais (92,8%), sendo que em um animal a obstrução foi devido acúmulo de pelos no seu interior e o cateter foi substituído. Em 3 animais (21,4%) houve a formação de pequeno abscesso na região cervical inferior, no local da primeira incisão, os quais drenaram espontaneamente. Não ocorreu nenhum acidente e o sangramento foi mínimo. Não houve mortalidade. **Conclusão:** A técnica descrita pode ser utilizada tanto em pesquisas semelhantes, como para alimentação de animais em experimentos do trato digestivo alto ou mesmo após operações de ressecção do esôfago e em grandes cirurgias no pescoço.

Descritores: Esofagostomia. Fisiologia digestória. Cães.

Introduction

It is important that the study of digestive physiology, gastric physiology in particular, be conducted in conscious animals, without sedatives that might interfere with the recording of data or results. Preferably, the amount of external stimuli should be reduced to a minimum. Few studies in the related literature have investigated alternative methods of collecting gastric contents, and the options reported are limited. Both open gastrotomy and percutaneous endoscopic gastrotomy (PEG) can have negative effects and cause alterations in secretions, for the studied organ is directly affected^{1,2,3}. A modified Komarov-Marks esophagostomy is a viable option, although animals can become malnourished in studies that last over a week⁴. Also, the insertion of the catheter

when gastric contents are to be collected can lead to distress². It is difficult to keep in position a flexible, pervious catheter, which will not be removed by the animal. Various artifices have been used, with little success. The purpose of this study was to perform and standardize a method of esophagostomy using an indwelling catheter to collect gastric contents for physiological analysis.

Methods

Fourteen mongrel dogs, five males and nine females, weighing from 6.7 to 13 Kg ($x = 9.74$, $SD = 2.20$), were used in this study. The animals were released by the veterinarian only after appropriate quarantine, vaccination and treatment of verminosis and other diagnosed pathologies.

1) After fasting for 16 hours, the dogs were placed in the supine position, with 5% glucose infusion. The animals were sedated with fentanyl and droperidol (2 ml IV), combined with thiopental sodium (5 mg/kg/hour IV). Orotracheal intubation followed, and the dogs were kept under intermittent positive pressure ventilation. The dogs' mouths were kept open with the aid of a wooden cylinder.

2) Upper, lower and lateral cervical regions were shaved and antiseptics was performed using povidone-iodine.

3) A sterile field was created using sterile drapes. Mixer forceps were introduced through the mouth of the animals and into the cervical esophagus. The tips of the forceps were pressed against the anterior wall of the cervical esophagus, protruding the skin. A small skin incision was made, the esophageal wall was identified, and a circular suture was placed around the projection of the forceps tips, using 4-0 prolene suture. A 3 mm opening was then made on the esophagus wall to let the forceps tips out. Then, a 14F Levine tube with a guidewire was inserted through the esophageal lumen and into the stomach.

4) A 5 cm laparotomy was performed to make sure the tube was correctly positioned in the stomach. The tube openings were placed in the fundus and body of the organ, close to the greater curvature (the position of the tube will vary according to the study to be conducted). Such great care was taken in order to avoid false results caused by bad positioning of the tube^{1,5}.

5) After positioning the tube, the circular suture was closed in the cervical esophagus and tied to the muscle aponeurosis with a 3-0 nylon monofilament suture.

6) Laparotomy was closed in layers with continuous suture using nylon monofilament size 0 in the aponeurosis, and separate stitches with 3-0 nylon monofilament in the skin. The stitches were carefully cut as short as possible.

7) In the cervical region, the tube was tunneled through subcutaneous tissue, surrounding the left lateral surface of the neck, and was made external by means of a midline counteropening between the upper cervical region and the dorsum. Subcutaneously, the tube was sutured to the muscle aponeurosis with 2-0 nylon monofilament suture. One stitch was placed in the tunnel's point of entry and two in the point of exit. Approximately 10 cm of the tube were left out and sutured to the skin with 2-0 monofilament suture (Figure 1).



FIGURE 1 - Animal in lateral decubitus; the esophagostomy tube can be seen at the posterior midline, between the upper cervical region and the dorsum. The tube is exteriorized and closed with Kelly clamps.

To prevent obstruction, the tubes were filled with saline solution and their proximal ends were closed using heat and Kelly clamps for some seconds. After surgery, the tubes were washed with saline solution twice a week to avoid obstruction caused by hair or food. After gastric contents were collected and the tubes were washed, saline solution was again used to fill the tubes, which were again closed. The animals were fed with proper feed soon after they regained consciousness.

Results

The tubes were kept in the animals for eight weeks, to provide data and enable study of gastric physiology. No problems or other apparent discomfort were observed. Tubes presented complete permeability and were used in 13 animals (92.8%). In one animal, lack of permeability was observed because of hair accumulation inside the tube, which was replaced according to the procedures previously described. Replacement of the tube did not lead to death. In three animals (21.4%), formation of a small abscess was observed in the lower cervical region, where the first incision was made. Spontaneous drainage occurred in two animals and in the third, surgical drainage was performed. This procedure did not cause suture dehiscence, and did not interfere with the animal's general health or with the studies of gastric physiology^{6,7}. During the surgical procedures, no accident occurred and bleeding was minimal. No deaths were registered. The animals ingested food normally, and no weight loss was observed during this study. Collection of gastric juice – for the study of gastric emptying applying George's test^{6,8} and gastric acid secretion test^{7,9} – was performed successfully after the animal was placed on the surgical table fully conscious and with no sedation of any kind. The material collected for the tests of gastric physiology were considered highly satisfactory.

Discussion

It is extremely important that the animal be conscious during the tests of gastric physiology to avoid any interference that might be caused by anesthesia or sedation^{10,11,12}. On the other hand, it is practically impossible to introduce a Levine tube (orogastric tube) and maintain it in adequate position when the animal is awake. In addition, any animal will naturally react against the insertion of the tube and will thus become stressed. Malpositioning of the tube may also injure the animal's mucosa¹³. Gastrostomy, advocated by some authors, is far from being considered the ideal procedure for the collection of gastric secretions or for animal nutrition. It is also difficult to maintain the tube in position for long periods of time, and there is always the risk that the tube be pulled out, since the animal is able to bite it. Ireland et al.² compared the advantages of gastrostomy and esophagostomy tubes for cat nutrition, and concluded that esophagostomy is a less invasive procedure, which requires no special material and is thus better than gastrostomy. Mack et al.³ showed the advantages of introducing esophagostomy tubes in critically ill patients, since it is a minimally invasive procedure and well tolerated. Han³ analyzed the advantages and

disadvantages of enteral tube feeding in critically ill animals, and compared nasogastric, nasoesophageal, esophagostomy and gastrostomy tubes. He concluded that esophagostomy is well tolerated and causes fewer complications. On the other hand, Crowe and Downs¹⁵ showed the advantages of pharyngostomy in clinical and experimental studies of the digestive system of dogs and cats. Barcelos et. al¹⁶ performed esophagostomy in dogs and tested various types of diet, observing the ideal characteristics to prevent dehiscence or local infections. We tested various methods for maintaining the tube in position and pervious for long periods of time, without performing gastrostomy in the animals. Esophagostomy with indwelling catheter was performed and was considered the ideal procedure. Standardization of the technique described above as cervical esophagostomy was tested repeated times. It was concluded that this procedure presents low morbidity rates, is effective and easily performed, making studies of gastric emptying⁶ and acid secretion⁷ possible. Three animals presented local infection where the esophagostomy was performed. This infection did not affect the animal's general health or collection of gastric contents for investigation. In case the tube is obstructed, there is the possibility of exchanging it for another one without jeopardizing the research or causing the death of the animal.

Conclusion

The technique described in this study may be used in similar studies or for nutrition of animals during investigations of the upper digestive tract, after esophageal resection, or in major neck surgeries.

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Conflict of interest: none

Financial source: none

Received: April 19, 2005

Revised: May 17, 2005

Accepted: June 22, 2005

How to cite this article:

Cavalcanti CAO, Andreollo NA, Santos WA. Cervical esophagostomy with indwelling catheter for analysis of gastric physiology in dogs. *Acta Cir Bras* [serial on the Internet] 2005 Sept-Oct;20(5). Available from URL: <http://www.scielo.br/acb>

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