A videocirurgia é um relevante recurso na rotina e na pesquisa em equinos por ser um tema importante e relativamente atual. Esta revisão teve como objetivo reunir informações recentes sobre este assunto, destacando as mais relevantes experiências dos autores. A rotina e a pesquisa videocirúrgica e videodiagnóstica são consideravelmente amplas, sendo opções largamente utilizadas para essa espécie como gastroscopias, endoscopias respiratórias, histeroscopias, laparoscopias, toracoscopias e artroscopias. Dentro das laparoscopias, as abordagens de posicionamento e acessos estão em constante desenvolvimento, fornecendo possibilidade de intervenções a vários sistemas, principalmente aos tratos geniturinário e gastrointestinal.

Palavras-chave: endoscopia, laparoscopia, cavalos, minimamente invasivo.

Endoscopicsurgery is a relevant resource in routine and research in horses due to importance and relatively current theme. This review aimed to gather latest information on this subject, highlighting the most relevant experiences of the authors. Routine and endoscopic or endoscopic diagnosis research are considerably large, and options widely used for this species, as gastroscopy, respiratory endoscopy, hysteroscopy, laparoscopy, thoracoscopy and arthroscopy. Within the laparoscopies, the positioning approaches and access are constantly developing, providing possibility of intervention to multiple systems, especially the gastrointestinal and genitourinary tracts.

Keywords: endoscopy, laparoscopy, horses, minimally invasive.
INTRODUCTION

In recent years, the study about endosurgery in veterinary medicine has been highlighted, occurring important advances and an increase in their routine (SILVA et al. 2000). In general, this type of surgery is performed through small body orifices, resulting in aesthetic benefits, less tissue trauma, a reduced postoperative pain and shorter time of convalescence and hospitalization, justifying the wide routine in human patients and the performing of several endoscopic techniques in other species (FUCHS, 2002; ROBINSON and STIEGMANN, 2004; CASTRO et al. 2014).

The use of endosurgery in horses is a major case series of veterinary medicine, ranging from routine procedures to developments in research, since the benefits to patients justify its application to this species (SILVA et al. 1997; NÓBREGA et al. 2011; TEIXEIRA et al. 2015).

Thus, because of the importance and advantages of this modality, especially for the patient in question, the aim of this study is to conduct an updated review of laparoscopic surgery in clinical practice and equine research.

EQUIPMENT AND ENDOSURGICAL INSTRUMENTS

A basic tower has video-camera, light source, insufflation and monitor system, possibly to include recording equipment or printing images. In routine cases that require flexible endoscopy, we need specific equipment for this purpose if the camera and light source are not compatible to rigid endoscopy. For large animals, instruments for laparoscopic surgery, in most cases, are slightly longer and larger, usually of 10 mm of width and a length exceeding 30 cm. These instruments were usually adapted from bariatric surgeries in human patients, but because of the evolution of this surgical modality in this species, specific instruments for horses were already developed (BOURÊ, 2005).

ROUTINE AND RESEARCH IN VIDEOSURGERY

Hysteroscopy

The hysteroscopy is part of the supplementary clinical examination that can be used to assess the reproductive tract of mare, with the aim of obtaining maximum possible of patient information, determining presence or absence of endometrial lesions. It is a relatively simple, fast and atraumatic procedure for the animal (BRACHER and ALLEN, 1992). This examination should be performed when uterine abnormality, detected by rectal palpation or ultrasonography, point to the need for obtaining more information, or when the cause of infertility in mares cannot be determined by other diagnostic procedure (LeBLANC, 1993).

To perform the procedure is necessary to use antisepsis care at the site and preparation for perineal exam. In docile animals, we need only restraint on the trunk, and in exceptional circumstances, tranquilization can be used. For more efficient viewing, is necessary to expand partially the uterus and can be performed distention with saline or water, inflating the uterus with air or even CO2, allowing full examination of the body and both uterine horns. The flexible endoscope is introduced through the cervix, should it be preferably in the diestrus period, since distension of the uterus is more easily maintained with a closed cervix (COLAHAN et al. 1999; TOLEDO et al. 2014; FILHO et al. 2015).

The color of the displayed uterine lining should be rosy and bright, without the presence of exudate on its surface. Structural changes that can be observed include endometrial cysts (most common in multiparous females), adhesions and changes in the texture and color of the endometrium (LeBLANC, 1993), which involve a series of morphological and functional changes in the uterus (ALLEN, 1992). The presence of cysts in the uterine lumen causes problems in the embryo migration, which may result in embryonic death (STANTON et al. 2004) (Figure 1).

Hysteroscopy followed by artificial insemination (AI) is widely used in the practice of equine reproduction. For this procedure the endoscope is introduced into the reproductive tract until the utero-tubal junction ipsilateral to the ovary where is the dominant follicle, the place where the semen is deposited by passing a tube through the endoscope working channel (MILLER, 2008). The purpose of this technique is to increase the amount of spermatozoa reaching the oviduct thus can increase pregnancy rates in mares, and also cause a decrease in the quantity of spermatozoa deposited within the genital tract (BRINSKO et al. 2003). AI by the conventional technique, guided by palpation, is...
the method of choice when the stallion shows excellent fertility and the sperm number is greater than 25-50 million per ml. If the animal has a lower concentration and especially if the sperm has suffered some damage by freezing process or sexing, video-assisted insemination can be justified (SQUIRES, 2005).

By video-assisted insemination, already has promising results, as reported in surveys, all with low sperm concentration. With sperm concentration of 1 million, the pregnancy rate achieved was 64%, a figure similar to that obtained in a conventional insemination (MORRIS et al. 2000). Another study reported rates of 30 and 50% with a concentration of 7 million to 5 million sperm cells, respectively (VAZQUEZ et al. 1998; LINDSEY et al. 2000). Morris et al. (2000) found a 79% pregnancy rate with frozen semen. Brinsko et al. (2003) compared the AI video-assisted and conventional, using concentration 25 milhões / mL, and obtained 67% vs. 59%, respectively.

Several factors may explain why the hysteroscopic insemination can result in a higher pregnancy rate. One reason is the surgeon is able to deposit the sperm as close to the utero-tubal junction, and thus minimize the loss of material in the endometrial villi present in mares in estrus, and can minimize a wall uterine injury, since it will be seen the uterine lumen (MANNING et al. 1998; LINDSEY et al. 2005).

Before and after the hysteroscopy procedure is recommended the administration of antibiotics, due to some degree of inflammation that can occur in the endometrium (LeBLANC, 1993). Due to the need of special equipment and surgeon training, insemination in mares by hysteroscopy has the value above the conventional insemination, which is the main reason the technique still not be the most used on the market (LINDSEY et al. 2005).

Gastroscopy, laringoscopy and bronchoscopy

Gastroscopy is extremely feasible in the diagnosis of gastric diseases, due to the possibility of direct observation and biopsy (CAMPBELL-THOMPSON and MERRITT, 1999). Gastric ulcers in foals are some of the major indications, however, other lesions, such as neoplasm in adults, also require a great technique (SPAIRS, 1997).

Two types of approaches (one with the animal in standing position and other in lateral decubitus) can be routinely used in horses. The technique is the same for both adults and foals, but the length of endoscope or fiberscope may vary. For foals aged 30 to 40 days, a length of 1.1 meters is sufficient to reach all portions of the stomach. Older foals require a slightly longer endoscope (1.5 - 1.8 meters). For adult animals, gastroscopy is carried out with a 2 to 3 meters in length. In the case of inspection of the respiratory tract, 1.5m endoscopes are sufficient to assess airway (ADAMSON and MURRAY, 1990; JONES and SMITH, 2009) (Figure 2).

Before each procedure are necessary adequate physical and chemical restraints. Very young foals (less than 20 days old) must only be contained by one or two people. An older foal and adult animals require chemical restraint. Four people in the team is the ideal number to work in one patient (ADAMSON and MURRAY, 1990).

Animals should be fasting (ADAMSON and MURRAY, 1990). For examination of antrum, for example, it is required at least 8 hours but preferably 12 hours of fasting and at least, 2 to 4 hours of water intake (MURRAY, 2002). However, the full stomach emptying is not always observed, since horses continually secrete gastric fluid and present on the normal gastric content reflux duodenal (CAMPBELL-THOMPSON and MERRITT, 1999).

Once you start the procedure, the passage of the endoscope through the nose is often an uncomfortable part for the animal. Achieving this, one comes to the glottis. In foals and older adults horses, the injection of water through the working channel facilitates swallowing and the endoscope forward into the esophagus (MURRAY, 2002). When inside the esophagus, it is necessary inflation with small amount of air helps to help in the endoscope passage. Once go by the esophageal sphincter, inflating with moderate amount of air helps in guiding and inspecting all portions of the gastric mucosa. The endoscope should be rotated and directed to any body structure to facilitate their observation (CAMPBELL-THOMPSON and MERRITT, 1999).

A healthy stomach mucosa is observed in white, shiny and very smooth surface coloring, contrasting with the glandular mucosa, which features darker pink color. In foals less than 30 days of life due to the immaturity of the mucous membrane before weaning is common to note thin pieces of epithelial desquamation,
distributed throughout the non-glandular mucosa, dorsal to margo plicatus, in addition to erosion and ulceration, although these are asymptomatic. Healing is spontaneous (CAMPBELL-THOMPSON and MERRITT, 1999; DEARO et al. 1999; OKAI et al. 2015). In older foals, lesions can also be observed in the squamous mucosa of the minor curvature and around the cardia (ADAMSON and MURRAY, 1990). Already in older adults, ulcerations are less often observed, however, other findings, such as cancer and parasites (Draschia megastoma and Gasterophilus nasalis larvae), are more common (SPAIRS, 1997). Currently, this technique has been an effective method for the detection of gastric habronemiasis (Draschia megastoma) in horses (BELLI et al. 2005).

Upon reaching the pylorus, if there is need for the duodenoscopy, the fiberscope must be rotated slightly in this region, and gastric contraction movements will help in device advancing (CAMPBELL-THOMPSON and MERRITT, 1999). When in the lateral position, sometimes observing the pyloric sphincter is hampered by the presence of food bolus, thus it is necessary to roll the animal, so there is displacement of the content, and thus facilitate the visualization of structures (ADAMSON and MURRAY, 1990).

At the end of the exam, to return the endoscope, but before its passage through the cardia, should be promoted gastric decompression using the opening of the appliance biopsy channel, releasing all the blown air (CAMPBELL-THOMPSON and MERRITT, 1999).

In the approach to the respiratory tract of horses, assessments of the larynx, trachea to the entrance of the bronchi are possible, enabling even biopsies or bronchial washings. Sport horses assessments are very common, especially in a known syndrome in Brazil as “Síndrome do cavalo roncador” caused by laryngeal hemiplegia, extension palate, its relaxation and/or imprisonment of glottis. In routine clinical sample, the axial deviation of the aryepiglottic folds is the most common abnormalities identified, followed by dorsal displacement of the soft palate and idiopathic left laryngeal hemiplegia. Also described are other artenoid collapse, collapse of the vocal fold, dynamic collapse of the pharynx, epiglottis imprisonment, epiglottis retroversion, rostral displacement of palatopharyngeal arch and right laryngeal hemiplegia in horses with axial deviation of aryepiglottic folds (TAN et al. 2005).

Another condition that can be diagnosed and treated endoscopically are the guttural pouch diseases, the endoscopic intervention enables both washes, and therapeutic interventions for swelling

**Laparoscopy**

Laparoscopic surgery is a procedure for abdominal cavity visualization, a tool for identification of various disorders, primarily affecting the digestive and genitourinary system, gaining importance in the treatment as minimally invasive surgery (GRIFFITH and WONG, 1996; FREEMAN, 1999; MERINI, 2012). For laparoscopy, especially regarding to the equine patient, you are able to access structures not possible to access, during a conventional celiotomy, despite being less invasive and reduce the risk of herniation and/or evisceration (Figure 3 and Figure 4A) (SMITH et al. 2005).

For laparoscopy, the access techniques have several adaptations and the materials used are constantly advancing (SILVA et al. 2000). Instrumental access to video-assisted EndoType ™ and Exel ™ already have your description in animals, the first widely used in horses (NÓBREGA et al. 2011).

For access techniques, we have closed or “Veress” access, which uses a special needle the same name of the method, and cut only the muscles, exposing a blunt tip to reach the peritoneum. With this technique, it decreases the risk of accidents in penetration of the trocar once the infusion is made of pre-form. However, there is a great risk of visceral injuries in the placement of the Veress needle (SILVA et al. 2000).

Upon the risk of Veress technique, another option is the open or Hasson technique, which uses a minilaparotomy to make a safer introduction of the first trocar access. Since this technique is more suited for humans and small animals, open technical modifications, in which only makes a small dermal incision was worked employing instrumental access to make blunt separation of the muscle layer and the peritoneum (CARON, 2012).
The trocar EndoType™ model has the advantage of providing safety by minimizing the entry wound and reducing the force required for introduction of the cannula once it has the characteristic “corkscrew”, introducing no shutter and may be video-assisted (VILLI et al. 2007). As a controlled access cannula, the EndoType™ allows a reduction in the risk of complications at the time of the puncture, and provides a safe environment for insufflation of CO2 (NÔBREGA et al. 2011).

Although not having the possibility of video-assisted introduction, by the color of its material, the trocar AdaptTM model brings the input of the security benefits not occurring lacerations viscera, and versatility in use of the 5 to 12 mm equipment, without pneumoperitoneum loss. Instead of sheets of metal or plastic that have cutting edges, the tip of AdaptTM dissects the tissue in an asymmetrical pattern, maintaining muscle integrity (TEIXEIRA et al. 2015b).

Modern laparoscopic access were recently described in this species, as single portal equipment (LESS), including multi-port (TriPort, QuadPort, Uni-X and R-Port) and even the surgeon’s hand access equipment (Hand-port). Regarding access LESS, these minimize the risk of bleeding, organ perforation, infections, tissue adhesions and hernia, but the surgeon need to have a greater ability to perform procedures due to the proximity of the grippers and special tweezers and optical to this (BADAJOZ et al. 2008; TRACY et al. 2008; OLWENY et al. 2012).

An efficient approach also used in horses is the video-assisted technique, in which we explore the cavity with the endoscope aid, but determined step of the procedure is performed by externalization of the organ (or part thereof). In some cases, it may be done surgeon’s hand access into the cavity (TEIXEIRA et al. 2011; TEIXEIRA et al. 2015). For this type of procedure, we can develop ovariectomy, cryptorchidectomy, nephrectomy and herniorrhaphy (SMITH et al. 2005).

Other access that has being used to access the abdominal cavity, is NOTES (Natural Orifice transluminal Endoscopic Surgery), which is endoscopic surgery through natural orifices (esophagus, colon, stomach, rectum, bladder and vagina) by eliminating incisions and related complications. In horses the vaginal stands during creation of the pneumoperitoneum or the introduction of trocars or during dissection (YIERRA, 1995). Regardless of the trocar model that will be used when the laparoscopic procedure have access by flank, we should have a greater care not to puncture the circumflex iliac artery, because it may cause lacerations of the vessel during the introduction of the material (HENDRICKSON, 2008).

The removal of the peritoneal parietal is a cited complication, but with low occurrence, occurring mainly when using short trocars, or conical tips, which may cause this type of complication, especially in larger horses or obese (SILVA et al. 2000). In view of this, we recommend the use of longer trocars (TEIXEIRA et al. 2015b). The leakage of CO2 through the portals is something observed mainly by wear of the equipment, in many cases requiring to reducing the use of smaller diameters instrumental (FREEMAN, 1999).

The patient must be attached to the operating table by, for example, the tail restraint (RAGLE et al. 1998), feet and / or straps in the chest region so that it does not move toward the floor when the table is tilted to the Trendelenburg position (30° to the upside down) (KELMER et al. 2006). In this position the table tilt is considered the animal in standing position and supine, for the investigations of the viscera (SILVA, 1997; TEIXEIRA et al. 2013). As mentioned, there is a risk of penetration bodies on access, it is very important that the surgeon is properly trained and that the abdomen is properly inflated (SMITH et al. 2005).

Access occurs by techniques already mentioned in standing position, with the needle or trocar connected to the inflator via silicone tubing, for establishing pneumoperitoneum, keeping ovariectomy, but limits its use as a diagnostic routine. In mares, ovariectomy vaginally through colpotomy are well established (ROCHA, 2013).

The surgeon must have good knowledge of equine anatomy, considering the animal in standing position and supine, for the laparoscopic technique may be performed both ways, depending on what the vet want to examine, the animal’s temperament, its general condition and the preference and experience of the professionals. The horse in standing position, only the dorsal aspect of the abdomen can be viewed properly, as supine, only the ventral abdomen evaluation is possible (SILVA et al. 2014).

Using the ventral median laparoscopy, you get a wide view of the organs of the abdominal cavity of horses, when divided into three regions: cranial and central flow through the middle line in the investigation of the viscera (SILVA, 1997; TEIXEIRA et al. 2013). As mentioned, there is a risk of penetration bodies on access, it is very important that the surgeon is properly trained and that the abdomen is properly inflated (SMITH et al. 2005).

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the pressure between 10 and 15 mmHg of CO2 and stream 5 at 8 L / min. (FISCHER et al. 1986; TEIXEIRA et al. 2013). If the open technique is used, the optics must be introduced by the trocar, before inflation to visualize the penetration into the abdominal cavity (HENDRICKSON, 2008). Using Veress technique, remove the needle and replace it by a trocar. Through this trocar becomes the insertion of a laparoscope into the patient’s abdomen, through the laparoscopic cannula, thus, the region of the umbilicus is the first portal (PEPE et al. 2005; KELMER et al. 2006).

As already mentioned, we recommend the use of laparoscopic from 30 to 57 cm in length and the second is the most used, due to the possibility of visualization of the entire abdominal cavity of the patient, once it appears deep enough (FISCHER et al. 1986; RAGLE et al. 1998; KELMER et al. 2006; HENDRICKSON, 2008). Regarding the laparoscope slope, those with 30º are the most used in cryptorchidectomy, working in recumbency position, but it is a surgeon’s preference criterion (FISCHER et al. 1986; RAGLE et al. 1998; KELMER et al. 2006; HENDRICKSON, 2008). Regarding the laparoscope slope, those with 30º are the most used in cryptorchidectomy, working in recumbency position, but it is a surgeon’s preference criterion (FISCHER et al. 1986; RAGLE et al. 1998; KELMER et al. 2006; HENDRICKSON, 2008).

In both cases cryptorchidectomy, conventional ovariectomy and/or diseases, we can work with the patient on Trendelenburg or standing position (HANRATH and RODGERSON, 2002; TEIXEIRA et al. 2015). Unilateral or bilateral ovariectomy in mares by flank, on standing position is advantageous compared to other techniques due to its low cost, reduced incidence of postoperative complications and possibility of removal even of large ovarian tumors, which it is not possible when using the vaginal access (Figure 4D) (BEARD, 1991). In the case of video-assisted ovariectomy or ovariohysterectomy, as mentioned, there is the possibility of “handport” being a less traumatic use for the patient and very interesting in cases of neoplasms (RODGERSON et al. 2002; JANICEK et al., 2004).

The steps for these procedures are mainly vascular hemostasis which can be done with conventional ligatures with surgical thread. However, especially for the size of the ovarian artery, this step is considered the most complex. Surgical clips used in this step are a safe option, but require dissection of vessels, thereby increasing the surgical time. Therefore, methods for this operative stage were studied. Today, already is consolidated ligation with pre-assembled endoligature (endoloops), a cheap option and easy to perform (CARPENTER et al. 2006). Others options are the ligature using polyamide tie-rap and the vessel-sealing devices (COKELAERE et al. 2005). The use of cutting and coagulation forms of energy is also an advantageous option in this operative step, and the ultrasonic scalpel the best option (HANRATH and RODGERSON, 2002; RODGERSON et al. 2002; ALLDREDGE and HENDRICKSON, 2004).

Endoscopic procedures applied to the gastrointestinal tract are increasingly acting in routine horses, because it allows the possibility of working with the patient in standing position (SCHOLES et al. 1993; SCHUMACHER et al. 2000). Thus reducing the chance of intraoperative complications (problems related to anesthesia and position, reducing abdominal cavity infection and less surgical time), postsurgical (hemias, eversion, evisceration). Access by flank is possible from both sides, but the right is easier to view and manipulate the thin segments, cranial and caudal duodenal flexure, the ascending and descending duodenum, jejunum and loops, but not usually the ileum. Through the left flank we have the vision of nephrosplenic space, location susceptible to incarceration of intestinal loops. The segments of the large intestine are possible in both, the visualization and manipulation (Figure 4B and 4C). The stomach is a difficult organ to visualize by this access (GIBSON et al. 1989).

Biopsies of the gastrointestinal tract are potential risk of contamination, therefore, should be used antibiotics and anti-inflammatory associations during the surgery. To reduce the chance of contamination of the cavity can be externalized the segment to be biopsied or using rescue bags for storing fragments. The biopsy should be performed with use of three portals, one for the endoscope, the second portal for atraumatic

Laparoscopy applied to the Genitourinary

In 1988, laparoscopy was once considered a helper method to examine the genitourinary tract in horses, suitable for performing procedures that require handling intra-abdominal structures structures that cannot be easily externalized (RODGERSON et al. 1986; RAGLE et al. 1998; KELMER et al. 2006; HENDRICKSON, 2008). As mentioned earlier, these approaches can be worked with the patient in supine or standing position, allowing the visualization of the abdominal cavity and identification of the viscera, and diseases that affect the digestive and genitourinary system (HENDRICKSON, 2008).

The endosurgical resource is already established in gonadectomy therapy (ovariectomy and cryptorchidectomy), ovariohysterectomy, removal of ovarian tumors, approaches hermaphroditic and pseudohermaphrodites, and approaches in cases of bladder rupture (most common in foals), for removal of uroliths and reviews and renal biopsies (Figure 4D) (BOURE et al. 2005; ROCKEN et al. 2006; HENDRICKSON, 2008; HENDRICKSON, 2012).

As already mentioned, we recommend the use of laparoscopic from 30 to 57 cm in length and the second is the most used, due to the possibility of visualization of the entire abdominal cavity of the patient, once it appears deep enough (FISCHER et al. 1986; RAGLE et al. 1998; KELMER et al. 2006; HENDRICKSON, 2008). Regarding the laparoscope slope, those with 30º are the most used in cryptorchidectomy, working in recumbency position, but it is a surgeon’s preference criterion (FISCHER et al. 1986; RAGLE et al. 1998; KELMER et al. 2006; HENDRICKSON, 2008). Regarding the laparoscope slope, those with 30º are the most used in cryptorchidectomy, working in recumbency position, but it is a surgeon’s preference criterion (FISCHER et al. 1986; RAGLE et al. 1998; KELMER et al. 2006; HENDRICKSON, 2008).
Manipulation forceps and the third one for biopsy scissors. The fragment should be collected in elliptical form 7 to 10 mm, and collecting submucosal seromuscular portions. The mucosa should be kept intact to avoid contamination. The closing of the incision should be done with absorbable suture using standard Lambert points or surgical clips. To avoid adhesions, it is adopted as post-surgical procedure the removal of blood clots and washing the wound with saline or nonstick solutions (DAVIS, 2003).

Situations after gastrointestinal infections and/or manipulation can cause adhesions, which can be diagnosed or even solved by endosurgical feature, adhesiolyis can be solved by this surgical approach, with faster recovery of the patient (TEIXEIRA et al. 2013).

The nephroesplenic entrapment is a recurrent disorder in cases of colic in horses and usually surgical interventions should be taken to remedy this situation. Nephroesplenic space closing can be performed with the animal in standing position by accessing the left flank with three portals, which are inserted the laparoscope and two instrumentals, tweezers (Babcock and Alligator) and needle holder (MARIEN et al. 2001; ROCKEN et al. 2005).

The first portal is between the 17th and 18th vertebrae, ventral to iliac tuberosity, the second portal is created in dorsocranial portion of the iliac tuberosity and the third portal incision is performed 4 to 5 cm ventral to the second portal. Trocars 10 mm are inserted and then the laparoscope and instruments (FARSTVEDT and HENDRICKSON, 2005; EPSTEIN and PARENTE, 2006).

Many laparoscopic techniques have been reported for performing closure of the nephroesplenic space, including the dorsal portion of the ligament is sutured to the dorsomedial splenic capsule. Reported cancellations were made with non-absorbable mesh attached to the surrounding tissue by helical coils of titanium, polypropylene meshes, loops with polyglactin 0 continuous pattern and interrupted, all laparoscopic and presenting favorable results (Figure 4B and 4C) (MARIEN et al. 2001; FARSTVEDT and HENDRICKSON, 2005; RO...
with arthrotomy. In horses, the rate is 0.5%, and the mortality caused by the infection is 0% (WAGUESPACK et al. 2006).

Other major advantages are the cost of arthroscopic equipment and availability of this when compared to other more complex imaging techniques, such as CT and MRI, and also the benefit that washing used in the distention of the joint for optimal viewing brings (FRISBIE, 2006).

The efficacy of the conventional technique is dependent on obtaining the field of view (MCILWRAITH, 1987). Thus, it is disadvantageous to use it in some joints or structures such as the dorsal and palmar bursa / planting of the distal interphalangeal joint, because the display is quite limited and even the dorsum of the navicular bone and the joint surface of the proximal phalanx, with the exception of dorsal and palmar margins because it is impossible to notice. To improve diagnosis of lesions in these or other places where arthroscopy is ineffective authors suggest associates it with the most modern techniques such as optical coherence tomography (NIEMELÄ, 2014).

Regarding the techniques used, each joint requires one type that favors the visualization of structures and help in the treatment of injuries. In any case, general anesthesia is required, aseptic area and the patient dorsal recumbent position according to the joint to be worked. Unlike laparoscopic surgery, which requires CO2 for insufflation of the abdominal cavity, the joints are inflated with sterile saline solution. Thus, the arthroscope is inserted through a small incision of the skin. There are several devices available today, but with an angle of 25° or 30° and 4 mm in diameter are the most used in the routine. With internal view, after direct observation of the structure to be treated, the input portals of the instruments are designed for the treatment of abnormal or injured tissues. Upon completion of the procedure, the common channel or tendon is released and the small skin incisions are sutured (Figure 5) (MCILWRAITH, 1987).

Thoracoscopy

Diseases of the respiratory tract is one of the problems in equine medicine, mainly in athletes animals, which is considered a major cause of decreased athletic performance and premature disability for the activity, along with musculoskeletal disorders (BREDA, 2014). Thoracoscopy is a tool that has been used a few years ago, being widely used in research and clinical to establish the diagnosis of thoracic diseases as well as in their treatment (PERONI et al. 2001).

The examination of the chest is recommended to evaluate accurately the pleural cavity as a whole and can visualize the presence of intracavitary adhesions, tumors and intrathoracic metastases, pericarditis, bronchopleural fistulae and abscesses, and also extremely helpful to establish some treatments as the drain abscesses in intrathoracic mass removal and for conducting tests such as lung biopsy (ZOPPA, 2003).

Thoracoscopy is considered a surgical procedure which can be performed with the animal in the lateral position under general anesthesia, or quadrupedal station with sedation and local anesthesia, using a rigid or flexible endoscope (ZOPPA et al. 2001), the rigid one has a better view of the cavity because of the easier handling in this situation (BUENO, 2012).

The choice of procedure depends directly on the animal healthiness, it is very important a thorough and pre-anesthetic evaluation before the protocol establishment (POTTER and HENDRICKSON, 1999). In lateral recumbency the procedure is feasible, however, compared to positioning the patient in standing position, there is no access to the mediastinal vessels and esophagus, since the lung ends covering these structures, therefore, the standing position is a better choice (WHEAT and MACKEY, 1985; ZOPPA et al. 2001).

The choice of position and the intercostal space (ICS) of the patient to be accessed depends on the structures that the surgeon wants to review, and advocated the closest access to the examined structure. To get a better view of the caudal portion of the mediastinum, it is advisable to access the 10th ICS, while the lung surface is more visible for the 8th ICS (POTTER and HENDRICKSON, 1999). For pulmonary fragment resection of the caudal lobe and lung parenchyma fragment recovery, the technique working with three access portals, the first in the 12th ICS, the second between the 14th and the 16th ICS and the third in the 14th or 15th ICS depending on the need of positioning of the instruments (ZOPPA et al. 2008).
The input antimere of the portals depends on the sought objective. In thoracoscopy for the 13th ICS in horses, using flexible endoscope in both hemithorax it is possible to observe the right and left heart and heart (ZOPPA et al. 2001; BUENO, 2012).

CONSIDERATIONS

The endosurgery is no longer a "novelty" for veterinary, especially for horses, already proven benefits that justify its use. However, the studies in this surgical approach are important for increasing the same gain prominence in veterinary surgery, in addition to meeting more effectively their therapeutic aims.

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