

Review on Application and Limitation of Endoscope in Veterinary Medicine

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Abstract: Endoscopy is the application of a specialized camera called an ‘endoscope’ to evaluate the interior of a hollow organ or cavity within the body. Endoscopes can be in rigid and flexible formats, and are equipped with fiber optic light sources that provide illumination for the transmittal of coherent images. There are many advantages of endoscopy, including less morbidity and mortality, it is illuminated optical, minimally invasive and can be inserted into the natural openings of the body such as the mouth or anus. Also, they can be inserted into small incisions and the sensitivity of this modality in the diagnosis of mucosal disorders of the GI tract. Its application in veterinary medicine has great role for the diagnosis and they can be used to examine visually or assist in surgery such as an arthroscopy and in thearupatic procedure. However, complications may occur, and there are limitations to endoscopy. Including small biopsy size, forceps artifacts on biopsies, inability to biopsy the jejunum and, most important, the inability to obtain full-thickness. Furthermore, when it is used, endoscope may cause damage to the mucosal membrane of the animals and may transmit infection from animals to animals. Although its application is very important, it has much limitation in veterinary medicine that requires modifying it.

Keywords: endoscope; application; rigid; flexible; sterilize; biopsy

LIST OF ABBREVIATIONS

GI	gastrointestinal
OCD	Osteochondritis Dissecans
ERCP	endoscopic retrograde cholangiopancreatography
CT	computed tomography

INTRODUCTION

Animal owners are increasingly keen to ensure that examinations, treatment and if necessary surgery for the animal patient is performed as a traumatically as possible. The improvement that performed in diagnostic and surgical techniques made possible by endoscopy methods particularly those that minimize trauma represents progress for the welfare of both animals and owners (smallanimal.vethospital.ufl.edu). An endoscope is an illuminated optical, typically slender and tubular instrument used to look deep into the body and used in procedures called an endoscopy (<https://en.wikipedia.org>). “Endo” is Greek for “within” while “scope” comes from the Greek word “skopos” meaning to target or look out. Mostly it is used to examine the internal organs like the throat or esophagus and other organs. Specialized instruments are named after their target organ. For instance the cystoscope (bladder), nephroscope (kidney), bronchoscope (bronchus), arthroscope (joints) and colonoscope (colon), and laparoscope (abdomen or pelvis) (<http://www.medicinenet.com>).

Recently, endoscopy and endosurgery are disciplines that have increased in popularity. It continues to do so not least because of public demand (Barakzai, s, 2007). They can be used to examine visually and diagnose, or

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important to assist during surgery such as an arthroscopy. It is one of the minimally invasive techniques used for diagnosis and in some cases therapeutic work in many upper respiratory tract diseases especially in horses (Barakzai, S, 2007). Furthermore the advantage of endoscopy over other methods of evaluating the digestive system is that it is non-surgical. This procedure is more preferable than other technique due to its ability to visualization of the lining of the digestive system and for collecting of samples of the lining of these organs, including biopsies. Although the application of endoscope in veterinary medicine has great role in diagnosis and in supporting treatment, it has some limitation (smallanimal.vethospital.ufl.edu). Some of it is mentioned in this paper.

The Objectives of this paper is to review the application and the limitation of endoscope in veterinary medicine

LITERATURE REVIEW

Endoscopy is a procedure that is performed in order to view the inside of the body without performing surgery. Endoscopy was developed during the 1800's and is widely used in both human and veterinary medicine (Higginbotham, M., et al., 2011). In simple phrase, the endoscope is a tube with a camera and light on the tip. The endoscope itself can either be a rigid or flexible tube (Higginbotham, M., et al., 2011). Rigid tubes or rigid endoscopy is a minimally invasive technique that uses specially adapted instruments and cameras to access areas of the body that are otherwise inaccessible without major surgical intervention. They are used primarily to visualize the colon/ rectum (proctoscopy), nasal passages (rhinoscopy), lower urinary tract (cystoscopy), joints (arthroscopy), and inside the abdomen /chest (laparoscopy/thoracoscopy). In the flexible tubes or flexible endoscope, there is no part of the body which not accessible for endoscopic viewing or treatment. It can be used to visualize the intestinal tract (upper and lower) or airways (bronchoscopy) (Barakzai, S, et al., 2007). In some situations, both a flexible and rigid endoscope may be used (Higginbotham, M., et al., 2011).

Endoscopy is indicated for many problems which can be encountered in veterinary medicine. It is used to examine for internal visualization of an area of the body, and can be used for diagnostic or therapeutic purposes including assist surgery (Wilson, M. S., Et al., 1995). When an area is visualized, it is easy to take samples for biopsy or foreign objects can be removed. For instance, examination of the esophagus may be recommended when a patient has persistent regurgitation in order to evaluate for possible stricture (narrowing of the esophagus), cancer, inflammation (esophagitis) or even to remove foreign objects lodged in the esophagus (bones, hairballs, rawhides, etc...). Biopsies may be taken using specialized instruments inserted through a channel in the endoscope. This open the way to some diagnoses to be made with lower cost, risk and patient discomfort compared to surgery (<http://veterinarycalendar.dvm360.com>). Its application to the nervous system was initially slow and not widely accepted.

History

The first endoscope was developed in 1806 by Philipp Bozzini in Mainz with his introduction of a "Lichtleiter" (light conductor) "for the examinations of the canals and cavities of the human body" (books.google.com.et). Until the end of the nineteenth century, the main impetus for the development of endoscopy came from its use in the inspection of the bladder, rectum, and pharynx. The word "endoscopy" was used first by Antonin Jean Desormeaux (1815–1894), an urologist from Paris (<http://www.medscape.com>). The "Lichtleiter," which he demonstrated in 1806 to the Academy of Medicine of Vienna, consisted of an eyepiece and a container for a candle light, which was reflected by a mirror through a tube (Edmonson, J. M, 2000). Visualization was quite limited and an evaluation conducted with the instrumentation was painful for the patient (Edmonson, J. M, 2000).

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APPLICATION OF ENDOSCOPE IN VETERINARY MEDICINE

Endoscopy is a procedure that is performed in order to view the inside of the body without performing surgery (DA Hendrickson, 2000). Endoscopic procedures do require anesthesia and some minimal preparation but can often be performed as soon as it is deemed necessary. In simple terms, the endoscope is a tube with a camera and light on the tip. The endoscope itself can either be a rigid or flexible tube (DA Hendrickson, 2000). Rigid tubes are used primarily to visualize the colon/ rectum (proctoscopy), nasal passages (rhinoscopy), lower urinary tract (cystoscopy), joints (arthroscopy), and inside the abdomen /chest (laparoscopy/thoracoscopy) (McCarthy, T. C. (2005).

While gastrointestinal (GI) endoscopy represents the most common use in veterinary medicine, endoscopes can be utilized to investigate multiple body systems (Table 1). Further, endoscopy can be therapeutic when used for foreign body retrieval, stone removal, or feeding tube placement (Clark, J. C, 2012).

Table 1. Procedures Commonly Performed Using Flexible & Rigid Endoscopes (Clark, J. C, 2012).

Flexible Endoscopy	Rigid Endoscopy
Bronchoscopy	Arthroscopy
Colonoscopy	Female urethroscopy
Esophagoscopy	Laparoscopy
Gastroduodenoscopy	Otoscopy
Male dog urethroscopy	Rhinoscopy
Nasopharyngoscopy	Thoracoscopy
Tracheoscopy	

An endoscope can consist of a rigid or flexible tube, a light delivery system to illuminate the organ or object under inspection (<https://en.wikipedia.org>). The light source is normally outside the body and the light is typically directed via an optical fiber system, a lens system transmitting the image from the objective lens to the viewer, typically a relay lens system in the case of rigid endoscopes or a bundle of fiber optics in the case of a fiberscope, an eyepiece. Modern instruments may be video scopes, with no eyepiece (PJ Pollock, RJM Reardon, et al, 2009). A camera transmits image to a screen for image capture, an additional channel to allow entry of medical instruments or manipulators. Patients undergoing the procedure may be offered sedation, which includes its own risks, including permanent cognitive impairments (<https://en.wikipedia.org>).

Some of the Most Common Uses of Endoscopy Include the Following

There are many advantages of endoscopy, including minimal morbidity and mortality, and the sensitivity of this modality in the diagnosis of mucosal disorders of the GI tract (Lisa E Moore, 2003).

For diagnosis

The examination of the inside of the gastrointestinal tract and the obtaining of pinch biopsies (small pieces of tissue) from various regions of the esophagus (as Figure; 1), stomach, small intestine, or colon, the retrieval of foreign bodies (bones, rocks, rawhides, etc.) that have lodged in the esophagus, stomach, or intestine, the evaluation of animals that have difficulty swallowing, regurgitation, chronic vomiting, or chronic diarrhea (<http://verchawaii.com>).

Understanding of many diseases has benefitted greatly from endoscopy esophageal reflux, Esophagus, peptic ulcer, gastritis, non-steroidal anti-inflammatory drug injury, bleeding, upper gastrointestinal tract cancer, pancreatic and biliary disease, to name a few. Colonic diseases have particularly been better understood as the result of ready availability of easy and repeated Endoscopy and biopsy (<http://verchawaii.com>).

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In treatment and preventing disease

In addition to that endoscopy must show value in treating or preventing disease at less discomfort and less cost than other methods polypectomy, common duct or pancreatic stone removal, stent placement, stricture dilatation, percutaneous endoscopic gastrostomy, hemostasis, and now laparoscopic (minimally invasive) surgery, come to mind (Goh, K. L., 2001).



Fig1. performing a standing endoscopic (<http://largeanimal.vethospitals.ufl.edu>)

In surgical procedure

Endoscopies are almost painless, although they may still cause some discomfort. Compared with stress experienced by the body in a full surgical procedure, an endoscopy is simple, low risk, and cost effective (Lisa E Moore, 2003).

Other advantages

Other advantages include: no scar – as a natural body opening is used, quick recovery time, less time in hospital, often, no time in hospital is required as the procedure is performed in the doctor’s rooms, and early detection of postoperative re-occurrence (finding early) (<https://jsendoscope.weebly.com>).

Procedures Carried Out Using an Endoscope

Arthroscopy

An arthroscopy is a type of keyhole surgery used both to diagnose and treat problems with joints (<http://www.nhs.uk/>). The endoscope is inserted through an incision in the skin near a joint under investigation (FR Noyes, RW Bassett, et al, 1980). This can be used to look at the joint and perform operations such as removing torn tissues. Initially, arthroscopy was simply a diagnostic tool for planning standard “open” surgery, known as “arthrotomy”. With development of better instrumentation and surgical techniques, many conditions can now be also treated arthroscopically (FR Noyes, RW Bassett, et al, 1980). Although nearly all joints can be viewed with an arthroscope, three joints are most frequently examined using this technique in veterinary medicine: the knee, shoulder and elbow. Some of the most frequent conditions amenable to arthroscopic examination and treatment in dogs are: Loose fragments of bone and cartilage: Osteochondrosis / Osteochondritis Dissecans (OCD) of the knee, shoulder, elbow, Inflammation: Synovitis (inflamed joint lining), Injuries and hereditary conditions in specific joints (<http://www.cuvs.org>).

Bronchoscopy

The endoscope is inserted through bronchial tubes within the lungs in order to look at the airway and to remove any objects blocking the airway (WJ Fulkerson, 1984). These devices are introduced at the nose or mouth to observe distal branches of the bronchi (Rha, J.Y., et al, 1999). Through working channels in the bronchoscope, the physician can sample lung tissue (e.g., when pulmonary malignancies are suspected), instill radiographic media for bronchographic studies, perform laser therapy, remove foreign objects, suction sputum for microbiological culturing, insert catheters, and perform difficult intubations(<http://www.who.int>). In addition to that it is a useful tool in the evaluation and management of canine and feline respiratory diseases (Rha, J.Y., et al, 1999).. Diagnostic indications include the evaluation of structural diseases (tracheobronchial collapse, stricture, intraluminal mass); inflammatory conditions (chronic bronchitis, pneumonia); and traumatic injuries (Rha, J.Y., et al, 1999).

Endoscopy Biopsy

The endoscope is inserted through an incision or opening in the body that leads to the area under investigation. Biopsy forceps are then used to take a sample of tissue that can then be analysed by a pathologist (KE Johansson, B Boeryd,. et al, 1986). Biopsy of the small intestine is the standard way to diagnose celiac disease. This procedure is always performed by a gastroenterologist, and is conducted most often in an outpatient surgical suite. The procedure lasts less than an hour, and includes sedation and local anesthesia (SJ Winawer, M Melamed, . et al., 1976).

The procedure involves a long, thin tube with a small camera on the end. The physician inserts the tube into the patient's mouth, down the throat and into the esophagus. When the tube reaches the patient's stomach the endoscopist finds the entryway into the small intestine (the duodenum) and inserts the tube there. As the tube makes its way to the small intestine, the camera on the end sends a video image to a monitor (<http://www.cureceliacdisease.org>). On the monitor, the endoscopist can visually assess any gastritis, or other inflammation (such as inflammation of the lower esophagus due to acid reflux). In the small intestine, the physician examines the entire length of the duodenum, the area most likely to be affected by celiac disease. However, in many celiac patients, their duodenum appears normal at the time of biopsy. This is why the surgical removal of tissue is important, for its only under a microscope that a definitive diagnosis of celiac disease can be made (DS Levine, RC Haggitt,. et al, 1993). To biopsy, the physician inserts a tiny surgical instrument through the tube. It reaches the small intestine, and working in concert with a surgical nurse, the physician will biopsy 5-6 areas of the small intestine (<http://www.cureceliacdisease.org>). The biopsy is taken by grasping very small sections of tissue and slicing them gently away from the walls of the intestine. Multiple tissue samples are vital to an accurate diagnosis—celiac disease can cause patchy lesions in the duodenum, which can be missed if only one or two samples are taken. Results of the biopsy will confirm if a patient has celiac disease. There are no nerve endings in the intestine, so this procedure does not cause pain (<http://www.cureceliacdisease.org>).

Endoscopic Biopsy of the Esophagus

Indications: Clinical signs of dysphagia, regurgitation, excessive salivation, vomiting, hematemesis, suspicion of stricture, diverticulum, or foreign body (DS Levine, RC Haggitt,. et al, 1993).

Patient preparation: Withhold food for 12-18 hours. Animals having esophageal retention of ingest or barium contrast may require additional time (DS Levine, PL Blount, .et al, 2000).

Instrumentation: Flexible endoscopy is preferred. Biopsy accessories should include serrated jaw pinch forceps (most useful), foreign body graspers, and a balloon catheter for dilatation of strictures. Mucosal biopsy of the esophagus is uncommonly required except for intraluminal mass lesions ((DS Levine, PL Blount, .et al, 2000).

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Abnormal findings: Mass lesions (neoplastic most commonly), esophagitis (mucosal erythema, hemorrhage, erosions), stricture, foreign body, focal or generalized dilatation, and perforation (<http://veterinarycalendar.dvm360.com>).

Biopsy recommendations: It is difficult to obtain esophageal biopsy specimens since the mucosa is tough and the biopsy instrument cannot be easily positioned perpendicular to the mucosal surface. Biopsy of mass lesions with pinch forceps often yields only superficial epithelia (<http://veterinarycalendar.dvm360.com>). Mass lesions should be biopsied deeply to avoid necrotic surface debris and superficial cells which may obscure a correct diagnosis. Always obtain specimens from the border delineating grossly normal mucosa from the abnormal mass. In my experience, exfoliative cytology of mass lesions is as or more useful than histopathology given the above limitations (<http://veterinarycalendar.dvm360.com>).

Gastroscopy (Also called Esophagogastroduodenoscopy)

Many horses do not show outward signs of EGUS, and some of the outward signs could be attributable to other conditions (R Schindler , 1950). Gastroscopy is the only way to get a definitive diagnosis of ulcers, and it also allows the vet to see the severity and extent of any ulceration. The combination of high stress, use of non-steroidal anti-inflammatories, decreased pasture grazing, high concentrate diet, travel, and competition can lead to the formation of ulcers in horses (R Schindler , 1950). Common signs of gastric ulcers include decreased performance, colic, weight loss, and teeth grinding. To determine if a horse has ulcers, a 3 meter gastroscopy is passed into the stomach so that the lining of the stomach walls may be evaluated. These horses are held off feed for 12 hours to ensure the stomach is completely empty (<http://comstockequine.com>). Gastroscopy is a procedure that we can readily perform at our clinic to examine a horse's stomach. It involves passing a fibre optic camera up a horse's nose, down the esophagus and then into the stomach. To perform this the horse must have been starved for at least 10 hours, and not been allowed to drink for the hour prior to the procedure, commonly they are sedated for this procedure (F Froehlich, W Schwizer, .et al., 1995).

During this procedure we can examine the oesophagus, the lining of the stomach and where the small intestine leaves the stomach, including where bile is ejected to mix with the food. We may recommend this procedure if we suspect the horse has gastric ulcers, is displaying signs of recurrent colic or weight loss, or has had an episode of choke and we need to check the oesophagus has not become damaged. We can also perform biopsies of the start of the small intestine this way, a part called the duodenum (<http://www.chapelfieldvets.co.uk/>).

Prepare for endoscopy

It is vital that the stomach and intestinal tract be empty of all food and fecal matter prior to an endoscopic evaluation (. A complete twelve-hour fast is usually sufficient if the stomach is being examined. If the colon is to be examined, oral medication is begun twelve to eighteen hours before the procedure to remove fecal material from the entire intestinal tract. Fasting for twelve to eighteen hours is also necessary so that new fecal material does not form. On the morning of the procedure, one or more enemas are given to remove any remaining stool from the lower intestinal tract."It is impossible to safely pass an endoscope into a conscious dog's stomach or colon."Most dogs will require only a short-acting anesthesia and the patient is allowed to go home shortly after completion of the procedure. (<https://vcahospitals.com/>).

Endoscopic removal of foreign bodies

It is also called Endoscopic foreign body retrieval refers to the removal of ingested objects from the esophagus, stomach and duodenum by endoscopic techniques. It does not involve surgery, but rather encompasses a variety of techniques employed through the gastroscopy for grasping foreign bodies, manipulating them, and removing them while protecting the esophagus and trachea (Eisen, G. M., Baron,. et al., 2002).Flexible endoscopy is the best diagnostic and therapeutic approach in the management of foreign bodies and food bolus impaction in the

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upper gastrointestinal tract, with success rates greater than 95% and complication rates of 0%-5% (Birk, M., Bauerfeind, et al., 2016). The choice of retrieval device is determined by the size and shape of the foreign body by the endoscope length and instrument channel, and by the endoscopists preference and practice.

Colonoscopy

It is the examination of the inside of the colon and large intestine to detect polyps, tumors, ulceration, inflammation, colitis diverticula, chrohn's disease, and discovery and removal of foreign bodies (DA Lieberman, DG Weiss, .et al., 2000).

ERCP (endoscopic retrograde cholangiopancreatography)

It uses endoscopic guidance to place a catheter for x-ray fluorosocopy with contrast enhancement. This technique is used to examine the liver's biliary tree, the gallbladder, the pancreatic duct and other anatomy to check for stones, other obstructions and disease. X-ray contrast is introduced into these ducts via catheter and fluoroscopic x-ray images are taken to show any abnormality or blockage (Frey, Charles F., et al, 1982). If disease is detected, it can sometimes be treated at the same time or biopsy can be performed to test for cancer or other pathology. ERCP can detect biliary cirrhosis, cancer of the bile ducts, pancreatic cysts, pseudocysts, pancreatic tumors, chronic pancreatitis and other conditions such as gallbladder stones (<http://www.hopkinsmedicine.org>).

And others are **Colposcopy**: direct visualization of the vagina and cervix to detect cancer, inflammation, and other conditions. **Cystoscopy**: examination of the bladder, urethra, urinary tract, uteral orifices, and prostate (men) with insertion of the endoscope through the urethra. **Laparoscopy**: visualization of the stomach, liver and other abdominal organs including the female reproductive organs, for example, the fallopian tubes. **Laryngoscopy**: examination of the larynx (voice box). **Proctoscopy**, sigmoidoscopy, proctosigmoidoscopy: examination of the rectum and sigmoid colon. **Thoracoscopy**: examination of the pleura (sac that covers the lungs), pleural spaces, mediastinum, and pericardium (Rodriguez-Panadero, F., et al, 2006). It used to visually inspect the lungs, pleura, or mediastinum for evidence of abnormalities, Used therapeutically to remove excess fluid in the pleural cavity or pleural cysts, or to remove a portion of diseased lung tissue (wedge resection) (<http://www.healthcommunities.com>).

LIMITATION OF ENDOSCOPE IN VETERINARY MEDICINE

As other technology, endoscope also has some limitation such as ; Cannot assess functional disease, luminal diameter, wall thickness, Cannot identify disease in most of the small intestine, Cannot detect disease in the deep submucosa, muscularis or serosa, Not appropriate if bowel perforation is suspected, Not ideal if pet not adequately prepared or barium/sucralfate present, Cannot assess or biopsy lymph nodes, Biopsy samples are very small, need multiple, it requires experience and knowledge and requires regular cleaning (<http://www.avsspecialists.com>). Some this limitation has written in details in the following page.

Technologic Limitations Associated with Endoscopy

As previously described, endoscopy requires and route of access into the body cavity, object, mummy wrapping, or other target space (<http://www.avsspecialists.com>). . While endoscopes do come in a wide variety of diameters and lengths, at times an access route does not present itself. Often another paleo imaging modality such as x-ray or CT has identified an area of special interest within the mummy or artifact (Beckett and Conlogue, 2010). This may be a unique ceramic or metallic burial inclusion or a calcified lymph node. No matter the case, the decision to create an entry route for the introduction of an endoscope should be weighed carefully. A risk to benefit analysis should be conducted to assure that the potential information gained would be worth making an access route (Beckett and Conlogue, 2010). In addition, a high probability of successful biopsy or retrieval should be assured. If the decision is made to move forward and create an opening, we have been successful

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in using a flap like opening that can be closed following the procedure (Woodward et al., 2011). The smallest diameter endoscope should be selected and the most direct route should be chosen that would have the greatest possibility of success. The procedure should be well documented and directed by alternate imaging methods as indicated (Beckett, R. G, 2015).

Even if there is access to internal body cavities or archaeological objects, another limitation of the endoscopic method is the potential lack of maneuverability. The space entered by the endoscope may be so narrow that the only view is that which is directly in front of the lens. While imaging data can still be collected, this lack of maneuverability can be a major limitation of this method (Tang, C. T., et al, 2013).

Another major limitation to the images derived from endoscopy is the interpretability of the data. The data obtained from endoscopic methods is descriptive rather than qualitative (Tang, C. T., et al, 2013). In desiccated human remains, the internal organs are often not in their typical anatomical position. Thoracic cavity contents can be found in the abdominal or pelvic cavities. Depending on the degree of taphonomic change, the morphologic features of organs, tissues and other anatomic structures can be very different from those seen in a well-preserved mummy and certainly different from living or recently dead humans or animals (Beckett, R. G, 2015). The characteristics of desiccated tissues and organs, as well as their potential assist with the collection of otherwise unavailable data. Further, the endoscope helps alleviate the need to autopsy mummified human remains, which, in turn, helps preserve the remains for future research and maintain appropriate respect for the deceased taken to control for any cross-contamination potential in this endoscopic application (Beckett, R. G, 2015).

It is important to realize that even though the endoscopic procedures are non-destructive, they are invasive. Any time an instrument is introduced into a body or artifact, there is a great risk of destructing some material (Beckett, R. G, 2015). Typically, this is due to “scope drag.” Scope drag occurs when the operator does not protect the entry route on insertion and subsequent manipulation of the endoscope (Beckett, R. G, 2015). The endoscope may also become destructive internally if the operator is too aggressive when trying to access deeper body regions or maneuver the distal end of the endoscope within the body or artifact. Care must be taken to avoid this limitation by taking care to protect the access point and to be certain not to force the endoscope into spaces within the body or artifact that it will not “flow” into naturally or with dependent manipulation (Beckett, R. G, 2015).

Since internal anatomic landmarks may not be as reliable in a desiccated mummified body, it is often difficult for the endoscopist to be certain as to their regional or exact endoscopic location within that body (Queensland Health, 2011). Location verification via x-ray, CT, or fluoroscopy is essential prior to recording images produced with the endoscope in a given position. Position verification adds validity to the image description attained from the endoscope. Your procedure may not be able to be finished due to problems inside your body or because of technical problems (Queensland Health, 2011).

A major archaeological concern with the use of endoscopic methods is that of illumination limitations within a large enclosure such as a coffin, tomb, or room. Standard endoscopes, both medical and industrial, do not have illumination capacities to accommodate a larger hollow space (Beckett, R. G, 2015). The endoscopist must be prepared and develop slave lighting strategies for these circumstances (Beckett, R. G, 2015)

Limitations of Endoscopist

Endoscopist must also receive training in order to perform endoscopy (Atar, M., et al., 2014). He or she must have adequate knowledge about it. Medical personnel conducting endoscopic research in mummified remains or artifacts will be well versed in the application of a wide variety of medical endoscopes and supportive technologies, but may not be aware of the many variations of industrial endoscopic instrumentation and

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supportive technologies that are available (Atar, M., et al., 2014). . This lack of knowledge of instrumentation variation can greatly limit any given research effort and impede the data collection process from this method (Atar, M., et al., 2014).

Another limitation is that of potential contamination of the sample when endoscope is used in biopsy (SGNA Practice Committee, 2008). . Even with the most careful adherence to sample collection protocol, this limitation poses a great risk to the success of such procedures. Great care must be another major human limitation is that of minimal experience with both the instrumentation associated with endoscopic methods, as well as the limitations associated with the interpretation of data collected by this method. Experience is critical in the reliability of the technique selected and the resultant images (SGNA Practice Committee, 2008). There are several consequences to an incompetently performed endoscopy. Most obvious are the occurrence of patient injury, such as a perforation, bleeding or a sedation-related complication, and incorrect or missed diagnoses (Beckett, 2007b; Beckett and Conlogue, 2010). Technically incomplete procedures expose the patients to two kinds of risks: those of a missed or delayed diagnosis, and those of additional procedures and other testing for the same presenting complaint (ASGE).

Finally, another human limitation to this method is in the reporting of not only the results from an endoscopic study, but from the technique and instrumentation used (Beckett, 2007b; Beckett and Conlogue, 2010). If endoscopy use in anthropologic and archaeological research is to continue to advance, reproducible studies must be reported. The report should include instrument used by name/type, diameter and length, light source, lens, image capture system, access route, body cavity or artifact examined, and major findings. The report should also include supporting photographs of the procedure as well as radiographic verification of endoscope position within the remains or object (Beckett and Conlogue, 2010).

Small Samples

Since the size of the lens of an endoscope is very small in order to fit in the body's natural openings, the sample it can generate is also limited up to 2 to 3 mm deep (PurinaVeterinaryDiets.com). So that it requires additional procedures to recognize the conditions of animals' patient.

Possible Complications

Some complications may arise when the endoscopic procedure is not properly administered (<http://www.phac-aspc.gc.ca>).. Those may be GI perforation possible, Laceration of major blood vessels or major organs adjacent to GI tract, Decreased venous return or hypoxia if stomach over inflated, Bradycardia due to vasovagal reflex from over distention/traction, GDV from inadequate removal of air as endoscope is removed, Mucosal bleeding usually minor unless ulcerations, neoplasia. Bacteremia post-endoscopy, noted in humans, likely in animals and Poor biopsy technique can damage the internal organs being observed (<http://www.ehow.com/>). In addition, too much pressure or force in moving the endoscope can cause complications ranging from perforation and vascular lacerations to excessive bleeding of the mucosa (<http://www.ehow.com/>).

According to the American Society for Gastrointestinal Endoscopy, complications may also ensue if the endoscope has not been properly cleaned between patients (Moore, L. E, 2003).. In "Keeping Your Endoscopy Safe," ASGE notes that each endoscope should undergo mechanical and chemical cleaning, rinsing and drying between uses. When properly cleaned, "the chance that a serious infection could be transmitted by endoscopy is only about 1 in 1.8 million," ASGE said (Moore, L. E, 2003).Infections related to flexible endoscopic procedures are caused by either endogenous flora (the patient's own microorganisms) or exogenous microbes (microorganisms introduced into the patient via the flexible endoscope and/or its accessories) (Moore, L. E, 2003)..

Endogenous infections after flexible endoscopic procedures arise when the patient's own microbial flora invade in to the bloodstream or other normally sterile body sites as a result of mucosal trauma or instrumentation and

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are not related to instrument reprocessing problems (Moore, L. E, 2003). Examples of endogenous infections include pneumonia resulting from aspiration of oral secretions in a sedated patient or bacteremia resulting from microscopic tissue trauma occurring during endoscope insertion or removal (Moore, L. E, 2003). . Exogenous infections arise from microorganisms introduced into the patient's body by the flexible endoscope or by the accessories used in the procedure and are the focus of this document. Such infections are preventable with strict adherence to accepted reprocessing guidelines (Moore, L. E, 2003).

Exogenously acquired microorganisms may originate from a number of sources. These include: A previously used endoscope, followed by inadequate cleaning and/or improper reprocessing technique, Contamination of the endoscope, accessories, or automated endoscope preprocessor from, the environment during reprocessing (e.g., environmental microorganisms, skin microorganisms, and water microorganisms) (Moore, L. E, 2003). Post-reprocessing contamination of the endoscope and accessories with water, environmental and/or skin microorganisms during final handling and/or storage., The reservoir for exogenous microorganisms within a flexible endoscope may be the suction/biopsy channel or any other channel in the flexible endoscope (e.g., elevator wire channel in side-viewing duodenoscopes, air/water channel in colonoscopes, or any auxiliary channels that may be present)(<http://www.phac-aspc.gc.ca>).

Endoscopes have been implicated in the transmission of disease (specifically nosocomial infections) when appropriate cleaning, disinfection or sterilization procedures were not employed. Of particular significance is the need to thoroughly manually clean equipment prior to any manual or automated disinfection or sterilization process (<http://www.gov.mb.ca>).

The major obstacle preventing widespread use of this technique is the high initial cost of the equipment (Kovaleva, J., ET AL., 2013). Consequently, endoscopy is used primarily in specialty practices and referral hospitals (Kovaleva, J., ET AL., 2013). Accurate reprocessing of flexible endoscopes involves cleaning and high-level disinfection followed by rinsing and drying before storage (<http://www.gov.mb.ca>). Most contemporary flexible endoscopes cannot be heat sterilized and are designed with multiple channels, which are difficult to clean and disinfect. The ability of bacteria to form biofilms on the inner channel surfaces can contribute to failure of the decontamination process (Kovaleva, J., ET AL., 2013).

Future Research Directions of Application of Endoscope in Veterinary Medicine

Endoscopic procedures are minimally invasive in nature, and have been found to decrease the postoperative stress response and postoperative pain compared with similar procedures performed by an open approach (SJ Van Lue, AP Van Lue, 2009). Endoscopy offers a minimally invasive means of collecting biopsies, hence achieving a definitive diagnosis, which in turns enables more accurate and targeted therapy and improved case success (Stephen J. Divers, 2010). There is an ongoing effort to make minimally invasive surgery even less invasive through research and the development of new and improved medical devices (SJ Van Lue, AP Van Lue, 2009). Few national and international guidelines highlight the need for the cleaning of flexible endoscopes to be carried out using formulations without any fixation potential, but use of peracetic acid for cleaning is discouraged (G Kampf, PM Fliss., et al, 2014). In addition to that a variety of endoscopy equipment is available based on your practice's needs. Purchasing a versatile scope, undergoing appropriate training, and educating your clients are key to implementing a successful endoscopy program (Clark, J. C, 2012).

CONCLUSION AND RECOMMENDATION

Generally, Endoscopy should not be a substitute for a complete work-up. But its application is very important in veterinary medicine. It is used to take biopsies of organs, remove foreign objects, examine the interior surface of hollow structure, and perform procedure typically done more invasive surgery. However, if for any of a number of reasons tissue samples obtained endoscopically are inadequate for diagnosis, unacceptable trauma occurs during endoscopic removal of foreign objects or mucosal surface cannot be adequately examined

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endoscopically, then endoscopy then endoscope cease to be useful. In addition to that complications may occur, and there are limitations to endoscopy. Including small biopsy size, forceps artifacts on biopsies, inability to biopsy the jejunum and, most important, the inability to obtain full-thickness.

According to above conclusion the following forwarded; -

- Endoscopes should be cleaned thoroughly and correctly disinfected after each use and that the guidelines for cleaning and disinfecting flexible endoscopes are adhered to strictly ensure a reusable endoscope is free from damage and debris prior to use on the next patient.
- Endoscopy is recommended after other diagnostic tests have been performed.
- It also important to try to modify some types of endoscope to reduce their limitation.

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