Avian Endoscopy

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Introduction

Endoscopy is a widely used diagnostic tool in avian medicine. It is primarily used as a means to surgically sex monomorphic species of birds (laparoscopy), but can also be used for diagnostic purposes. Body orifices including the ear canal, choana, nares, cloaca and oviduct can be examined. The oropharynx, trachea, oesophagus, crop, proventriculus and ventriculus are also readily examined. Insufflation of the crop, oesophagus and proventriculus is necessary for adequate visualisation of the mucosal surfaces. Diagnostic laparoscopy can be used if the results of other procedures are inconclusive. Avian anatomy lends itself to laparoscopy as the air filled air sacs preclude the need for insufflation of the body cavity (which is necessary in mammals and reptiles). Many organs including heart, lungs, air sacs, gonads, kidney, adrenal glands, oviduct, liver and much of the gastrointestinal tract can be examined. Typical lesions of diseases such as aspergillosis, chlamydiosis and avian tuberculosis may be visualised and subsequently sampled.

Retrieval of foreign bodies, biopsies and minor surgery may be accomplished with the use of a biopsy instrument or fine forceps in conjunction with the endoscope. Swabs and aspirates of tissues or fluid can also readily be taken.

Equipment

The basic equipment needed are a light source, fibreoptic cable and an endoscope. A trocar or cannula set is occasionally used, but is usually unnecessary. A number of different brands and models are available. Small rigid endoscopes are most commonly used in avian medicine and are sized according to the diameter of the operating barrel. They are usually sold as human arthroscopes.

Sizes useful for avian patients range from 1.7 mm - 2.7 mm. The smaller endoscopes are useful for patients weighing less than 100 g or in small anatomic sites (e.g. sinus, trachea, oviduct). The major disadvantage of these small endoscopes are their fragility, small field of view and transmission of less light. The 2.7 mm is possibly more versatile and can be used for small mammals (dogs and cats) as well. Light transmission, the field of vision and the 2.7 mm diameter make this endoscope useful for a wide range of bird species and is a good choice if it is the only endoscope in an avian practice. The end of the scope may be flat (0^o) or bevelled to 30° and may have a wide or narrow angle of vision. A 30° bevel, angles the field of vision obliquely in the direction of the bevel. This allows for improved viewing in confined areas. A bevelled end enables an easier and less traumatic passage through air sac and peritoneal membranes.

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Equipment Care and Sterilisation

Endoscopes are expensive and precision optical instruments. They are fragile and must be carefully handled during use and cleaning. No stress should be placed on the barrel of the endoscope, as this will cause it to bend and damage the fibreoptics. Endoscopes should always be picked up by the ocular (eye piece) rather than the barrel.

Instruments should be cleaned after use. This can be done by wiping down with a non-abrasive cloth (e.g. a gauze swab) wetted with 2% gluteraldehyde or 70% alcohol. An alcohol wipe before storage chemically dries the endoscope.

Wet sterilisation is usually adequate for veterinary use of endoscopes. Some endoscopes are autoclavable, however, this usually shortens the life of the instrument. Most endoscopic procedures should be regarded as sterile and in order to avoid the transmission of organisms from one patient to another, or contamination of the surgical site, wet sterilisation between patients is strongly recommended. Soaking or wiping down the instrument with a 2% gluteraldehyde solution or 70% alcohol is adequate. If gluteraldehyde is used, the instrument should be rinsed with sterile water or saline before inserting it into the patient, as it is highly irritant. If 70% alcohol is used, wiping the endoscope with a dry, sterile swab is usually adequate.

Patient Preparation

For laparoscopy, pre-operative fasting is recommended. Two to three hours is recommended for granivorous, insectivorous and frugivorous birds, while longer (8 - 12 hours) is recommended for carnivorous and piscivorous birds. This not only avoids the risk of regurgitation, but also ensures that the proventriculus and gizzard are empty, which when full, may impede vision of many other organs, particularly the gonads.

Restraint and Positioning

Chemical restraint should always be used for endoscopic examination. This is necessary both to protect the bird, as well as expensive equipment.

The positioning of the bird will depend on what is being examined. For procedures other than laparoscopy the position will be that which is most comfortable for the veterinarian and allows adequate visualisation of what is being examined.

For laparoscopy the most common position is right lateral recumbency (this is the standard position for surgical sexing). Left lateral recumbency is useful if an area on the right side of the body is to be examined. In both cases the upper wing should be extended dorsally and the upper leg extended caudally, leaving the flank area exposed. In some cases the upper leg can be extended cranially and the caudal thoracic air sac entered from behind the leg. A major advantage in placing the leg forward is that the lateral body wall can be more easily approached without interference of the femoral musculature. This is particularly important in birds with heavily muscled upper thighs. The degree of rotation of the body can be changed to suit the surgeon.

Laparoscopy

The entry site for most laparoscopies (including surgical sexing) is a point on the flank halfway between the acetabulum and stifle, either between the last two ribs or behind the last rib, depending on the species. In psittacine birds the entry site is usually between the last two ribs. The feathers are plucked from the area and the site prepared with povidone iodine or alcohol.

A small 3 mm incision is made in the skin using sterile, fine iris scissors and fine forceps. Blunt dissection in a ventrodorsal direction, parallel to the ribs, through muscle and peritoneum is then used to enter the body cavity. The hole is held open with the forceps while the endoscope is inserted.

With this approach one usually enters the caudal thoracic air sac, but occasionally the abdominal air sac. If clear, organs can usually be visualised through the air sac membranes, but if clearer visualisation is required, the abdominal air sac can be entered by puncturing the membrane with the end of the scope without adverse effects. The gonad is located just caudal to the adrenal gland, and ventral to the cranial pole of the kidney. Just cranial to these structures is the left lung. Other structures that can be seen from this point are the heart, proventriculus, liver (lateral edge of left lobe), parts of the intestines, left kidney, oviduct, vas deferens and membrane of the cranial and caudal thoracic and abdominal air sacs. Other less commonly used approaches to the coelonic cavity can be used if a specific organ is to be visualised.

In most avian species, only the left ovary and oviduct develop. It is for this reason that endoscopy to examine the gonads is performed through the left side of the abdomen. The testes of the adult male bird are ellipsoidal and in most species they are creamy white, although they can be pigmented gray to black (e.g. in cockatoos). There is great seasonal variation (10 - 500 times) in the size of the testes. The ovary of the mature female, during the non-breeding season has many small follicles giving the appearance of tapioca pudding. When in breeding condition the follicles develop and mature at different stages and give the appearance of a bunch of grapes. The oviduct also increases in size and becomes tortuous and folded.

In juvenile birds, gonadal tissue is more difficult to differentiate. However, careful and close examination of the area in which the gonad lies and associated structures usually allows one to identify the sex of the bird. Testes are tubular to ellipsoidal with distinct, rounded cranial and caudal poles. The ductus deferens is a thin, white tubular structure. The juvenile ovary is comma-shaped, dorsoventrally flattened and closely adhered to the adrenal and cranial pole of the kidney. Very young ovaries have a faintly granular surface. The oviduct is pale white with a thicker, more substantial appearance that the vas deferens. An important structure to look for is the supporting ligament of the infundibulum, which is clearly visible as a white band crossing the cranial pole of the kidney. This structure is part of the dorsal ligament of the oviduct and is absent in males.

Wound Closure

Most laparoscopy wounds are small enough not to require suturing (both body wall and skin). Application of a small amount of antiseptic/antibiotic spray or powder is usually adequate. If there is a large opening (more than 3 mm) in the skin and body wall, suturing with fine absorbable suture material is indicated.

Complications

Lack of endoscopy experience and lack of knowledge of anatomic differences among species can make organ identification and detection of pathologic changes difficult. Practice is essential and if you have endoscopic equipment every opportunity should be taken to use it in order to familiarise oneself with endoscopic techniques and normal endoscopic anatomy. Necropsy specimens can also be used to study endoscopic principles.

Blurring of the visual field may occur if the end of the scope is not clean, or if blood, cells or pieces of tissue obscure the lens. This can be cleared by touching the end of the scope on an organ or removing and cleaning the scope. Laparoscopy in obese birds can be difficult as excessive fat interferes with visualisation of the viscera and the lens of the endoscope easily becomes contaminated with lipid material. In these cases an improved diet and re-examination in six to eight weeks is recommended.

Care should be taken with left coelonic examination in hens near the time of ovulation, as the ova and oviduct can be very large and can be damaged or obliterate one's view.

Trauma to the patient such as bruising or haemorrhage may occur. This is usually not serious and can be avoided by gentle technique. Subcutaneous emphysema and infections are rare if adequate care is taken.

References

1. Bush M: Laparoscopy in birds and reptiles. In: Harrison RM, Wildt DE (eds): Animal Laparoscopy. Williams and Wilkins, Baltimore, 1980, pp 183-197.
2. Cannon, MJ: Surgical Sexing. Proceedings 178, Avian Medicine, University of Sydney Post Graduate Committee in Veterinary Science, 1991, pp 35-38.
3. Harrison GJ: Endoscopy. In: Harrison GH, Harrison LR (eds): Clinical Avian Medicine and Surgery. WB Saunders Co., Philadelphia, 1986, pp 224-244.
4. Hunter DB, Taylor M: Lung biopsy as a diagnostic technique in avian medicine. Proc Assoc Avian Vet, 1992, pp 207-211.
5. Jones DM, et al: Sex determination of monomorphic birds by fibreoptic endoscopy. Vet Rec 115:596-598, 1984.
6. Kollias GV: Liver biopsy techniques in avian clinical practice. Vet Clin North Am 14(2):287-298, 1984.
7. Kolias GV: Avian endoscopy. In: Jacobson ER, Kolias GV (eds): Contemporary Issues in Small Animal Medicine, Exotic Animals. Churchill Livingstone, New York, 1988, pp 75-104.
8. Kolias GV, Harrison GJ: Biopsy techniques. In: Harrison GJ, Harrison LR (eds): Clinical Avian Medicine and Surgery. WB Saunders Co., Philadelphia, 1986, pp 245-249.
9. Lumeij JT: Endoscopy. A Contribution to Clinical Investigative Methods for Birds with Special Reference to the Racing Pigeon (*Columba livia domestica*). Utrecht, PhD Thesis, 1987, pp 151-186.
10. McDonald SE: Endoscopic examination. In: Burr EW (ed): Companion Bird Medicine. Ames, Iowa State University Press, 1987, pp 166-174.
11. Taylor M: A morphologic approach to the endoscopic determination and sex in juvenile macaws. J Assoc Avian Vet 3(4):199-201, 1989.
12. Taylor M: Endoscopy. Proc Assoc Avian Vet, Phoenix, 1990, pp 319-323.
13. Taylor M: Endoscopy. Laboratory Manual. Assoc Avian Vet, 1992, pp 1-10.
14. Taylor M: Endoscopic Examination and Biopsy Techniques. In: Ritchie BW, Harrison GJ, Harrison LR (eds): Avian Medicine Principles and Application. Wingers Publishing, Florida, 1994, pp 327-347.