

Diagnostic coelioscopy in a budgerigar (*Melopsittacus undulatus*) for evaluation of internal organs

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Endoscopic procedures in avian medicine dates back several decades. The earliest study was published around 1978 (Harrison 1978) where coelioscopy was performed for the assessment and identification of gonads in sexually monomorphic birds.

Since then, this technology has undergone numerous advancements over the years, leading to specifically designed avian endoscopic systems that is now used extensively for diagnostic and therapeutic interventions (Zaheer and Beaufrere 2022) in avian medicine. Benefits include the ability to safely execute biopsy procedures, less invasive internal assessment, and exclusion of extensive, invasive surgery (Divers 2010). Diagnostic investigations of internal organs in pet and exotic birds are very limited and the need for introduction of modern investigation techniques is high. Investigation of internal organs is very essential to plan for health care and disease management in pet and exotic birds.

Endoscopic procedures are rapid, reliable and minimally invasive, making it a great diagnostic tool for confirmatory examination in birds. With increasing number of families maintaining pet birds and demanding advanced treatment facilities, modern techniques like endoscopy has become essential. In India, these procedures are rarely used, especially in smaller psittacines as there are not enough trained practitioners. Hence there is a need for proper clinical training and standardization of avian endoscopic procedures. Endoscopy can be done in birds which may have conditions like dyspnoea and regurgitation, crop burn or trauma, organomegaly, abnormal radiographic findings, in those suspected for infertility, systemic disorders, non-responsive to treatment etc. Hence, this diagnostic study was performed to explore the feasibility of diagnostic coelioscopy in smaller psittacines.

This study was carried out in the Department of Wildlife Science and the Endoscopy Referral Clinics of the Department of Veterinary Clinical Medicine at Madras Veterinary College, Chennai. Clinical features such as body weight, cloacal temperature, respiratory rate and heart rate were routinely documented for the bird (Doneley 2016) selected for coelioscopic investigation. The blood could not be collected due to the small size of the bird. The food and water were withheld according to the body weight for almost one hour for the budgerigar.

For restraint of the bird, chemical immobilization was done using injectable drugs such as xylazine (Xylazine[®] Indian Immunologicals Limited) and ketamine (Aneket[®] Neon Laboratories Limited). Required dosage, according to the body weight (ketamine-50 mg/kg and xylazine-10 mg/kg) was administered into the pectoral muscle of the bird (Hawkins *et al.* 2018). All the vital signs, including body temperature, respiratory rate, heart rate and different sensory reflexes were recorded at prescribed time intervals of five minutes for the first 15 min and later every 10 min along with the induction period and the duration of anaesthesia (Durrani *et al.* 2009).

For the diagnostic coelioscopic procedure, a 2.7 mm 180 mm fiberoptic rigid endoscope (Karl Storz- 64019 BA) was used (Lamb 2019). Amongst the four basic approaches to the coelom for a diagnostic coelioscopy (left lateral, right lateral, ventral, and interclavicular), a left lateral approach was made use of in this particular case (Fig. 1).

After immobilization, the bird was positioned in right lateral recumbency with its wings secured dorsally over its back using self-adhesive tape. To expose the left flank, the left pelvic limb was pulled cranially and secured to the neck using a self-adhesive bandage. The entry site was located immediately behind the last rib and just ventral to the flexor cruris medialis muscle as it courses from the caudal stifle to the ischium. The area was aseptically prepared and a 2 to 4 mm skin incision was made, straight haemostats were used to bluntly dissect between the thin subcutaneous tissues and enter the caudal thoracic air sac. During the coelioscopic procedure (Fig. 1), identification

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Fig. 1. Coelioscopy in a budgerigar using a 2.7 mm 180 mm rigid endoscope (Karl Storz).

of the lungs (straight ahead), cranial thoracic air sac (to the left), abdominal air sac (to the right), caudal edge of the liver and proventriculus (ventral), ribs and intercostal muscles (dorsal) was done. Collagen fused antibiotic ointment along with analgesics were given post procedure to the bird for recuperation.

The bird was around one year old with body weight of 20 g, respiratory rate 96 bpm, heart rate 376 bpm and cloacal temperature 107.4°F. It did not show clinical signs of any illness and was active and alert with a standing posture. The preparatory step of fasting the bird prior to endoscopic examination did not result in any abnormalities. The dose rates selected in this study did not cause any problem during the initial induction period, however, later during the immobilization, moderate muscle tremors and wing flapping were observed. Responses of budgerigar during immobilization in the present study were in agreement with Gandomani *et al.* (2009) who opined that for the induction and maintenance of prolonged anaesthesia in budgerigars, a combination of ketamine and xylazine can be used successfully and safely for up to 2.5 h. Incoordination, opisthotonus, drooping of the head, closure of the eye, lateral recumbency and loss of body reflexes including palpebral reflex, toe pinch reflex, righting reflex and table knock reflex were observed as effects of immobilization. Excess salivation was also noticed in the bird.

The duration of immobilization and the induction period in budgerigars were comparable to the findings of Gandomani *et al.* (2009), who also noted convulsions, muscular rigidity and eye movements during the course of anaesthesia. The total time of anaesthesia in budgerigar in this study was 64 min, however, it was 60.59 mins as observed by Gandomani *et al.* (2009). Recovery from the effects of immobilization was observed to be smooth in the bird.

Cranial thoracic air sac, caudal thoracic air sac and abdominal air sacs were transparent in the bird pertaining

to a normal appearance. Seok *et al.* (2020) observed thick opaque air sacs with distinct yellowish plaques suggestive of aspergillosis in a red crowned crane. Entry into the caudal thoracic air sac provided access for exploration of adjacent air sacs by pressing the tip of the scope and advancing in sweeping motion until they were perforated. The scope was extended into the cranial thoracic air sac through caudal thoracic air sac where medial portion lung and heart were visualized. This was in agreement with Divers (2010). For examining the heart, cranial thoracic air sac was entered and a transparent pericardium was observed similar to the findings by Lierz (2006) and Divers (2010). In this case, a typical bright pinkish beating heart along with greater vessels were observed (Fig. 2a).

The caudal edge of liver was visualized (Fig. 2b) at the ventral floor of the caudal thoracic air sac as also reported by (Azmanis *et al.* 2018). It appeared as a sizeable homogenous brownish red coloured organ with tapering edges (Divers 2010). This is appraised as the normal feature according to Lierz (2006) who also mentions the abnormal changes like rounded borders of the organ, dark red colour due to haemosiderosis, dark spots as focal bleeding points representing necrosis, abscesses or neoplasia. These liver attributes were not observed in any of the birds during the coelioscopic evaluation.

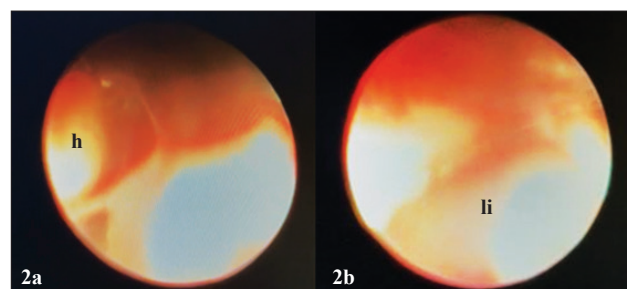


Fig. 2. Coelioscopic visualization of internal organs of a budgerigar. 2a) heart (h), 2b) liver (li).

The entry into the left abdominal air sac was carried out from the caudal thoracic air sac (Lierz 2006, Divers 2010). The kidneys were adhered to the dorsal surface (Fig. 3a) where the cranial lobe along with the gonads were visualized. It appeared as brownish orange tubular organ whereas a smooth whitish tubular testis was seen (Fig. 3b). All the findings resembled normal appearance of the organs and were in accordance with the studies by

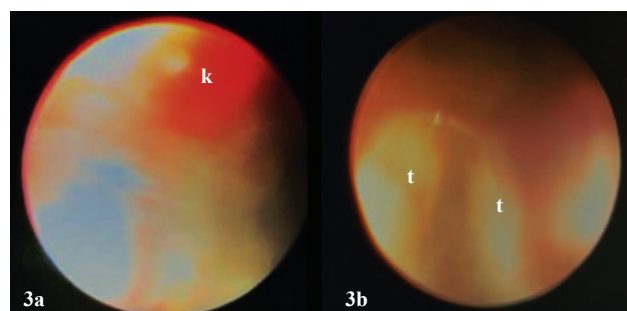


Fig. 3. Coelioscopic visualization of internal organs of a budgerigar. 3a) kidney (k), 3b) testis (t).

Divers (2010). The yellow to white deposits on kidney, discolouration and hard nodular swelling are some of the abnormal characteristics (Lierz 2006) however none of these anomalies were observed in this study.

The conclusion of the present study of feasibility assessment of diagnostic coelioscopy in a budgerigar was that coelioscopic procedures are safe, accurate and advanced method for observing normal baseline assessment studies of internal organs (heart, liver, lung, proventriculus, kidneys, intestines and reproductive organs) in birds as small as 20 g in body weight. A rigid 2.7 mm fibreoptic endoscope can be used safely in birds of body weight ranging from 20 g and above for coelioscopic procedures however this scope size is too big for tracheoscopy and oesophagoscopy in birds with body weight of 20 g as the small size of trachea and oesophagus do not allow the passage of the scope.

SUMMARY

There is limited data on minimally invasive coelioscopy in smaller exotic birds like budgerigar. This study was taken primarily to collect baseline data of internal organs of budgerigar during a diagnostic coelioscopic procedure. A 2.7 mm 180 mm rigid endoscope (Karl Storz) was used for the procedure where in lung, liver, heart, kidney, gonad and intestines were visualized and evaluated. Special emphasis is placed on assessing feasibility and safety of applying advanced diagnostic procedures in small birds.

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