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PARTICULARITIES OF NECROPSY IN CASES OF BIRDS KEPT IN CAPTIVITY

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Abstract

Diagnosis in captivity bird pathology requires, in most cases, gross postmortem examination and is a valuable tool regarding potential zoonosis, improving husbandry conditions or establishing the cause of disease, which, sometimes cannot be completed in live birds by the clinician. The present paper is a study of 35 captivity bird cases, belonging to different species, submitted to postmortem diagnosis at the Department of Pathologic Anatomy, from the Faculty of Veterinary Medicine of Bucharest. Results showed that different instruments and multiple approaches for examination and evisceration are required depending on the size of the bird, from ophthalmologic scissors and blades to instruments used in mammal necropsy. Regarding necropsy technique, feather examination showed stress bars for two cases and eight cases of self-mutilation, marking the importance of husbandry conditions. In addition, changes in the air sacs, internal organ topography and modified organ size were revealed in seven cases. Autolysis was present in 10 cases, due to improper or long conservation, compromising diagnosis or histopathologic examination. In conclusion, necropsies of birds kept in captivity require special care and knowledge, both in preparation and during the examination.

Key words*: captive birds, avian pathology, necropsy.*

INTRODUCTION

Gross examination and postmortem diagnostic testing are important parts of avian medicine, requiring specific approach of the examination of organs and sample collection (Cooper, 2004; Rae, 2006; Bulliot et al., 2009).

Nowadays, exotic and captive bird necropsies are required not only to satisfy curiosity of the owner or the attending veterinarian, but also to provide useful information for the rest of the birds in the flock and for further knowledge of bird diseases and response in treatments (Rae, 2003; Dorrestein, 2008).

Due to great variability of anatomical characteristics, necropsies of birds require knowledge and are time-consuming for the veterinary specialists (Wobeser, 1997; Mayer and Martin, 2005; Samour, 2016).

Instruments and procedures vary among bird species and different techniques used today were developed with the experience of ornithologists and other specialists monitoring birds in the wild (van Riper III and van Riper, 1980; Cooper, 2004).

MATERIALS AND METHODS

The present study was carried during October 2014 until October 2019, at the department of Anatomical Pathology, from the Faculty of Veterinary Medicine of Bucharest. It comprised a total of 35 cases of birds kept in captivity, some of them as pets and some as rescued birds unable to be released. These cases were submitted to post-mortem diagnostic procedures by private owners. Most frequent cases examined in the present study were psittacine species, a total of 22 birds, including 12 budgerigars, three Nymph parrots, two Rosellas, two Small Alexander, one Monk parrot, one Aratinga and one Ara parrot. The remaining cases included five domestic pigeons, two canaries, two crows, one owl, one swan, one seagull and one penguin.

The diagnostic procedure included clinical history of the birds, necropsy and collection of samples for further investigation such as histopathology or microbiology.

Gross examination was performed with different instruments, depending on the size of

the bird carcass. Three categories of instruments were used: for large birds (over 1000 g) - instruments used in necropsies of medium sized mammals, for medium size birds (500-1000 g) - instruments used in small size mammals and small size birds (30-499 g) - instruments used in small size mammals and oftalmic instruments (scissors, blades).

RESULTS AND DISCUSSIONS

Preparations for necropsy

The present paper showed that most cases of birds submitted to necropsy lack of information regarding history, clinical signs and treatments administered due to poor comunication of the owners with veterinarians. Only 5 cases were accompanied by a clinical sheet from the clinician, out of the total 35 cases. For 20 cases, owners recalled important information such as time of disease, changes in the environment and if any treatment was applied to the bird. A number of 10 cases were submitted to diagnosis without any information from the owner, when large number of birds were kept and no veterinarian clinical sheet. Other literature sources mention that often, history of the cases submitted to necropsy also lack of information regarding treatments, type of death-natural of euthanasia, challenging the results by artifacts of genuine lesions (Rae, 2006; Bello et al., 2012; Samour, 2016).

In adititon, knowledge of the normal anatomical features before starting the procedure is an important step (Bulliot et al., 2009). Absence of different structures in the digestive tract is a common finding in some bird species (Rae, 2003; Samour, 2016). An anatomic particularity is the fact that ceca is absent in some Psittaciformes (Rae 2003); in our study, it was the case of the 12 budgerigars submitted to necropsy. Another organ is the gallbladder, which is normally absent in most Columbidae and many psittacines (Rae, 2003). In our study, 28 out of 35 did not have this organ.

External examination

The first step in gross examination of an exotic bird case is general assesment of weight, length and the exterior as seen in Figure 1. For 18 cases of birds kept in captivity submitted in the present study, the body weight was under the normal ranges regarding their species, showing poor husbandry conditions and predisposition to other pathologies further discovered during necropsic examination.

Figure 1. Measurement of body length-from the beak to the tail in the case of penguin

Feathers and external orifices are the first tissues to be examined (Graham, 1992; Dorrestein, 1997; Rae, 2006). In the present study, examination of feathers revealed stress bars for two cases belonging to the group of Psittaciformes. Examination of the plumage is important to differentiate normal molting from pathologic causes, including parasitosis, trauma or modified behaviour (Rae, 2006; Samour, 2016). Another eight cases of psittacines and paseriformes presented self mutilation in the pectoral and wing areas. These cases presented feather rods or partial destruction of feathers due to excessive grooming. Two cases presented also, scratching skin lesions. History of the cases recorded multiple birds kept in small cages with little sunlight.

In the cases of parrots and canaries submitted to necropsy, the legs and the facial areas were also carefully examined. One case of budgerigar presented infestation with *Knemidocoptes pilae.* Morphologic diagnosis was leg hyperkeratosis, confirmed by skin scraping (van Riper III and van Riper, 1980).

Internal examination

Examination of internal organs of avian species is done by positioning the carcass on ventral recumbency and dislocation of hip joints (Latimer and Rakich, 1994; Samour, 2016). For three cases of small birds wings and feet

were nailed on a board in order to facilitate further examination as seen in Figure 2.

Figure 2. Ventral position of a canary *(Serinus canaria)* with pinned wings and internal examination of the carcass after sectioning the sternum: congestive organs and reddish liquid can be observed in the coelomic cavity

In most cases, feathers were plucked from neck and sternum and the rest were soaked in water. After skin incision and removal, muscular tissue was examined. Pectoral muscle atrophy was observed in 12 cases of birds, while excessive subcutaneous fat tissue was observed in two cases. The skeletal system is examined for traumatic, nutritional or infectious diseases (Samour, 2016). Sternal bone modified shape was recorded in three juvenile birds, two cases of pigeons and one case of the monk parrot, associated with other defects (small body weight, low bone mineralization, hip dysplasia) suggesting metabolic pathologies (Rae, 2003).

Next, thyroid glands were examined, before cutting clavicular bones. These bilateral organs are located in front of the thoracic inlet, closely to carotid arteries (Rae, 2003). In most cases, due to the small dimensions for gross examination, thyroids were sampled for histopathology.

In the present study, the following step was carefully removing the sternum and air sacs examination. Five cases presented gross changes of the abdominal air sacs. The aquatic birds submitted to diagnosis showed lesions associated with the cause of disease. The swan died of drowning after entanglement of the neck in wires. This cases was a rare situation of disease among the group species frequent diseases (Wobeser, 1997). The penguin and the seagull died of generalized granulomatous disease, including fibrino-granulomatous airsaculitis. After visual inspection, a small cut was done to take microbiologic samples with least contamination. The other three cases, two pigeons and one budgerigar presented discrete aerosaculitis of one or multiple airsacs, observed as whitish deposits and associated pneumonia or lung congestion. The history of the birds affected by granulomatous disease and aerosaculits included lethargy, weight loss and respiratory distress, but no specific clinical signs were recorded.

A true diaphragm is absent in avian species, but a pulmonary fold is situated ventral to the lungs, creating a pseudoseparation of celom and the peritoneal area (Work, 2000; Samour 2016).

The following steps in avian necropsic examination were the evisceration of liver and the heart. If the liver is dissected first, less manipulation is applied, except the cranial edge where the heart overposes. In the case of heart examination and evisceration first, some blood will cover the liver capsule and contamination can appear (Lowenstine, 1996; Dorrenstein, 1997). In the present study, the order of evisceration was chosen in every case, after visualization of possible lesions of these organs and, also in the cases with advanced autolysis, liver was eviscerated first, due to friability.

Liver examination revealed seven cases of circulatory lesions (anemia, active and passive hyperemia), four cases of inflammation and necrosis and 10 cases with autolytic changes.

The heart and pericardial sac revealed two cases with macroscopic lesions of heart dilation and pericardial effusion. Another 10 cases presented autolytic changes of imbibitions and post-mortem blood clotting or blood lysis.

The digestive tract is eviscerated from oesophagus or proventriculus up to the cloaca. In small sized birds, canaries, budgerigars and youngsters, better evaluation was obtained by evisceration from proventriculus to the large intestine.

The spleen requires identification and separation from the digestive tract, either before evisceration or following this step. It is situated between the proventriculus and the gizzard (Lowenstine, 1996; Samour 2016). The shape varied considerably, the examined canaries, pigeons and the penguin presented elongated shape, while the psittacine species,

the crows and the swan presented round shape, all within anatomic limits (Rae, 2006; Samour, 2016). In five cases of small birds, due to autolysis spleen could not be identified. The lesions identified in this organ were granulomatous splenitis, necrosis and congestion.

Next, examination of alimentary tract is similar to mammalian procedures, both of the exterior examination and opening technique (Rae, 2006). For small sized birds and juveniles, exceptions were applied, only opening areas of the intestines for better preservation in case of further microscopic examination or even evisceration en bloc and formalin preservation for further microscopic investigations (Rae, 2006).

Two psittacine species presented proventricular dilatation. One case, of a budgerigar presented a parasitic infestation with ascarids that migrated from duodenum to ventriculus and proventriculus, producing dilatation by an iritation mechanism. Scientific papers mention *Ascaridia* spp. as one of the most frequent parasitic diseases in cases of caged birds kept in crowded environments with multiple species and in individuals with low immunity (Lima et al., 2016). The other case, a young Ara parrot, two years old, presented a history of several months of weight loss and regurgitation (Figure 3).

Figure 3. Proventricular dilatation, thinning of the proventriculus wall, catarrhal proventriculitis in an Ara parrot *(Ara macao)*

The second case, was likely affected by the pathology of Macaw Wasting Disease, but also scientific papers mention the possibility that dilatation can occur in juveniles and dissapears over the procces of growing as a result of hand feeding (Raghav et al., 2010; Staeheli et al. 2010). History of this case was limited and, although histopathologic examination did not confirm any viral inclusions, immunohistochemistry and virusologic tests were not performed due to financial reasons.

Also, with 10 exceptions, the rest of 25 avian cases submitted to diagnosis presented digestive tract disorders or post mortem changes due to gas formation and enlargement of the intestines. Catarrhal enteritis was observed in four cases, belonging to multiple species. Diagnosis was established based on necropsic examination in the cases of recently dead birds and confirmed by histopathologic examination. Post-mortem changes of the digestive tract were manifested as intestinal distension with gas formation along with sulfmethemoglobin imbibition and putrefaction, when more then 48 hours passed after death until submission to necropsy and improper conservation was performed.

Lungs are examined at the carcass by visual inspection and then eviscerated following anatomic particularities, with blunt dissection (Rae, 2003; Samour, 2016). In the present study, 30 cases presented gross changes of the lungs. Most birds suffered of local and diffuse lung congestion. This is most likely the effect of respiratory stress in both chronic and acute cases of diseases that lead to the death of the birds. Other, less frequent lesions were lung anemia, necrosis and autolytic changes. Three cases of birds previously identified with granulomatous disease and fibrinous airsaculitis presented similar lesions on the lungs (Figure 4).

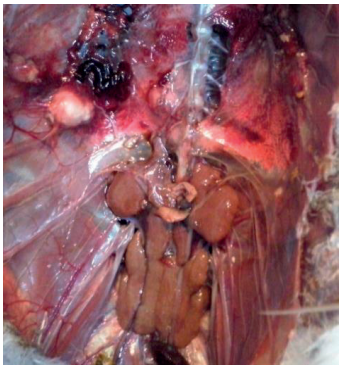

Figure 4. Carcass of a seagull *(Larus argentatus)* after removal of the digestive tract: lungs with granulomatous pneumonia and multifocal haemorrhages and kidneys with distrophic aspect

The organs examined on the carcass were the kidneys, the adrenal glands, the gonads and oral cavity and neck area (trachea, oesophagus and crop). One case of a budgerigar presented a testicular tumor, changing the topography of most organs from coelomic cavity (Figure 5).

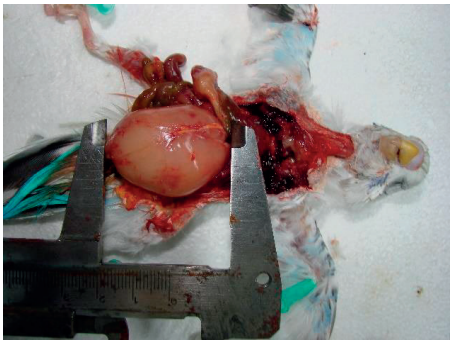

Figure 5. Necropsy of a bubgerigar *(Melopsittacus undulatus)* showing a 3 cm diameter, spheric tumour, located in the coelomic cavity, modifying internal organs topography

Last examination of the necropsy is the nervous system. Peripheric nerves were examined at the bird's, especially ischitic nerve and, for some cases the brachial plexus (Work, 2000). The brain, instead, was only examined in the cases of sudden death with little or no macroscopic lesions in organs and the cases with history of head trauma, tilt or other neurologic signs. This examination was performed in 5 cases of parrots submitted to the present study. Visual inspection was done on spaces created in the bone head, in two the small bird cases for better preservation in formalin and further histologic diagnosis. Scientific research mentions similar techniques of obtaining samples from brain regarding the size of the bird and focuses on further investigations for viral inclusions especially in Psittaciformes (Latimer and Rakich, 1994).

Advanced autolysis was a post mortem change observed in 8 cases and lead to impossibility of establishing the diagnosis and the cause of death. History of these birds included unknown moment of death in the enclosure, improper preservation at room temperature and several days (2-4 days) before being brought for examination.

Another aspect of interest is the method of preservation. Although it is best to refrigerate the bird for examination, 9 cases were freezed before being submitted to necropsy. For 6 of these cases, histopathology was performed, although results were partially compromised due to artifacts.

Necropsic examination was able to establish main lesions that caused the death in 25 cases, as seen in Figure 6, completed by further investigations for 19 of them. This group included two Psittacine birds with sudden death syndrome as the final diagnosis, although no lesions were identified on gross and microscopic examination and microbiologic and toxicologic results turned negative. The rest of 10 cases were affected by severe autolytic changes and potential lesions were masked.

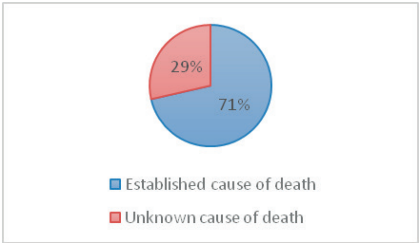

Figure 6. Percentage result of necrospic examination relevance in caged birds cases

CONCLUSIONS

Exotic bird necropsy is an important tool for diagnostics, but also for improving knowledge about these species. Preparations of the procedure, regarding species, history and instruments are key steps in obtaining best results of the examination. The order of examination and evisceration of organs and tissues is preset, in order to preserve tissues and organs, especially in small sized birds.

The present study showed the value of necropsic examination in obtaining a diagnosis in 71% of the dead birds kept in captivity.

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