Clinical management of an ectopic egg in a Timneh African grey parrot (Psittacus erithacus timneh)

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Case Description—A 13-year-old female Timneh African grey parrot (Psittacus erithacus timneh) was evaluated because of the presence of a bald patch of skin caudal to the sternum and increased territorial and nesting behavior of 2 weeks’ duration.

Clinical Findings—Whole-body radiography revealed a mineralized egg of normal size and shape. However, no oviposition occurred, and the bird had no signs consistent with dystocia. After 7 days, repeated radiography revealed that the egg had rotated by approximately 180° along its short axis, leading to a diagnosis of ectopic egg retention, which was supported by the results of ultrasonography.

Treatment and Outcome—Surgical removal of the ectopic egg was performed by means of a ventral midline approach 14 days after administration of leuprolide acetate (800 µg/kg [364 µg/lb], IM). No intracoelomic abnormalities, such as coelomitis or oviductal disease, were diagnosed, and the bird recovered without complications. Physical examination and whole-body radiography at 8 months and a follow-up phone call with the owner at 16 months after surgical treatment revealed no evidence of ectopic egg recurrence or reproductive behavior.

Clinical Relevance—Clinical management of ectopic egg retention differs considerably from treatment of intraoviductal egg binding. Therefore, careful evaluation of avian patients with radiographic evidence of egg binding should be performed to avoid possible iatrogenic deterioration of the patient’s condition, secondary to inappropriate treatment attempts such as hormonal induction of oviposition or attempts to remove the retained egg via the cloaca. Repeated radiography and ultrasonography and close monitoring of the patient’s general condition as well as the lack of clinical signs consistent with dystocia will facilitate the diagnosis of ectopic egg retention. (J Am Vet Med Assoc 2013;242:963–968)

A female Timneh African grey parrot (Psittacus erithacus timneh) that was approximately 13 years old was evaluated because of a bald patch of skin caudal to its sternum, abnormal behavior during petting over the ventral abdomen, and increased territorial behavior of approximately 2 weeks’ duration. The bird was maintained in a private household and had visual and, rarely, physical contact with a male conspecific. The bird’s diet consisted of commercial parrot pellets, a seed mix, and miscellaneous table food. The previous medical history included trauma to the beak more than 5 years ago. This bird had lived with the owner since it was fledged, and there was no reproductive history. The bird was reported to have displayed possible nesting behavior underneath the sofa for the previous 2 weeks and began to show territorial behavior and act increasingly aggressive toward the female owner. The owner considered the animal’s appetite and activity level normal.

On initial evaluation, the bird was bright, alert, and responsive and in very good body condition (body condition score, 4/5), with a body weight of 370 g (0.81 lb). To facilitate a complete physical examination, whole-body radiography, and blood sample collection, the bird received combined midazolam hydrochloride* (2 mg/kg [0.91 mg/lb]) and butorphanol tartrate* (1 mg/kg [0.45 mg/lb]) intranasally for procedural sedation. After completion of all diagnostic procedures, flumazenil* (0.05 mg/kg [0.023 mg/lb]) was administered intranasally to reverse the sedative effects of midazolam. The physical examination revealed an area of alopecia located between the cloaca and caudal sternum, consistent with a brood patch, an enlarged vent, and an increase in width between the pubic bones. Deep coelomic palpation revealed no abnormalities. The physical examination findings were consistent with reproductive activity in a female bird. A blood sample was collected for a CBC and plasma biochemistry profile. Abnormalities included leukopenia (1.54 × 10³ cells/µL; reference range, 5 × 10³ cells/µL to 15 × 10³ cells/µL) with heterophilia (82.99%; reference range, 43% to 75%); and lymphopenia (14.03%; reference range, 20% to 50%), severely elevated creatine kinase activity (> 4,800 U/L; reference range, 123 to 875 U/L), and hypercalcemia (22.6 mg/dL; reference range, 8 to 13 mg/dL).

Whole-body radiography revealed a smooth, mineralized egg, of normal shape and size, localized to the caudal coelomic cavity (Figures 1 and 2). Evaluation of the ventrodorsal view demonstrated that the egg was located in the right lateral coelom, away from midline. An abnormal increased soft tissue opacity of the mid to caudal dorsal coelomic cavity was observed on the lateral view, and on midline extending laterally on the ventrodorsal view, compatible with an enlarged reproductive tract. An in-
crease in medullary bone opacity was evident in the pelvic limbs. On the basis of these initial diagnostic findings, it was presumed that the bird was displaying reproductive behavior, and oviposition was expected to occur within the next 12 to 24 hours. The bird was discharged to the client, with instructions to provide a nest box and to monitor for oviposition. The bird was reexamined 7 days later because no oviposition had occurred. The owner reported no changes in the animal’s appetite, activity level, or pattern of defecation or the size and consistency of its droppings. Further, no signs of straining over the last 7 days were noticed. Territorial and nesting behavior had ceased. The results of a repeated CBC and ionized calcium concentrations were within reference limits. Whole-body radiography was repeated, and the results revealed that the mineralized egg had rotated 180° on its short axis, resulting in the blunt pole of the egg being directed caudally, compared with the radiographs obtained 7 days earlier. Because the radiographic evidence demonstrated a 180° rotation of a normal-sized egg, lack of straining, and the relatively normal condition of the bird, a presumptive diagnosis was made of an ectopic egg free in the coelomic cavity. Coelomic ultrasonography revealed a mineralized egg located in the right middle coelom. A tubular structure, suspected to be the oviduct, was identified left of midline and was not associated with the mineralized egg. Surgical exploration and removal of the suspected ectopic egg was recommended. The bird received an injection of leuprolide acetate¹ (800 µg/kg [364 µg/lb], IM) to decrease ovarian activity and vascularity of the oviduct, thereby reducing potential complications during surgical exploration, which was scheduled for 14 days later. The bird was empirically prescribed terbinafine⁶ (25 mg/kg [11.4 mg/lb], PO, q 24 h for 21 days) for antifungal prophylaxis to prevent the development of respiratory aspergillosis. On the day of surgical admission, repeated radiographs (21 days after initial examination) revealed that the egg had flipped again 180° along the short axis, with the blunt pole now directed cranially. The results of a repeated CBC revealed no abnormalities. Prior to induction of anesthesia with isoflurane via a mask, the animal was premedicated with midazolam (1 mg/kg, IM) and butorphanol (2 mg/kg, IM). Intraoperative fluid therapy (balanced electrolyte solution,¹⁰ 10 mL/kg/h [4.5 mL/lb/h]; hetastarch,¹¹ 10 mL/kg) was provided via an intraosseous catheter (22 gauge) placed in the left proximal tibiotarsus. With a monopolar radiosurgical device, a standard ventral midline approach to the coelomic cavity was performed, with precautions taken not to lacerate the caudal thoracic and abdominal air sacs. Upon entry to the intestinal peritoneal cavity and reflection of the duodenal loop, a white mineralized egg was visible floating free in the coelomic cavity (Figure 3). The egg was extracted from the coelomic cavity via cotton-tipped applicators and digital pressure. Upon close exploration of the coelomic cavity, no adhesions or other abnormalities suggestive of coelomitis were evident. The oviduct was visually inspected, and no abnormalities were observed. Closure of the coelomic musculature and skin was routine with 5-0 monofilament polyglyconate suture,⁷ and the bird recovered without complications.

The surgically removed egg had a normal shell, but was without a yolk. Treatment with azithromycin¹ (40 mg/kg [18.2 mg/lb], PO, q 24 h for 10 days) and

Figure 1—Lateral radiographic views of a female Timneh African grey parrot (Psittacus erithacus timneh) with an ectopic mineralized egg at initial evaluation (A), 7 days later (B), and 21 days (C) later. Notice the difference in the egg position between the 3 radiographs. The egg rotated by approximately 180° along its short axis, as observed on repeated radiographs (B and C). Notice the increased soft tissue opacity of the mid to caudal aspect of the coelomic cavity dorsally on the first 2 radiographic views (A and B; arrows). The bird received leuprolide acetate (800 µg/kg [364 µg/lb], IM) 2 weeks before the last radiograph was obtained (C). A considerable reduction in soft tissue opacity was evident, as was the degree of medullary bone formation in the femurs and proximal tibiotarsi. These changes were suspected to be secondary to the antigonadotropic effects of leuprolide acetate.
meloxicam® (0.5 mg/kg [0.023 mg/lb], PO, q 12 h for 7 days) was initiated, and terbinafine was continued as previously prescribed. A second injection of leuprolide acetate (800 µg/kg, IM) was administered 3 days after surgical intervention, and the bird was discharged from the hospital. Owner recommendations were provided and included reduction of reproductive stimulation through the following: avoiding oversupplementation with energy-dense foods, avoiding inappropriate petting of the bird (petting involving any body part other than the head and upper neck), and preventing access to sites that could serve as a nest box and trigger reproductive behavior. The bird was reevaluated 248 days after surgical removal of the mineralized ectopic egg. Results of the physical examination and whole-body radiography revealed no clinically important abnormalities. Four hundred ninety-seven days after surgical treatment, during a follow-up phone call, the client reported no recurrence of reproductive behavior or clinical signs that could be attributed to ectopic egg retention.

Discussion

To our knowledge, this report represents the first complete description of the clinical diagnosis and successful treatment of an ectopic mineralized egg in a psittacine bird. The phenomenon of ectopic mineralized eggs has been only inconsistently and incompletely described in the literature.3–6 It is recommended that the diagnosis of an ectopic egg retention be made on the basis of palpation, radiography, and ultrasonography and confirmed by means of surgery or endoscopy.3,5 However, as illustrated in this case, coelomic palpation is a poor diagnostic method for this condition, as eggs
may or may not be palpable, and differentiation between ectopic or intraoviductal eggs cannot be made by palpation alone. In the bird of this report, the egg was not palpable, even after sedation and radiographic confirmation.

Radiography provides an excellent tool to diagnose the presence of mineralized eggs in birds. However, as shown in this case, a single series of radiographs cannot rule out the potential ectopic location of a mineralized egg. Whereas the position of the egg was right of midline on the initial ventrodorsal radiographic view (Figure 2), which suggested that the egg may not have been within the oviduct, only repeated radiography and documentation of a approximately 180º rotation could help confirm the diagnosis. It would be remarkable for a mineralized egg of normal size and shape, located within the oviduct, to flip along its short axis, as documented in the case described here. Ultrasonography proved to be a useful diagnostic imaging modality, as it was possible to visualize the mineralized egg independent of the oviduct, supporting the suspicion of the extraoviductal location of the egg. However, ultrasonographic results might be inconclusive, particularly in smaller birds, as it might be challenging to gain an appropriate ultrasonographic coelomic window to reliably visualize the oviductal walls.

The cause of the extraoviductal location of the egg in the patient described in this report remains unknown. Possible causes for ectopic eggs reported in the literature include oviductal rupture and reverse peristalsis of the oviduct. Malnutrition, physiologic stress, dystocia, and obstruction of the oviduct or salpingitis have been suggested as possible triggers for reverse peristalsis and oviductal rupture. None of these were clear causes in the patient described in this report. Plasma creatine kinase activity was markedly elevated at initial evaluation in our patient, supporting the theory that oviductal rupture had occurred. However, clinical findings associated with oviductal or uterine rupture have been reported to include signs of depression, anorexia, and coelomic distension secondary to coelomitis, none of which were observed in this case. During surgical exploration, no abnormalities of the oviduct or signs of coelomitis were evident, but oviductal lesions might have been missed or already healed, considering that weeks lapsed from the time of initial examination to surgical exploration.

Treatment options recommended for intraoviductal egg retention are contraindicated in cases of ectopic retention and could potentially result in fatal complications. Therefore, it is important to differentiate ectopic from intraoviductal egg retention. Techniques to facilitate oviposition or resolution of intraoviductal egg retention in birds range from hormonal induction of oviposition using oxytocin or prostaglandin F₂α, or dilation of the vaginal sphincter by topical application of prostaglandin E₂, to invasive procedures such as transabdominal or transcloacal ovocentesis and dilation of the egg prior to transcloacal removal. Many of the reported techniques carry a risk for complications in cases of intraoviductal egg retention, and whereas these techniques may be considered in cases of intraoviductal egg retention, they are contraindicated and inappropriate in cases of ectopic retention and can lead to potentially fatal complications. The treatment of choice for ectopic mineralized egg retention is surgical removal via coeliotomy. This treatment proved to be successful in the case described here. It also allowed for examination of the coelom for signs of coelomitis or oviductal disease, such as presence of necrotic tissue, a tear, or adhesions secondary to a possible oviductal rupture.

A ventral midline approach to the coelom was used in this bird to successfully remove the ectopic mineralized egg and examine the reproductive tract. The ventral midline approach is recommended for removal of intrauterine eggs, which are located in the caudal coelom. A ventral midline approach is considered less invasive, compared with the left lateral approach, as it does not require the resection of ribs and does not perforate the caudal thoracic and abdominal air sacs.

Azithromycin was used in bird of this report to provide postsurgical antimicrobial coverage. Azithromycin pharmacokinetics and efficacy have been reported in psittacines, indicating that a dosing frequency of once every 48 hours is sufficient to maintain therapeutic plasma levels for treatment of susceptible bacterial organisms. Azithromycin was used in the patient described here because of its less frequent dosing frequency, compared with that of other antibiotics recommended for use in psittacine birds. Azithromycin has good coverage against gram-positive bacterial organisms, which are part of the normal skin and intestinal flora in psittacine birds and which could potentially contribute to a postsurgical wound infection.

Terbinafine was prescribed as a systemic prophylactic antifungal treatment while the animal was treated for ectopic retention, since African grey parrots have been reported to be more susceptible to fungal infections of the respiratory tract, compared with other psittacine species. Because of the ubiquity of Aspergillus spp spores in the environment, infections in birds frequently occur secondary to immunosuppression. Since repeated veterinary visits and diagnostic procedures as well as surgical egg removal and postsurgical hospitalization can potentially be stressful, secondary immunosuppression was of concern. The choices of antifungal medications recommended for use in African grey parrots are limited. Itraconazole should be used cautiously and only at low dosages because of a reported high incidence of adverse effects of this drug in African grey parrots. Voriconazole is a newer-generation azole antifungal medication, for which pharmacokinetic studies have been performed in Timneh African grey parrots. Because of the need of frequent (q 12 h) dosing of voriconazole and the high associated costs, this drug was not considered for the prophylactic antifungal treatment in the case described here. Instead, we prescribed terbinafine, for which once-daily dosing has been recommended. Terbinafine pharmacokinetics are available for various bird species.

Given the low incidence of adverse effects reported after use of this drug in birds, its once-daily dosing frequency, our extensive clinical experience with this drug in multiple avian species, and its lower costs compared with other antifungal medications, terbinafine was chosen in the patient described here.

In addition to 1 preoperative and 1 postoperative leuprolide acetate injection, behavioral, environmental,
and dietary changes were recommended to the owners over the course of several visits, to reduce future re-
productive activity and possibly prevent recurrence of ectopic egg retention. A follow-up discussion with the owners 16 months after surgical treatment suggested that this approach was successful, without the repeated use of gonadotropin-releasing hormone agonists or further surgical intervention. Alternatively, deslorelin, a potentially long-acting gonadotropin-releasing hor-
mone agonist, could have been considered for this case. However, the effectiveness of deslorelin for suppression of ovarian activity and egg production, and its duration of effectiveness, have not been studied or reported in psittacine birds in the peer-reviewed literature. Therefore, we decided to use leuprolide acetate prior to and after surgical egg removal because effects on ovarian activity and egg production in psittacine birds have been reported.13,14 Surgical treatment beyond the re-
moval of the ectopic mineralized egg could potentially include the removal of the oviduct (salpingohyster-
tomy). Salpingohysterectomy has been recommended for treatment of chronic egg production as well as for cases of oviductal disease, such as neoplasia, oviductal torsion, or oviductal prolapse.1 Salpingohysterectomy is typically not performed as a preventive treatment be-
cause of the considerable risks associated with the pro-
cedure.7 Since no apparent abnormalities of the oviduct were observed during exploratory coeliotomy and prior ultrasonographic evaluation of this patient, we decided that there was no indication to remove an apparently normal organ and possibly predispose the bird to the development of egg-yolk coelomitis. Even though the chance of recurrence of ectopic egg retention could not be eliminated, this condition seemed to be more manageable in contrast to egg-yolk coelomitis, which is associated with high morbidity and mortality rates in birds.3 The long-term effects and long-term outcome of psittacine birds undergoing salpingohysterectomy have not been reported in the peer-reviewed literature. In particular, continued ovulation and egg-yolk coelomitis are potential complications of salpingohysterectomy in birds.7 On the basis of the grossly normal oviduct and the potential associated short-term and long-term dele-
terious consequences, salpingohysterectomy was not considered for this case.

The bird was reexamined 8 months after surgical removal of the ectopic egg, and a physical examination, as well as whole-body radiography revealed no recur-
rence of ectopic egg retention or reproductive activity. A follow-up phone call 16 months after surgical remo-
val of the ectopic egg also revealed no clinical signs consis-
tent with ectopic egg retention. Therefore, the per-
formed medical and surgical management of the case reported here, in conjunction with the environmental and dietary and behavioral adjustments, was consid-
ered to be effective in preventing recurrence of ectopic egg retention.

The cause for the leukopenia diagnosed on initial examination remains unknown. Leukopenia can be the result of either decreased production or increased consumption of peripheral leukocytes.15 Because there was no evidence for toxic changes in the heterophils or the presence of immature heterophils in the peripheral blood on initial examination, increased consumption, caused by an overwhelming bacterial or viral infection, seemed unlikely, given that the animal appeared to be in good general condition, with no evidence of an underly-
ing infection. However, leukopenia with normal cell morphology is reported to be associated with the initial stage of stress in birds.16,17 Therefore, no further therapeutic or diagnostic steps were taken at the initial evaluation, and the leukopenia had resolved within 7 days. Sampling or laboratory artifacts, such as smudged WBCs, extended storage of whole blood samples, and clotted blood samples, can lead to lowered WBC numbers in an analyzed blood sample. However, none of these sampling artifacts were reported by the labora-
tory performing the CBCs in the case described here and therefore were not considered responsible for the leukopenia observed on the initial CBC.18,19

In the female Timneh African grey parrot of the present report, the lack of clinical signs consistent with attempted oviposition and the stable general condition of the bird, along with diagnostic modalities including ultrasonography and repeated whole-body radiography, provided the diagnosis of an ectopic egg. Surgical removal of the ectopic egg was curative in this case. Cli-
nicians need to be aware that in avian patients, a diag-
nosis of egg retention made on the basis of radiographs alone may be incorrect, especially in the absence of classic clinical signs of true dystocia, such as straining, lack or change in fecal output, a base-wide stance, and deteriorating general condition.4 Therefore, careful differen-
tiation of intraoviductal and ectopic egg retention should be made to ensure appropriate treatment and a successful outcome.

References

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umburg, Ill.
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Effects of anesthetic induction with midazolam-propofol and midazolam-etomidate on selected ocular and cardiorespiratory variables in clinically normal dogs

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Objective—To compare effects of anesthetic induction with midazolam-propofol or midazolam-etomidate on intraocular pressure (IOP), pupillary diameter (PD), pulse rate, blood pressure, and respiratory rate in clinically normal dogs.

Animals—18 dogs.

Procedures—Dogs undergoing ophthalmic surgery received midazolam (0.2 mg/kg, IV) and either propofol or etomidate (IV) until intubatable. For all dogs, results of physical examinations, ophthalmic examinations of the nonoperated eye, and preanesthetic blood analyses were normal. Intraocular pressure, PD, blood pressure, pulse rate, and respiratory rate were measured in the nonoperated eye at 5 time points: just prior to the anesthetic induction sequence, after 5 minutes of preanesthetic oxygenation via face mask, after IV administration of midazolam, after IV anesthetic induction, and after endotracheal intubation.

Results—PD decreased significantly from baseline by 4.4 ± 0.4 mm (mean ± SD) at anesthetic induction and 5.3 ± 0.4 mm at intubation in the propofol group and by 1.2 ± 0.4 mm at intubation in the propofol group. Intraocular pressure was increased significantly from baseline by 3.2 ± 1.0 mm Hg at anesthetic induction in the etomidate group and by 4.7 ± 1.2 mm Hg at anesthetic induction and 4.5 ± 1.2 mm Hg at intubation in the propofol group. Pulse rate was significantly lower by 28.6 ± 12.6 beats/min at anesthetic induction in the etomidate group, compared with the propofol group.

Conclusions and Clinical Relevance—At the studied doses, midazolam-etomidate caused clinically important miosis and increased IOP. Midazolam-propofol caused an even greater increase in IOP but had minimal effects on PD. (Am J Vet Res 2013;74:629–635)