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What Is Your Diagnosis?

History

A 6-month-old, 112-g sun conure (*Aratinga solstitialis*) was presented by a pet store manager immediately after it had been attacked by a dog. The bird's condition warranted a quick external examination before it was placed into an incubator. The physical examination revealed a poor response to stimuli, moderate weakness, and lethargy. The bird had drooped wings but was able to perch with a widened stance. Respiratory rate at rest was normal (40 breaths per minute; reference range, 40–52/min), and heart rate was low normal (240 beats per minute; reference range, 206/min at rest, or 500–600/min under restraint).[1] Thoracoabdominal auscultation was unremarkable and no abnormalities of the skin or feathers were observed. The basilic vein was moderately turgid and refilled instantly. The initial therapeutic plan included piperacillin (80 mg/kg intramuscular [IM] q8h; Piperacil, 200 mg/ml, Lederle Inc, Carolina, PR), lactated Ringer's solution (50 ml/kg subcutaneous [SC]), supplemental oxygen, and placement into an infant incubator at 30°C (86°F).

After 10 hours of observation, the bird was more responsive and had a normal posture on the perch. Venous blood was collected for a complete blood count. Abnormal results of the diagnostic tests were (reference ranges in parentheses): total white blood cell count, 27.0×10^3 cells/μl ($4.0–11.0 \times 10^3$ cells/μl); heterophils, 84% (55–75%); and lymphocytes, 15% (25–45%).[2] No abnormal cell morphology was observed. Physical examination at this time revealed 2 small (1- to 2-cm) bilateral areas of subcutaneous gas along the caudoventral aspect of the pectoral muscles. Radiographs were attempted, but when the bird was placed in dorsal recumbency, audible sounds of fluid were heard on inspiration and expiration. The respiratory noises subsided quickly when the bird was placed on a low perch in the incubator. The therapeutic plan was then altered to include amikacin (15 mg/kg IM q12h; Amiglyde-V; Fort Dodge Laboratories, Fort Dodge, IA, USA), lactated Ringer's solution (30 ml/kg SC), furosemide (2 mg/kg SC q12h); calcium gluconate (30 mg/kg IM; Phoenix Pharmaceuticals, St Joseph, MO, USA), and vitamin B complex (0.3 ml/kg IM; Butler, Columbus, OH, USA). Nutritional support (Emeraid I and II, 1 ml of each product per os; Lafeber Company, Cornell, IL, USA) was initiated by gavage at 24 hours after the bird was presented because of minimal appetite and weight loss of 6 g.

Thirty-six hours after presentation, the bird was alert and responsive with diffuse areas of subcutaneous emphysema on the ventral and lateral torso. Because the bird still exhibited gurgling rales when placed in dorsal recumbency, radiographs were taken by using a horizontal beam and manual restraint (Figures 1 and 2).

Please evaluate Figures 1 and 2 and list your differential diagnoses before continuing.

Figure 1. Ventrodorsal full body radiographic view of sun conure that was attacked by a dog.

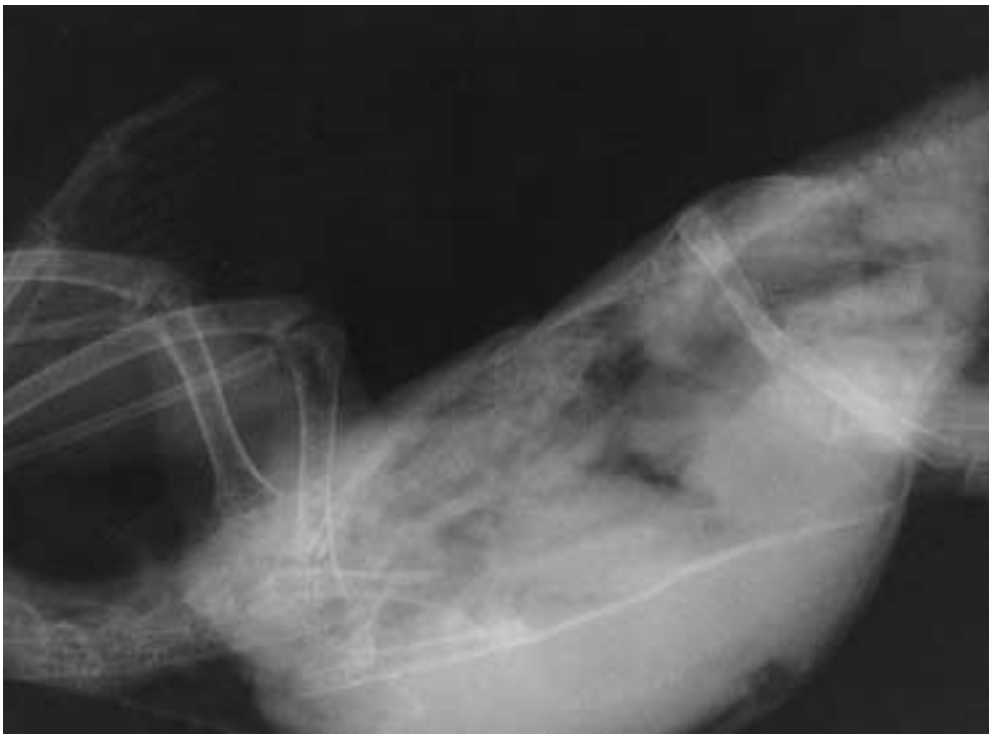

Figure 2. Lateral full body radiographic view of the sun conure described in Figure 1.

Diagnosis

The diagnosis in this bird is a traumatic injury leading to air sac rupture with internal hemorrhage, pneumocoelom, and subcutaneous emphysema. Radiographic abnormalities include subcutaneous and intracoelomic gas revealing the cardiac apex, increased prominence of the thoracoabdominal structures, and a gas line between skeletal muscle and skin (Figure 3). Fluid accumulation (edema) in the lungs and thoracic air sacs is indicated by the loss of normal pulmonary honeycomb appearance and general increase in air sac opacity. Parabronchial ring shadows suggest concurrent respiratory inflammation (Figure 4).

Leukocytosis with heterophilia can be associated with infection, but in this bird leukocytosis was attributed to endogenous glucocorticoid excess resulting from the traumatic injury. Moderate leukocytosis with heterophilia and lymphopenia has also been suggested to develop in young birds, such as this conure, that reside in pet stores before sale to the public.[3]

Treatment of the pulmonary edema consisted of increasing the inspired oxygen concentration for the first 36 hours and reducing respiratory fluid accumulations with 2 doses of IM furosemide (2 mg/kg) 12 hours apart. Administration of antibiotics was indicated because of the potential for infection with pathogenic oral flora from a dog attack.[4,5] In this bird, the use of aminoglycosides was delayed until the mild signs of hypovolemic shock had diminished. Antibiotics and nutritional support (5 ml by gavage) were continued every 12 hours for 7 days, and the bird's appetite improved on the third day after presentation. No treatment was needed for the subcutaneous emphysema, and clinical signs resolved within the 14 days before the last examination.

Comments

Birds that have been involved in animal attacks often present with a multitude of clinical problems.

Figure 3. Same as Figure 1. Arrows point to subcutaneous and intracoelomic gas associated with injuries received during the attack.

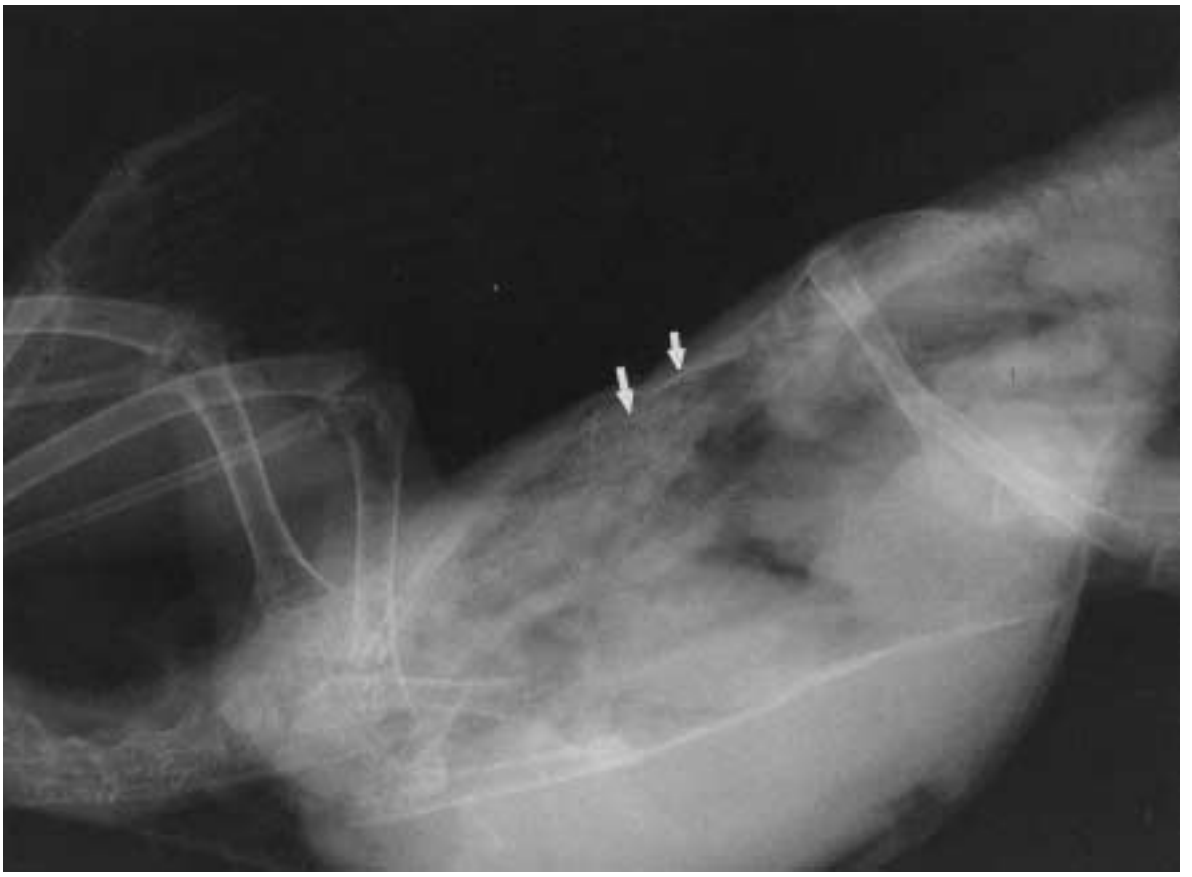

Figure 4. Same as Figure 2. Arrows point to the parabronchial ring shadows suggesting possible respiratory inflammation.

The initial physical examination requires rapid assessment of the severity of the injuries, considering the possibility of damage to the nervous, cardiovascular, gastrointestinal, musculoskeletal, respiratory, and integumentary systems. Patient evaluation, diagnostic sample collection, and treatment must proceed according to the status of the patient. To avoid disaster, the initial evaluation should progress in steps with rest in a quiet, dark, warm, humid, well-oxygenated environment.

Clinical signs of hypovolemic shock can be difficult to ascertain, but include mucosal pallor, slow refill (greater than 0.5 seconds) of the basilic vein, and general weakness.[4,6] Signs of internal hemorrhage also include increased cardiac and respiratory rates, generalized weakness, and dyspnea with restraint.[5] Immediate treatment can include fluid therapy, bacteriocidal antibiotics, and rapid-acting glucocorticoids.[4,5,7] In hypovolemic patients, blood pressure is shifted away from the peripheral circulation and all medications should be administered by the intraosseous or intravenous route.[4,5,8] Subcutaneous fluids are absorbed rapidly when peripheral circulation is intact, but if pooling in the ventral abdominal area is observed, a more aggressive route must be chosen. In cases of animal attack, specific antibiotics must be considered because fatal septicemia often follows bite or scratch wounds from dogs or cats if not treated aggressively.[5] Pathogenic oral flora, such as *Pasteurella multocida* in cats, are commonly isolated, but treatment must begin long before culture and sensitivity results are returned. Combinations of bacteriocidal antibiotics such as piperacillin or cefotaxime (Claforan, Hoechst-Roussel Pharmaceuticals, Somerville, NJ, USA) with amikacin or tobramycin (Nebicin, Eli Lilly, Indianapolis, IN, USA) are recommended.[4,5,9,10] Adequate hydration must be maintained during administration of potentially nephrotoxic therapeutic agents, especially in birds where septic shock is suspected. This bird was regarded to be in very mild shock and was treated conservatively initially with subcutaneous fluids and piperacillin, adding amikacin only after the danger of hypovolemic shock had passed.

Calcium gluconate can be useful in trauma therapy of avian patients. Hyperkalemia can occur with severe tissue trauma, and calcium acts as a myo-

cardial protectant by facilitating the movement of potassium ions across cell membranes.[5] Excessive hemorrhage is a common sequela to animal attacks in companion birds, and calcium is essential for proper coagulation. Although thrombin is activated primarily by the extrinsic pathway in birds, both the intrinsic and extrinsic pathways require calcium ions for most of the reactions. Thrombin is the mediator of the coagulation cascade and cannot be split from prothrombin without the action of calcium.[5,11]

Nutritional support of avian patients should begin as soon as possible. Most birds have limited reserves and may have been eating a nutritionally inappropriate diet before the traumatic event. Juvenile psittacine birds, such as the conure in this case, are particularly susceptible to nutritional deficiencies from weaning stress and inadequate hand feeding. A high basal metabolic rate also contributes to the nutritional needs of critically ill avian patients.[12–14] When enteral feeding is possible, a liquid diet that meets the metabolic requirements of the patient can be administered by feeding tube into the crop 1–4 times daily. Feeding volume and frequency can be calculated according to basal metabolic rate, recovery needs, and species of bird and are reported elsewhere.[4,7,12,14] Total parenteral nutrition is required when the gastrointestinal system is compromised, but is rarely used in avian patients.

Radiography was essential for diagnosis in this bird, but routine restraint procedures were considered too stressful. Use of a horizontal x-ray beam proved to be a safe alternative for the patient, but restraint was more difficult, and exposure to technical staff was somewhat increased. Although patient stress was minimal, manual restraint in the upright position allowed some rotation and produced oblique views. With practice, the use of a horizontal beam could become a standard method of radiography for avian patients in respiratory distress.

This case was submitted by **Paul M. Gibbons, DVM,** and **Susan Horton, DVM,** from Niles Animal Hospital and Bird Medical Center, 7278 North Milwaukee Avenue, Niles, IL 60714, USA.

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