Pre-surgical Evaluation of the Avian Patient

Anne Fowler BSc (Vet), BVSc, MACVSc (Avian Health, Med of Aust Wildlife)

PO Box 1152, Camden, NSW 2570

Introduction

Pre-surgical evaluation of the avian patient aims to detect the underlying problems that will impact upon the ability to provide a safe anaesthesia to the patient. The evaluation begins with collection of the history and performance of a physical examination. In some situations, further diagnostic workup including haematology and biochemistry profiles may be indicated to determine the extent of the underlying disease. There will always be some situations where it is imperative to perform anaesthesia and surgery immediately, yet, when possible, it is preferable to delay elective procedures in compromised patients. Avian patients can easily be scored in terms of level of risk using the grading system used by anaesthestists.

Table 1: **Risk Classification of Anaesthetic Patients (adapted from Sims, 1994).**

Grade	Description
I	Young, healthy patient, elective procedure
II	Healthy patient on examination, with biochemical abnormality
III	Patient with pre-existing but stable health problem
IV	Patient with major underlying health problem that is unstable
V	Moribund, emergency surgery required

From this table, for example, surgical sexing of a healthy young bird might be grade I in terms of risk. A bird with egg-yolk peritonitis may be graded III after drainage of the abdominal effusion and a fat galah with a bleeding lipoma, that has not been dieted could be graded as IV.

History

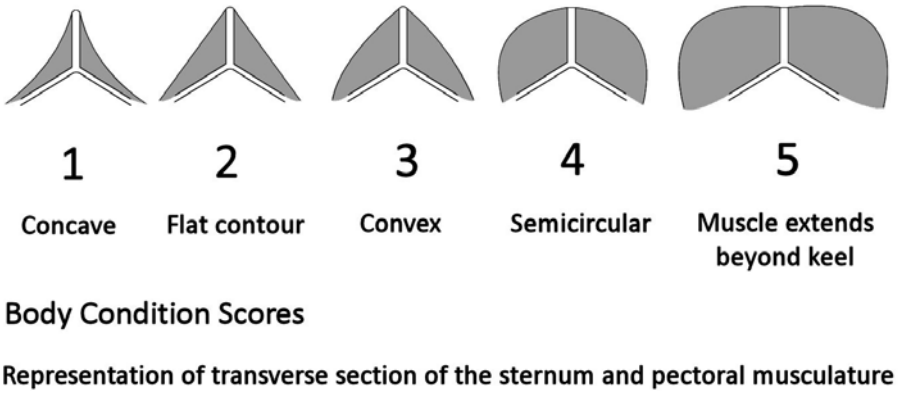
The history in itself may reveal the reason that the bird may require surgery – such as a traumatic injury or sexing by endoscopy. The history may also reveal the dietary background and prior illnesses that may point to disease that will impact on the anaesthesia and surgery.

Physical Examination

A detailed physical examination is required to identify conditions that may impact on successful surgery and anaesthesia of the patient.

- Distant examination of the bird is required to identify respiratory tract pathology. It is worthwhile taking a minute to watch the bird from a distance before picking it up.
  - Upper respiratory tract. Examine the nares and choana for obstructions as this may interfere with the induction of anaesthesia by mask (Heard 2000).
  - Lower respiratory tract disease may manifest as tachypnoea, tail-bobbing and open-mouth breathing – all of which indicate reduced respiratory capacity.
  - Harrison recommends measuring the time taken for breathing to return to normal after handling. In healthy birds, respiratory distress after handling has resolved within 3 – 5 minutes. Distress after this time is an indication of severe respiratory pathology and this should be investigated before surgery.
- Mucus membrane colour may be paler in anaemic birds.
- Evidence of blood loss – on feathers, body, beak or cage environs.
- Periorbital swelling, and petechial haemorrhages of the eyelids in psittacine birds suggests thrombocytopaenia (Powers, 2000).
- The heart should be auscultated to measure rate, and to detect arrhythmia or murmurs.
- Hydration status. In birds this may be determined by:
  - Turgidity of the peripheral veins. If the ulnar vein is easily compressed and takes more than 1 – 2 seconds to fill, this represents more than 7% dehydration (Abou-Madi and Kollias, 1992).
  - Push the skin over the keel and look for tenting and elasticity.
  - Pinch the skin on the feet – if the skin remains tented, dehydration is present.
- Crop should be palpated for distension. The bird may need to be induced in an upright position, with the oesophagus occluded by digital pressure. Endotracheal intubation and aspiration of the crop contents prior to surgery is recommended (Flammer, 1989).
- Examination of droppings
  - Yellow urates may indicate starvation
  - Green urates may indicate liver disease
  - Blood in urates may indicate a current blood loss or disease
  - Polyuria is a non-specific sign that warrants further investigation of liver and kidney
- Suggestion of hepatopathy upon examination (Cannon, 2001) include:
  - long beak, discoloured feathers;
  - distension of liver below the keel bone visible on physical examination.
- Ascites. Coelomic fluid reduces the volume that is available for expansion of the air sacs.
- Abnormal droppings may also give an indication of internal organ disease.
- Body condition score:

- Emaciated birds may need nutritional support prior to surgery for at least 24- 48 hours.
- Obese birds will have reduced respiratory volume due to intracoelomic fat (Sims, 1994). Dieting for several weeks to months prior to surgery may be indicated where possible.



Body condition score system in birds

Haematological Parameters

Packed Cell Volume

A decrease in the amount of erythrocytes, the Packed cell volume (PCV), is indicative of anaemia. A wide variety of conditions can result in anaemia from lead toxicosis, tramatic blood loss and chronic disease from aspergillosis, chlamydophilosis, as well as other bacterial and viral diseases. Evaluation of a blood smear may show the type of anemia (macrocytic/microcytic, hypochromic); the presence of blood parasites and whether regeneration is present (Fudge, 2000).

An increase in PCV is most commonly due to relative polycythaemia as a result of dehydration. However, it may not always accurately reflect acute changes in blood volume in birds (Abou-Madi and Kollias, 1992). Absolute polycythaemia is due to abnormally increased bone marrow production. Clinically this may be due to chronic respiratory disease initiated by infection or hypersensitivity (Fudge, 2000).

Thrombocytes

The normal thrombocyte count for birds is between 20 000 – 30 000 cells/uL. Evaluation of a blood smear is recommended, where 10 – 15 thrombocytes per 100 erythrocytes should be seen. This translates to 1- 2 thrombocytes per high power field (HPF). An estimated thrombocyte count can be calculated by dividing the average number of thrombocytes seen on five HPF by 1000 and multiplied by 3 500 000. Thromobocytopaenia may manifest clinically as periorbital swelling and eyelid petechial haemorrhages in psittacine birds (Powers, 2000).

Clotting time

Clotting time is underutilized in pre-surgical assessment of avian patients. However, clotting disorders occur with some common conditions such as viral disease (circovirus, polyomavirus and

reovirus), bacterial septicaemia and hepatic disease. Unfortunately Prothrombin Time (PT) in birds has not been well-validated and is not commonly available. 3ml of blood has been used experimentally (Morrisey et al, 2003) and this would also preclude its use in any but the largest avian species. It is assumed that if the bird has liver disease, then there are reduced clotting factors. Vitamin K absorption from the gut will also be reduced in liver disease.

Some simple ways to assess clotting time include:

1. Evaluation of a blood smear to count the number of thrombocytes. The normal thrombocyte count for birds is between 20 000 – 30 000 cells/uL.
2. Cut a toenail and calculate the time it takes to clot. However, 'normal' values have not been established in birds.

Biochemical parameters

Flammer (1989) suggests that a minimum biochemical profile would include AST, Uric acid, total protein and glucose. A more comprehensive profile which includes these parameters as well as cholesterol, bile acids and LDH has been recommended by Sims (1994).

Glucose

Hypoglycaemia may need to be addressed. Birds have a limited capacity to store glycogen. Shock and sepsis, starvation and liver disease can result in low blood glucose levels. Treatment with assisted feeds and administration of dextrose intravenously is warranted.

Aspartate Aminotransferase (AST)

AST elevations without elevations of LDH may indicate muscle damage. AST will also elevate with muscle damage – concomitant elevations in CK will occur in this scenario. Muscle damage may have occurred to either skeletal or cardiac muscle in association with these elevations. Elevated AST has been associated with hepatocellular damage in chickens, turkeys, psittacine birds and ducks (Campbell and Coles, 1986). Increases by 2 – 4 fold suggest muscle damage, whereas marked elevation occurs with liver necrosis.

Lactate Dehydrogenase (LDH)

This enzyme has a very short half life, so elevations can suggest liver damage when they occur with elevated AST levels, especially when CK is not elevated concurrently. As haemolysis will elevate LDH, it is important to identify whether haemolysis is present in the sample.

Table 2: Interpretation of Elevations in Muscle and Liver Enzyme (adapted from Fudge, 2000).

AST	LDH	CK	Interpretation
⇑	⇑	⇑	Nonhepatic cellular damage
⇑	⇔	⇔	Acute muscle damage 2-4 days ago or hepatocellular damage
⇔	⇑	⇑	Muscle damage (skeletal or cardiac) less than 24h prior
⇑	⇑	⇔	Hepatocellular damage
⇔	⇔	⇔	No muscle or liver damage

Key: ⇔ normal enzyme values, ⇑ elevated enzyme value

AST and LDH may need to be interpreted together with CK levels to determine whether elevations in these enzymes represent muscle or liver damage. These changes are tabled above. Liver pathology will impact on the patient's ability to metabolise anaesthetic agents and perform adequate coagulation (Sims, 1994).

Cholesterol

Elevations in cholesterol, as well as elevations in other liver enzymes suggest hepatopathy. Other conditions that can increase cholesterol include dietary fat, xanthomatosis and hypothyroidism (Campbell and Coles, 1986).

Uric Acid

Uric acid elevations are associated with damage to the proximal tubules or severe dehydration (Phalen, 2000). However, birds may have advanced kidney disease with normal uric acid levels due to the interplay between uric acid production and secretion by the diseased kidney. High levels are associated with starvation, gout, tissue destruction and renal disease (Campbell and Coles, 1986).

Table 3: Abnormality detected on biochemical changes and recommended actions (adapted from Cannon, 2001).

Parameter	Alteration	Action
PCV	<20 % <15 % >40 – 55 %	Postpone and ID cause Blood transfusion Rehydration
Thromobocyte number	<20 000	Blood transfusion Pre-surgical Vitamin K
PT	prolonged	Vitamin K
Glucose	<10 mmol	10% dextrose at 1ml/kg IV prior to surgery 2.5% glucose during surgery
AST	>650 IU/L	Postpone
LDH	>350 IU/L	Postpone
Cholesterol	>18 mmol/L	Postpone
Uric acid	>450 µmol/L	Postpone; rehydrate with fluids
Total Protein	increased	Rehydrate with fluids

Urea

This enzyme is not typically used in birds as their kidney does not produce this enzyme in high levels. However, one study found that elevated urea levels in pigeons can accurately indicate dehydration in pigeons (Lumeij, 1987) but is not useful in the assessment of renal damage

Total Protein

An elevation in total protein (TP) may reflect dehydration which requires correction prior to surgery. A decrease in TP may also impact on the anaesthesia as there is less protein circulating in the blood to carry drugs, thus their activity may be prolonged or enhanced if their activity is determined by bound or unbound drug.

Pre-anaesthetic Fasting

Fasting will reduce the risk of regurgitation and passive reflux that may occur during or after anaesthesia. The size of the proventriculus and ventriculus will also be reduced which will have less impact on the respiratory system (Heard, 2000).

There has been some debate as to the ideal time to fast birds prior to surgery. There is no hard and fast rule but it is prudent to remember that the goal is to have the upper gastrointestinal tract is empty (Cannon, 2001). The following points need to be considered in deciding on the ideal time to fast

1. Size of the bird. Larger birds over 500g can be fasted for 12 hours (Heard, 2000). Smaller birds may only be able to tolerate shorter fasts of 6 – 12 hours. Birds lack the ability to store glycogen for extended periods as their trade-off for increased wing loading in flight (Blem, 1976).
2. Family group also has an impact on fasting times
    a. Psittacine birds with crops will require longer fast than similar sized passerine birds without crops.
    b. Delayed gut emptying is seen in seabirds and raptors.
    c. Nectivorous birds have a fast gut transit time compared to other species of similar size
3. Underlying clinical condition will also impact the requirement for fasting. Gastrointestinal conditions such as ileus, obstruction, starvation will alter normal gut transit time and this needs to be considered in deciding on the fast (Heard, 2000).
4. Diet - larger food items such as sunflower seeds may still be present in the crop after fasting.

Correcting Dehydration

It is assumed that the fluid requirement for birds is similar to mammals and is estimated at 40-60 ml/kg/d and that traumatized or sick patients are 10% dehydrated (Sims, 1994). In terms of correcting dehydration, one quarter to one half of the deficit can be corrected in the first 4-6 hours and the remainder given over the next 20 hours (Abou-Madi and Kollias, 1992). The maximum acute fluid load that can be tolerated by healthy avian patients is 90ml/kg/h (Sims, 1994). Fluids should be warmed prior to administration and may be given intravenously, intraosseously to correct the initial deficit and subcutaneously for the remainder. Hartmans is the recommended crystalloid replacement fluid.

Conclusion

Forearmed is forewarned: with a thorough physical examination to identify underlying pathology and some basic laboratory testing, the common conditions that will impact on survival during surgery can be identified and mediated.

References

Abou-Madi N, Kollias GV (1992). Avian Fluid Therapy: in Current Veterinary Therapy XI. Pub Saunders. P 1154.

Blem CR (1976). Patterns of Lipid Storage and Utilisation in Birds. American Zoologist 16(4):671-684.

Campbell TC and Coles EH (1986). Avian clinical pathology: In Veterinary Clinical Pathology. 4th ed, ed Coles; pub Saunders. P 279 – 297.

Cannon M (2001). Avian Anaesthesia: in *AAVAC Conference Proceedings*, p 24 – 27.

Flammer K (1989). Update on Avian Anaesthesia: in *Current Veterinary Therapy X*, Pub: Saunders, p 776.

Fudge AM (2000). Disorders of Avian Erythrocytes. In: In *Laboratory Medicine: Avian and Exotic Pets*, ed AM Fudge, Pub: Saunders. Ch4, p 28 – 34.

Fudge AM (2000). Avian Liver and Gastrointestinal Testing: in *Laboratory Medicine: Avian and Exotic Pets*, ed AM Fudge, Pub: Saunders. Ch 6, p 47 – 60.

Heard DJ (2000) Avian Anaesthesia. Ch 22 in *Manual of Avian Medicine*: ed GH Olsen and SE Orosz. Pub: Mosby.

Lumeij JT (1987). Plasma urea, creatinine and uric acid concentration in response to dehydration in racing pigeons. *Avian Pathol*, 16, p 377 - 382

Morrisey JK, Paul Murphy J, Fialkowski JP, Hart A, and Darien BJ (2003). Prothrombin times of Hispaniolan Amazon Parrots and Umbrella Cockatoos. *JAMS* 17(2) 72 – 77

Phalen DN (2000). Avian Renal Disorders: in *Laboratory Medicine: Avian and Exotic Pets*, ed AM Fudge, Pub: Saunders. Ch 8, p 63

Powers LV (2000) Avian Haemostasis: in *Laboratory Medicine: Avian and Exotic Pets*, ed AM Fudge, Pub: Saunders. Ch5, p 35 – 45

Sims LC (1994). Anaesthesiology: in *Avian Medicine: Principles and Application*. Ed: Ritchie, Harrison and Harrison. Pub: Wingspan, Ch 39, p 1074 - 1076