Avian Emergency and Critical Care Wet Lab

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I. Venipuncture

A. The indications for venipuncture in birds are analogous to those in mammals. In emergency medicine, blood is collected as part of a minimum data base.

B. Jugular venipuncture

1. The right jugular vein in birds is usually larger than the left, however, both are present in most species. In some species, such as pigeons, a distinct vein is difficult to identify. A vascular plexus is present instead.
2. Large quantities of blood are best obtained from this site. It is also useful for catheter placement.
3. The right jugular vein is located subcutaneously in the apteryla (featherless region of skin) on the dorsolateral aspect of the neck.
4. Part the feathers to identify this featherless tract. An alcohol moistened gauze is used to wet the feathers and skin. This will make the skin more transparent allowing you to visualize the jugular vein.
5. The needle is passed through the skin and into the vein for blood collection.
6. The vein is often mobile and to puncture the vein, you may need to stab the vein with the needle in a quick motion.
7. If there is air in the cervicocephalic air sac, it may be difficult or impossible to see the vein. If this occurs the left jugular should be evaluated or another vein selected for blood collection.
8. Once blood has been collected, gentle digital pressure is applied to the site to prevent hematoma formation. In this location, there is little support from surrounding tissues to prevent hematoma formation. Large, even life-threatening, hematoma can form.

C. Medial metatarsal venipuncture

1. The medial metatarsal vein courses along the medial aspect of the hock joint from caudomedial to craniomedial and then along the medial aspect of the tarsometatarsal bone.
2. This vein is smaller than the jugular vein and it may be difficult to collect a large volume of blood from this location. It is a useful site for catheter placement and is the least likely location for a large hematoma to form after venipuncture because the skin in this region is thicker and more tightly associated with surrounding structures.
3. The feathers are plucked along the medial aspect of the hock joint. If the vein can be accessed in the featherless, thick skinned region of the leg it is preferred.
4. Venous drainage is occluded by digital pressure at the caudal aspect of the stifle. This will allow the vein to distend.

5. Insert the needle into the vein. As with the jugular vein, this vein can be mobile, especially in the thin, feathered skin portion. Once it crosses the hock joint it becomes less mobile in the tighter, featherless area of the tarsometatarsal region.
6. In small birds, suction applied to the syringe can collapse the vein preventing blood collection. It may be best to allow blood to flow into the needle hub and collect the blood into heparinized capillary tubes.
7. Digital pressure is used to control hemorrhage after the needle is removed minimizing hematoma formation.

D. Cutaneous ulnar venipuncture
1. The cutaneous ulnar vein (also called the wing vein) is located on the ventral (medial) aspect of the wing at the elbow joint. It joins proximally to the basilic vein at the midhumerus region.
2. This vein seems to be the most fragile and most likely to develop a hematoma following blood collection. It is also small making it difficult to obtain enough blood for a data base.
3. The vein can frequently be accessed without plucking feathers; however, it is often easier to see the subcutaneous vein if a few feathers are removed.
4. The vein is located subcutaneously and it is easier to see the vein if the skin and feathers are moistened with an alcohol soaked swab.
5. The vein is most easily accessed as it crosses the muscles of the proximal antebrachium distal to the location where it joins the basilic vein. In this location the vein can be punctured where it is flat along the muscles.
6. As for the medial metatarsal vein, in small birds suction on the syringe may result in collapse of the vein. Blood can be collected from the hub of the needle in small birds.
7. Once the needle is removed, pressure must be applied to prevent hematoma formation. The site is checked to assure bleeding is under control before the bird is released back to its cage.

II. Intravenous Catheter Placement

A. Sites for placement of intravenous catheters are the same as those used for phlebotomy. In most birds more than 100 g body weight it is possible to place a catheter in the medial metatarsal vein. In most birds more than 30 g body weight, it is possible to place an intravenous catheter in the jugular vein. In birds less than 30 g body weight, it might be necessary to use the intraosseous route.

B. In large birds, the medial metatarsal vein is preferred as it is easy to secure in place using tape with an encircling wrap.
1. Catheters in this location are best used for short duration. They serve well for establishing venous access during surgery or in patients that are too ill to bother them.
2. Catheters in the medial metatarsal are easy for birds to get to, chew at, and removed. It can be difficult to maintain them long term.

C. Birds tolerate catheters placed in the jugular vein and they are easy to maintain. Birds cannot chew at them. They do not even appear to notice that they are in place.
   1. Catheters placed in the jugular can be secured in place using tape or can be sutured in place.
   2. Catheters should be replaced after they have been in use for 3 days.
   3. It is important to control hemorrhage from the catheter site after the catheter is removed to prevent hematoma formation.

D. The cutaneous ulnar vein is the most difficult site for catheter placement and maintenance. It is difficult to secure and maintain a catheter in this location. In most cases, it is used for placement of a butterfly catheter for very short term use.

III. Intraosseous Cannula - Tibiotarsus

A. Pluck the feathers surrounding the cranial aspect of the stifle joint and palpate the structures associated with this joint. You should be able to palpate the cranial cnemial crest which will be a landmark for cannula insertion.

B. Using the ½ cc insulin syringe inject 0.02 cc 2% lidocaine to block the periosteum. The needle is inserted as if inserting an IM pin. Once bone is contacted the lidocaine is injected to block the periosteum. (We will not do this in the cadaver lab)

C. The area is prepared for an aseptic procedure using chlorhexidine and alcohol gauze sponges.

D. The stifle is held in flexion with the left hand (for right handed people) using the thumb and forefinger to feel the lay of the tibiotarsus.

E. The cannula is inserted in a manner similar to insertion of an IM pin into the tibiotarsus starting between the cranial cnemial crest and the caudomedial prominence of the plateau. The needle is rotated and advanced until it penetrates the plateau into the medullary canal.

F. Confirm placement:
   1. A 3 cc syringe is attached to the needle and aspirated to check placement. If flashback is visualized, placement is confirmed. In this manner a bone marrow sample may also be obtained.
   2. If there is no flashback following aspiration, slowly inject 0.3 cc of heparinized saline and try again. If blood tinged fluid is retrieved, placement is confirmed.
   3. If both 1 and 2 fail, you may inject 1-1.5 cc saline which should cause swelling of the muscles in the tibiotarsus area if the needle is NOT within the canal.

G. Once you have confirmed placement, you may suture the needle in place. A butterfly tape is placed on the needle and two nylon sutures used to secure the tape to the skin.

IV. Intraosseous Cannula - Ulna

A. As above the dorsal aspect of the distal ulna is prepared for insertion of the cannula. In order to pass the needle ventrally it must pass through the ulnar carpal bone which is difficult and results in more damage to the joint.

B. The needle is inserted into the dorsal aspect of the distal ulna. Three prominences are palpable; the distal radius, the extensor process of the carpometacarpus, and the distal ulna. The distal ulna is identified as a crescent shaped raised area proximal to the extensor process of the carpometacarpus. The bone over the leading edge of the carpus is NOT the ulna, rather it is the extensor process and must be avoided. Needle insertion is initiated at this prominence.

C. The carpometacarpus is bent downward (adducted) to open the space for pin insertion. The needle must be started 2-4 mm deep to the crest or it will come out the bone and not be advanced into the medullary canal.

D. The needle is twisted and advanced until the needle is in the medullary canal of the ulna. The needle is driven at an angle parallel to the ulna.

E. Confirmation of placement is as described above except that placement may also be confirmed by injecting saline and visualizing the cutaneous ulnar vein. If properly placed, when saline is injected, this vein will blanch.

F. The cannula is secured in place as described above.

V. Inraosseous Cannula - Proximal Ulna

A. Placing the cannula in the proximal ulna avoids damaging the joint.
B. The needle is inserted between the 2nd and 3rd flight feathers distal to the elbow joint.
C. The needle insertion is initiated perpendicular to the long axis of the bone until it begins to cut through the cortex.
D. Then, change the angle to parallel with the long axis of the ulna while still twisting the needle.
E. Secure the needle in place.
F. This is technically the most difficult method but avoids damaging a joint.

VI. Subcutaneous Fluid Administration

A. Knee Web
   1. The knee web is a double layer of skin extending between the stifle and the sternum when the leg is extended.
   2. Moisten this area so you can see the skin.
   3. Insert the needle between the two layers of skin and inject the saline fluids.
   4. Both knee webs may be used so the volume needed can be split between the two sites.
   5. This is my preferred site for subcutaneous fluid administration.

B. Patagium
   1. The patagium is also called the wing web and is also a double layer of skin.
   2. Moisten the skin as above and insert the needle between the two layers of skin.
   3. Administer the fluids as described above.

C. Interscapular
   1. This site is somewhat more difficult but preferred by some avian veterinarians. The skin in this location is a single layer and fairly tightly adhered to deeper structures
   2. Moisten the skin in the interscapular area so you can visualize where to insert the needle.
   3. Insert the needle under the skin and administer the fluids.

VII. Tracheal Wash

A. The indication for tracheal wash in birds are the same as those for mammals.
B. The sample should be submitted for cytologic examination as well as culture and sensitivity testing.
C. A through-the-needle (a.k.a. jugular) catheter or a small (3.5 fr) sterile rubber or polypropylene catheter is used to instill the saline and collect the sample.
D. A mouth speculum is used in an awake bird to prevent the bird from biting the tube off and inhaling it.
E. The sterile catheter is inserted through the glottis using aseptic technique.
F. Advance the catheter as far as it will go without forcing it.
G. 1-3 ml/kg sterile saline are instilled into the trachea and aspirated back into the syringe.

VIII. Air Sac Tube Placement

A. The approach used for placement of the air sac breathing tube is the same used for left lateral laparoscopy for gender determination.
B. The bird is placed in right lateral recumbency with the wings extended dorsally and the left leg retracted caudally as far as possible. The feathers are plucked from the skin in the triangular area formed by the epaxial muscles dorsally, the cranial thigh muscles caudally, and the sternum cranioventrally. In this area the ribs are palpable.
C. A nick incision is made either between the last two ribs or just caudal to the last rib. Following skin incision, hemostats are used to firmly penetrate through the muscles of the body wall and into the caudal thoracic air sac. Spread the jaws of the hemostats to create an opening large enough for insertion of the breathing tube.
D. Placement is confirmed by visualization of fogging in the tube during respiration. In some cases, air can be heard passing through the tube. The mouth and nares may be occluded to require air to flow through the breathing tube.
E. The tube is secured in place using the butterfly tape method described above.
F. An alternative approach for placement of an air sac breathing tube is caudal to the leg. Using this approach, an incision is made just medial to the muscles of the caudal thigh. The hemostat is used to penetrate the body wall into the caudal thoracic air sac. Placing the tube in this location allows for more normal ambulation and is indicated for tubes that will be in place for long periods of time; however, it

is more difficult to place as the hemostat frequently travels subcutaneously rather than penetrating the body wall.

IX. Gastrointestinal Cytology

A. A sample may be collected from the crop (ingluvies) or the cloaca (feces).
B. Insert a saline moistened cotton-tipped applicator into the mouth along the right side of the neck down into the crop.
C. You should be able to feel the end of the swab in the crop.
D. Roll the swap around to make sure you sample the wall of the crop and not just the food within it.
E. Roll the swap onto two or more glass slides for cytology and Gram stain.
F. For fecal cytology, insert a moistened cotton-tipped applicator into the cloaca through the vent.
G. Roll the swab around being sure to sample the wall of the cloaca and, ideally, get some feces on it as well.
H. Process the sample as described above for crop cytology.

X. Esophagostomy Tube Placement

A. Indications for esophagostomy tube placement in birds are to protect the beak, mouth and pharynx during healing following surgery or trauma, to establish a means to provide enteral alimentation for birds that are chronically anorectic requiring repeated tube feeding.
B. The esophagus of birds courses along the right side of the neck. However, this is also the side of the larger jugular vein. In most cases, it is best to place the esophagostomy tube in the left side so it will not interfere with blood collection from the right jugular should that be necessary.
C. It is not necessary to pluck the feathers of the neck for tube placement. The apteryla (featherless tract) on the left side of the neck is identified and prepared for aseptic surgery.
D. An appropriate sized tube is selected and measured so that the tip of the tube will be in the ingluvies (crop). Mark the tube with a Sharpie measuring from the catheter tip end. The tube should be as large as possible to allow the food material to easily pass.
E. A curved hemostat is placed into the mouth and advanced down the esophagus. The hemostat is directed outward in the cervical esophagus to tent the skin in the left side of the neck over the esophagus.
F. A nick incision is made in the skin and esophagus allowing the hemostat to be pushed outside the skin. A small nick is created as the incision will generally stretch to accommodate the catheter.
G. The blunt end of the red rubber tube is grasped in the forceps and it is pulled through the skin, into the esophagus, and out the mouth.
H. The blunt end of the tube is cut off and 2-3 additional side holes are created in the tube to help minimize the risk of tube plugging.
I. The tube is turned around and passed down the esophagus to the ingluvies. It is advanced to the mark created on the tube to assure that it is placed the appropriate distance into the esophagus.
J. The tube is secured in place using a butterfly tape or a purse-string suture with a figure trap suture to prevent the tube from pulling out.

K. The external end of the tube is plugged with a Christmas tree adaptor or a catheter male adaptor for smaller tubes. The tube is flushed with water before and after each use to help minimize the risk of tube plugging.

L. It is best to allow the tube to remain in place at least 5 days to allow tissues to heal around the tube.

M. Once the tube is no longer needed, the sutures are removed, the tube is pulled, and the wound is allowed to heal by second intention.

N. Most birds tolerate esophagostomy tubes very well and do not attempt to remove them. They may be maintained for months to provide supplemental or complete enteral nutrition. It is easy to show owners how to use the tube at home.

XI. Ingluviotomy for Foreign Body Retrieval

A. A foreign object has been placed in your bird. This will be removed through an ingluviotomy.

B. Pluck the feathers over the crop of the bird (thoracic inlet) and prepare the skin for aseptic surgery.

C. You will use a scalpel and scissors for this procedure but if you have an electrosurgical or radiosurgical unit it will help with hemostasis. Make a 1-2 cm incision left of midline in the thoracic inlet and identify the underlying crop. Be careful to not cut through both the skin and the crop wall.

D. Make a corresponding incision in the ingluvies.

E. Remove the contents of the crop until you can identify and retrieve the foreign object.

F. Closure is accomplished in two layers. The ingluvies is closed in a simple continuous pattern of monofilament synthetic absorbable material. You may oversew with an inverting pattern to get serosa-to-serosa contact and improved healing. The skin is closed in a simple continuous pattern or Ford interlocking pattern.