Tracheal disease in avians: preparation and treatment

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The trachea extends from the base of the tongue to the primary bronchi, just within the chest cavity.

It runs opposed to, and parallel with, the oesophagus. Birds do not have an epiglottis – instead, the rima glottis functions to open and close, protecting the airway when swallowing and otherwise enabling respiration. The rima glottis is located in the caudal tongue.

The proximal trachea attaches to the rima glottis (joining the tongue to the trachea). The avian larynx (unlike in mammals) is not involved in vocalisation – this function is performed by the syrinx (situated at the tracheal bifurcation in the proximal thoracic cavity). Thyroid and epiglottic cartilages are absent. The larynx functions to open the glottis during inspiration, and to close it during swallowing (**Figures 1** and **3**).

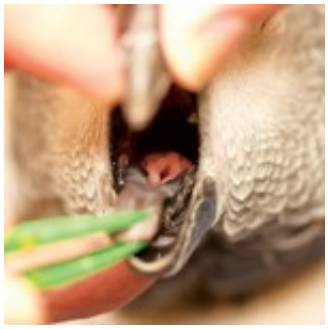

Figure 1. African grey parrot glottis – entrance into the trachea.

Figure 2. Close-up of a psittacine glottis.

Figure 3. Papilloma lesion on the glottis of a hawk’s head, caused by psittacine herpesvirus.

There is significant tracheal variation between species. The level of the bifurcation into the primary bronchi can vary (penguins and spoonbills are more proximal), the length and convolutions of the trachea vary inside or outside the sternum (55 species, mainly cranes and swans, possess complex loops), while some ducks have distended syringeal bulla (an ovoid resonance chamber, created as a dilation from the lower trachea). For voice alteration, such structures are absent in psittacines.

The trachea consists of four layers: mucous membranes, sub-mucosa, cartilage and adventitia. The internal lining comprises a glandular epithelial layer. The rigidity of the trachea is made up of complete rings (shaped like signet rings), which interlock, unlike the incomplete tracheal rings of mammals. The trachea divides into the primary bronchi at the level of the syrinx, just within the thoracic cavity (note species variations, such as penguins bifurcating more proximal).

The diameter of the psittacine lower trachea ranges from 1.5mm in cockatiels, 3.5mm in African grey parrots, and 6mm in blue and gold macaws. As such, any foreign body (such as millet seed), tumour or fungal granuloma (for instance, aspergilloma), will rapidly cause a significant or complete

blockage to airflow. Other common clinical signs of tracheal disease are:

- increased noise on inspiration or expiration
- coughing (although this is often the bird imitating a human family member)
- wheezing
- tail bobbing in rhythm with the breathing
- a loss or change of voice

Aetiology

A range of disease aetiologies are seen in psittacines, including:

- trauma
- inhalation of foreign bodies or material
- parasitic infestation
- bacterial, fungal or viral infections
- neoplasia – tumours are rare, so full and thorough history collection is vital

Species, accommodation and lifestyle, and nature of husbandry have a great bearing on predisposition to respiratory disease. For instance, parasitic tracheal disease is more common in aviary-kept birds with earthen floors.

Presenting signs

Birds with tracheal disease present with respiratory stridor, inspiratory or expiratory noise, tail bobbing, coughing (although in parrots this is typically due to mimicry), loss or change of voice or wheezing.

Any pre-handling (non-
invasive) clinical pathology tests that can be carried out (such as faecal parasitic ova analysis) should be conducted. Once tracheal parasites are excluded, preparation should be made for more invasive diagnostic tests.

Preoxygenation (30 minutes) may be appropriate prior to handling. Typically, the clinician is uncertain of pathology until tracheoscopy is undertaken; preparations in respect of equipment and staffing should be made.

Preparation

The patient is anaesthetised using a gaseous anaesthetic. The endoscope (typically a 2.7mm, 0°), is then advanced down the trachea, while carefully observing the appearance of the internal

tracheal lining, to the syrinx (bifurcation into the primary bronchi).

Equipment should be at hand to recover any foreign bodies, sample (so testing for relevant pathogens can be carried out), and aspirate any exudate. In the event of a significant tracheal obstruction, an air sac breathing tube (akin to a tracheotomy tube in a mammal), is placed either in front of the pelvic limb between the 7th and 8th rib on the left side, or caudal to the pelvic limb in the sub-lumbar area, entering the caudal thoracic air sac.

The caudal thoracic air sac is larger on the left side, which is used preferentially unless pathology otherwise dictates. This air sac tube bypasses the trachea and introduces air into the respiratory system before it has passed over the oxygen transfer surface of the lung.

The lining of the trachea should be pale pink, dry and shiny with a slight silvery appearance.

During this procedure, foreign bodies (such as seeds), foreign material (for example, plaster dust in the tracheal lining), exudates as a result of infections, parasites (such as *Syngamus trachea*), fungal plugs (aspergillosis), soft tissue narrowing (tracheal stenosis, typically consequent to previous trauma or aspiration of crop contents), and tracheal flattening (following previous trauma to the front of the neck) may be observed (**Figures 4** to **7**).

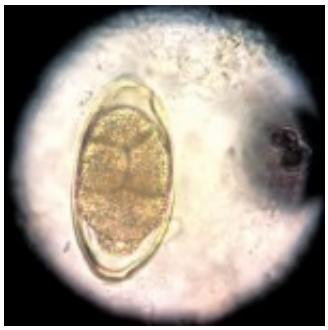

Figure 4. *Syngamus trachea* ova, seen under the microscope.

Figure 5. *Syngamus trachea* worms seen in saline.

Figure 6. *Syngamus trachea* worms seen in the trachea of a dead bird.

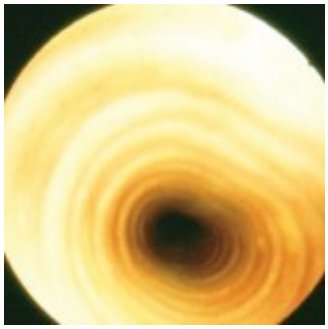

Figure 7. Normal endoscopic view of the trachea.

Infectious conditions

Bacterial

Bacterial pathogens commonly comprise *Streptococcus* species, *Staphylococcus* species, *Klebsiella* species, and *Pseudomonas* species, but other enterobacteriaceae may occur.

Fungal

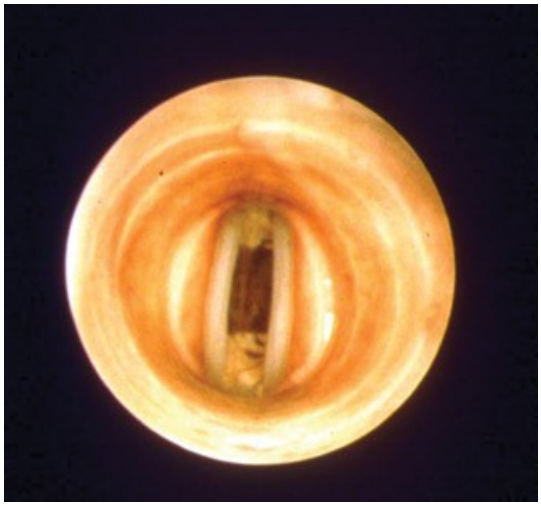

Figure 8. Early aspergillosis lesion.

Figure 9. Advanced Aspergillosis lesion.

Candida is rarely found, but *Aspergillus* species is the most common of all pathogens. Aspergillosis is characterised by a white (to cream), soft to hard “globule” of exudate at any point in the trachea (most commonly at the syrinx). Suction or surgical removal may be required. Medical therapy with

voriconazole, itraconazole or similar is indicated and must be maintained for two months, with regular post-treatment rechecks for recurrence (**Figures 8** and **9**).

Viral

Herpes tracheitis of Amazon parrots, infectious bronchitis and other species-specific viral pathogens are occasionally found.

Parasitic

Tracheal mites

Sternostoma tracheacolum are common in finches and occasionally found in canaries, but not normally in psittacines. Gasping, wheezing, coughing, and neck stretching may be evident. Tracheal transillumination (wetting feathers with alcohol) will enable visualisation of intratracheal mites. Mites are controlled by treating the whole group with topical per cutaneous avermectin therapy on two occasions, seven to 10 days apart.

Syngamus trachea

Syngamus trachea (gape or lungworm) is most commonly found in aviary birds that eat earthworms (the latter are an intermediate host for S trachea). Adult *S trachea* worms are found in the trachea and live in permanent copulation (Y-shaped as the male worm is much shorter). Infected birds may present with dyspnoea, stridor, loss or change of voice, respiratory distress, gasping or coughing.

Any patient in which Syngamus is possible should undergo faecal examination prior to other diagnostics. All birds in the same aviary should be treated (using benzimidazole or avermectin) and future access to soil and earthworms should be prevented (**Figures 4** to **6**).

Trichomonas gallinae

Trichomonas gallinae is a motile protozoal parasite. It is very rarely found in the trachea and should be considered as an alternative differential.

Chlamydia psittaci

Causing chlamydiosis, also known as psittacosis, *Chlamydia psittaci* rarely causes tracheitis, instead tending to affect the air sacs, lungs or upper respiratory tract. However, it should always be excluded in psittacine respiratory cases. The pathogen is reported to affect between 20% to 80% of all psittacine birds. It is highly infectious between birds and can cause serious, even fatal, disease in humans.

Toxic/irritant

Inhalation of smoke (such as household fires) is less commonly serious compared with mammals (principally as air passes through the avian pneumonic system). Smoke particles may settle out in the air sac system prior to reaching the respiratory exchange surface. Fine particulate matter inspired (such as plaster dust) may cause long-term tracheitis, and may be problematic to resolve.

Trauma

Internal trauma to the trachea may arise following aspiration of food or crop contents, or from pressure after cuffing or use of oversized endotracheal tubes. This is a particular risk in macaws, where the trachea is very wide at the glottis, but rapidly narrows. A correctly sized tube at the glottis will be excessive at the distal point. Tracheal stenosis typically arises 10 days later (**Figure 10**).

Figure 10. Tracheal stenosis lesion following surgical removal.

Figure 11. Air sac breathing tube prior to placement.

Figure 12. Air sac breathing tube in situ.

Air sac breathing tube

In situations where there is significant loss of functional respiratory diameter, or risk of this arising during or following treatment, then an air sac breathing tube should be inserted into the left caudal thoracic air sac, gaining access either between the seventh and eighth rib (**Figures 11** and **12**).

After air sac tube placement, tracheal lesions may be aspirated per glottis, otherwise tracheotomy or tracheotomy may be necessary.

Tracheotomy

Tracheotomy is indicated for treatment of syringeal aspergilloma or retrieval of foreign bodies, where in situ treatment or per glottal aspiration are impossible. This is a delicate procedure, with significant risk of postoperative complications, particularly if performed by inexperienced avian vets and should not be undertaken by regular companion animal vets. The trachea is very fragile and damage may be caused during surgery, resulting in a postoperative tracheal stenosis (**Figure 13**).

In cases where a severe tracheal stenosis occurs following trauma (including recent intubation) or infection, tracheal resection and removal of the affected tissue can be performed.

Depending on the site of the lesion, most species can cope with losing up to six (on occasions eight) tracheal rings. In such cases, close apposition of cartilages following surgery, using a suture material that elicits minimal tissue reaction, will minimise the risk of intraluminal granuloma formation. Trauma to tracheal tissues during surgery is minimised.

This would normally only be considered by experienced and highly trained avian surgeons. However, it can be a most rewarding procedure, with very rapid and marked postoperative clinical

improvements (**Figure 14**).

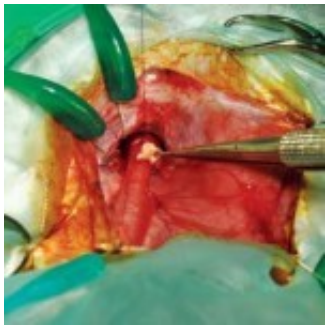

Figure 13. Tracheotomy in process, with removal of aspergilloma.

Figure 14. Section of diseased trachea following resection. The patient made a full recovery in three days, having been under treatment with various vets for several months.

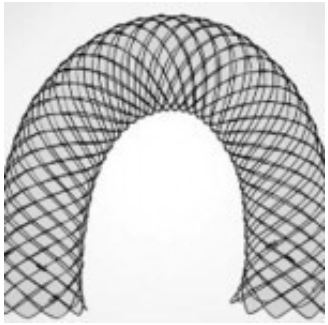

Figure 15. Illustration of a tracheal stent.

Placement of tracheal stents

Although rarely indicated,a custom-made stent can be used where tracheal rings have suffered trauma, such that the tracheal aperture is a flattened ovoid, rather than a circle, and the patient has difficulty breathing. The smallest possible size is 4mm – suitable for larger Amazons and also macaws, but not smaller species – and may be fitted within the internal lumen of the trachea.

This procedure has only been carried out on a few psittacines worldwide, but has a place when other options are exhausted. If only a small section of trachea is affected, then a tracheotomy is a viable alternative. (**Figure 15**).

- Please note drugs mentioned may not be licensed for birds and should be used under the cascade.