A Short Review of the Methods Used and Outcomes in Some Recent Avian Cases Following Ventriculotomy for Foreign Body Removal

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Introduction

A number of methods have been developed for managing cases involving ventricular foreign bodies in birds, both medical and surgical. This paper looks at surgical methods including four cases involving eight birds at our clinic where surgery was performed to remove foreign material from the avian ventriculus.

Birds have a curious nature and a natural desire to explore their environment and often do this with their beaks, picking up objects to examine them. Parrots bite and chew into objects, while pigeons peck and forage. The opportunity for ingestion of foreign material therefore often presents itself. Several reasons have been proposed for the deliberate ingestion of foreign material. These include the provision of a novel substrate, hunger, a deficient diet and crop or proventricular pain.

Because of the stomach arrangement in birds, many objects that would often pass through a mammalian digestive tract, such as small balls and needles, will not pass and many are retained in the ventriculus.

This combination of factors contributes to making the diagnosis of problems associated with foreign body ingestion not an uncommon one in birds. Foreign material retained in the gizzard can lead to physical obstruction, damage to the ventricular wall, interference with ventricular function or be digested to release toxins (especially in the case of heavy metal ingestion).

Clinical signs such as inappetance, regurgitation, weight loss, abdominal distension, enlarged ventriculus, lethargy and neurological signs can be seen. Diagnostic aids include palpation, radiology – plain and contrast, biochemistry and haematology, faecal examination and endoscopy.

The avian stomach consists of the glandular proventriculus and the muscular ventriculus. The junction of these is a constriction called the isthmus. Compared with the mammalian stomach, the ventriculus is much less amenable to surgery. This is due to the highly vascular thick muscular wall, which is difficult to manipulate and slow to heal. The ventricular wall has four bands of muscle – two thick layers of circular smooth muscle that join at a tendinous aponeurosis on the left and right sides, and two layers of paler, thin muscles forming blind sacs cranially and caudally. These sacs are recommended as the best place for a ventriculotomy incision. [1]

The ventriculus can be accessed surgically by incising directly into the ventriculus, as we have in these cases, or through an incision in the proventriculus. The proventriculus approach has the benefits of being easier to manipulate, ability to invert the suture line to achieve a better seal and faster healing. The disadvantage is that full access to the ventriculus is not achieved and large objects cannot always be removed through this method. A ventriculus approach will obviously allow better visualization of the contents within the ventriculus, but is more difficult to close and is slower to heal.

The proventriculus is very fragile and easily torn so must be handled with atraumatic instruments. Stay sutures can be placed in the ventriculus to allow elevation of the two structures for better access and visualization. The proventriculus/ventriculus should be packed off from the coelomic cavity with moist swabs to prevent contamination. Leakage from the incision may be more likely due to the lack of omentum. Thus, the surgeon must be meticulous with the closure of any incision. Food and water should be offered in the immediate postoperative period. If incisional leakage is of concern, a duodenal feeding tube can be placed to bypass the stomach during the healing phase. [2]

A proventriculotomy is performed through a left coeliotomy incision. Soft tissue supporting structures are bluntly dissected to allow elevation and better visualization of the proventriculus. The proventriculus is incised with a scalpel at the isthmus, and the incision is extended with scissors orad in an avascular area. An endoscope, forceps, suction and a small curette can be useful tools in assisting evacuation of contents from the ventriculus. Closure is achieved with two layers of fine monofilament absorbable suture – a simple continuous layer for apposition and then a continuous inverting pattern to achieve a good seal. [3]

There are two approaches described for ventriculotomy. One involves a similar approach as above for the proventriculus, where the initial incision at the isthmus is extended distally into the ventriculus. The other, which we have used, involves an incision in the thinnest portion of the ventricular wall. This is an area on the caudo-ventral ventriculus where the muscle fibres run in a different direction and are much paler than the rest of the ventriculus. Closure can be achieved with a single layer of slowly absorbable monofilament suture in a horizontal mattress pattern. As an alternative to this, our method of closure involves two layers of 4-0 PDS in a simple interrupted pattern. The inner layer was placed deep in the muscle layer and included the ventricular lining adjacent to the koilin, with the outer layer encompassing the outer layer of muscle and exterior surface of the ventriculus.. We feel that this provides a more secure closure.

CASE 1 – "PUDDLES", A 6-MONTH OLD FEMALE DOMESTIC DUCK

Presented for repeated straining (as if constipated) and attempts at regurgitation. On examination, the duck was underweight, the ventriculus was palpably enlarged and there was also palpable grinding of its contents, indicating hypermotility. X-rays revealed seven rocks, each approximately 3cm x 3cm, and a bottle top in the ventriculus. There were also two larger rocks in the crop.

Under isoflurane/oxygen general anesthetic, a diagonal coeliotomy approach was made to the ventriculus. The ventriculus was incised at the caudal sac and the rocks and bottle top were removed. A two-layer 4-0 PDS closure of the ventriculus and routine abdominal closure was performed. Rocks from the crop were also removed by milking them out through the mouth. "Puddles" was discharged on oral enrofloxacin for 5 days, was to be kept warm and dry, and fed normally. At a revisit in 10 days, "Puddles" was doing well, had put on weight and her skin wound had healed. At a 28-day revisit she was clinically normal and the ventriculus was also palpably normal. At the time of writing this paper, "Puddles" had represented with three rocks in her ventriculus. These have again been removed in the same manner and 10 days later she is doing well.

CASE 2 – "CHUCKY", A 2-MONTH OLD FEMALE SCALY BREASTED LORIKEET.

Initially "Chucky" presented for chronic regurgitation. She was being fed a home diet. On clinical examination, she was thin and pale, with a palpable hepatomegaly. Blood results included changes consistent with hepatopathy and cachexia or malabsorption. A Chlamydia immunocomb was a weak positive, Chlamydia PCR was positive. She responded well to a change in diet to Passwell's Lorikeet formula, the provision of fruit and vegetables and a 6-week course of doxycycline injections.

Two months later, "Chucky" represented for regurgitation. On physical examination her ventriculus was palpably enlarged. On follow-up blood tests, the biochemistry was normal, however the haematocrit had dropped further and leucopenia was now evident. A series of barium contrast x-rays revealed a filling defect in the ventriculus.

"Chucky" had a general anaesthetic with isoflurane/oxygen and an exploratory coeliotomy. The ventriculus was incised at the caudal sac and a large fibrous ball removed. 4-0 PDS was used for a two-layer closure of the ventriculus. The bird was discharged from hospital with a prophylactic course of enrofloxacin.

Four weeks later, "Chucky" had developed a discharging abdominal wall sinus from the ventriculus. This was repaired under general anaesthetic. At revisits at 4 days, 3 weeks and 5 weeks post-surgery, "Chucky" had made a good recovery and her ventriculus was palpably normal.

	1/06/2007	17/09/2007	Normal
Calcium (mmol/L)	1.7	2.1	2-2.9
Protein (g/L)	18	28	19-41
Albumin (g/L)	7	12	13-21
AST (IU/L)	525	214	141-369
CK (IU/L)	3382	224	178-396
GLDH (IU/L)	13	2	<3
Haematocrit	0.38	0.33	0.41-0.55
WCC (x 10^9/L)	13.8	3	8-13
Heterophils	75%	53%	(39-60)
Lymphocytes	8%	32%	(22-69)
Monocytes	17%	11%	<3

Table 1: "Chucky" Blood Test Results Out of Normal Range.

CASE 3 – THREE RACING PIGEONS

Three breeding hens from a racing loft were presented by their owner because they had become lethargic and lost weight. These were 2-, 4- and 5-year old birds who had been paired two weeks earlier. The loft had been renovated immediately prior to the breeding season. On clinical examination, the birds were underweight, lethargic, dehydrated and had green droppings. Two of the birds had palpable abnormalities on the surface of their ventriculi. X-rays showed bits of wire and nails in the ventriculus of all three birds, presumably collected as nesting material from the recent loft renovations. In two of the birds, one or more pieces of wire and nails had perforated the full ventricular wall with some nail heads lying flat against the koilin.

Each bird in turn was given an Isoflurane / oxygen general anesthetic. A diagonal incision in the abdominal wall was made, the ventriculus was incised at the caudal sac and the foreign material removed. Multiple fibrotic adhesions covered the ventricular surface surrounding the protruding foreign bodies and leaked ventricular contents. One nail tip protruded into the ventral surface of a kidney lobe and had resulted in an abscess full of caseous material. The ventriculus was closed with two layers of 4-0 PDS. Sutures were also placed in the ventricular wall where wire had perforated it and visible purulent material removed. Post-operative care included heat, injectable calcium EDTA and enrofloxacin and hand feeding pigeon pellets.

Two of the birds made an uneventful recovery; the third represented with an abdominal/ventriculus sinus 3 weeks later, which was repaired under general anaesthetic. This was repeated another two times at 3- week intervals before the bird finally recovered.

CASE 4 - THREE RACING PIGEONS

Three breeding hens were presented from a pigeon racing loft under similar circumstances to Case 3. The loft having been renovated prior to breeding and inadequately cleaned, giving birds access to wire and nails when collecting nesting material. The birds had swallowed one, three and four lengths of wire respectively, varying in length from 1 to 3 cm. All had collected in the birds' gizzards. None had perforated the full ventricular wall, although some had pierced the ventricular lining. All birds were managed as in Case 3, made an uneventful recovery and were discharged 3 days post-operatively. The birds failed to present for re-examination but on contacting the owner 6 weeks pos-surgery two birds appeared well in the loft while the third bird had been found dead on the floor 4 weeks after surgery. The cause of this death was not investigated.

Summary

Of the eight birds in this paper undergoing ventriculotomy using the approach and closure method described, five recovered uneventfully, two developed abdominal/ventricular sinuses, requiring repeat surgery (one of these two on two occasions) and one bird died 4 weeks after surgery of an unknown cause, but the close proximity to surgery raises the possibility of a surgical complication. The bird that developed repeat abdominal/ventricular sinuses was a racing hen with severe ventricular wall damage associated with multiple full ventricular wall perforations and secondary infection and it is likely that this contributed to her delayed healing.

Seven of the eight birds eventually made a full recovery, indicating that this surgical approach is an acceptable one under certain circumstances, particularly when large or irregularly shaped ventricular foraging bodies are involved or there is the risk of ventricular wall injury requiring repair. However, the risk of delayed healing and sinus formation is a significant one and should be considered in post-operative management and care.

References

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