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Short Communications

Fluoroscopic evaluation of gastrointestinal transit time in African Grey parrots

M. Kubiak, N. A. Forbes

Contrast studies are commonly performed to evaluate the gastrointestinal tract. With ever increasing knowledge of Proventricular Dilation Disease (PDD) in psittacines, and its association with avian bornavirus, radiographic assessment of the proventriculus is used as a diagnostic and screening tool for PDD (Bond and others, 1993, Boutette and others 2004, Clubb and others 2006). Contrast radiography is carried out following crop tube administration of a radiopaque solution. The resulting radiographic series gives information on gastrointestinal tract morphology with approximation of transit time by evaluating contrast medium progression. However, each single exposure requires fixed positioning, and stress associated with repeated handling and restraint can directly affect motility, thus distorting results (Tully and others 2000). Use of anaesthesia is advisable in minimising stress and improving positioning, but this risks regurgitation of contrast medium on induction with associated aspiration pneumonia. Anaesthesia itself has effects on intestinal contractility (Tully and others 2000). Gaseous anaesthetic induction can also lead to aerophagia and gaseous dilation of the gastrointestinal tract, complicating film interpretation and potentially leading to false positive identification of proventricular dilation (McMillan 1999). There is significant variation of gastrointestinal transit time reported between avian species, and also between individuals with factors such as diet, food availability, health, stress, medications administered and age cited as factors (Garcia Martinez and others 2007).

Fluoroscopy has been proposed as an alternative to radiography, avoiding some of the complicating factors and offering additional advantages (Ritchie and others 2004, Harcourt-Brown 2005). The real-time images produced allow assessment of gastrointestinal tract morphology, and also appreciation of peristaltic movements for superior assessment of gastrointestinal motility. As images are continuously streamed and updated, positioning is less critical than for a single radiographic exposure. This means that birds do not need significant restraint, resulting in decreasing patient stress, and avoiding chemical interference in results. Fluoroscopy is also considered a more sensitive test for PDD, as the changes in intestinal motility can be identified on real-time assessment earlier than dilation, which would be evident on standard radiographic images (Boutette and others 2004, Clubb and others 2006). Abnormalities indicative of PDD include dilation of the gastrointestinal tract, particularly the proventriculus and proventricular-ventricular junction, and slow passage of contrast media. Currently, assessment of transit times relies on comparison with anecdotal values or published values recorded from radiographic series in anaesthetised birds which may not be directly comparable. This study utilised fluoroscopy in evaluation of the intestinal tract of African Grey parrots, with subsequent comparison of the transit times recorded against reported values from radiographic contrast series.

The birds involved in this study were eight clinically healthy African Grey parrots (*Psittacus erithacus erithacus*) aged 2.8 ± 3.4 years (range 1–10 years), with DNA-confirmed sex distribution of two males and six females, and weighing 446 ± 36 g (range 402–494 g). The birds were kept by a single breeder with a large psittacine collection with no evidence of bornaviral pathology identified at any time in the closed parent flock. The birds in this study were submitted for fluoroscopic examination to evaluate proventricular size and gastrointestinal motility as indicators of subclinical bornaviral changes, as part of a screening programme prior to sale as breeding animals. Clinical examination and evaluation of stained faecal smears on the day of fluoroscopy were unremarkable.

Each bird was administered 25 ml/kg of a 30 per cent w/v barium sulphate suspension via crop tube, as described by McMillan (1999). Immediately following administration, the bird was placed into the fluoroscopy chamber. This was a specially constructed clear plastic box with ventilation holes and a perch fixed at a height to allow visualisation of the entire coelom during fluoroscopy. The birds were kept in these chambers for the duration of the fluoroscopic evaluation period to avoid the repeated stress of handling, though food and water were offered in suspended bowls for short periods at intervals of two hours.

Fluoroscopy was carried out immediately after placement into the chamber (designated time 0). Further fluoroscopic examinations were carried out at 15, 30, 45, 60, 90, 120, 180, 240, 200 and 360 minutes. Results are shown in Table 1.

No birds demonstrated any proventricular dilation or abnormal peristaltic movements. In all birds, clear visualisation of the barium suspension was possible. At time 0, barium was found primarily within the crop, but in all birds barium was also found in the proventriculus, and in the ventriculus of four birds. Presence of barium in the ventriculus was noted at 30 minutes in all birds. The proventriculus was never seen to contain greater than 30 per cent luminal filling with contrast media; a similar phenomenon has been noted in contrast evaluation of Blue-fronted Amazons (Vink Nooteboom and others 2003). Movement of barium into the intestines was seen between 15 and 90 minutes after barium administration.

Crop emptying time was highly variable, with one bird having an empty crop by 120 minutes, and three birds continuing to demonstrate low-grade crop filling at 360 minutes. Barium was still present in all birds' ventriculi and intestines at the end of the 360-minute monitoring period. The onset of intestinal filling varied from 15 to 90 minutes. Both antegrade and retrograde peristaltic contractions were noted within the intestine, and this is considered a normal finding in psittacine species (Gancz and others 2010). In this group, there were consistent time periods identified when barium would be found in a given gastrointestinal segment in all birds.

Gastrointestinal transit time was defined as the time taken for the contrast medium to move from the crop at time 0, to the cloaca. In six of the eight birds this was 240 minutes, with 300 and 360 minutes being recorded in the remaining two birds, giving a mean value of 262.5 minutes with a standard deviation of 44.64 minutes. Previously reported values for radiographically determined transit times for this species of 120–130 minutes (McMillan 1999) vary markedly from the recorded values suggesting that imaging technique, restraint and use of anaesthesia are likely to significantly impact on gastrointestinal transit times.

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TABLE 1: Time of filling of named gastrointestinal regions following barium administration to African Grey parrots (Psittacus erithacus erithacus) undergoing fluoroscopy

	Time of initial filling with contrast medium (minutes)				
Bird	**Crop**	**Proventriculus**	**Ventriculus**	**Intestines**	**Cloaca**
1	0	0	0	90	240
2	0	0	15	15	240
3	0	0	0	30	240
4	0	0	15	15	240
5	0	0	0	90	360
6	0	0	0	15	300
7	0	0	30	90	240
8	0	0	15	30	240
Mean	0	0	9.375	46.875	262.5
Times common to all birds	0–90	0–90	15–780	90–780	360–700

As specific laboratory bornavirus testing develops, the role of imaging in screening of birds may change. Bornaviral screening of mammals by serology is not frequently resorted to, as antibody titres remain low even in clinical disease, but avian bornavirus causes a systemic disease, and may induce a more marked humoral response (Staeheli and others 2010). If demonstrated to be specific and sensitive in psittacine species, then serology may become preferred for viral screening of apparently healthy birds. However, this does require demonstration of a rising titre to confirm infection rather than exposure, and blood sampling typically requires general anaesthesia in psittacines. Using PCR technology to detect viral RNA on a cloacal swab may be preferable as a non-invasive testing method, but there are concerns that subclinical cases may falsely test negative due to low or intermittent viral shedding, and marked genetic variability of avian bornaviruses is not reflected in the limited primer sets available so far, thus, use of PCR as a screening tool is limited (Staeheli and others 2010)

Imaging will always remain a vital tool in detecting clinical PDD, and it is hoped that the values recorded from this study will be beneficial in providing reliable data for subjectively identifying changes in intestinal motility and filling. Further studies would be beneficial to confirm whether the values reported are consistent across the larger population, and to compare the baseline values with those in birds with confirmed clinical PDD and other gastrointestinal pathology.

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