# Textile foreign body in a Green Iguana (*Iguana iguana*): Diagnostic imaging for localisation

M. Lebens[1], B. Länger[2], P. Günther[1], M. Fehr[1, 2], K. A. Mathes[1]

[1] Clinic for Pets, Reptiles and Birds [2] and Clinic for Small Animals, University of Veterinary Medicine Hannover, Germany

## Summary

This case report includes different diagnostic imaging methods for localization of textile foreign bodies in reptiles and shows the limitations and advantages of these methods. A six-year-old, male, green iguana was presented to our clinic after ingesting a sock 5 days earlier. Ultrasound, contrast x-ray, computed tomography and endoscopy were used to locate the foreign body before surgery. Attempts to remove the sock endoscopically failed. The sock was surgically removed via celiotomy and enterotomy.

Keywords: reptiles, lizards, diagnostic imaging, foreign body, gastrointestinal tract

## Grüner Leguan (*Iguana iguana*) mit textilem Fremdkörper: Bildgebende Diagnostik zur Lokalisation

Dieser Fallbericht beinhaltet verschiedene Methoden bildgebender Diagnostik zur Lokalisation von textilen Fremdkörpern bei Reptilien und zeigt die Grenzen und Vorteile dieser Methoden auf. Ein sechs Jahre alter grüner Leguan wurde in unserer Klinik vorgestellt, nachdem er 5 Tage zuvor einen Socken verschluckte. Ultraschall, Kontrastmittelröntgen, Computertomographie und Endoskopie wurden angewandt, um die Lage des Fremdkörpers vor einem operativen Eingriff zu bestimmen. Versuche den Socken endoskopisch zu entfernen schlugen fehl. Der Socken wurde schließlich via Coeliotomie und Enterotomie entfernt.

Schlüsselwörter: Reptilien, Echsen, bildgebende Diagnostik, Fremdkörper, Gastrointestinaltrakt

DOI 10.17236/sat00093

Received: 17.12.2015
Accepted: 28.07.2016

## Introduction

This case report includes different diagnostic imaging methods for localization of textile foreign bodies in reptiles and their removal. Foreign bodies in gastrointestinal tracts are common findings in reptiles and cause different clinical signs due to their size, shape and material (Kik and Nickel, 2001; Büker et al., 2010). In pet reptiles given free reign of rooms or whole garden enclosures, foreign bodies are even more common. Ingestion of bedding material, especially sand, gravel and shavings, may cause gastrointestinal obstruction (Rahal et al., 1998). Obstructed animals may present with depression, anorexia and/or vomiting (Anderson, 1992; Wellehan and Gunkel, 2004). For an adequate interpretation of imaging knowledge about the gastrointestinum anatomy of the green iguana is required (Iverson, 1980; Smith et al., 2001). Diagnostic imaging like x-ray, ultrasound, computed tomography (CT) and endoscopy should be combined to reliably diagnose the localization of the foreign body (Hernandez-Divers, 2001; Schumacher and Toal, 2001; Banzato, 2013). Contrast-enhanced study is a common non-invasive diagnostic technique that enables good visualisation of the gastrointestinal tract. Megluminamidotrizoat/Natriumamidotrizoat (Me/Na) (Gastrolux®, Sanochemia Pharmazeutika AG, 1090 Wien, Austria) is an appropriate contrast agent to gain a fast result of the location of obstructions in the gastrointestinal tract via x-ray or computed tomography (Meyer, 1998; Gumpenberger and Henninger, 2001; Long et al., 2010). Gastroscopy is another diagnostic option to locate and even remove foreign bodies still resting in the stomach (Lumeij and Happe, 1985). If removal via gastroscopy is not possible, the foreign bodies have to be removed via celiotomy (Mitchell and Diaz-Figueroa, 2005; Büker et al., 2010).

## History and clinical examination

A six-year-old, 5 kg, male, green iguana (*Iguana iguana*) was presented after ingesting a sock 5 days earlier. It was kept in a 2 × 2 × 2.3 meters wooden terrarium, containing branches, artificial plants and a large pool on a bed of wood chips. UV lighting was provided and humidity was maintained at 70%. The diet consisted of daily vegetables and occasional fruits. A calcium-vitamin product was provided daily. The iguana had free run in the room during a cleaning session. After the keeper left the room he missed a sock he used for cleaning, so the keeper assumed that the iguana ate the sock while he left the room. The day after suspected ingestion the iguana still accepted its usual food but in the following days it stopped eating completely. Three days later it started vomiting undigested food. Defecation was reduced and could not even be improved with repeated baths. In our clinic no abnormal findings were seen at examination.

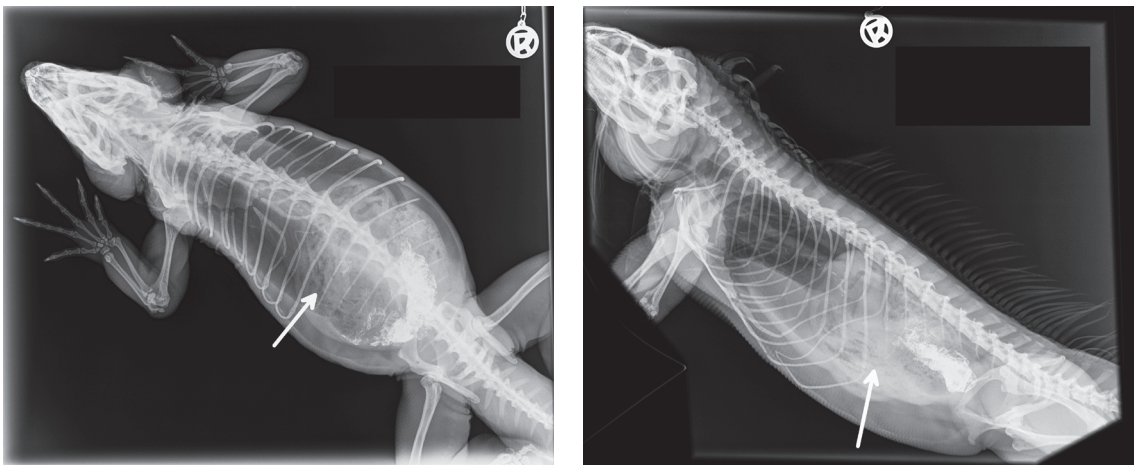
## Diagnostic imaging (pre surgical)

The laterally recumbent plain x-ray (Bird S/M 60 cm; 50 kV; 5 mAs. Gierth HF 400 A, Gierth X-Ray Int. GmbH, Riesa, Germany) showed a textured, well-filled gastrointestinal tract and a roundish, pleated structure could be differentiated in the middle of the coelomic cavity. Due to the fact that the stomach of the green iguana is located nearly in the middle of the coelom it was not yet clear, whether there was a portion of the ingested foreign body still in the stomach or if it had completely passed to the proximal parts of the intestine. Via ultrasound, a clear view of the suspected foreign body was not possible.

The iguana was hospitalized and a contrast-enhanced x-ray study was started by administering Me/Na (Gastrolux®, Sanochemia Pharmazeutika AG, Wien, Austria) suspension (2 ml/kg, PO). After oral administration the first x-ray was taken immediately, and then repeated after 30 min, 1.5 h and 3.5 h. The contrast agent entered the u-shaped stomach and then passed distally. After 1.5 h and 3.5 h there were still some remains of Me/Na (Gastrolux®, Sanochemia Pharmazeutika AG, Wien, Austria) in the stomach but most of it had accumulated in the right ventral position proximal to and within the textile foreign body (Fig. 1A, B).

## Therapy

While the green iguana stayed in our clinic, we started an antibiotic therapy with enrofloxacin (Baytril®, Bayer Vital GmbH, Leverkusen, Germany) (10 mg/kg, SC, q 24 h, 21 days) and carprofen (Rimadyl®, Pfizer, Berlin, Germany) (4 mg/kg, SC, once preoperative, then q 24 h, 5 days after surgery). We also administered a 2.5% glucose infusion (20 ml/kg, SC, q 24 h) in order to stabilise the circulatory system. A blood sample was taken from the vena coccygea ventralis to determine the suitability for anesthesia and whether blood values had already altered. Blood chemistry showed no significant abnormalities (Tab. 1) (Hitachi, cobas C311, F. Hoffmann-La Roche AG, Basel, Switzerland). Me/Na (Gastrolux®, Sanochemia Pharmazeutika AG, Wien, Austria) was orally administered 24 hours before general anesthesia was performed. Anesthesia was induced with intramuscular injection of diazepam (Lipuro®, B. Braun Melsungen AG, Melsungen, Germany) (1mg/kg, IM) and ketaminhydrochloride (Ketamin®, B. cp-pharma, Burgdorf, Germany) (5 mg/kg, IM) into the forelimbs, followed by exposure to isoflurane (Isofluran-cp®, cp-pharma, Burg-



**Figures 1:** Dorsoventral (A) and lateral (B) radiographs of the iguana´s coelomic cavity showing the accumulation of the contrast agent proximal to and within the textile foreign body (arrows) 3.5 hours after administration of Megluminamidotrizoat/ Natriumamidotrizoat[a].

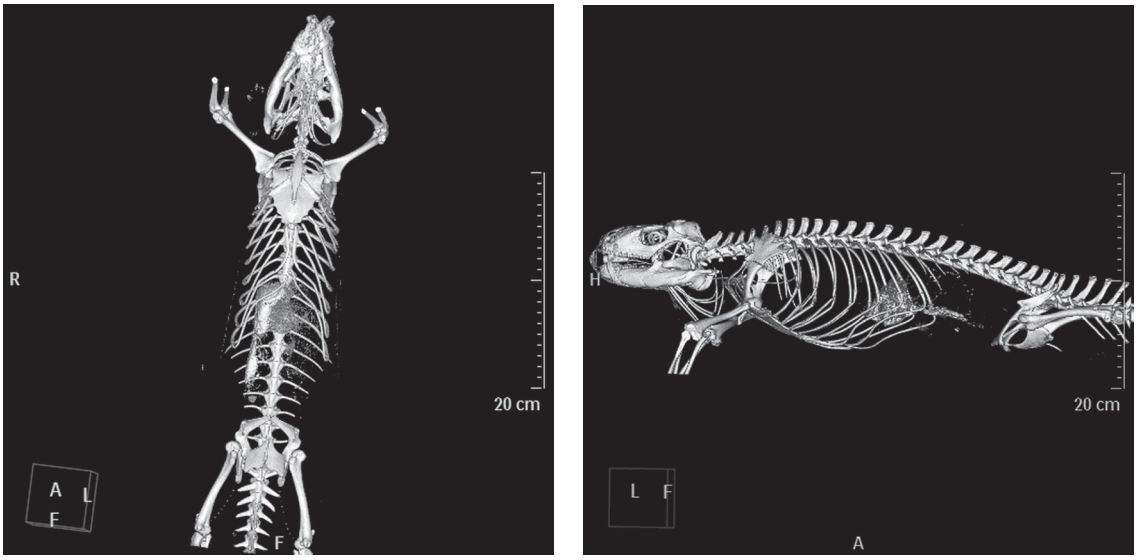
**Table 1:** Preoperative blood values of the iguana and reference values (Harr et al., 2001).

| Parameters | Measured values | | Reference values | |
|---|---|---|---|---|
| ALT | 4 | U/l | 32 (±21) | U/l |
| GLDH | 0.60 | U/l | – | |
| ALP | 19 | U/l | 39 (±19) | U/l |
| AST | 10 | U/l | 33 (±14) | U/l |
| CHE | 3,238 | U/l | – | |
| CK | 632 | U/l | – | |
| Bilirubin | 0.20 | mg/dl | 0.8 (±0.4) | g/dl |
| HST | 2 | mg/dl | – | |
| URIC | 3.64 | mg/dl | 2.7 (±1,8) | mg/dl |
| GLUC | 201 | mg/dl | 166 (±45) | mg/dl |
| FRUC | 380 | µmol/dl | – | |
| TP | 6.12 | g/dl | 5.4 (±0.9) | g/dl |
| ALB | 2.49 | g/dl | 2 (±0.5) | g/dl |
| Sodium | 159.50 | mmol/l | 157 (±3.7) | mEq/l |
| Potassium | 4.01 | mEq/l | 4 (±0.9) | mEq/l |
| TCA | 12.04 | mmol/l | 11.3 (±1.2) | mg/dl |
| PO4- | 1.80 | mmol/l | 5.3 (±1.2) | g/dl |

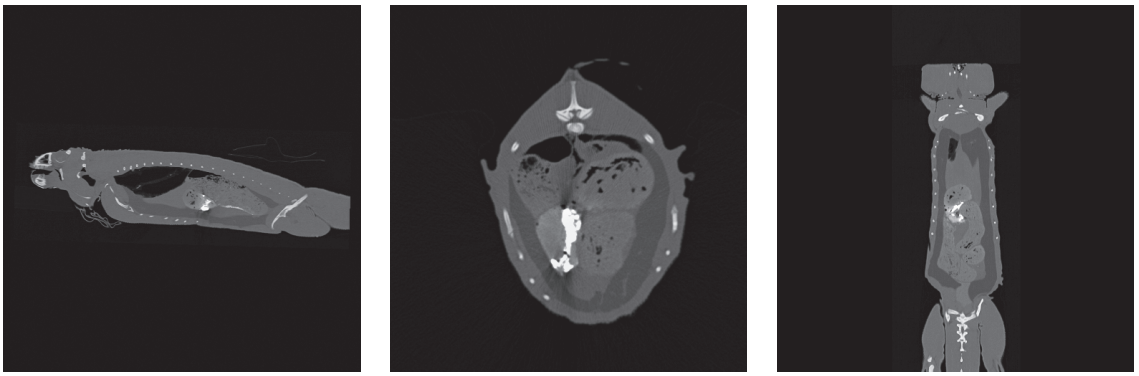
dorf, Germany) in an airtight box. Anesthesia was maintained with inhalation isoflurane anesthesia administered using an endotracheal tube. This anesthesia was also used to gain more details about the foreign body's location via computed tomography before a potential surgery.

## Surgical procedure and further diagnostic imaging

Contrast CT (Slice Thickness: 0,72 mm; kV: 120; 781 mAs; Philips Brilliance 64, Philips GmbH, Hamburg, Germany) revealed that the foreign body could be present in the proximal small intestine (Fig. 2A, B; 3 A - C) without being able to exclude a portion of it being reachable in the stomach. Therefore while already preparing everything for a celiotomy a trial was made to remove the foreign body via flexible endoscope but it failed. The flexible endoscope (GIFN180 Bronchoscope, length: 1100 mm, working channel diameter: 2 mm, whole bronchoscope: 4.9 mm; Olympus Germany GmbH, 20097 Hamburg, Germany) was inserted through the iguana's mouth with a 10 ml syringe to protect the endoscope from the iguana's teeth. After carefully passing the oesophagus and reaching the stomach no sign of the foreign body or ingesta could be visualised and it was impossible to follow the duodenal flexure beyond the stomach. Thus celiotomy was performed using the same anesthesia. An enterotomy with a right side paramedian approach was performed using a 13 cm longitudinal incision of the skin followed by the muscle of the body wall. The dilated, dark red intestine was then placed outside the coelomic cavity. The intestine was opened by another 8 cm longitudinal incision directly over the textile foreign body and it was removed with difficulty due to its huge mass, suggesting that a further physiological passage was not to be expected. The intestine was closed by a continuous two-layer inverting pattern (Serafit® EP1, HR-12, Serag-Wiessner, Naila, Germany). Closure of the celiotomy was accomplished in two layers using a simple continuous pattern with a synthetic absorbable material on a fine atraumatic needle for the muscle and the coelomic membrane (Serafit® EP1, HR-12, Serag-Wiessner, Naila, Germany). The skin closure was accomplished using a nonabsorbable material with a sharp needle by an interrupted horizontal mattress pattern (Vicryl® Plus 4-0 GEFL FS-2, Johnson




**Figures 2:** Dorsoventral (A) and lateral (B) Multiplanar Reformation of the iguana highlighting the contrast agent in the textile foreign body in right ventral position 24 hours after administration of Megluminamidotrizoat/Natriumamidotrizoat[a].



**Figures 3:** Sagittal (A), transversal (B) and dorsal (C) CT images of the iguana highlighting the contrast agent in the textile foreign body within the small intestine 24 hours after administration of Megluminamidotrizoat/Natriumamidotrizoata.
One can see that there is only poor contrast agent resting within the stomach that increases after the duodenal flexure – the position of the textile foreign body.
It cannot be excluded that there is still a portion of it reachable in the stomach via gastroscope.

& Johnson Medical GmbH, Ethicon Deutschland, Norderstedt, Germany). After the surgery another x-ray in lateral recumbency was performed to prove the absence of the contrast enhanced structure seen on the pre-operative radiographs. Recovery was uneventful and post-operative therapy including infusion, antibiotics and analgesics was continued. Sucralfate (Ulcogant®, Merck, Darmstadt, Germany) (1 ml/kg, PO, q 24 h, 10 days) was administered to protect the gastrointestinal tract mucosa. The patient recovered well at home and the owner started feeding carrot mash four days after surgery. Feeding dose was increased and chopped salad was added. Two weeks after surgery ingestion and defecation returned to normal.

At the time of the recent telephone call approximately one year after surgery the iguana was doing well.

## Discussion

The uptake of foreign bodies in reptiles is common, especially in green iguanas (Anderson, 1992). Our case shows the importance of localizing it for further procedures with the help of several diagnostic imaging methods (Silverman and Janssen, 2006). The size of the sock, and consequently, the fact that we did not expect it to totally pass the iguana's stomach by physiological peristalsis alone was a motivation for the attempt to locate and remove the foreign body via gastroscopy (Lumeij and Happe, 1985; Kik and Nickel, 2001). Judging the actual situation of the mucosa endoscopically and following the gastrointestinal tract out of the pylorus was unproblematic. However, as the pylorus is connected to the duodenum bulb followed by a 180° flexure distal to the liver as reported in the literature, it was impossible to pass through with the endoscope (Smith et al., 2001). Therefore, we had to abandon this attempt as there was no part of a sock left in the iguana's stomach that could be reached and carefully removed. As contrast agents can often accumulate in or proximal to foreign bodies, it is useful to carry out a contrast agent imaging study to locate a foreign body before removal. For that either Me/Na (Gastrolux®, Sanochemia Pharmazeutika AG, Wien, Austria) or a barium suspension can be applied (Long et al., 2010). An earlier study listing the times for barium to pass through the different divisions of the gastrointestinal tract of the green iguana shows a median transit time of 8 h for the stomach, 4 h for the small intestine, and 15 h for the large colon. Normal gastrointestinal passage of herbal food of a green iguana takes 2 to 3 weeks (van Marken Lichtenbelt, 1992; Smith et al., 2001; Silverman and Janssen, 2006). In our case we used Me/Na since we could not exclude a perforation of the gastrointestinal tract. Also, Me/Na has a shorter passing time than barium (Long et al., 2010). In contrast to previously reported small intestinal transit times, it is understandable that a large part of the sock was found inside the small intestine five days after ingestion because the foreign body's size and structure lead to longer transit and emptying times than herbal food (Smith et al., 2001). If the size of the foreign body is compared to the intestinal lumen it is unlikely that a large sock would pass through the whole small intestine at all. Our contrast agent x-ray study showed a spreading of the Me/Na after 30 minutes but an accumulation after 3½ h. We assumed that it accumulated proximal to and within the textile fibre of the foreign body. The post-operative x-ray proved the absence of that structure. Computed tomography delivers a very detailed view into the coelomic cavity of reptiles (Gumpenberger and Henninger, 2001; Banzato et al., 2013). Using this modality gave us a hint at the foreign body's location and size so that, should endoscopic removal fail, a potential surgery could be planned more effectively. The remaining contrast agent within the textile fibres of the sock after

24 hours proved that at least a large part of the sock was no longer in the stomach but not yet in the large colon, both of which could be differentiated with the computed tomography. It did not show if there was a portion of the sock still available for gastroscopic removal in the stomach so a trial was made before more invasive surgery. But as it was not, celiotomy had to be performed. In order to expedite removal of the foreign body it can be necessary to prepare for a potential surgery if the foreign body is not surely located in the stomach and cannot be removed via gastroscopy. Blood values were examined prior to anesthetizing the patient in order to determine the suitability for anesthesia and see whether the iguana had any liver or renal dysfunction (Harr et al., 2001). This case shows the combination of diagnostic imaging methods in case of foreign body location and treatment in lizards.

## References

*Anderson N. L.:* Diseases of *Iguana iguana*. Compend. Contin. Educ. Vet. 1992, 14: 1335–1343.

*Banzato T., Hellebuyck T., Caelenberg van A., et al.:* A review of diagnostic imaging of snakes and lizards. Vet. Rec. 2013, 173: 43–49.

*Büker M., Foldenauer U., Simova-Curd S., et al.:* Gastrointestinal obstruction caused by a radiolucent foreign body in a green iguana (*Iguana Iguana*). Can. Vet. J. 2010, 51: 511–514.

*Gumpenberger M., Henninger W.:* The use of computed tomography in avian and reptile medicine. Seminars in Avian and Exotic Pet Medicine 2001, 10: 174–180.

*Harr K. E., Alleman A. R., Dennis P., et al.:* Morphologic and cytochemical characteristics of blood cells and hematologic and plasma biochemical reference ranges in green iguanas. J. Am. Vet. Med. Assoc. 2001, 218: 915–921.

*Hernandez-Divers S., Hernandez-Divers S.:* Diagnostic imaging of reptiles. In Pract. 2001, 23: 370.

*Iverson J. B.:* Colic Modifications in iguanine lizards. Journal of Morphology 1980, 163: 79–93.

*Kik M.J. L., Nickel R. F.:* Removal of a foreign body from the intestine of a leopard tortoise (*Geochelone pardalis*) via laparoscopy. Prakt. Tierarzt 2001, 82: 174.

*Long C. T., Page R. B., Howard A. M., et al.:* Comparison of Gastrografin to Barium Sulfate as a gastrointestinal contrast agent in Red-Eared Slider Turtles (*Trachemys scripta elegans*). Vet. Radiol. Ultrasound 2010, 51: 42–47.

*Lumeij J. T., Happé R. P.:* Endoscopic diagnosis and removal of gastric foreign bodies in a caiman (*Caiman crocodilus crocodilus*). Vet. Q. 1985, 7: 234–236.

*Meyer J.:* Gastrografin® as a gastrointestinal contrast agent in the Greek Tortoise (*Testudo hermanni*). J. Zoo Wildl. Med. 1998, 29: 183–189.

*Mitchell M. A., Diaz-Figueroa O.:* Clinical reptile gastroenterology. Vet. Clin. North Am. Exot. Anim. Pract. 2005, 8: 277–298.

*Rahal S. C., Teixeira C. R., Castro G. B., et al.:* Intestinal obstruction by stone in a turtle. Can. Vet. J. 1998, 39: 375–376.

*Schumacher J., Toal R. L.:* Advanced radiography and ultrasound in reptiles. Seminars in Avian and Exotic Pet Medicine 2001, 10: 162–168.

*Silverman S., Janssen D.:* Diagnostic imaging. In: Reptile Medicine and Surgery 2. Ed. D.R. Mader, Elsevier/Saunders, St. Louis, 2006, 471–489.

*Smith D., Dobson H., Spence E.:* Gastrointestinal studies in the Green Iguana: technique and reference values. Vet. Radiol. Ultrasound 2001, 42: 515–520.

*van Marken Lichtenbelt, W. D.*: Digestion in an ectothermic herbivore, the green iguana (*Iguana iguana*): effect of food composition and body temperature. Physiol. Zool. 1992, 65: 649–673.

*Wellehan J. F., Gunkel C. I.:* Emergent diseases in reptiles. Seminars in Avian and Exotic Pet Medicine 2004, 13: 160–174

## Corresponding author

DVM Matthias Lebens
University of Veterinary Medicine Hannover
Clinic for Pets, Reptiles, Pet and Feral Birds
Buenteweg 9
30559 Hannover
Germany
Tel: 0049511-9536800
Fax: 0049511-9536802
E-Mail: matthias.lebens@tiho-hannover.de