Radiographic and ultrasonographic characteristics of ventral abdominal hernia in pigeons (Columba livia)

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ABSTRACT. Five female egg-laying pigeons presented with painless, reducible, ventral abdominal swellings located between the keel and the pubis, or close to the cloaca. Based on clinical, radiographic, and ultrasonographic examination, these pigeons were diagnosed with ventral abdominal hernia requiring surgical interference. Reduction was successfully performed under general anesthesia. Radiographic and ultrasonographic examinations were beneficial for confirming the diagnosis and visualizing the hernial content for surgical planning. Lateral radiographs were more helpful than ventrodorsal radiographs for identification of the hernial content and its continuation with the abdominal muscles. Ultrasonographic examination offered a non-invasive diagnostic tool that allowed for the differentiation of hernia from other abdominal swellings. In addition, it played a beneficial role in identification of the hernial content and follow up after surgical interference. In conclusion, radiographic and ultrasonographic examinations were beneficial in the diagnosis, surgical planning, and follow up after surgical interference of ventral abdominal hernia in pigeons.

KEY WORDS: abdominal, hernia, radiography, surgery, ultrasonography

Abdominal hernia is an uncommon finding in birds. It has been reported in the psittacinie species, particularly in budgerigars, cockatoos, and cockatiels [1], but sporadically in mynas, chickens, turkeys, ducks, and pigeons [3, 4, 7–10]. The exact etiology is unknown; a small proportion of these hernias were reported to be congenital while the majorities were acquired [1]. A weakness and tear in the abdominal wall musculature along the midline or surrounding the pericloacal region may have resulted from egg laying or egg binding, or due to hormonal imbalance. Trauma, or intra-abdominal masses may also lead to hernia formation [1, 7]. Abdominal hernias in birds are atypical in that there is no hernia ring, due to the lack of an opening in the aponeurosis of the abdominal muscle [1, 10].

Palpation and clinical examination are usually sufficient for diagnosis of abdominal hernias. However, due to the lack of a hernia ring, a more advanced diagnostic tool was required to confirm the diagnosis and to visualize the hernia contents. This was facilitated by the widely available radiographic and ultrasonographic scans.

To the authors’ knowledge, there have been no reports in literature describing the radiographic and ultrasonographic characteristics of ventral abdominal hernia in pigeons. The aim of the present study was to describe the radiographic and ultrasonographic findings in 5 pigeons that were diagnosed with ventral abdominal hernia and underwent surgical reduction.

MATERIALS AND METHODS

The present study was performed on 5 female pigeons (Columba livia) brought to the Department of Surgery, Anesthesiology and Radiology, Faculty of Veterinary Medicine, Cairo University with abdominal swellings. These pigeons were of middle age (1.5 ± 0.2 years), and were used for breeding purposes. The mean body weight was 240 ± 45 g.

All abdominal swellings were painless, reducible, and located in the ventral abdomen between the keel and the pubis, or close to the cloaca (pericloacal region). One of these swellings had an acute onset while the remaining had developed gradually over one (n=2) to four weeks (n=2). A history of falling or trauma was not reported by any owner. Reduced appetite was recorded in one pigeon, and diarrhea was indicated by pericloacal sealing in another. All pigeons had a history of egg laying prior to development of the swellings.

A complete clinical examination was performed to evaluate the vital parameters and to determine the nature and extent of the
swellings. Radiographic examination included right-lateral and ventrodorsal radiographs obtained using a medium speed (400) grid with the following parameters: dimensions, 0.2 x 20 x 30 cm; settings, 35–40 kVp and 1 mAs; focal film distance, 70–80 cm.

Ultrasonographic examination was performed using an 8 MHz linear transducer attached to an ultrasound machine (Toshiba Just Vision 200, Toshiba, Osaka, Japan) after removal of feathers around the swollen area and application of acoustic coupling gel. Sweeps were taken in sagittal and transverse scans, with the pigeons gently restrained in dorsal and lateral recumbence.

Based on clinical, radiographic, and ultrasonographic examination, the diagnosis confirmed that these pigeons had ventral abdominal hernia requiring surgical reduction.

Surgical reduction and closure of the abdominal wall was performed under general anesthesia. Anesthesia was achieved using a combination of Xylazine HCl (Xylaject®, Adwia Co., El-Oubor city, Egypt) at a dose of 8 mg/kg and Ketamine HCl (Ketalar®, EPICO Co., 10th of Ramadan city, Egypt) at a dose of 30 mg/kg injected intramuscularly into the pectoral muscle [2, 10].

Post-surgical follow up included daily dressing of the abdominal wound with antiseptic solution using Povidone iodine (Betadine®, EPICO Co.), and local antibiotic cream using sodium fusidate (Fucidine®, Mina Pharm Pharmaceutical & Chemical Industries, Cairo, Egypt), for one week. Diet was reduced and was corrected to soft food for two weeks following surgery. Follow up was continued for 6 months following surgery. All owners were aware of their pigeon’s involvement in the study and signed a consent form indicating their approval.

RESULTS

Clinical examination

Upon admission, all pigeons were evaluated to have normal vital health parameters (heart rate 185 ± 15 beat/min, respiratory rate 29 ± 6 breath/min, and cloacal temperature 39.6 ± 0.3°C). A spheroid (2.6 ± 0.3 x 3.7 ± 1.2 cm) ventral midline swelling was located between the keel and the pubis (n=2) or in the percloacal region (n=3) (Fig. 1). The skin over the swelling was erythematous in 4 pigeons, with erosions and skin ulceration occurring in 2 pigeons. The skin was covered with a thick crust in one pigeon. Reduction of all swellings was easily performed by finger pressure over the protruded swelling.

Radiographic examination

Right lateral radiographs revealed a rounded soft-tissue radiopaque mass protruding from the abdomen. The mass was continuous with the abdominal wall and no obvious neck could be detected. In two pigeons, small radiolucent areas were clearly visualized within the radiodense protruding mass. Ventrodorsal radiographs were less valuable in identification of the hernia content due to the superimposition of the swelling with the abdominal content (Fig. 2).

Ultrasonographic examination

Ultrasonographic examination of the swelling revealed a spherical to elliptical structure with multiple echogenicity. The swelling had a thin outer hypechoic curvilinear structure, representing the skin enclosing a thick hypechoic structure pertaining to the hernia sac. The echogenicity of the hernial content varied among pigeons. In 3 pigeons, the hernial content was visualized as a hypechoic structure that was less echogenic than the hernia sac. In the other 2 pigeons, the hernial content was of mixed echogenicity, including a hypechoic structure representing abdominal fat and hypechoic structures representing the intestinal loops. The intestinal loops were clearly visualized as parallel lines in sagittal scans, and as circular structures in transverse scans. Gases within the intestinal loops produced a characteristic acoustic shadowing. In one pigeon, markedly echogenic bands were observed between the skin and hernia content and between the structures of hernia contents. These bands were suggestive of fibrous adhesions (Fig. 3).

Surgical reduction

Under the effect of general anesthesia, pigeons were restrained in dorsal recumbence with dorsal flexion of the wings. After routine aseptic preparation of the surgical field, an elliptical incision was made at the base of the swelling with dissection of the hernia sac (Fig. 4).

In four pigeons, the hernial content constituted of abdominal fat and intestinal loops (ileum and cecum), while in one pigeon the pancreas was also included. Adhesion between the hernial sac and content was reported in one pigeon, necessitating careful dissection.

After careful inspection, the hernial contents were reduced into the abdominal cavity. The gap between the separated aponeurosis of the abdominal muscles was closed at the linea alba with an interrupted suture pattern using No. 2/0 Vicryl. The skin was sutured by interrupted suture pattern using No. 3/0 Vicryl (Fig. 5).

No pigeons were reported to have post-surgical complications. All pigeons had continued egg laying without reoccurrence of the hernia at 6 months follow up.

DISCUSSION

Surgical reduction of ventral abdominal hernias was successfully achieved in 5 pigeons following clinical, radiographic, and ultrasonographic examinations.

A localized, painless, reducible abdominal swelling is typically indicative of abdominal hernia. Such swellings should be
Fig. 1. A photograph demonstrating the clinical presentation of different abdominal hernias located in the ventral abdomen at varying locations between the keel and the pubis or in the percloacal region.

Fig. 2. Right lateral radiograph of a pigeon with abdominal hernia showing a radiodense mass protruding in the percloacal region (a). Ventrodorsal radiograph of the same pigeon where the protruded mass was superimposed over the abdominal contents; the hernial contents could not be visualized (b).
Fig. 3. Sagittal scans of two different pigeons with ventral abdominal hernias, demonstrating a curvilinear hyperechoic structure representing the skin, followed by a hypoechoic hernia sac. The hernial contents were of mixed echogenicity (a). A hypoechoic hernial sac was separated from the uniformly hypoechoic hernial content. Thick hyperechoic bands representing fibrous adhesions were seen between the hernia sac and content (b).

Fig. 4. The hernia sac (s) is exposed through an elliptical incision in the skin enclosing the hernia. Note the separated aponeurosis of the abdominal musculature (arrow) representing the atypical hernia ring.

Fig. 5. Closure of the surgical wound after complete reduction of the hernial content using an interrupted suture pattern.
differenced from other abdominal swellings, including abscess, hematoma, tumor, and retained egg. It has been reported that reduction of abdominal hernia in birds is not a simple surgical procedure, as proposed in initially. Unexpected morbidity and mortality are often observed, and an accurate diagnosis is necessary [1].

The exact etiology of abdominal hernia in birds remains unclear [7]. These hernias may be congenital (present at the time of hatching or soon after) or acquired (present in older birds) [1, 6]. Congenital hernias usually develop as a result of failure of the linea alba to close completely, or due to a defect in the abdominal muscle. Acquired hernias usually develop in overweight and reproductively active birds as a result of splitting or atrophy of the abdominal muscles [1]. As the pigeons in this study were reproductively active females, it is suspected that these hernias resulted from the increase in estrogen levels that leads to ovarian and/or oviduct enlargement with subsequent increase in intracelomic pressure. The increase in the celomic pressure may also be caused by a space-occupying mass including celomic fats and organ enlargement [5, 6]. The age of the presented pigeons may have an influence on the development of weakness of abdominal musculature leading to herniation.

Herniation of abdominal content results in skin stretching over the protruded swelling. The skin may become weak, thin, and ulcerated, or thick and covered in crusts that become avascular over time, leading to skin necrosis [7]. The separation between the aponeurosis of the weak abdominal musculatures was representative of the atypical hernia ring, in agreement with previous reports [1, 10].

The radiographic and, more specifically, ultrasonographic examinations were undoubtedly beneficial in confirming the diagnosis and visualizing the hernial content for surgical planning. Lateral radiographs were more useful than ventrodorsal radiographs for identification of the hernial content and its continuation with the abdominal muscles. The radiolucent areas within the hernias indicated a gas-containing structure suggestive of intestinal lobes. Ultrasonographic examination offered a non-invasive diagnostic tool allowing for the differentiation of the hernia from other abdominal swellings. In addition, it was also useful in identification of the hernial content and follow up after surgical interference.

Surgical reduction was an essential lifesaving procedure to prevent skin ulcerations and necrosis resulting from traumatization of the protruded swellings against rubbing surfaces [6]. Additionally, the entrapment of the abdominal organs (intestine and pancreas) necessitated surgical reduction to prevent further complications (e.g. strangulation, incarceration, or adhesion). The adhesion between the intestinal lobes observed in one pigeon during ultrasonographic examination also necessitated surgical interference.

The main limitation of the present study is the relatively small number of birds included in the study, but this was in line with the uncommon presentation of hernia in pigeons. In addition, the lack of hormonal profile of the reproductively active pigeons was a limiting factor in investigating the underlying cause of herniation.

In conclusion, radiographic and ultrasonographic examinations were beneficial in the diagnosis, surgical planning, and follow up after surgical interference of ventral abdominal hernia in pigeons.

ACKNOWLEDGMENT. The authors have declared no competing interests; none of the authors have any conflict of interest or relation with any third party that may bias the publication of this report.

REFERENCES

1. Doneley, B. 2015. Considerations for hernia repair in parrots. In: Annual Conference Proceedings: Combined conference scientific program. Association of Avian Veterinarians Australasian Committee Ltd. Annual Conference, Sydney, NSW Australia. 9–11 September.
2. Durrani, U.F., Ashraf, M. and Khan, M.A. 2009. A comparison of the clinical effects associated with xylazine, ketamine, and a xylazine-ketamine cocktail in pigeons (Columba livia). Turk. J. Vet. Anim. Sci. 33: 413–417.
3. Haridy, M., Sasaki, J. and Goryo, M. 2013. Herniation of duodenum into the right ventral hepatic peritoneal cavity with groove formation at the ventral hepatic surface in a 2-week-old chicken. J. Vet. Med. Sci. 75: 1405–1407. [Medline] [CrossRef]
4. Jahromi, A.R., Nazhvani, S.D. and Haddadi, S. 2009. Ventral abdominal hernia in a common Myna (Acridotherestristis) – a case report. Vet. Arh. 79: 621–625.
5. Langlois, I. and Jones, M.P. 2001. Ventral Abdominal Hernia Associated with Hepatic Lipidosis in a Red Lory (Eos bornea). J. Avian Med. Surg. 15: 216–222. [CrossRef]
6. MacWhirter, P. 1994. Review of 60 cases of abdominal hernias in birds. pp. 27–37. Proceedings of the Annual Conference of the Association of Avian Veterinarians. Reno, Nevada, September 28–30.
7. Parrah, J.D., Dar, K.H., Athar, H. and Qureshi, B. 2016. Surgical Management of Abdominal Hernia in a Duck (Anas Platyrrhynchos). M. J. Vet. 1: 1–4.
8. Ranck, F. M. Jr. 1973. Umbilical hernias in turkeys. Poult. Sci. 52: 1991–1992. [Medline] [CrossRef]
9. Ranck, F. M. Jr. 1974. Umbilical hernias in turkeys from two flocks. Avian Dis. 18: 477–483. [Medline] [CrossRef]
10. Smolec, O. Kos, J., Vnuk, D., Babcic, T. and Bottegaro, N.B. 2009. Abdominal ventral hernia in a pigeon (Columba livia): a case report. Vet. Med. 54: 291–294.