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Olgu Sunumu / Case Report

## Undertail body wall herniation with abdominal air sac rupture in budgerigar (*Melopsittacus undulatus*)

Eren USLU<sup>1,2,a\*</sup>, Şeyma Sueda BAYRAKTAR<sup>1,2,b</sup>, Zeynep ATEŞ<sup>1,2,c</sup><sup>1</sup> Ankara Üniversitesi Veteriner Fakültesi, Cerrahi Anabilim Dalı, Ankara, Türkiye<sup>2</sup> Ankara Üniversitesi Sağlık Bilimleri Enstitüsü, Ankara, TürkiyeID 0000-0002-1923-2042<sup>a</sup>; 0009-0005-1435-2706<sup>b</sup>; 0009-0004-7256-8719<sup>c</sup>

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## ABSTRACT

Ventral abdominal hernia cases are frequently encountered in bird species. These abdominal hernias are usually seen in sexually active female birds. Although the etiopathology is not fully understood, it is believed that the main cause is hyperestrogenism. Among the herniated organs, intestines have been reported most commonly. However, a case of abdominal hernia accompanied by air sac rupture has not been identified in the literature. An 8-year-old female budgerigar presented with a complaint of swelling under the tail and was brought to Ankara University Veterinary Hospital. Clinical examination revealed the presence of a ventral abdominal hernia under the tail. Radiographic evaluation showed that a significant portion of the swelling was filled with air, and the herniated structures were identified as intestines. The swelling was punctured with a 16G gray cannula, and the air was completely drained. Immediately after the air was expelled, it was observed that the air was refilled, indicating air sac rupture. During the surgery, the herniated intestines were reduced, and the abdominal wall was repaired. At the final follow-up examination after 14 days, complete recovery of the patient was observed. In conclusion, the surgical procedure and postoperative follow-up results of a case involving previously unreported ventral abdominal herniation accompanied by air sac rupture are presented.

### *Muhabbet kuşunda (Melopsittacus undulatus) abdominal hava kesesi rupturu ile birlikte seyreden kuyruk altı fitik olgusu*

## ÖZET

Kuş türlerinde ventral abdominal hernia vakalarına oldukça sık olarak rastlanılmaktadır. Abdominal fitiklar genellikle seksüel olarak aktif olan dişi kuşlarda görülmektedir. Bunun etiopatolojisi tam olarak bilinmese de temel nedenin hiperöstrojenizm olduğu düşünülmektedir. Fitiklaşan organlar arasında en sık olarak bağırsaklar bildirilmiştir. Ancak hava kesesi rupturu ile birlikte abdominal herni şeklinde bir vaka literatürde belirlenmemiştir. Kuyruk altı şişkinlik şikayetiyle gelen 8 yaşında dişi muhabbet kuşu, Ankara Üniversitesi Hayvan Hastanesi'ne getirildi. Yapılan klinik muayenesinde kuyruk altı fitik olduğu saptandı. Radyografik değerlendirmesinde, bu şişliğin büyük bir kısmının hava olduğu, ayrıca fitiklaşan yapıların da bağırsaklar olduğu saptandı. Şişliğe 16G gri kanül ile punksiyon yapıldı ve hava tamamen boşaltıldı. Hava boşaltıldıktan hemen sonra tekrar havanın dolduğu gözlemlendi ve buna istinaden hava kesesi rupturu olduğu saptandı. Yapılan operasyonda, fitiklaşan bağırsaklar reddedilerek abdominal duvar tamir edildi. 14 gün sonraki son kontrolünde hastanın tamamen iyileştiği gözlemlendi. Sonuç olarak, daha önce literatürde rastlanmamış kuyruk altı herniasyon ile birlikte seyreden hava kesesi rupturu olgusunun operasyonu ve post-operatif kontrol sonuçları paylaşılmaktadır.

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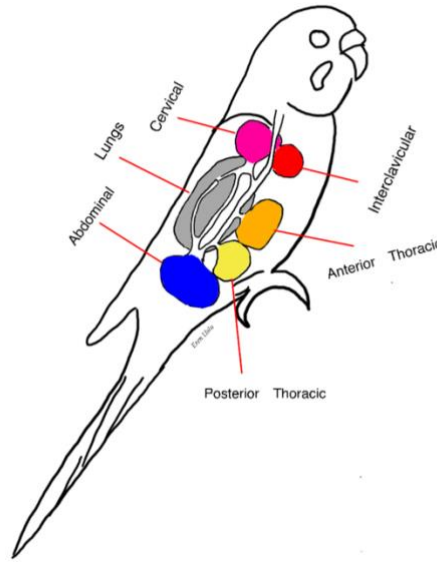
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\* Sorumlu Yazar e-posta adresi / Corresponding Author e-mail address: uslue@ankara.edu.tr

## 1. Introduction

The avian respiratory system includes two morphologically and functionally distinct but concomitant pulmonary structures. The first is the lungs, which provide the main gas exchange, and the other is the air sacs. The parenchymal, gas-exchanging portion of the lung is attached dorsolaterally to the rib cage and most of it is buried between the ribs (1). The lungs connect directly with the air sac system (2).

Air sacs are large, sensitive and transparent air chambers that connect to the lung in areas called ostia located on the cranial, ventral, and distal edges of the lung (Figure 1). Air sacs make up the largest portion of the total volume of the bird's respiratory system (3). The avians have five air sacs of different size and place. These are the cervical, the interclavicular, the craniothoracic, the caudothoracic, and the abdominal air sacs (4).



**Figure 1:** Anatomical positioning of the air sacs in the budgerigar

**Şekil 1:** Muhabbet kuşlarında hava keselerinin anatomik yerleşimi

Compared to the cranial air sacs group, the oxygen concentration is higher and the carbon dioxide concentration is lower in the caudal air sacs (5). The air sacs most commonly come to veterinary attention when infectious agents take root or with rupture of the air sacs causing subcutaneous emphysema (3). Focal damage to any air sac may result in air sac rupture and subsequent subcutaneous emphysema (6).

Budgerigars (*Melopsittacus undulatus*) are the most common avian patients for abdominal hernias and are thought to be caused by the thinning and gradual separation of muscle fibres (7). Although the aetiology is not known precisely, it is suggested that hyperestrogenism, and changes in calcium metabolism cause abdominal hernias (8). Reproductively active females are more common for hernias caused by straining, possibly from dystocia or chronic ovulation (9). Trauma or intra-abdominal masses can also lead to hernia formation (10). The intestines are the most commonly reported herniated organ in avian abdominal hernias (11).

Affected birds are middle-aged to older birds that usually present with varying degrees of abdominal distension. If the hernia grows, ulceration and bleeding may occur on the skin. Typically, a broad-based stance is observed. Droppings are usually larger in volume and defecation occurs less frequently (8).

The aim of this case report is to describe the clinical findings and post-operative processes of a previously unreported occurrence of gallbladder rupture associated with a subhepatic abdominal hernia. Furthermore, it aims to contribute this unprecedented condition to the existing literature.

## 2. Case Story

An 8-year-old female budgerigar used as a breeder applied for an evaluation of a ventral tail mass that was first noted 1.5 years earlier (Figure 2). The patient was originally seen by another veterinarian, but no diagnosis could be made. Known to have had a history of egg squeezing, the bird had no history of reproductive activity after the event and showed no symptoms other than the present undertail mass. About a month before his admission to our hospital, the patient's owner observed that the swelling in question was filled with air by inflating like a balloon, and this swelling was relieved, especially with sleep, in the evening hours. In addition, it was stated that the patient did not want to fly too much and generally wanted to stay in her cage. During this period, appetite and general condition were evaluated as normal. An application was made to our faculty for the diagnosis and treatment of swelling that reached the size of an egg in the last week.



**Figure 2:** Photographs of an 8-year-old female budgerigar while presenting for an undertail mass caudal to the cloaca during her examination on her first visit to the clinic.

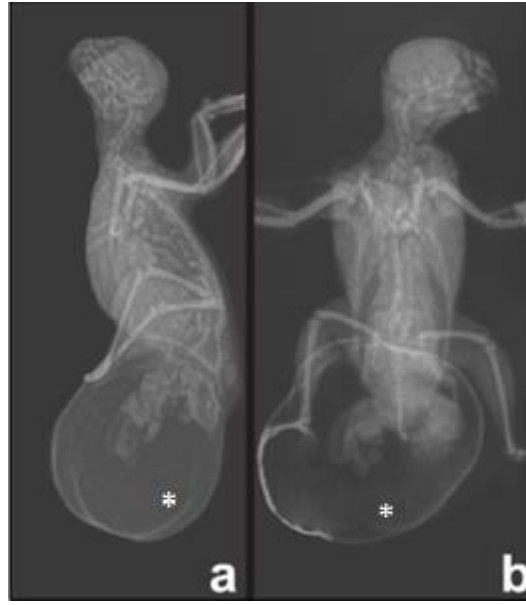
*Şekil 2: Kliniğe ilk getirildiği gün kuyruk altında şişlik belirlenen 8 yaşında dişi muhabbet kuşunun fotoğrafları*

On physical examination at the presentation, the patient was alert and responsive. The body weight was 32 grams and according to Burton et al, (12) the body condition score was 3/7. As a result of the clinical examination, a well-demarcated 6 cm in diameter, fluctuant, gas-filled, keratinized mass with a thick abdominal skin line was observed in the abdominal region (belly).

The radiographic evaluation identified abdominal herniation and showed that the radiolucent area inside the hernia sac may be due to abdominal air sac rupture due to chronic irritation (Figure 3).

A fine needle aspiration (FNA) with a 16G gray cannula of the mass was performed and the accumulated air in the abdomen was evacuated. 2-3 seconds after the completion of the procedure, the evacuated air filled the abdomen more than its former tension (Figure 4). As a result, rupture of the abdominal air sac was determined.

One week later, the budgerigar presented for a mass removal. Due to patient size and the limited blood volume to be sampled, no hematologic testing was performed before the planned surgical removal of this mass.



**Figure 3:** Preoperative right lateral radiograph of a budgerigar with abdominal hernia (a) showing a radiodense protruding pericloacal herniation with radiolucent air. Ventrodorsal radiograph of the same budgerigar showing the protruding mass; hernia and air contents could be visualized (b). Extended skin margin and air opacity between the abdominal wall and skin margin are observed (star).

**Şekil 3:** Pre-operatif olarak çekilmiş abdominal fitiği olan muhabbet kuşunun sağ lateral radyografisi (a), radyolojik olarak yoğun bir şekilde dışarı doğru çıkıntı olarak belirlenmiş perikloakal fitikleşmeyi ve radyolüsent hava içeriği gösterilmektedir.

Aynı muhabbet kuşunun ventrodorsal radyografisi (b). Abdominal karın duvarı ile deri arasında gözlenen radyolüsent hava (yıldız).



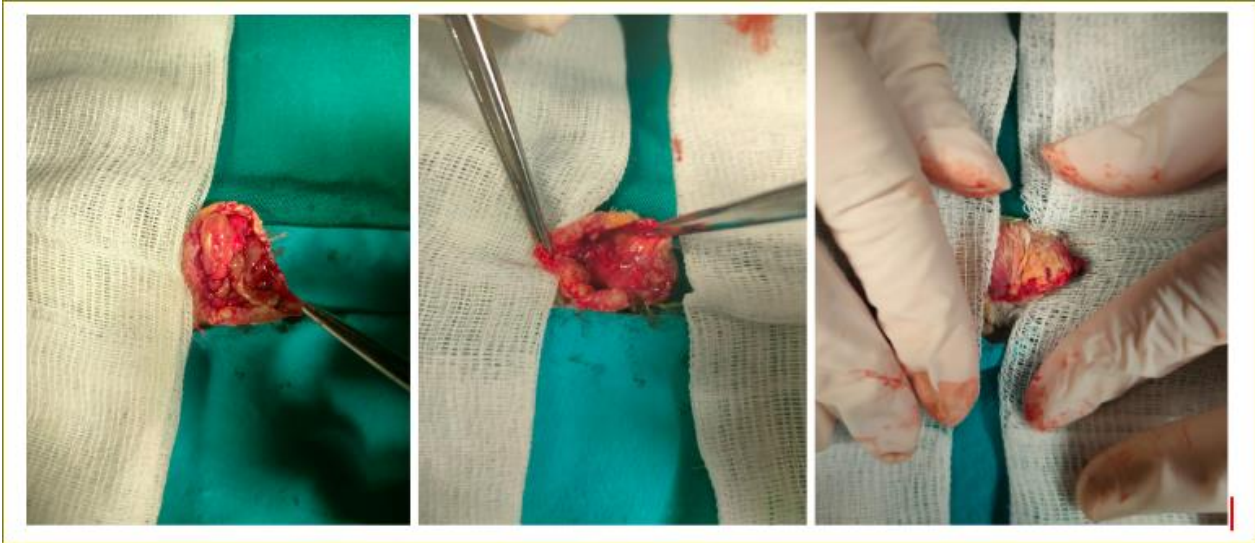
**Figure 4:** Refilling the mass with air as a result of puncture; Evacuation of air by puncture (a), when the air is completely evacuated (b), refilling the air 2-3 seconds after puncture (c)

**Şekil 4:** Karın altındaki havanın püksiyon ile boşaltılması prosedürü; Havanın boşaltılması (a), Hava tamamen boşaltıldığında (b), Boşaltılan havanın 2-3 saniye içinde tekrar dolması (c)

Oxygenation was applied for 10 minutes before the operation. Preoperative analgesia (Tanacetum parthenium, 1 drop/50 gr, PO, Avicare, Turkey) and antibiotics (Enrofloxacin 15 mg/kg, PO, Baytril 5%, Bayer, Turkey) were administered. The bird was induced with isoflurane (5% in 5 L/min of 100% oxygen), (Isoflurane USP, Adeka İlaç, Turkey) via facemask and anesthesia was maintained (SMS Medical Co. Ltd, Turkey). The bird was placed in dorsal recumbency, and a heating bag was used to help maintain normothermia. The feathers around the operation area were removed to cover the abdomen and the site was prepared aseptically with 2% chlorhexidine solution. A melon slice incision was made on the yellow, dry, and keratinized skin with a no15 scalpel. In the surgical evaluation, the mass observed that the intestines were herniated as a result of the rupture of the abdominal muscles (Figure 5).

After the herniated bowel tissue was rejected into the abdomen, the hernia hole was debrided and the muscular defect in the body wall was closed with a simple continuous suture with absorbable suture (5/0 PGLA, Katsan, Turkey). Excess skin tissue was removed and the skin was narrowed and closed in a simple continuous pattern with the same absorbable suture (5/0 PGLA, Katsan, Turkey). With this method, it was expected that the gas leaking from the air sac would accumulate in the abdomen and heal the air sac defect by creating pressure.

Blood loss in the procedure was minimal and hemostasis was performed using tampons. The patient recovered uneventfully from surgery and passing normal excrements within 1 hour and eating was allowed 3 hours after the operation.

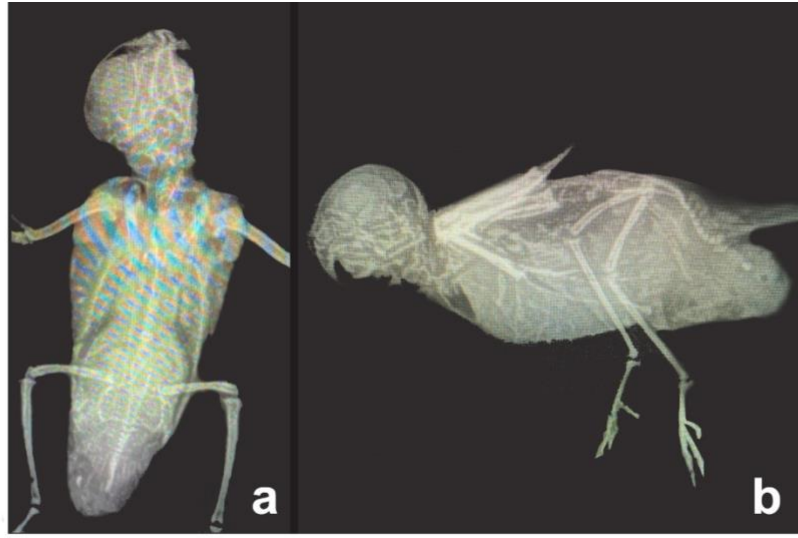


**Figure 5:** Surgical evaluation, the mass observed that the intestines were herniated as a result of the rupture of the abdominal muscles

**Şekil 5:** Cerrahi değerlendirme sonrasında, belirlenen kitlede hava ile birlikte bağırsakların fıtıklaştığı belirlenmiştir.

Postoperative radiographs containing lateral and dorsoventral views were supported (Figure 6). The bird was released to care for its owners with continued enrofloxacin (15 mg/kg, PO, q24h, 7 days, Baytril %5, Bayer, Turkey), analgesic (Tanacetum parthenium, 1 drop/50 gr, PO, q24h, 7 days, Avicare, Turkey), liver support (Silybum marianum, 1 drop/ /50 gr, PO q24h, 7 days, Avicare, Turkey) and multivitamin & amino acid (Multivitamin&Aminoacid, 1 drop/50 gr, PO, Avicare, Turkey).





**Figure 6:** Postoperative right ventrodorsal radiograph of a budgerigar with abdominal hernia operation (a), postoperative lateral radiograph of the same budgerigar (b).

*Şekil 6: Postoperatif olarak çekilen radyografilerde fitiğin tamamen düzeldiği görülmektedir. Ventrodorsal görüntü (a), Laterolateral görüntü (b).*

The owner was instructed to keep the budgerigar in a smaller cage to limit activity for 7 days (Figure 7). Two weeks later, the bird was rechecked and showed no abnormalities in medical history, lifestyle or physical examination.



**Figure 7:** Post-operative 7th day control photograph of an 8-year-old female budgerigar who applied to the clinic with the complaint of an abdominal mass.

*Şekil 7: Post-operatif 7. Günde muhabbet kuşunun herhangi bir şikayeti ve nüks olgusu ile karşılanmamıştır.*

On the 14th postoperative day, the patient was allowed to fly and the treatment process was completed after the controls. To date, 2 months after the procedure, the bird remained healthy and flying performance also increased as reported by the owner over the phone.

### 3. Discussion and Conclusion

This case report describes a unique appearance of the diagnosis and surgical repair of a chronic ruptured abdominal air sac with a ventral abdominal hernia in a budgerigar. Abdominal hernias are common in sexually active female budgerigar (7). However, no case associated with rupture of the abdominal air sac has been reported. The budgerigar in this case was a solid female, moderately overweight, and had a problematic history of laying or breeding.

Ventral abdominal hernias, though commonly seen in budgerigars (7,13), have been reported in other avian species including a common myna (*Acridotheres tristis*) (13), a red lory (*Eos bornea*) (8), a wild Northern pintail (*Anas acuta*) (14), and multiple pigeons (*Columba livia*) (9). Typically, the abdominal muscles are dilated along the line of the linea alba (13) resulting in the representation of a ventral midline hernia (11). However, there are no reports of abdominal hernia and air sac rupture in budgerigars.

Air sac rupture in birds is usually the result of trauma; however, other causes include infectious disease, nutritional deficiencies and significantly difficult breathing. The most common complication of air sac rupture is subcutaneous emphysema, which presents as a painless, soft swelling (15). It is not usually life-threatening, but is a source of pain and discomfort and significantly affects quality of life (15). Although air sac ruptures in budgerigars usually occur as a result of chronic inflammation, it is thought to be caused by intense abdominal pressure formed during egg laying in this case.

Subcutaneous emphysema can be differentiated from other lesions by its characteristic features, which include painless, non-febrile, and balloon-like palpation. It can be easily diagnosed through fine needle aspiration (15). Various techniques have been attempted in previous literature for subcutaneous emphysema, with the most commonly used being subdermal stents. These have been found to provide significant benefits in the clinical improvement of the patient. Different materials are used for these stents, with Teflon or plastic stents being the most commonly used (16). Various underlying causes can lead to subcutaneous emphysema, including trauma, inflammation, infection, and nutritional deficiencies. It is believed that in this budgerigar, subcutaneous emphysema is caused by an increase in abdominal pressure due to continuous egg-laying. Furthermore, it is thought that as the bird ages, the weakening of abdominal muscles and excessive increase in internal pressure can cause the rupture of the air sac and result in subcutaneous emphysema.

The most common complication observed following stent implantation surgeries is usually the formation of debris due to inflammatory reactions in the region, leading to the failure of stents to adhere permanently. The reason for this is the development of foreign body reactions (17). Therefore, in this case, a stent was not implanted during the operation. Despite the absence of a stent, the patient fully recovered and did not develop subcutaneous emphysema again as a result of air sac rupture. The possible reason for the absence of recurrent air sac rupture may be attributed to the internal organs that were replaced during the repair of the parakeet's abdominal hernia, which applied pressure to the abdominal air sac and prevented leakage.

In the present case, surgical management was successful in resolving the budgerigar's chronic recurrent emphysema due to air sac rupture and abdominal hernia. Postoperatively, the patient recovered with no complications. Antibiotic therapy was used due to communication of the surgical site with the respiratory system. Analgesic therapy was limited to meloxicam postoperatively, but was deemed sufficient given the prompt return to normal habits immediately after surgery. Subsequently, there was no need to use a specific analgesic protocol. The patient did not report any problems and did not revisit our clinic during the following 2-month follow-up period.

Birds do not have sweat glands, and under heat stress they use improved evaporation from the respiratory system as the main route for heat dissipation. Air sacs in birds are important structures that provide thermoregulation by evaporating heat (18). In this case, measurements were not made, considering that the patient might be under respiratory stress owing to air sac rupture.

The prognosis for air sac rupture in acute cases is often good with treatment. As previously discussed, air sac rupture is not typically life-threatening but can be a significant source of morbidity for the bird and frustration for clients in chronic cases (19). Advanced therapy may be necessary for a good prognosis for birds with chronic, recurrent air sac rupture. In the present case, the budgerigar had a good surgical outcome with no complications on follow-up 2

months postoperatively.

This case illustrates the potential benefits of utilizing advanced surgical exploration to identify chronic air sac rupture defects with an abdominal hernia in avian species. This case report presents the first documented case of concurrent air sac rupture and an abdominal hernia in budgerigars. This clinical report may serve as a valuable resource for clinicians managing similar cases of chronic air sac rupture with abdominal hernia in budgerigars.

### **Conflict of Interests**

The authors declare that there was not any conflict of interest.

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### **Authors' Contributions**

Motivation / Concept: Eren USLU, Şeyma Sueda BAYRAKTAR, Zeynep ATEŞ

Design: Eren USLU, Şeyma Sueda BAYRAKTAR, Zeynep ATEŞ

Control/Supervision: Eren USLU

Data Collection and / or Processing: Şeyma Sueda BAYRAKTAR, Zeynep ATEŞ

Analysis and / or Interpretation: Eren USLU, Şeyma Sueda BAYRAKTAR, Zeynep ATEŞ

Literature Review: Eren USLU, Zeynep ATEŞ

Writing the Article: Eren USLU, Şeyma Sueda BAYRAKTAR

Critical Review: Eren USLU

### **Ethical Statement**

An ethical statement was received from the authors that the data, information and documents presented in this article were obtained within the framework of academic and ethical rules and that all information, documents, evaluations and results were presented in accordance with scientific ethics and moral rules.

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