

*Clinical Report*

## Pulmonary Bulla in a Dog Secondary to Blastomycosis

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### Abstract

**Case description-** A two-year-old intact Golden Retriever was affected with the 6-months previous history of blastomycosis and treatment was performed using fluconazole.

**Clinical findings-** Cough, fever, nasal discharge, dry and harsh lung sounds with peripheral lymphadenopathy was observed. Emphysematous change and large pulmonary bulla was reported in computed tomography of the thorax.

**Treatment and outcome-** Under general anesthesia using hydromorphone, combination of ketamine and diazepam and isoflurane the dog was prepared for the surgery. Right lateral thoracotomy thorough 5<sup>th</sup> intercostal space was performed. Following releasing of the pleural and pulmonary adhesions, right cranial lobe was resected. Chest tube was placed and Bupivacaine was injected as costal nerve block to control the post-operative pain. Cefazolin and NSAID were also administered for an overnight. In follow up nasal discharge and lymphadenopathy was resolved and the pulmonary pattern appeared normal in radiographs.

**Clinical Relevance-** Blastomycosis is a systemic fungal disease that may affect skin and lungs. Surgical treatment and pulmonary lobectomy is recommended in case of pulmonary bulla formation due to blastomycosis.

Key words- Blastomycosis, Pulmonary bulla, Pneumothorax, Dog.

### Introduction

Blastomycosis is a systemic fungal disease caused by agent *Blastomyces dermatitidis* that primarily affects dogs and humans. Infection occurs primarily through inhalation. In the lung, alveolar macrophages phagocytize spores and the organism transforms to the yeast phase. Pulmonary macrophages transport the organism to the pulmonary interstitium. Other routes of

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infection include skin lesions or penetrating injuries that introduce the organism into the body.<sup>1</sup> In one retrospective study, clinical signs mostly included respiratory tract problems (49%), depression (48%) and anorexia (48%). Also dermatologic abnormalities, lethargy and fever of unknown origin may be seen.<sup>2</sup> Antifungals like amphotericin B, fluconazole, itconazole are considered the standard treatment for systemic fungal infections like blastomycosis. Prognosis for any animal diagnosed with blastomycosis is guarded to good.<sup>1</sup> The numerous causes for spontaneous pneumothorax is defined as air in the pleural space without preceding trauma have been reported in dogs. They include parasitism, bacterial and fungal pneumonia, neoplasia and pulmonary abscess formation.<sup>3, 4, 5 & 6</sup> Ruptured sub-pleural blebs have been cited as the most common cause of spontaneous pneumothorax in humans and dogs.<sup>7, 8</sup> Bullae are large cystic air spaces within the pulmonary parenchyma radiographically characterized by a barely perceptible rim or no rim around the hyperlucent lesion. Bullae result from destruction, dilation, and confluence of adjacent alveoli, but the pathogenesis is not completely understood.<sup>9, 10</sup> Different treatments have been suggested for spontaneous pneumothorax like thoracentesis, mechanical pleurodesis, lung lobectomy and sometimes it cures spontaneously.<sup>11</sup>

### **Case Description**

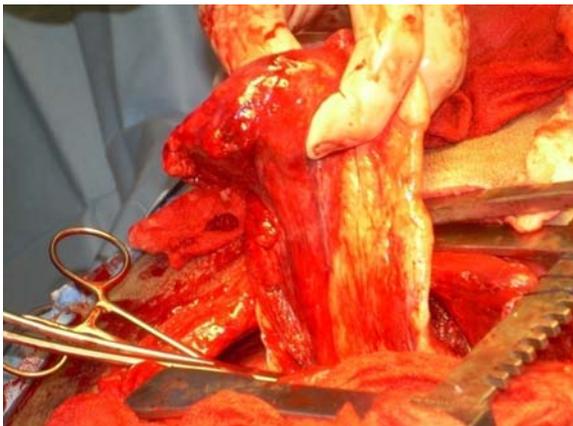
A two-year-old intact Golden Retriever was diagnosed with blastomycosis by a private clinician and received fluconazole for treatment 6 months prior to presentation to the hospital. The patient was referred due to cough, fever and continuous nasal discharge. Peripheral lymphadenopathy and bilateral diffuse edema near the rear limbs was noticed. In physical examination, increased respiratory rate (40 /min) and harsh lung sounds were detected. Computed tomography of the thorax was performed with the dog under general anesthesia and sternal recumbency. In right images of the thorax, large right cranial bullae was observed in dorsocaudal aspect of the right lung. Also emphysematous change was reported secondary to blastomycosis infection. Other lung lobes and mediastinal lymph nodes were normal. Diffuse and severe arterial enlargement was present in right cranial lobe. Hematology data were normal while slight increase in total WBC (13700/ml) and neutrophilia was reported.

### **Treatment and outcome**

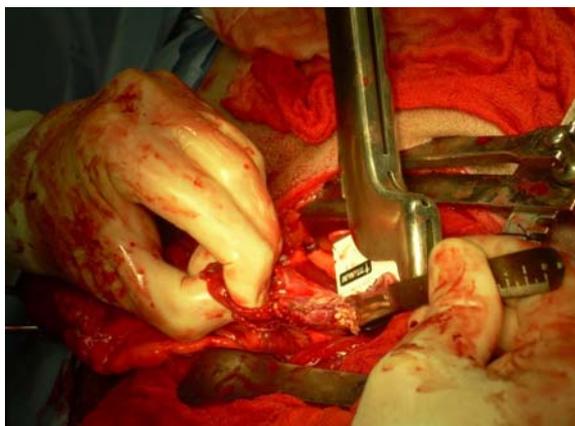
Acepromazine (0.05 mg/kg, IM [Neurotranq®, Alfasan, Woerden-Holland]) was used as premedication and general anesthesia was induced by IV administration of diazepam (0.22 mg/kg [Zepadic®, Caspian Tamin Pharmaceutical Co., Rasht, Iran]) and ketamine (6 mg/kg [Ketalar®, Alfasan, Woerden, Holland]) combination. Isoflurane (1.7%) [Nicholas Piramal Limited, London, UK] in 100% Oxygen was used for maintenance of anesthesia thorough one lung ventilation using intermittent positive pressure ventilation. Cefazolin (22 mg/kg, IV [Cefazex®, Loghman pharmaceutical Co, Tehran, Iran]) was used as prophylaxis at the time of induction of anesthesia.

In left lateral recumbency, the area from upper thorax to mid-abdomen was clipped and aseptically prepared for the surgery. Thorough the right- 5<sup>th</sup> intercostal space lateral thoracotomy was performed. The thorax was fully opened and the adhesion between right cranial lobe, parietal pleura and thoracic wall was released initially. Small bleeders were ligated using 3-0 polypropylene. Care was taken not to damage the bulla. Next the right cranial lung lobe was dissected until the bronchus exposed and it was resected distal to the bronchus using intra-thoracic staplers (Fig. 1 & 2). The air tight seal of the resection site was

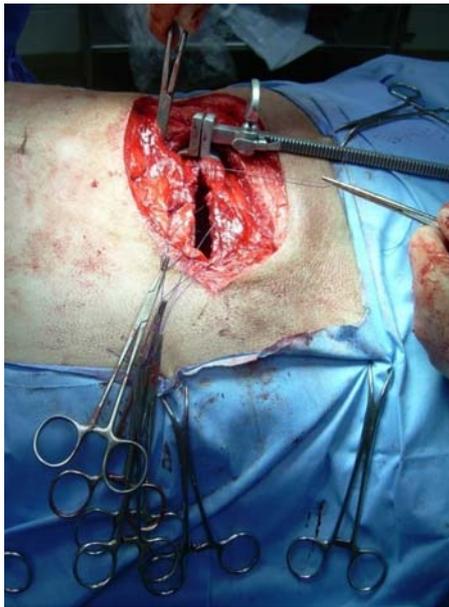
confirmed using warm saline. The chest tube was placed prior to thoracotomy closure and Roman sandal sutures using 0 polypropylene were used to stabilize the tube to the thoracic wall. Thoracotomy incision was closed in a 4 layers. Series of sutures placed around the ribs using 0 polydioxanone firstly (Fig. 3). Prior to tightening the sutures, lidocaine HCl 2% (Pastor Institut, Tehran, Iran) was injected to perform costal nerve block as part of post-operative pain management program. Thoracic muscles and subcutaneous tissues closed using 2-0 polydioxanone and Monocryl respectively. Skin staplers were used to close the skin (Fig 4). Following the surgery cefazolin (22 mg/kg, IV, 8 qh), dexamethasone (1 mg/kg, IM [Iramadol®, Osveh Pharmaceutical Co, Tehran, Iran]) and tramadol (3 mg/kg, PO, 8 qh [Iramadol®, Iran Daru Co, Tehran, Iran]) continued for an overnight. Chest tube was removed a day following the surgery and the patient received fluconazole for three more weeks. The owner was instructed to limit the dog's physical activity for 2 weeks. On histopathology broad areas of necrosis of the lung parenchyma, characterized by accumulations of eosinophilic cellular debris mixed with degenerate inflammatory cells, predominantly neutrophils, were present and in some areas granulation tissue was present. There was marked smooth muscle hyperplasia scattered throughout the affected lung in associated with increased fibrous tissue. Cross section of blastomyces yeast was present with the surround granulomatous inflammation. The final diagnosis was blastomycosis infection resulted in pulmonary atelectasia, necrosis and formation of the bullae.



**Figure 1.** The pulmonary bulla with the affected cranial lobe is exposed via thoracotomy incision following adhesion detachments.



**Figure 2.** Right cranial pulmonary lobectomy was performed using thoracic staplers.



**Figure 3.** Sutures pre-placed prior to complete closure of the thoracotomy incision.



**Figure 4.** Chest tube was place for evacuation of discharges. Skin staplers were used to close the skin.

## Discussion

Spontaneous pneumothorax may result from different underlying pulmonary diseases, but early diagnosis and treatment is concern. Plain radiography is generally non-diagnostic and even misleading in patients with pneumothorax associated with ruptured pulmonary blebs or bullae.<sup>9,10</sup> In one study of dogs with spontaneous pneumothorax, thoracic radiographs failed to reveal the pulmonary lesions in 11 of 12 dogs and it was detected during surgery.<sup>10</sup> Because radiographic confirmation of the pulmonary bullae in dogs and humans is not reliable, advanced diagnostic techniques like computed tomography need to be considered when pulmonary bullae is suspected.<sup>4</sup> In this patient bullae was not diagnosed by private clinician using thoracic radiographs, while computed tomography revealed the bullae in the affected lung lobe. However thoracic radiographs are essential to rule out other causes of the bullae or pneumothorax like pulmonary neoplasia or abscess.

In the retrospective study of 125 dogs affected with pulmonary blastomycosis by Crews et al in 2008, it was reported that pulmonary bullae were seen in 20 (16%) dogs, is most often in association with an alveolar pattern.<sup>12</sup> Lateral thoracotomy is performed when lung disease could be localized to a single lobe. Lung lobectomy thorough lateral thoracotomy was performed in 25% of the patients for resolution of pneumothorax reported by Valentine et al.<sup>11</sup> In dogs with undefined spontaneous pneumothorax, early surgical exploration is recommended and improved results are expected. Although conservative treatment is suggested for treatment of bullae, most patients respond poorly to such treatment. Surgical thoracotomy is the treatment of choice for these patients. Since blastomycosis may cause pulmonary bullae and the rupture of the bullae leads to pulmonary pneumothorax, early diagnosis and effective treatment of the fungal agent is mandatory to prevent life-threatening condition in dogs. In case of bullae formation, surgical management of the patients prevents pneumothorax.

## References

1. Legendre AM. Blastomycosis. In CE Greene, ed. *Infectious Diseases of the Dog and Cat*. W.B. Saunders Co, St. Louis, 1990:371-377.
2. Arceneaux KA, Taboada J, Hosgood G. Blastomycosis in dogs: 115 cases (1980-1995). *J Am Vet Med Assoc* 1998;213:658-663.
3. Burrows CF, O'Brien JA, Biery DN. Pneumothorax due to *Filaroides* infestation in the dog. *J Small Anim Pract* 1992; 3(4):613-618.
- 4- Oliveira C, Rademacher N, David A, et al. Spontaneous Pneumothorax in a Dog Secondary to *Dirofilaria Immitis* Infection. *J Vet Diag Invest* 2010;22:991-994.
- 5- Schaer M, Gamble D, Spencer C. Spontaneous pneumothorax associated with bacterial pneumonia in the dog- two case reports. *J Am Anim Hosp Assoc* 1981;17:783-788.
- 6- Dallman MJ, Martin RA, Roth L: Pneumothorax as the primary problem in two cases of bronchoalveolar carcinoma in the dog. *J Am Anim Hosp Assoc* 1988;24:710-714.
- 7- Mayo P. Spontaneous pneumothorax. A 28-year review. *J Ky Med Assoc* 1984;10:369-373.
- 8- Berzon JL, Rendano VT, Hoffer RE. Recurrent pneumothorax secondary to ruptured pulmonary blebs: A case report. *J Am Anim Hosp Assoc* 1979;15:707-711.
- 9- Au JJ, Weisman DL, Stefanacci JD, et al. Use of computed tomography for evaluation of lung lesions associated with spontaneous pneumothorax in dogs: 12 cases (1999–2002). *J Am Vet Med Assoc* 2006; 228:733–737.
- 10- Lipscomb VJ, Hardie RJ, Dubielzig RR. Spontaneous pneumothorax caused by pulmonary blebs and bullae in 12 dogs. *J Am Anim Hosp Assoc* 2003;39:435–445.
- 11- Valentine A, Mauterer M, Smeak A, et al. Spontaneous pneumothorax in dogs. *Continue education compendium*, Ohio State University, January 1996.
- 12- Crews LJ, Feeney DA, Jessen CR, et al. Radiographic findings in dogs with pulmonary blastomycosis: 125 cases (1989-2006). *J Am Vet Med Assoc* 2008;232(2):215-221.

## حباب بزرگ ریوی در اثر عفونت بلاستومایکوزیس در سگ

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**توصیف بیمار** - سگ نر عقیم نشده، ۲ ساله از نژاد رترایور طلایی با سابقه تشخیص بلاستومایکوزیس شش ماه پیش از مراجعه تحت درمان دارویی با فلوکونازول قرار گرفته بود.

**یافته های بالینی** - پنج هفته قبل بیمار مجدداً با علائم سرفه، ترشحات سرریزی بینی و بزرگی غدد لنفاوی به کلینیک ارجاع داده شد. در معاینه بالینی صداهای غیر نرمال ریوی همراه با ادم دوطرفه پاهای خلفی نیز مشاهده شد. در رادیوگرافی از قفسه سینه در ریه سمت راست امفیژم ثانویه در اثر عفونت قبلی با بلاستومایکوزیس مشاهده شد. همچنین یک حباب بزرگ در لوب قدامی ریه راست در تصاویر سی تی اسکن ملاحظه شد. غدد لنفی مدیاستینوم نرمال بودند. در داده های آزمایشگاهی تغییر غیر طبیعی گزارش نشد.

**درمان و نتیجه** - بیمار تحت بیهوشی عمومی (هیدرومورفون، کتامین و دیازپام) و در ادامه تهویه یکطرفه ریوی به کمک ایزوفلوران (۱/۷ درصد) و اکسیژن جهت انجام جراحی روی ریه راست حالت گماری شد. از ریهافت فضای ۵ بین دنده ای توراوتومی از سمت راست انجام شد. پس از آزاد سازی چسبندگی ها پلور و دیواره توراکس، لوب قدامی ریه راست از برونش جدا شده و به کمک استپلر مخصوص از پایین تر از برونش لوبکتومی انجام شد. پس از کارگذاری chest tube برش توراوتومی به روش معمول بسته شد. در نهایت مراقبت های پس از عمل شامل تزریق بوپیواکایین ۰/۵ درصد برای بلوک بین دنده ای جهت کنترل درد پس از عمل، سفازولین و ضدالتهاب غیراستروئیدی بود. در مراجعات بعدی، لنفادنوپاتی، ترشحات بینی و صداهای ریوی مرتفع شده بود.

**کاربرد بالینی** - بلاستومایکوزیس بیماری خطرناک قارچی است که معمولاً ابتدا پوست و ریه را درگیر می سازد. در صورتی که منجر به شکل گیری حباب ریوی شود، تشخیص و برداشت قسمت آسیب دیده ریه می تواند مانع پارگی حباب و پنوموتوراکس شود.

**کلمات کلیدی** - بلاستومایکوزیس، حباب ریوی، پنوموتوراکس، سگ.