



## Sharp Foreign Body within the Thorax Concurrent with Pneumomediastinum in an Adult Cow: A Case Report

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### ABSTRACT

According to the author knowledge, this report described for the first time pneumomediastinum that was concurrent with sharp foreign body syndrome in an adult recently parturient cow, which was admitted with signs of traumatic reticuloperitonitis. The radiographic examination revealed both sharp metallic foreign body (nail) within the thoracic cavity and pneumomediastinum. The latter is recognized by visualization of the structures, which could not be seen on the radiograph of normal animals. The animal did not receive any type of treatment and its owner was advised with its slaughter.

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### Introduction

The sharp foreign body syndrome (SFBS) is considered a challenging problem in the bovine species. The complications and outcomes of the SFBS are multiple starting from the decrease of milk production, treatment costs, to death or culling of the animals (Roth and King, 1991; Bani Ismail *et al.*, 2007). This syndrome is considered a managerial problem. Also the nature of food prehension in cattle using the tongue without discrimination has an integral role in the occurrence of that syndrome (Misk and Semieka, 2001; Barker and Van Dreumel, 1985). The presence of the sharp foreign bodies (nail, needle and wire) within the reticulum causes a cascade of serious problems as a result of its contractions (Roth and King, 1991). The problems start with traumatic reticulitis, and traumatic reticulo-peritonitis and may end with traumatic pericarditis, diaphragmatic hernia and traumatic pneumonia (Roth and King 1991; Radostits *et al.*, 2007).

In the previous literature, air leakage syndrome includes pneumoperitoneum, pneumoretroperitoneum, interstitial emphysema, subcutaneous emphysema, pneumothorax, pneumopericardium and pneumomediastinum (Carey, 1999; Slack *et al.*, 2004). The pneumomediastinum is the entrance of the gas into the mediastinal space. The source of this gas is either the exterior environment or the internal thoracic structures such as trachea, esophagus or lungs. Pneumomediastinum is considered as a rare case. There are few published case reports that recorded different causes for pneumomediastinum in cattle (Thomas and Syring, 2013; Orton and Monnet, 2018). One of them, related the occurrence of the pneumomediastinum to pneumothorax (Slack *et al.*, 2004). Another study, attributed the occurrence of pneumomediastinum after calving to pre-existing pulmonary disease or exertion of the animal during parturition (Divers, 2007). It may be resulted from bronchopneumonia according to Bezek *et al.* (1995), or might be associated with subcutaneous emphysema as reported in a rabid bull (Pereira *et al.*, 2015).

According to the author's knowledge, this report described for the first time the clinical and radiographic pictures of the pneumomediastinum, which was associated with traumatic thoracic foreign body in adult cow.

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## Case description

A 4-year-old recent parturient domestic cow, weighing about 300 kg, was referred to the Animal Surgery Department, Veterinary Teaching Hospital, Assiut University (Egypt) for clinical evaluation. The case history revealed a gradual decrease of the feed intake, decrease of rumination, reluctance of movement, arching of the back and mild degree of cough. After visiting the private veterinarian, 10 ml of antoplex (2 times weekly i.m; Tornel Laboratorious Products, Mexico), 20 ml of pen-strep (S.I.D for 5 consecutive days. i.m; Procaine Penicillin G, Dihydrostreptomycin, Norbrook, Egavet co., Giza, A.R.E) and 20 ml of bykahepar (just one time i.v; Clanobutin, Schering- Plough) were administered seemingly without positive effects.

At presentation, the patient appeared depressed and showed mild degree of dehydration (6%), tachypnea (30 rate/min.), normal temperature (38.6°C) and the mucous membranes were normal with slight congestion of the conjunctival blood vessels. Thoracic auscultation revealed tachycardia (80 beat/min.) with high amplitude and exaggerated vesicular lung sound. The animal did not show any ocular or nasal discharge. Ferrosopic examination on the abdomen showed positive finding.

The left lateral radiograph of the thorax and cranial abdomen was obtained. It revealed the presence of sharp foreign body in a vertical position within the thorax which overlies the cardiac silhouette near its apex. All the outlines of the thoracic cavity were clear. The line of diaphragm was clearly demarcated and separated from the caudal border of the heart except at the ventral part. The outline of the trachea (dorsal and ventral walls) was demarcated. The esophagus was clearly detected on the radiograph. It appeared radiopaque and with normal size. The ventral wall of the esophagus was separated clearly from the dorsal wall of the trachea by a radiolucent line (gas). The cranial blood vessels, which are included within the cranial mediastinum could be determined on the radiograph. The ventral caudal border of the heart, the cardiophrenic angle and the ventral diaphragm are obscured or masked with uniform radiopaque material causing what is called border effacement (the abdomen is equal in the radiodensity to the cardiac silhouette due to the presence of a material between them has the same density) (Figs. 1 and 2).

The definite diagnosis of this case was the pneumomediastinum, which was associate the traumatic foreign body within the thorax. The treatment of this case was not possible.



Fig. 1. Pneumomediastinum and metallic foreign body within the thorax in a cow.

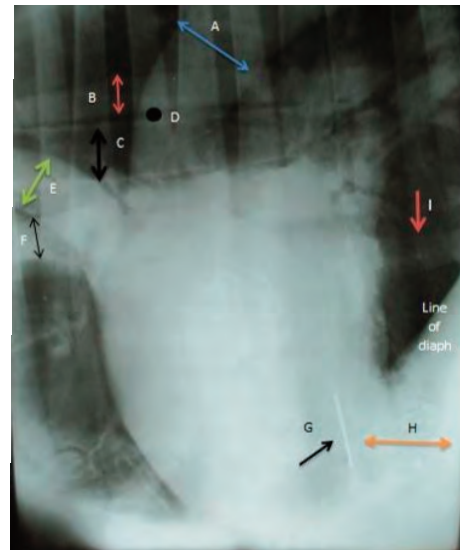


Fig. 2. The same picture of fig. 1 with labeling of the thoracic structures. A. aorta, B. esophagus, C. Trachea, D. Space between the esophagus and trachea filled with gas, E. brachiocephalic trunk, F. cranial vena cava, G. metallic foreign body, H. border effacement due to the presence of exudate between the line of diaphragm and caudal ventral border of the heart, and I. the caudal vena cava.

## Discussion

According to the previous literature, the pneumomediastinum was recorded in the canine, feline, equine and bovine species (Hance and Robertson, 1992; Morris *et al.*, 1995; Slack *et al.*, 2004; Divers, 2007; Thomas and Syring, 2013; Agudelo *et al.*, 2018; DeLay, 2016; Yun *et al.*, 2016). It could be either primary or secondary; the latter form is the most common to be occurred in animals according to the previous studies (Slack *et al.*, 2004; Divers, 2007; Pereira *et al.*, 2015).

Although the definite cause of pneumomediastinum in this case was not uncovered, the traumatic foreign body is closely to be accused. This may be attributed to one of three potential causes from clinical point of view. The first one is the direct impact of foreign body on the bronchioles and/ or alveoli (Orton and Monnet, 2018). However, the ventrodorsal or the dorsoventral radiographic views that could prove this possibility are hardly to obtain in the practice (Misk and Semieka, 2001). The second one is the presence of gas forming microorganisms came along the foreign body from the rumen and reticulum. In human, the microorganisms such as *Staphylococcus* spp. and *Mycoplasma pneumonia* were isolated from cases suffered pneumomediastinum (Roshan *et al.*, 2003 and Fearon *et al.*, 2007). Lastly, a small tract could be formed from the abdomen to mediastinum via the penetrating foreign body that allowed the passage of gas from the abdomen to the thorax. According to a study conducted by Van Den Broek (1986), the most common cause beyond the occurrence of pneumomediastinum is the thoracic trauma. This trauma may lead to damage of the lungs, trachea and esophagus as recorded by Orton and Monnet (2018).

The radiography in this presenting case was considered an important tool in diagnosis and confirmation of pneumomediastinum and the foreign body within the thorax. Jones *et al.*, (1975) used the radiography for diagnosis and monitoring the treatment of pneumomediastinum in dogs. They stated the importance of thoracic radiography as a crucial tool in definite diagnosis. The radiographic signs of pneumomediastinum are characteristic, which include the visualization of the structures, which could not be seen in normal thorax such as the esophagus, the walls of trachea and some of B.Vs. The

air within the mediastinum acts as a contrast agent and the mediastinal structures are clearly visible. These results were in consistent with the results of previous studies (Jones *et al.*, 1975; Farrow, 1976; Van Den Broek, 1986).

The sharp foreign body syndrome as was reported in the previous studies, may lead to traumatic diaphragmatitis, diaphragmatic hernia, traumatic pericarditis and traumatic pneumonia (Aref and Abdelhakiem, 2013; Chaudhary, 2016). Traumatic pericarditis in cattle mainly resulted from a migrating sharp reticular foreign bodies (Braun, 2009). In a case study reported by Sojka *et al.*, (1990), the traumatic foreign body in the thorax may penetrate the body wall without reticular involvement. In the present case, the thoracic radiograph revealed the vertical alignment of the foreign body, which might refer to the unusual penetration of it without the reticular way. On the other hand, the obscuring of the cardiophrenic angle on the thoracic radiograph due to border effacement may verify the exudation and the fibrinous adhesion, which may be resulted from the foreign body comes from the abdomen. The author of this present case supported the reticular way of the thoracic foreign body. This is may be due to the presence of the border effacement only between the caudal border of the heart and the diaphragm. Additionally, the absence of the head of the foreign body may facilitate the penetration of it readily through the diaphragm into the thorax. The reticular, diaphragmatic and cardiac movement may affect the direction of the foreign body.

In the presented case, the animal did not exhibit the most common signs indicating pericarditis such as muffled heart, abnormal heart sounds, jugular distension, submandibular, brisket and ventral abdominal edema as was reported by Braun (2009), meanwhile, the animal suffered some of the uncommon signs of heart diseases that were reported by Buczinski *et al.* (2010) such as tachypnea and inappetence.

The thoracic radiograph could not refer to the accurate seat of the foreign body either in the lung or the heart. The vertical position of the foreign body might refer to its lung penetration readily than heart. This is due to the lower density of lung tissue which has a low power to resist the penetration of the sharp foreign body through it. So, the pneumomediastinum in the present case was attributed greatly to lung trauma caused by sharp foreign body. Similar findings and suggestion were reported by previous studies (Thomas and Syring, 2013; Orton and Monnet, 2018).

## Conclusion

In short, this case report discussed for the first time to best of our knowledge, the pneumomediastinum that accompany sharp foreign body syndrome in cattle.

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