Luminal Corrosion Cast of Tracheo-Bronchial Tree of Equine Lung

R. Menaka*, Pankaj Thanvi** and Hemant Joshi**

Department of Veterinary Anatomy, Apollo College of Veterinary Medicine, Agra Road, Jaipur-630 318, Rajasthan, India.
** Assistant Professor, College of Veterinary and Animal Sciences, Rajasthan University of Veterinary and Animal Science, Udaipur (Rajasthan), India.

*Corresponding Author:  R. Menaka  Email: rmenaka2008@gmail.com
(Present Address: Assistant Professor, Vanbandhu College of Veterinary Science and Animal Husbandry, NAU, Navsari, Gujarat, India).

Received: 17/09/2015
Revised: 28/09/2015
Accepted: 29/09/2015

Abstract
The luminal corrosion cast of tracheo-bronchial tree is extremely important to understand the behavior of lung at large. The equine is sensitive to allergic condition and commonly prone to lower respiratory diseases. The fresh samples were utilized and silicone gel was injected to prepare the luminal cast of plastinate models. The knowledge of the branching morphology of the air way system is crucial for a complete understanding of the entire lung. The principle bronchus and its segmental bronchi were observed in the equine species. This study tried to account for the natural variation and distribution of bronchial tree pattern as concern with body mass and behavior of individual animal. It may be an ideal model for comparative anatomical study of various species by luminal corrosion cast technique.

Keywords: Bronchial tree, Plastinate models, Corrosion cast, Allergic, Silicone, Bronchus.

1. Introduction
The horse is one of nature’s great athletes. Equine athletes can be affected by a variety of disease and conditions. It reduces their performance in mild cases and result in early retirement of their work. Horses are different from humans in the way that the oral cavity and pharynx are always separated by the soft palate except for swallowing. This is what makes variation among animals in the horse an obligate nasal breather, meaning that horse cannot breathe through the mouth. Macklin and Macklin (1942) emphasized that “the lung is the bronchial tree”. The pulmonary air ways are organized in a complex branching arrangement to facilitate gas exchange in the lung. The mammalian respiratory physiology and air way spaces are adapted to the body mass and behavior. Luminal corrosion cast technique is useful to study the dimensions and architecture of different cavities of organs and to study the tubular pattern of arterial, venous, various duct branches. This method is used for trachea bronchial cast of lungs cerebral ventricles, bony labyrinth, vascular pattern of liver, kidney, lung, spleen, coronary vessels etc. (Parashuram et al., 2010). The study is an important contribution to the development of an animal models and teaching aids for better understanding of lower respiratory passage. The corrosion cast luminal plastinates yielded durable, odorless and pleasant to handle. It allows better visualization of the branching pattern of the airways in the bronchial tree patterns.

Recurrent airway obstruction (RAO) is a familiar disease which affects a horse’s lung. RAO causes constriction of the lower respiratory passage and accumulation of mucus. Human asthma has been used as a model for RAO research and can provide some insight as to what a horse might be experiencing. The equine respiratory system is extensively studied because it is thought to be one of main area of respiration. Even then, certain factors limit a horse’s ability to perform at full potential. This paper does not replace the fundamental diagnostic causes made by a veterinarians but is meant to provide better understanding of lower respiratory airways. The studies mainly focused on lower respiratory bronchial tree luminal cast plastination.

2. Materials and Methods
The two lung samples (adult horse) were collected from postmortem cases in the department of Veterinary Pathology, Apollo College of Veterinary Medicine, Jaipur. The lung samples were injected with silicone sealant (Dr. Fixit) into the tracheal bifurcation level by injecting gun. Frank and Yoder (1966) introduced the use of silicone for forming casts. The
3. Results and Discussion

The right lung is divided into a cranial lobe and its bronchial tree as right cranial bronchus, a middle lobe and its bronchial tree as middle bronchus. The accessory lobe and its bronchial tree as accessory bronchus and a caudal lobe and its bronchial tree as right caudal bronchus. The left lung is divided into a cranial lobe and its bronchial tree as left cranial bronchus and caudal lobe and its bronchial tree as caudal bronchus. The principal bronchus of each lobe further divided into secondary or lobar bronchi. The segmental bronchi then divide and subdivided through the entire lung and formed the bronchial tree (Fig 1-2).

A picture is worth a thousand words.

In the eighteenth century most of the French anatomists injected the vascular system with a coloured mixture of wax, animal fat and plant resins and the body was dehydrated by immersion in a bath of alcohol. However the procedure of the classical technique was not revealed by Honore’ Fragonard (Kamath et al., 2013). There is no doubt that student of various medical/veterinary colleges will be the ultimate beneficiary as this anatomical technique of preservation becomes more realistically in the virtual learning of anatomy. The particular approach may be considered as teaching aids/models are restricted by various ethical concerns (Menaka et al., 2015).

4. Conclusion

The luminal corrosion cast of bronchial tree pattern of equine specimens is more interactive and could be adopted for virtual class room teaching and learning. The anatomy of the lungs and its bronchial tree pattern are species specific. These differences explain the airway diameters in any branching level and can determine the volume of air flux in the lung. The bronchial tree luminal cast plastinates is best model to demonstrate for understanding of the principles of morphological variation, physiological importance of air circulation and other abnormalities in the lung pathology.

Acknowledgement
Authors cordially extended special thanks to Dr. Sohan Singh Rathore, Retd., Dean, ACVM, Jaipur and Dr. V. Ramkrishna, Retd., Professor and Head, College of Veterinary Science and Head, KVAFSU, Bidar, Karnataka for disseminating valuable knowledge and his moral support.

References