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Original Research Article

THE STUDY OF THE GOAT (CAPRA AEGAGRUS HIRCUS) LUNG BY LUMINAL PLASTINATION TECHNIQUE

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ABSTRACT

Plastination is useful in anatomy as well as serving as models and teaching tools.The plastinated specimens retain their dilated conformation by a positive pressure air flow during the curing process, which allows them to be used to teach both endoscopic technique and gastrointestinal anatomy. With the use of plastination as a teaching method of animal science, the plastination process allows specimens to be studied for a long time. Platination is derived from the Greek (from plassei to shape, to form, a creation of Gunther Von Hagens. A process at the interface of the medical discipline of anatomy and modern polymer chemistry. Plastnation makes it possible to preserve individual tissues and organ. Luminal plastination can be uses to upgrade the knowledge of comparative anatomy which is of profound importance in the present Era of advances in therapeutic science that use animal model for testing drug. The tracheobronchial pattern of human lungs is well known. An attempt was made to compare the pattern with that of goat lung using luminal plastination of goat lung. Several similarities were observed between the two patterns, due to which, the goat lung serves as an ideal experimental model to study the effect of treatment in several human airway diseases.

KEY WORDS: Luminal Plastination, Silicon Sealant; Silicon Gun; Bronchial Tree Of Domestic Animal.

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INTRODUCTION

The method of luminal Plastination is a novel technique, in this study to realize the branching of bronchus in the lung of goat the lung of five goats was injected with acetic cure silicone sealant solution and the coagulated branches tree was used to examine. The comparative anatomical study of the lung numerous mammal lungs, including human .The method was first invented by Gunther Von Hagens who imagined as to what would happen if plastic was impregnated in to substance. Luminal plastination can be used to enrich the knowledge of comparative anatomy which is of profound importance in the present era of advances in therapeutic science that use animal models for testing drugs.

MATERIALS AND METHODS

A fresh ten specimen of goat lung was obtained and they were preserved in water. The tracheo-bronchial tree was cleaned repeatedly with tap

water until all the blood clot was drained out of lung. The silicon sealant was then injected to tracheo-bronchial tree using a silicon gun. The specimen was then left to dry until all the sealent solidified. The surrounding lung tissue was then destroyed by boiling. Thus a plastinated luminal cast of the tracheo-bronchial pattern was obtained which was then cleaned. Then the specimens were mounted in a glass jar.

RESULTS

The goat lung shows an additional bronchus on the right side arising directly from the trachea and additional bronchus present on right lobe of lung and similar lower lobe of left lung.

Specimens: additional lobe on

1) 6 cm away from right bronchus 2) 5 cm away from right bronchus 3) 4.5 cm away from right bronchus 4) 4.5 cm away from right bronchus 5) 4 cm away from right bronchus

The additional bronchus on the right side again divides in to two bronchi secondary bronchi and broncho- pulmonary segment of additional lobe 7.

Two principal bronchi are seen on each side. Right main bronchus is wider, shorter and more vertical than left.

Right superior lobar bronchus arises from lateral aspect of parent bronchus its divides in to three segmental bronchi.

The right middle lobar bronchus starts 1 cm below the superior lobar bronchus from front of the right bronchus intermedium and descend anterolateraly.

The inferior right lobar bronchus is the continuation of the principal bronchus beyond the origin of the middle lobar bronchus.

The left superior lobar bronchus arises from the anterolateral aspect of its parent stem, curves laterally and soon divides into two large and two small bronchi.

The left middle lobar bronchi arises below superior lobar bronchi and divides in to two bronchi

The left inferior lobar bronchus descends postero-laterally and soon divides to supply territories of the lung.

Segmental anatomy: The (right lung)apical segmental bronchus divides near its origin in to apical and anterior branch. The posterior Segmental bronchus soon divides in to a lateral and posterior branch.

The right middle lobar bronchus soon divides in to a lateral and medial segmental bronchus. This pass to the lateral and medial parts of middle lobe .The right middle lobar bronchus starts 2cm below the superior lobar bronchus from the front of right bronchus. The right inferior lobar bronchus is the continuation of the principal bronchus beyond the origin of the middle lobar bronchus, gives off a large superior segmental bronchus posteriorly then divides medial lateral and superior branch the medial basal segment bronchus branches from the anteromedial aspect inferior lobar continues and divides in to anterior basal lateral basal and posterior basal.

The left principal bronchus is narrower and less vertical than right 5 cm long. The left superior lobar bronchus give off superior division divides in to an anterior segmental bronchus and apico-posterior segmental bronchus and divides in to apical and posterior branch.

The left middle lobar bronchus division forms the lingular bronchus which divides in to superior and inferior lingular segmental bronchi.

Fig. 1: Showing the lung by luminal plastination technique.

The apical bronchus arises from the inferior lobar bronchus posteriorly. After further inferior lobar bronchus divides in to an antero-medial and a posterolateral stem. And two small anterior and posterior segments. Anteromedial divided in to three segments and posteromedial divides in to 5 small segments.

Additional segments on posterior aspect of anteromedial segment of left lower lobe.

DISCUSSION

In humans there are two principal bronchi, onefor each lung. The right lung has three lobes and hence shows three secondary bronchi and the left has two lobes and hence shows two secondary bronchi. The secondary bronchi divide into several tertiary bronchi and in humans there are ten tertiary bronchi on each side. Each tertiary bronchus supplies one bronchopulmonary segment and hence there are ten segments on each side [2]. The segments are named as follows:

Right side	Left side
1. In upper lobe	
a. Apical	a. Apical
b. Anterior	b. Anterior
c. Posterior	c. Posterior
2. In middle lobe	d. Superior lingular
a. Medial	e. Inferior lingular
b. Lateral	
3. In lower lobe	**2. In lower lobe**
a. Apical	a. Apical
b. Anterior basal	b. Anterior basal
c. Lateral basal	c. Lateral basal
d. Posterior basal	d. Posterior basal
e. Medial basal	e. Medial basal

The above mentioned human tracheobronchial pattern is described by standard text books. When compared to the pattern in goat. We notice that the only difference is in the extra lobe that is observed on the right side and two accessory lobe. The division of the two principal bronchi follow a common pattern in both, with equal number of secondary and tertiary bronchi.

Bronchopulmonary Segments: (goat Lung)

1. Left Apical, 2. Left Posterior, 3. Left Anterior, 4, 5. Superior & Inferior Lingular

6. Left Apical, 7. Left Medical Basal, 8. Left Anterior Basal, 9. Left Lateral Basal, 10. Left Posterior Basal, 11. Right Superior Lobar, 12. Right Middle Lobar, 13. Right Anteromedial Basal, 14. Right Lateral Basal, 15. Right Apical, 16. Right Posterior Basal, 17. Right Additional Bronchus, 17a, 17b- Its two branches, 18. Additional bronchus on right and left lobe.

CONCLUSION

Plastination is a good replacement for formalin as a preservative as there are no health hazards and solves several ethical and religious issues regarding dissection of dead bodies in some countries. The technique can also be used to prepare luminal casts, sheet plastinated specimens that are comparable to C-T Scans and whole organ plastinations. These specimens can be handled with bare hands without side-effects like contact dermatitis and conjunctivitis. These specimens are also odourless and easy to preserve in contrast to formalin fixed specimens.

The luminal casts of gastrointestinal system and tracheobronchial system, if well prepared can be used to practice endoscopic procedures as well. The knowledge of the comparative anatomy of tracheobronchial tree is very useful as patterns that closely resemble human pattern are useful in therapeutic research.

Conflicts of Interests: None

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