



The 10th International Scientific Conference  
Under the Title

“Geophysical, Social, Human and Natural Challenges in a Changing Environment”

المؤتمر العلمي الدولي العاشر

تحت عنوان "التحديات الجيوفيزيائية والاجتماعية والانسانية والطبيعية في بيئة متغيرة"

25 - 26 يوليو - تموز 2019 - اسطنبول - تركيا

<http://kmshare.net/isac2019>

---

## A Study of Tracheobronchial Tree lungs and Pulmonary Vessels Using Luminal Cast in Local Iraqi Sheep

Sameera A.Da'aj<sup>a</sup>, Haifa A. Hussein<sup>b</sup>, Nadhim A.Shehan<sup>c</sup>

Department of Anatomy and Histology, College of Veterinary Medicine, University of Basrah , Iraq.

<sup>a</sup> Hamideen94@gmail.com

<sup>b</sup> alihiafa22@gmail.com

<sup>c</sup> Nadhimazeez66@gmail.com

**Abstract:** Respiratory system is the basic prerequisite for living organisms. Fresh and well preserved specimens are a must in anatomy teaching. Casting has emerged as a ray of hope for near ideal preservation of biological specimens . Naturally macerated cast of the bronchial tree of the Iraqi sheep lungs was made with epoxy resin and silicone resin .These cast forms a good teaching aid as well as a nice museum specimen.

the present study was done on 7 fresh trachea and lungs divided three group. The first group injected with epoxy resin. Second group injected with silicon two color ( white and black ) and third group for study blood supply to trachea bronchus left and right bronchus and bronchia tree .

The cast of normal trifurcate branching pattern in right upper lobar bronchus and left. The model showing that the pulmonary trunk divides in to right left pulmonary arteries after arising the right ventricle of heart. the knowledge of anatomy and variation in branching pattern of the tracheobronchial tree .The method of silicon cast resin is better than the epoxy resin.

**Keywords:** Casts , Silicon , Epoxy ,Sheep , Lung, Bronchial tree.



### **Introduction:**

The used of casts of respiratory airway is essential for clear conceptualization of the interior of the lung . Numerous method for the preparation of such specimens using plastics and resins .The technique of casts referred to previous are examined by dissecting microscope for finer resolution of replicas of internal surface structures (HODDE and NOELL 1980). Further details of this technique are described in detail and method.Used two main types of casting material silicone rubber and polyester resins. Cast technique for using silicone rubber was developed by (Phalen et al. 1973)

Silicon casts have been employed of dimensions of airways in all mammals (Horsefield K. 1990).Silicon based compound have been found by several authors to provide excellent replication, good flexibility of the finished product and the advantage of curing at room temperature (Phalen et al. 1973).Corrosion casts provide the most direct and effective approach to establishing the geometry of airways in normal or disused states.

They have been used principally to derive mathematical models for the mechanical properties of normal airways (Smith et al. 1990). The vascular corrosion cast is the most adequate and effective technique to examine the angioarchitecture of normal and pathological tissues. The vascular microcorrosion casts precisely reflect the course and anastomoses of blood vessels and also allow observing arrangement of arterial networks and venous plexuses. Vascular corrosion casts allow observing the microangioarchitecture ( Nakakuki 1993).The aim of the study to investigate the branching of trachea and the lung lobes.

### **Material and Methods:**

Materials required

- 1-Fresh specimen of Basrah sheep trachea &lung.
- 2-Polymerizin resin (cold acylic)
- 3-Silicone gel tub with its cannula
- 4-Forceps
- 5-Plastic tubes
- 6-Syringes

### **Methods:**

for casts technique seven fresh trachea , lungs of local Iraqi sheep's to study the trachea, bronchial tree and blood vessel.

1- used the polymerizing resin (cold acylic) or epoxy.

After washing by using tap water or saline solution injected the trachea by epoxy .The specimens are then left at room temperature (Nuttum, J.A.1995) .

2- Using three specimens for study the blood vessels, the resin mixed with red or blue color was used for injection.

3- used silicone casts were prepared two fresh specimens for casting , the airways were washed twice with tap water to remove blood and debris the lung a two component silicone (3MEXPRESS 2 light body standard Quick) was injected into the trachea using a gun like silicon dispenser (garant ,with a 3 Mixing tip), which mixed the two components during injection.

The compound was chosen for its qualities of low. Viscosity and very high hydrophiicity.for the injection, the lungs were positioned horizontally on the table and silicon mix was applied separately into each bronchus .



When silicone material started to flow out around the applicator tip. The injection was deemed finished.

**Results:**

1- The trachea:

The cast form trachea of local sheep is a firm tube like structure a began immediately caudally from cricoid cartilage of the larynx and extended caudally to its bifurcation in the hillus lung the trachea was made of incomplete C- shaped cartilage rings held to gather by connective tissues.

The trachea gives off bronchus to the cranial lobe of the lung called tracheal bronchus originated from the right side only of the trachea before its bifurcation trachea divided into right and left bronchi Fig 1 (A,B, C).

2- Lung and bronchial tree

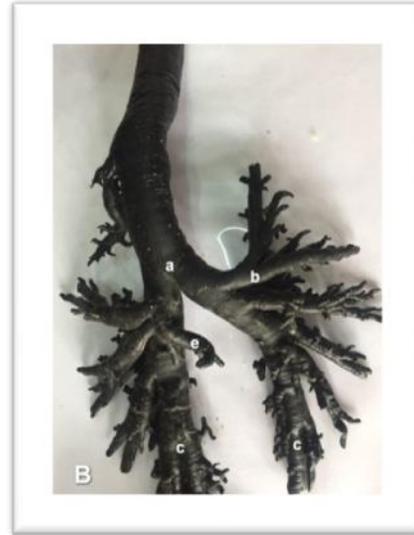
The lung is a soft compact and spongy mass of tissues. The right lung of the local sheep divide by inter lobal fissure into four lobes, cranial, middle caudal and accessory lobe, while the left lung consisted of two lobes , cranial lobe & caudal lobes Fig 2 (A,B).

The bronchial tree pattern which were relatives size of the bronchi and bronchioles .

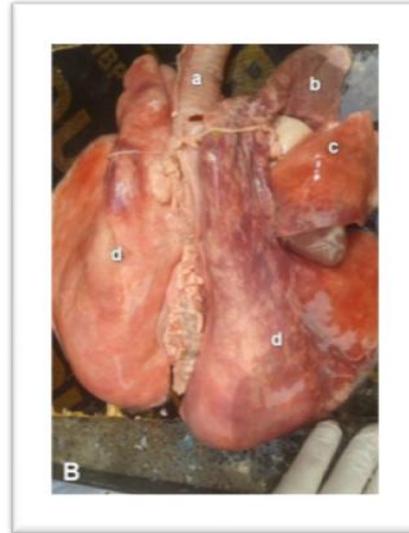
The cranial bronchus inter to cranial lobe , caudal bronchus inter to caudal lobe .

Cast of blood vessel distribution of pulmonary artery of casts.

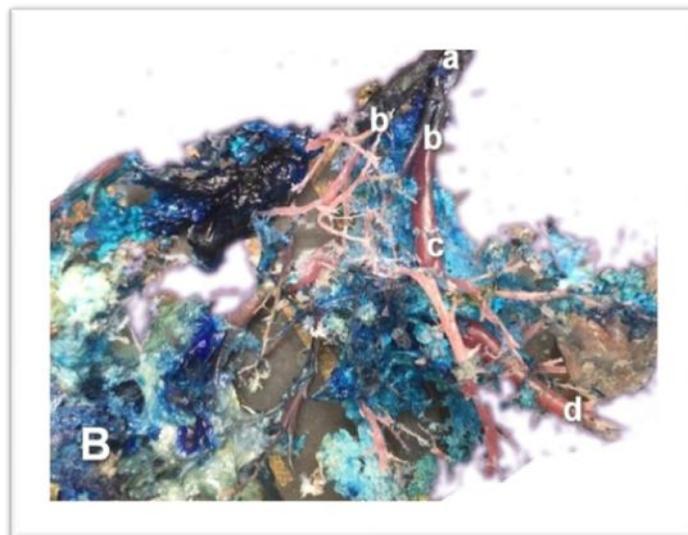
These results are obtained from the cast model showing that the pulmonary trunk divides into right and left pulmonary arteries after arising from the right ventricle of heart. Fig 3 (A,B).

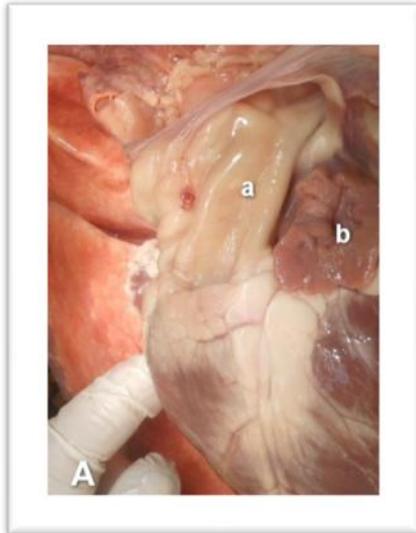


Figure(1): A- Silicone Cast photograph of sheep lung illustrates the Ramification of the Bronchial (a) trachea (b) trachea bronchus (c) right main bronchus (d) left main bronchus (e) bronchial Tree. B- Silicone Cast black color (a) tracheal bronchus (b) cranial bronchus (C) caudal bronchus in caudal lobe(e) accessory bronchus. C- Resin Cast of sheep Lung (a) trachea (b) right principle bronchus (c) right principle bronchus (d) left principle bronchus (e) bronchial tree



Figure(2): **A-** a photograph showing the fresh trachea lungs and heart before cast injection (a) Trachea (b) cranial part of cranial lobe of the right lung (c) caudal part of cranial lobe (d) caudal lobe in two lung. **B-** a photograph showing the trachea and heart of sheep at time of cast injection (a) Trachea (b) cranial part of cranial lobe of the right lung (c) caudal part of cranial lobe (d) caudal lobe in two lung





Figure(3): A- Heart with lung during the Cast injection (a) pulmonary arteries (b) left atrium

B-Cast photograph of the lung illustrates the ramification of the right pulmonary (a) pulmonary trunk (b) right and left apical pulmonary (c) right middle pulmonary (d) right caudal pulmonary artery.

**Discussion:**

The result of cast technique of bronchial tree showed the trachea give off tracheal bronchus and divided into right and left principal bronchi and each bronchus subdivided to bronchi to bronchioles(AL-UmeryS.K.W. in sheep 2015 , Dyce et al. 2010 ) similar with this study.

The silicon compound a accurately reproduced .

The main aspects of tracheobronchial branching this was confirmed by comparing the lung casts of the lynx to that of the domestic cat that in tum corresponded with the known tracheobronchial branching of cat lung (Nickel.R,Schummer&Sciferle.E. 1979).

These of silicone casts forgathering

Morphological data from free – ranging wild life by documenting the tracheobronchial anatomy of the Eurasian lynx (*lynx lynx*) (laakonen,J & Kivalo,M 2013.)agree with these study. The most proximal intrapulmonary bronchi show considerable organizational variation between animal species (Nakakuki 1993, Hyde et al.2009)

Cast of blood vessel distribution of pulmonary artery and vein of cats (Mirhis & Nassar 2013 ) in local cats also similar with study

The lungs of rabbit divided by fissure into cranial lobe caudal lobe and accessory lobe of the right lung but left lung have two lobes cranial divided two part and caudal lobe (Autifi et al.2015) in rabbit agree with result study.

**Conclusion:**

The casting specimens are near ideal and are excellent for teaching gross anatomy , neuroanatomy and radiology .Though it is difficult and time consuming , it is the most promising and stable method to preserve the specimens as an alternative to formalin preservation .These specimens can be used as a better teaching aid in schools , colleges and research institutes.

**References**

HODDE and NOELL. (1980). Preparation of experimental animal tissue for Scan Electron Microscope . (pt2). 1-19. US National library of Medicine.



- Phalen,R.F. YEH, H.C.Raabe,O.G. and Velasquez,D.,J.(1973). casting the lungs In-situ. *Anat. Rec.*177: 255-263.
- Horsfield K. (1990). method for casting airway in : *Models of disease: microscopy and structural methods*;265-277. Marcel Dekker,inc,Newyork.
- Smith, B.J., Hollady, S.D. and Hudson, L.C.A. (1990). Simplified method of casting the mecroscopic airway of lungs. *Acta. Anat.* 137: 109-113.
- Nakakuki, S (1993) . The bronchial tree, lobular division and blood vessels of the Japanese deer (cervus Nippon) lung. *J. Vet. Med. Sci.* 55(3): 443-447.
- Nettum, J. A. (1995). Combined vascular-broncho-alveolar casting using formalin-fixed canine lungs and a low viscosity silicone rubber. *Anat. Rec.* 243: 479-482.
- Al-Umery S. KW.(2015),Grossly and Microscopic study of the local sheep *Bas.J.Res.*vol.14 No1.
- Dyce.K.MSack.W.O.&wesing C.J.G. (2010 ):*Textbook of veterinary anatomy*.4<sup>th</sup> ed.-sauader Elsevier.St.louis, USA.
- Nickel.R,Schummer.A.&Sciferle.E. (1979 ):*The Niscera of the domestic mammals* –Verlag Paul Parey,Newyork,USA.
- Laakkonen,J.&Kivalo,M (2013):the use of silicone casts in collection of morphological data from free-ranging wildlife-the case of tracheobronchial anatomy of the Eurasian lynx (lynx,lynx)*Ann.zool.Fennici*50:256-261.
- Nakakuki,S.(2008) Distribution of the pulmonary artery and vein the dog lung . *Adv-Amin. Cardio.*33(1):16-23.
- Hyde,D.M.,Hamid,Q.&Larvin.C.G. (2009 ):*Anatomy.Pathologyof the tracheobronchial tree:Emphasis on the distal airways- Journal of Allergy and clinical Immunology* 124:S72-S77.
- Mirhis,S.M.& Nassar,R.AA.(2013):*Anatomical Study of the tracheal cast and lung in local breed cats Felis Cactus Domesticus* . *L. Bas.i.vet. Res Voll* 2.No 2.
- Autifi,M.A.ELBannaA.K.Ebaid A.EL.(2015)*Morphological study of Rabbit lung,Broncheal tree and pulmonary vessels using corrosion cast Technique AL-AZHAR Assiut Medical Jurnal.AAMJ*,Vol13,No3 .