

## A Study of Variations of the Branching Patterns of right Upper Lobar Bronchus by Corrosive Cast Method

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### ABSTRACT:

**Introduction:** Respiratory system is the basic prerequisite for living organisms. So precise knowledge of normal anatomy and various dimensions of human respiratory tract is inevitable. The right upper lobe bronchus is prevailingly trifurcates into apical, anterior and posterior segmental bronchi. **Material and Methods:** The present study was done on 28 tracheo-bronchial casts prepared by corrosive cast method in the anatomy department of B. J. medical college of Ahmedabad, Gujarat, India from 2011 to 2013. **Result and Observation:** In 16 specimens (57%) normal trifurcate branching pattern was seen in right upper lobar bronchus. Most common variation observed was bifurcate pattern in right upper lobar bronchus in 36% of specimens. In 7% specimens quadrivial pattern was seen in right upper lobar bronchus in which it divided into four bronchi. **Conclusion:** The knowledge of anatomy and variation in branching pattern of the tracheo-bronchial tree enables the physicians to recognize clinical picture and pathology of human lungs, as well as the application of therapeutic and diagnostic methods like tracheal intubation, bronchoscopy, bronchography and postural drainage etc.

**Keywords:** Right upper lobar bronchus, Tracheobronchial cast, Branching pattern of tracheobronchial tree.

### Introduction

Respiratory system is the basic prerequisite for living organisms to retain their life. This system has undergone various modifications and in multicellular organisms like man it developed into a system of branching network of bronchial tree<sup>[1]</sup>. Any pathology in air passage will call for an urgent intervention. Several diseases have definite segmental importance. One of these is bronchiectasis which starts in one or more segments and spreads to other segments. The extent of the disease can be readily determined by bronchography and rather neatly removed by segmental resection<sup>[2]</sup>. Many benign neoplasms and granulomas can be so removed. When a bronchial adenoma occurs, in one out of 10 instances it is located in a segmental bronchus rather than a main bronchus<sup>[2]</sup>. Thus a precise knowledge of normal anatomy and various dimensions of human respiratory tract is inevitable. Normal anatomy of the tracheo-bronchial tree enjoys considerable attention in various fields like surgery, anaesthesiology, medicine, radiology etc. The right upper lobe bronchus is prevailingly trifurcate into apical, anterior and posterior segmental bronchi.<sup>[3]</sup>

### Material and Method

The present study was conducted on the human lungs collected from post mortem room and also from the embalmed bodies from the

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*Procedure:* A clear plastic cannula was placed into the tracheal lumen and ligated in place. The trachea was flushed with running tap water. Then it was irrigated with mild detergent solution to remove the mucous plugs. The flushing procedure was repeated 5 to 10 times, until the majority of mucous and blood was removed. Silicone gel was injected in trachea with help of gun. The cannula of silicone gel was introduced directly into trachea and gel was pushed into the lungs to near capacity as in fig.1. During this filling process, it gradually becomes more difficult to inject the silicone gel into the airways. Therefore care was taken not to over fill the lungs or rupture the airways by gentle and continual pressure applied to the plunger of the gun. The silicone gel was allowed to harden overnight. On next day, the lungs were placed in a jar containing HCL. Once most of the parenchyma was removed by acid, cast was taken out from acid and rinsed with running tap water to remove any remaining loose tissue. Any variations in the branching pattern were observed.

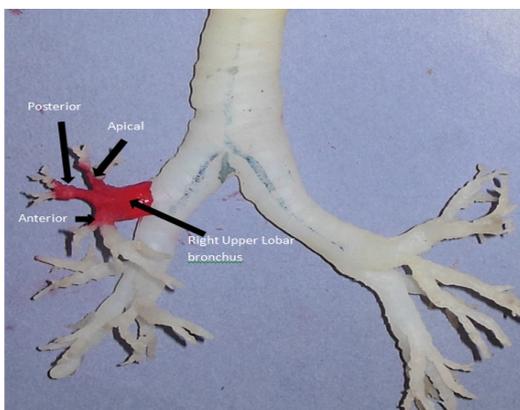
**Image 1: Showing injection of silicone in trachea-bronchial tree**



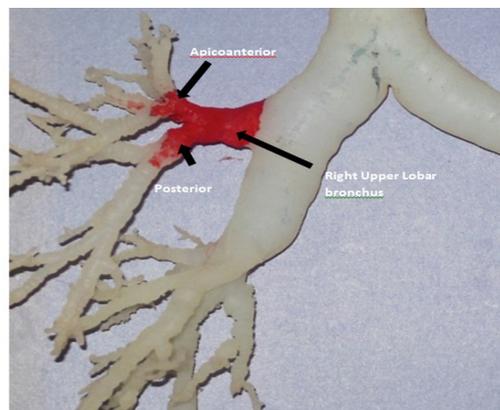
**Result**

**Table 1 showing branching pattern of Right upper lobar bronchus**

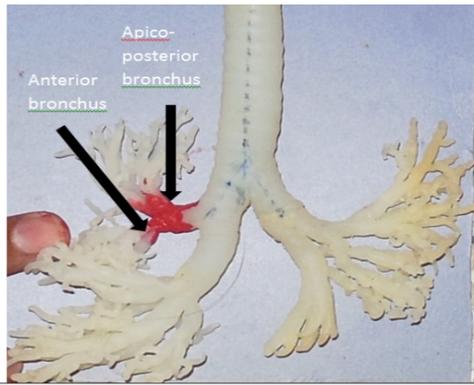
Bronchus		pattern	Divides into	No. of specimen	%
Right Upper Lobar Bronchus	Normal	Trifurcate	Apical+Anterior+Posterior	16	57
	Variations	Bifurcate	Apicoanterior+Posterior	8	29
			Apicoposterior+ anterior	2	7
		Quadrivial	Apical +Apical division of posterior +Posterior division of posterior + Anterior	2	7



**Image: 2 Trifurcate branching pattern in Right Upper lobar bronchus**



**Image : 3 Bifurcate branching pattern in right Upper lobar bronchus**



**Image: 4 Bifurcate branching pattern in right Upper lobar**



**Image: 5 Quadrivial branching pattern in right Upper lobar bronchus**

## Discussion

In present study 28 casts of tracheo-bronchial tree were prepared. Branching pattern of bronchial tree was studied in detail. The obtained values were compared with the similar studies done in the past.

According to Ghaye et al. <sup>[4]</sup>, the trifurcate pattern was observed in 30% of 30 lungs, according to Yamashita <sup>[5]</sup> in 34% of 170 lungs, Boyden <sup>[1]</sup> & Boyden and Scannel <sup>[6]</sup> in 46% of fifty lungs and Koshino et al. <sup>[7]</sup> in 45% of 194 lungs, Cenk et al. <sup>[8]</sup> in 87% of lungs and in present study trifurcate pattern was seen in 57% of 30 lungs.

The study done by Boyden and Scannell <sup>[6]</sup> and Gonlugar U. et al <sup>[9]</sup> showed the bifurcate pattern in the right upper lobe in 38%, 48% of specimens respectively. A bifurcate pattern has comprised 48–53% of specimens in other studies done by Yamashita, <sup>[5]</sup>; Ghaye et al. <sup>[4]</sup>, Koshino et al <sup>[7]</sup>. In present study bifurcate pattern was seen in 36 % of specimens.

A quadrivial pattern was observed in 14% by Boyden and Scannell<sup>[6]</sup>, and 2.6% by Koshino et al. <sup>[7]</sup>, 10% by Gonlugar U et al. <sup>[9]</sup> and 13% by Cenk et al.<sup>[8]</sup> In present study quadrivial pattern was seen in 7% of specimens.

## Conclusion

In present study, casts of tracheo-bronchial tree were prepared by corrosive cast method. Silicone rubber was used as injection material and three dimensional casts were prepared. In present study branching patterns of the bronchial tree and variations were noted. Most common variation observed was bifurcate pattern in right upper lobar bronchus in 36% of specimens. Variations were mostly due to displacement of segmental and sub segmental bronchi. The knowledge of anatomy and variation in branching pattern of the tracheo-bronchial tree enables the physicians to recognize clinical picture and pathology of human lungs, as well as the application of therapeutic and diagnostic methods like tracheal intubation, bronchoscopy, bronchography and postural drainage etc.

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