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A Cadaveric Study of Morphological Variations of Lung in Vidarbha Region

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Abstract: ***Knowledge of the position and grade of accessory fissures and lobes is necessary for appreciation of lobar anatomy and thus locating bronchopulmonary segments. Proper understanding of the anatomy of the pulmonary lobes, segments, and fissures allows the surgeon to correlate imaging, pathologic processes, and possible resectional procedures, thus insuring that each patient gets the best possible operation.During the routine dissection variations in major fissures of lung are frequently observed. Taking this into consideration the present study was done to know the prevalence of variations involving lobes and fissures of lung in cadavers of vidarbha region. The study included 50 adult cadaveric lungs obtained from Anatomy dissection hall. The specimens were macroscopically observed for gross morphology of fissures and lobes.Among the right lungs, oblique fissure was incomplete in 5(17.24%) lungs.Transverse fissure was incomplete in 9(31.03%),absent in 2(6.89%)lungs. Accessory fissures were noted in 7(24.13%). In the left lung, oblique fissures was incomplete in 6(28.5%)and absence of oblique fissure in 1(4.76%) lung.Accessory fissures were noted in 4(19.04%)lungs.Variational lung anatomy is important in diagnosis and treatment of diseases involving all domains of medicine. Anatomical Knowledge of fissures and lobes is important for CT surgeons, radiologists for interpreting x-rays, CT scans and MRI and is also of academic interest to all medical persons.***

Keywords: lung, lung fissures, lobes, bronchopulmonary segments, Accessory fissures

1. Introduction

Anatomical knowledge of morphological variations of lung is required by the clinicians for accurate interpretation on different imaging techniques.Hayashiet al [1]affirmed that knowledge of anatomy of lung along withvariations is essential for recognizing various images of relatedabnormalities. Satoh K et al [(2)]concluded that Assessment of incomplete interlobar fissure is important with regard to collateral ventilation and pulmonary disease processes. Aldur et al[(3)] concluded that a surgeon must alwaysrecognize the anatomical variations taking place in lungs before committing the patients for lobectomies and segmental resection. Aziz et al. (2004) suggested that interlobar fissures are important landmarks for proper identification of normal pulmonary anatomy and evaluation of disease. Accurate knowledge of anatomy is recommended for appropriate interpretation of medical imaging including computed tomography scans.Various workers in different lung studies reported their observations as cadavers are still the best means to study all the domains of Anatomy.[(3,6,7,8,,9,10,11,12)].Taking into consideration the above scenario the present study was undertaken to determine morphology of lung in vidarbha region. The study included 50 adult cadaveric lungs obtained from Anatomy dissection hall. The specimens were macroscopically observed for gross morphology of fissures and lobes.

Both the right and left lungs are divided by fissures into lobes. The right lungcommonly has two fissures, namely oblique and transverse, dividing it into superior,middle, and inferior lobes (Standring, 2005). The left lung is commonly divided byan oblique fissure into upper and lower lobes (Standring, 2005). Any finding differentfrom the aforementioned pattern may be referred as anatomical variation. The fissures of lung helps in the movement of lobes in relation to one another, which will accommodate the greater distension and movement of the lobes during respiration and hereby helps in uniform expansion of lung.[(14)]These fissures may be complete, incomplete or absent. Other than usual fissures, the lungs may also have an accessory fissure which may be single or multiple dividing the lungs into many lobes.[15]

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2. Materials and Method

50 lung specimens free from pathological lesions, removed from the formalin fixed cadavers from the department of anatomy, Indira Gandhi government Medical College Nagpur were included in the study. The morphological features of variations of fissures of lung such as complete, incomplete or absence, presence of any accessory fissures were noted. The length of oblique and horizontal fissures were measured and statistically analyzed. The anatomical classification proposed by Craig and walker[16]was followed to determine the presence and completeness of fissures.

3. Results

Out of 50 lungs, 29 lungs were of right side and 21lungs from left side. Among the right lungs, oblique fissure was complete in 24 (82.75%) lungs, incomplete in 5(17.24%) lungs. Transverse fissure was complete in 18(62.06%) lungs, incomplete in 9(31.03%), absentin 2(6.89%) lungs. Accessory fissures were noted in 7(24.13%).In the left lung, complete oblique fissures was noted in14(66.6%)lungs, incomplete in6(28.5%)and absence of oblique fissure in 1(4.76%) lung. Accessory fissures were noted in 4(19.04%)lungs. The length of oblique fissure ranged from a maximum of 29cm to minimum of 13cm on right side and a maximum of 28cm to aminimum of 8cm on the left lung was observed. The length of transverse fissure ranged from 18cm to 10cm on right lung.

Figure 1: Incomplete transverse fissure of right lung

Figure 3: Absence of oblique fissure in left lung

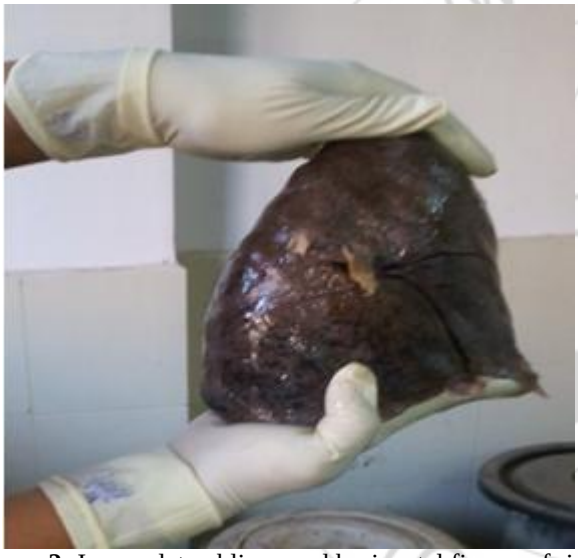

Figure 2: Incomplete oblique and horizontal fissure of right lung

Table 1: Comparative prevalence of anatomical variations of fissures of lung.

Author	*Method of study*	*Prevalence of incomplete or absent horizontal fissure of right lung (%)*	*Prevalence of incomplete or absent oblique fissure of right lung (%)*	*Prevalence of incomplete or absent oblique fissure of left lung (%)*	*Presence of accessory fissures right and left (%)*
Medlar, 1947	Cadaver & specimen	62.3	25.6-30	10.6-18	--
Raasch et al., 1982	Fixed inflated specimen & radiograph	94	47-70	40-46	--
Frija et al 1998	High resolution CT	96.7	87	77	--
Glazer et al, 1991	Thin section CT	--	64	52	--
Otsuji et al., 1993	Thin section CT and cadaver	96	83.1	50	--
Lukose et al., 1999	Cadaver & specimen	31.5	-	21	--
Aziz et al,2004	High resolution CT	63	48	43	--
Meenakshi et al. 2004	Cadaver & specimen	63.3	36.6	46.6	--
Bergman et al.,2008	Cadaver & specimen	67	30	30	--
Prakash et al,2010	Cadaver & specimen	57.1	39.3	35.7	--
Bhimai Devi et.al 2011	Cadaver & specimen	18	9	36	--
Varalaxmi et al 2014	Cadaver & specimen	30/ 10	16.7/---	29.4/3	14.7/ 20
Present study 2014	Cadaver & specimen	31.03/6.89	17.24/--	28.5/4.76	24.13/19.04

4. Discussion

Morphological variations in the lobes and fissures of lung is mainly due to the defective pulmonary development[23]. During the development, as the lung grows, the spaces or fissures that separate individual bronchopulmonary buds/segments become obliterated except along two planes, evident in the fully developed lungs as oblique or horizontal fissures [24].Obliteration of these fissures either completely or partially may lead to absence or incomplete fissures. Accessory fissure could be due to non-obliteration of spaces which normally are obliterated.[9] The presence of fissures in the normal lungs enhances uniform expansion, and their position could be used as reliable landmark in specifying lesions within the thorax, in general and within the lungs in particular[17]. Sometimes especially in infant, accessory fissures of varying depth can be seen in unusual locations of the lung, delimiting abnormal lobes which corresponding to the normal bronchopulmonary segments [14]From a radiological point of view, an accessory or anomalous fissure is important as it can be mistaken for a lung lesion.[3] The knowledge of anatomy of fissures of lung may help clarifying confusing radiographic findings like extension of fluid into an incomplete major fissure or spread of various diseases through different pathways [24].

In Table no.1 a comparison of work done by previous authors regarding the prevalence of pulmonary fissures is made with the present study. Analysis and comparative cadaveric data revealed that in the CT scan and radiological studies there was more prevalence of variations in the fissures of lungs than the whole cadaver and isolated lung studies. Prevalence of incomplete oblique fissure of left lung was lesser in our work, where as it was more prevalent on the right side in the study of Prakash et al. Bhimai devi et al and varalaxmi et al. In the reports published by various authors there was a variation in the presence of or absence of complete or incomplete horizontal and oblique fissure on the right side. The present study findings nearly corresponds to the previous authors study. From studies of different authors knowledge of fissure anatomy also explains various radiological appearances of inter lobar fluid [6] Postoperative air leakage is due to an incomplete fissure.[16] The accessory fissure might act a barrier to spread in the tissue creating a sharply demarcated pneumonia, which could be misinterpreted as an atelectasis or consolidation[21]. In x-ray, incomplete fissure always give an atypical appearance of pleural effusion. Many a times the accessory fissure fails to be detected on CT scans, because of their incompleteness, thick sections and orientation in relation to a particular plane [7]. In many diseases, segmental localization is a must, and the knowledge of accessory or variant fissure is of muchclinical importance to the clinician. Preoperative planning and strategy for segmental resection or pulmonary lobectomy may also change during presence of such accessory or variant fissure.

Considering the clinical and surgical importance of such variations, from anatomical point of view, one can opine that prior anatomical knowledge and high index of suspicion for probable variations in the fissures, lobes and bronchopulmonary segments in the lung may be important for clinicians, surgeons and radiologists

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