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 were 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 with variations is essential for recognizing various images of related abnormalities. 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 always recognize 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.4,5,6,7,8,9,10,11,12. 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 lung commonly has two fissures, namely oblique and transverse, dividing it into superior, middle, and inferior lobes (Standring, 2005). The left lung is commonly divided by an oblique fissure into upper and lower lobes (Standring, 2005). Any finding different from the aforementioned pattern may be referred as anatomical variation. The fissures of lung help 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.1,4,15 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.1,5

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 walker16 was followed to determine the presence and completeness of fissures.

3. Results

Out of 50 lungs, 29 lungs were of right side and 21 lungs 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%), absent in 2 (6.89%) lungs. Accessory fissures were noted in 7 (24.13%). In the left lung, complete oblique fissures was noted in 14 (66.66%) lungs, incomplete in 6 (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 29 cm to minimum of 13 cm on right side and a maximum of 28 cm to a minimum of 8 cm on the left lung was observed. The length of transverse fissure ranged from 18 cm to 10 cm on right lung.
Figure 1: Incomplete transverse fissure of right lung

Figure 2: Incomplete oblique and horizontal fissure of right lung

Figure 3: Absence of oblique fissure in left lung

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

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

Morphological variations in the lobes and fissures of lung is mainly due to the defective pulmonary development. 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. 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. 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. 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. From a radiological point of view, an accessory or anomalous fissure is important as it can be mistaken for a lung lesion.

The knowledge of anatomy of fissures of lung may help clarifying confusing radiographic findings like extension of lesions within the thorax, in general and within the lungs in particular. 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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