Case Report

Supernumerary Pulmonary Lobe: Clinico-Anatomical Description

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Abstract

The right lung features two fissures; an oblique and a horizontal which demarcate the three lobes namely superior, middle and inferior. Though CT scans are the mainstay of studying the precise fissural anatomy of the lungs, the extra/additional fissures are scarcely reported in gross studies. In the present case we report a supernumerary lobe of a right lung due to presence of a deep fissure seen prominently on its diaphragmatic surface. The fissure was 10.8cm in length, it started from the oblique fissure on the diaphragmatic surface, ran backwards parallel to the inferior border in a curve to cut the posterior border behind and thus creating an additional lobe. This extra lobe could be due to abnormal division of the right principal bronchus. Such unusual fissures and lobes are clinically significant in differentiating broncho-pulmonary segments. Anatomical knowledge of such anomalous fissures and lobes of lungs is also important for surgeons performing segmental resection, lobectomies; radiologists interpreting X-ray and CT scans besides scholastic interest.

INTRODUCTION

Vital to sustain life the lungs are soft, spongy and elastic. Characteristically the right lung is divided by an oblique and a horizontal fissure into three lobes namely superior lobe (SL), middle lobe (ML) and inferior lobe (IL). The higher placed oblique fissure is deep; it separates the inferior from upper and middle lobes. It runs from the inferior border upward and backward across the medial and costal surfaces until it cuts the posterior border approximately at the spine of fourth thoracic vertebra, 6.3 cms below apex at the posterior end of the third rib [1]. As a handy approximation the oblique fissure follows the medial border of scapula when it has rotated with the arm in full abduction [2]. The shorter horizontal fissure demarcates superior and middle lobes; it runs horizontally from oblique fissure near mid-axillary line across the costal surface to the anterior border at the level of the fourth costal cartilage [1]. The SL lies superior to oblique and horizontal fissures. The ML rests superior to oblique but inferior to horizontal fissures. The IL lies behind and inferior to the oblique fissure. Lung fissures form an inconstant feature which may be complete, incomplete or absent [3,4]. Studies depict that it is partially incomplete in fifty percent of subjects [4]. Incomplete or complete fissures lead to merging of lobes and conversely accessory lobes form due to creation of the new fissures [5]. These accessory fissures could be due to non-obliteration of spaces which are normally obliterated [6]. The present case describes an atypical peculiar third fissure in a right lung leading to the formation of the supernumerary fourth lobe.

The importance of the normal or extra fissures of lung lies in the fact that these help in the uniform expansion of the lungs in all directions during inspiration [7]. Anatomical awareness of inconsistency in fissures and lobes of lungs is important for bronchopulmonary segmental recognition, so that these are not misinterpreted on a standard chest skiagram or a CT scan. Knowledge of such variations is of paramount importance in procedures like lobectomy or a segmental resection.

CASE PRESENTATION

During routine gross anatomy teaching programe for students pursuing MBBS (Bachelor of Medicine and Bachelor of Surgery) course, an accessory fissure on the on the right lung was observed in an adult male Indian cadaver. The fissure demarcated a supernumerary lobe in an apparently normal right lung. The fissure ran a curvilinear course on the diaphragmatic surface. It commenced from the oblique fissure, about 2.5 centimeters from the inferior border and approximately was located in the central
area of the diaphragmatic surface. It was deep and distinct; ran backwards and medially in a curve, approximately parallel to the circumference of the right lung. The depth of the fissure on diaphragmatic surface was 1.9 centimeter and its total length along the curve was 10.8 centimeter. This extra fissure divided the right lung into a supernumerary fourth lobe which was prominently seen on the inferior surface. No other abnormality was observed. The left lung displayed normal anatomical features (Figures 1,2).

**DISCUSSION**

During lung development the spaces or fissures demarcating the bronchopulmonary buds/segments get obliterated except alongside the two planes which are seen as oblique and the horizontal fissures in normally developed lungs. Partial or complete obliteration could lead to an incomplete or absent oblique or horizontal fissure. Accessory fissures could feature in any of the lobes of the two lungs. These fissures could be a result of non-obliteration of the clefts or spaces which usually are wiped out during development [6]. These accessory fissures are of varying depth and may demarcate one or more bronchopulmonary segments. According to Tarver RD the inferior accessory fissure and the superior fissure which demarcate the medial basal segment and the superior segment are the most common accessory fissures detected on CT scan [8]. In the present study apparently the medial basal segment of the right lung has been totally demarcated as a separate supernumerary lobe due to the presence of the additional fissure on the inferior surface.

In an interesting study by Godfrey EU, Garba TM, Habib MM and Ogugua EA, extra fissures were noted in all the three lobes of the right lung; in the upper lobe an incomplete fissure demarcated the apical bronchopulmonary segment, the middle lobe presented with incomplete fissure which separated medial and lateral bronchopulmonary segments and the lower lobe presented with a fissure that separated medial basal segment with the other basal segments [9].

Disparity in the number of lobes has been divided into two main classes by Ernest Mayland and Londo; class 1 where the number of lobes has been reduced, either due to developmental deficiency in number of lobes (A) or deficiency in the fissure themselves (B) and class 2 where the number of lobes have been increased due to the presence of accessory lobes (A) or additional fissures demarcating an extra lobe from the main divisions (B) [10]. The additional fourth lobe designated as supernumerary lobe observed in the current study can be regarded as a division of the lower lobe and possibly represents the medial basal segment of the right lobe. An embryological anomalous azygos lobe develops in the right lung when the right apical bronchus develops medial to azygos vein; this leads to the embedding of the azygos vein in the additional azygos fissure in the superior lobe of right lung [11].

Accurate localization of the fissures is particularly important in determining optimal route for diagnosis such as fibroptic bronchoscopy, transthoracic needle biopsy. Comprehensive knowledge of various configurations of the fissures is helpful in correct localization of a lesion [12]. Precise segmental localization in many pathological conditions warrants acknowledging accessory fissures and additional lobes for proper diagnosis of pulmonary lesions [13].

In a morphologic Study of fissures and lobes of lungs in hundred specimens, accessory fissures were found in 8% percent in the right lung and 2% in the left lung and the accessory lobes were found in two right lungs. The authors concluded that the incomplete fissures could alter the spread of disease within the lung and could misinform during analysis of a radiologic image [14]. Appreciation of such lung anomalies improves understanding of diseases like pneumonia, pleural effusion and collateral air drift alongside the spread of disease through the lung as visualized by imaging techniques [15].
Preoperative planning strategy for segmental resection or a pulmonary lobectomy may necessitate change in case of a chance finding of an additional lobe. Identification of level of completeness of a fissure is important before performing lobectomy as incomplete fissures are more prone to develop postoperative air leakage than those with complete fissures.

In view of the clinical and surgical importance of such rare anatomical entities, these variations of bronchopulmonary segments/lobes in lung may be important for Pulmonologists, Surgeons and Radiologists.

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REFERENCES