Abstract
Bronchogenic cysts arise from abnormal budding of developing foregut. Usually along the foregut passage and in the middle mediastinum, atypical locations of the bronchogenic cyst are also infrequently found. CT scan and MRI can help us identify them in these locations and their radiologic features without a histo-pathological confirmation may aid in deciding on management and follow up strategies.

Keywords
Bronchogenic cyst/surgery; bronchial diseases/surgery; cysts/surgery; mediastinal neoplasms/surgery

Introduction
The mediastinum is formed by pleural cavities laterally, thoracic inlet superiorly and diaphragm inferiorly [1]. Conventionally, it is further divided into anterior, middle and posterior compartment. The initial differential diagnosis of a mediastinal mass is based on the basis of the anatomical location and are often asymptomatic and thus an incidental finding on imaging. Fifty percent of all mediastinal masses are in the middle mediastinum [1]. Thymomas, lymphomas, teratomas and benign thyroid lesions constitute the majority of lesions of anterior mediastinum. Bronchogenic cyst/tumors, lymphomas constitute majority of middle mediastinum. Neurogenic tumors, neuro endocrine tumors, esophageal duplication cyst constitute majority of posterior mediastinal masses [1]. When symptomatic, they present with cough, stridor and dyspnea – more often in younger age group due to soft tracheobronchial tree [2].

Bronchogenic cysts are a rare occurrence and largely asymptomatic and thus the incidence and prevalence is difficult to determine. The prevalence found in two hospital series was 1 in 42,000 and 1 in 68,000 [3]. They account for 10-15% of mediastinal tumors and 50-60% of mediastinal cysts [4]. Bronchogenic cysts are most commonly located in carinal region - 52%, para tracheal- 19%, intrapulmonary and para esophageal [1]. They are closed columnar ciliated epithelium lined sacs and are single, round, or elliptic mass with well-defined, thin smooth wall, and non-enhancing homogenous cystic nature on imaging techniques [3, 4]. Bronchogenic cysts can be viewed on CXR as sharply defined, solitary, round homogenous opacities [4]. Any abnormality on CXR should be followed up with CT scan as it is the investigation of choice [4]. The location of the budding determines their stage of development. Abnormal central tracheobronchial budding is associated with early developmental abnormality, whereas a peripheral presentation is usually associated with late stage developmental anomaly [5].

This mini-review highlights two cases of atypical radiographic presentation of bronchogenic cysts at our LSU Health Network clinic where their CT scans and MR imaging and clinical follow up did not necessitate specific histopathological confirmation.

**CASE 1:** 54 y/o woman had an incidental finding of widened mediastinum after a chest x-ray was done for evaluation of neck and shoulder pain. CT showed non-communicating multiple cystic lesions with largest of 4.6x3.0 cm in anterior and superior mediastinum without septation or enhancement. The patient is being followed-up since three years by annual CT scan showing a stable lesion. The symptoms were unrelated and resolved spontaneously.

**CASE 2:** 57 y/o woman with history of chronic cough had a CXR done showed an incidental finding of mediastinal mass. CT-MRI were done showing of low signal intensity lesion in T1 and high signal intensity lesion in T2 in the left lateral margin of T3 vertebral body. The cough was attributed to a transient allergy. The patient is being followed up with annual MRI for two years showing a stable lesion.

Discussion
Bronchogenic cysts are often present in the middle mediastinum (79%), less commonly they are located in the posterior mediastinum (19%) and rarely in anterior mediastinum (3%) [6]. Both the cases presented here are less common locations of bronchogenic
Cysts and were incidental findings. Bronchogenic cysts are usually asymptomatic, but they can present with symptoms like cough, fever and dyspnea. These symptoms are associated with complicated cysts, most commonly due to infection of the cyst [2].

Based on the guidelines for diagnosis of mediastinal masses with multi-detector CT developed by International Thymic Malignancy Interest Group (ITMIG), bronchogenic cysts manifest as single, smooth, round or ovoid mass with internal attenuation [8]. The internal heterogeneity can be due to hemorrhage or proteinaceous content. In such conditions, MRI is used to confirm the cystic nature of the lesion showed as low density lesions in T1 weighted sequence and high density lesion in T2 weighted sequence [8].

For both cases, bronchogenic cyst was lower in list of differential due to its location. In case 1, the cyst was located in antero-superior mediastinum and the differential was thymic cyst, pericardial cyst and bronchogenic cyst. Since there was the lack of vascularity and lack of connection with the pericardium thymic and pericardial cyst were excluded, and the cystic and the homogenous nature of the density suggested the diagnosis of bronchogenic cyst [1]. In case 2, the lesion was present in the posterior mediastinum and the differential for the lesion was a esophageal duplication cyst, cystic schwannoma and bronchogenic cyst. Here the lesion presented with a thin wall which was unlikely for esophageal duplication cyst as it would have a double layer of smooth muscle. Also, there was no cartilage present with lack of internal cysts homogeneity, hemorrhage or calcification, which are the characteristics of cystic schwannoma. This exclusion helped us conclude the diagnosis as bronchogenic cyst [1,7].

There are different approaches on management of bronchogenic cysts. Symptomatic masses are surgically removed with thoracotomy or video assisted thoracoscopy regardless of the age [4, 9]. Percutaneous or trans-bronchial drainage can be attempted as well [10]. For intrapulmonary cyst lobectomy is the treatment of choice [2]. Surgical excision of the lesion is recommended to prevent the development of symptoms or complications [4,10]. For asymptomatic masses in infants and children, surgical intervention is indicated. For adults, observation of small, asymptomatic masses is accepted. If the cyst appears to be complicated by air-fluid level is enlarging or produces symptoms or demonstrates malignant cells on aspiration, thoracotomy is treatment of choice [10]. The morbidity and mortality is 20% post-operatively regardless of complicated or uncomplicated bronchogenic cysts [11].

As many as 45% of the patients develop complications of bronchogenic cysts [2]. The possible complications without treatment are rupture, infection, pneumothorax and fistulation. The prognosis of the patient is excellent after extirpation [2]. However, the surgical excision of the lesions is associated with high recurrence if there is incomplete excision. Trans-tracheal and percutaneous cyst aspirations have been suggested for recurrent cysts, but carries substantial morbidity risk [2]. Other post-operative complications include adhesions which may require further surgery [12].

In view of the above considerations, conservative approach without the need for histopathological confirmation was adopted.

Conclusion
Bronchogenic cysts are not common and this mini-review outlines the variable nature of clinical and radiologic presentations. Treatment options regarding surgical excision depend upon factors related to age, symptoms and potential complications and should be based on case to case basis. Conservative follow up without surgical intervention even when radiological location is atypical may be a reasonable approach.

References
6. Saeed Ali, Conceptualization, Methodology, Resources, Writing – Original Draft Preparation, 1 Abdul Rauf, Methodology, 2 Ling Bing Meng Resources, 1 Zeeshan Sattar, Writing – Original Draft Preparation, Writing – Review & Editing, a,2 Sana Hussain, Investigation, Methodology,2 and Umair Majeed, Conceptualization, Data Curation. 1 Case Report: Severe back pain, epigastric distress and refractory nausea; an unusual presentation of mediastinal bronchogenic cyst. Version 1. F1000Res. 2018;7:960.