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Research Article

An Investigation into Symptoms, Diagnosis, Management, and Complications of Treatment in Patients with Pulmonary Bullae

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Abstract

Introduction: Bullous lung disease is characterized by the development of bulla within the lung parenchyma. Smoking is considered as a main risk factor of bulla formation. The clinical manifestation varies from asymptomatic bulla to severe respiratory distress. The exact medical approach is still controversial.

Here in we aimed to evaluate the patients' characteristic and the indication of surgery in the patients

Methods: This study was an analytic cross-sectional study in Razi, Rasht in 2012- 2017. The 110 patients with newly diagnosed lung bulla underwent evaluation based on a check list which assessed the variables as clinical characteristics, bulla features, the medical treatment and its complication. Eventually, the statistical analysis was performed by using SPSS v21.0.

Results: 110 patients were enrolled. All the patients were smoker. In 72.9% the primary presentation was respiratory distress which needed surgical resection with no recurrence over 8 month. The clinical manifestation varies from asymptomatic bulla in 4.3%, pneumonia in 34.3% to respiratory distress in 61.4%. There was not a statistical correlation between clinical manifestation and all the studied variables excluding respiratory distress (p value: 0.659). The seventy patients underwent surgical treatment in which twenty cases were complicated by air leak that was managed by chest tube in 16 patients and Heimlich valve in 4 patients. No evidence of recurrence was detected.

Conclusion: The main risk factor of bullous formation is smoking. Due to various clinical presentations, the appropriate medical approach is in paramount of importance

Keywords: Lung bulla; Smoke; Respiratory distress; Bullectomy; Bleb

Introduction

A bulla is an air-filled space within the lung parenchyma that is about of 1-2cm in size with a fibrotic wall that is bordered by the remnants of alveolar septae [1]. Smoking is considered as a main risk factor of bulla formation [2-4]. Despite the high prevalence of this disorder, the exact role of bullae on pathogenesis of pneumothorax is still a challenge [5,6]. Lung bulla is categorized to two main groups: bullae within otherwise a normal lung parenchyma which is usually single and bullous formation within emphysematous lung which is usually multiple. A single huge bulla which occupies more than thirty percent of the hemi-thorax is considered a giant bulla [1]. Although the bullous lung disease often occurs in the context of pulmonary disorder as chronic obstructive pulmonary disease (COPD), it could occur in otherwise healthy lungs as an incidental finding on imaging [7]. The pathophysiology of bullous formation is a parenchymal weakness resulting to localized air trapping. Consequently, the pressure induced by the elasticity of the adjacent lung leads to build-up of pressure within bullae contributing to their progressive enlargement and compression and atelectasis of the adjacent lung. Identification and reconstruction of the intact parenchyma is the main aim of treatment [1].

A bulla is seen as an avascular, high radiolucent area with a thin or poorly defined wall. Standard chest X-ray could estimate the size, location and volume of the bullae. However to determine the exact size, chest computed topography (CT) is required to demonstrate detailed characterization of the size, number and location of bullae. CT is a sensitive tool which reveals the exact anatomic location of the bullae a feature which might be easily missed in AP or lateral view of chest X-ray (Figure 1-4). Furthermore, it is capable to differentiate an emphysematous bulla from a pneumothorax [8-10]. Lesur O et al study showed that by the use of CT scan, the discovery of bullae had been on the rise. In a way that, the prevalence of incidental bullae were observed 0-15 % in a healthy population [9]. There are a few reports of sonography application to recognize an emphysematous bulla from pneumothorax [11]. Regarding to modern diagnostic methods, it is noted that 75-100% of patients with pneumothorax have simultaneous bullae. However, no

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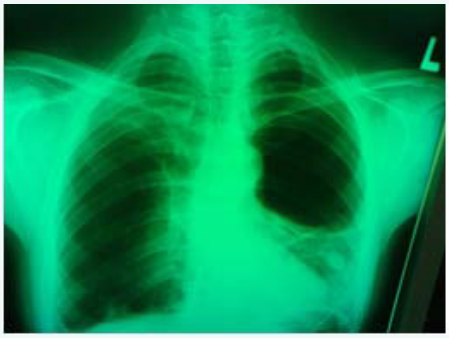

Figure 1 Show CXR and left side huge bullae.

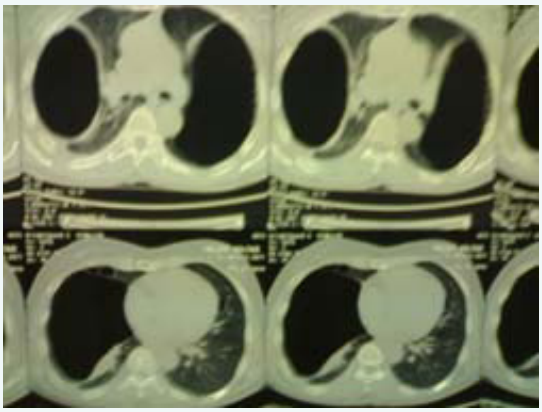

Figure 2 Show CT Scan with bilateral bullae.

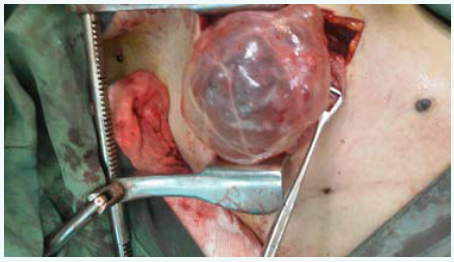

Figure 3 Show CT-scan with bilateral bullae.

Figure 4 Show complete and intact of bullae after resection.

study has clearly mentioned these changes as etiologic factors in pneumothorax pathogenesis. Furthermore, it is not clear the exact acquired or genetic basis of these bullae formation [12-14].

As mentioned before, affected patients tend to have significant exposure to tobacco smoke [2-4]. Gaensler EA et al., showed all their patients with bullous lung disease had a history of smoking and smoke cessation improved lung changes which secondarily contributed to better response to surgery [15].

Although the majority of patients benefit medical treatment which is the same as COPD management, the large emphysematous bullae do not have an adequate response to standard conservative treatment and further surgical therapy is in need. Based on the patients' clinical status, diverse surgical approaches as bullectomy, lobectomy or pneumonectomy might be considered [16-18].

Regarding diverse clinical manifestation as asymptomatic bulla in one side of the spectrum compared to serious features as pneumothorax, hemoptysis or compressive effect, it is in paramount of important to design an appropriate medical guideline in approach to lung bullous disease [19].

In this study we aimed to assess the factors as characteristic features, possible complication, the selected diagnostic and therapeutic method, surgery indication and prognosis of the patients with bullous lung disease who referred to our center since 2012-2017 in Razi hospital, Rasht.

Material and Methods

This study was an analytic cross-sectional study in Razi, Rasht in 2012- 2017.

Study procedure

110 patients of any age and sex with newly diagnosed bullous lung disease underwent evaluation. The diagnosis was based on clinical suspicion and chest CT scan.

The data collection tool was a checklist prepared by referring to the patients' file which included the patients' characteristics as age, sex, past medical history, habitual history, clinical manifestation and bulla features as size, location and the site of involvement. Furthermore the medical therapeutic approach command in case of surgery the complication and prognosis and the time of hospitalization were recorded. It should be noted the patients with incomplete information were excluded.

After data collection, the statistical analysis was performed by using SPSS v21.0. Normal data distribution was performed by Kolmogorov-Smirnov test. For the comparison of the quantitative variables independent two-sample t test and for the qualitative variables, chi-square test was performed. Significant P value was considered less than 0.05.

Ethical statement

This article has been accepted Inflammatory Lung Disease Research Center of Guilan University of Medical Sciences, Rasht, Iran.

Results

The 110 patients were enrolled in the study which eventually dropped to seventy. Mena age (± SD) of study participants was 50.9 ± 12.83. The least and the highest age of the patients was 18 and 80 years old, respectively. The 70% of the patients were male and in 93% the past medical history was negative. 72.9 % has a history of cigarette smoking. The clinical manifestation varies from asymptomatic bulla in 4.3%, pneumonia in 34.3% to respiratory distress in 61.4%. In 55.7% there was a single bulla compared to multiple bullae in 27.1%. The right and left lung was involved in 54.3% and 18.6 % respectively. In addition in 27.1%, both sides were involved. The seventy patients underwent surgical treatment in which twenty cases were complicated by air leak that was managed by chest tube in 16 patients and Heimlich valve in 4 patients. The later follow up revealed complete recovery in these patients over a month. Furthermore the mean hospitalization time was 11 days. No evidence of recurrence was detected.

The patients' characteristic are brought in Table 1.

There was not a statistical correlation between clinical manifestation and all the studied variables excluding respiratory distress which showed a meaningful statistical relationship based on the Cramer's index (p value: 0.659) (Table 2).

Table 1: patients characteristics.

Variable		Number	Percentage
Age	< 35 y/o	10	14.3
	35 -80 y/o	33	47.1
	> 80 y/o	27	38.6
Gender	Male	49	70
	Female	21	30
Past medical history	Negative	65	92.9
	Positive	5	7.1
Habitual history (smoking)	Negative	19	27.1
	Positive	51	72.9
Clinical presentation	Incidental	3	4.3
	pneumonia	24	34.3
	Respiratory distress	43	61.4
Bulla size	Small (2 to 6cm)	18	25.7
	Large(7 to 20 cm)	52	74.3
Bulla number	Single	39	55.7
	Two	12	17.1
	multiple	19	27.1
Bulla location	Rt side	38	54.3
	Lt side	13	18.6
	Both sides	19	27.1
Lung involvement	Negative	51	72.9
	Positive	19	27.1
Therapeutic approach	Conservative	16	22.9
	Resection	52	74.3
	Resection and conservative	2	2.9
Hospitalization period	< 5 days	7	10
	5-7 days	56	80
	< 7 days	7	10

Table 2: Clinical presentation.

Respiratory distress		incidental	pneumonia	Respiratory distress
	Negative	66.7 %	4.2%	0%
	positive	33.3%	95.8%	100%
Linear-by-Linear Association = 4.191 df= 1 Sig.= 0.041				
Cramer's V= 0.659 Sig.= 0.000				

Discussion

A fluid level in a bulla has an exclusive pathology which presents itself in a various types. The exact etiology of lung bullous diseases is unknown. However, the probable hypothesis is inappropriate bronchial connection leading to incomplete drainage of fluid and consequent fluid collection which results to inflammation and infection [1,7,19,20].

In our study, we evaluated 70 patients with newly diagnosed bullous lung disease. The majority of the patients were male which were similar to the study of Gunnarsson et al who observed the twelve patients with giant bulla over 18 years. They revealed that 11 patients were male with an average age of 60 years old [21]. In contrast in the study of Schipper et al., on 43 patients with giant emphysematous bulla, they found the majority of the patients were female [22] or in the study of Amjadi et al., nine out of 15 patients with bullous lung disease were female [23].

It should be noted that smoking is considered as an important risk factor of bulla formation [2-4]. Schipper et al., showed all their patients were smoker with a 50 pack/ year consumption [22]. Similarly, Luser et al., evaluated the relationship between smoking and bulla in idiopathic spontaneous pneumothorax in case-control study. Their finding revealed that all their patients were smoker. Besides in 85 % of case group and 155 of the control group, a simultaneous bulla was detected [9].

In our study, 72.9 % of the patients were smoker which was similar to previous studies.

Although lung bullous disease might be asymptomatic and found only incidentally on imaging, they are usually associated with pulmonary malfunction. Sudden and severe dyspnea should raise the suspicion for pneumothorax due to a ruptured bulla which occurs mostly in the context of underlying emphysema [7,24-26]. Our study showed that the most common clinical presentation was respiratory distress in which case the patients had been under surgical resection with a complete recovery over a month.

It is in paramount of importance to take an appropriate medical therapy in patients with severe distress or superimposed infection. These patients can be candidate for surgical treatment. Currently, the classic surgical method for isolated bulla is bullectomy which involves surgical resection or ablation of one or more bulla [16-18,27-31].

In our study, 52 patients were under bullectomy with a significant response and on recurrence which was similar to other studies which highlighted the importance of surgical resection in case of respiratory distress.

Conclusion

Bullous lung disease is characterized by the development of bulla within the lung parenchyma. Although it usually occurs in the context of pulmonary disorder, it might be seen in isolation. The most common risk factor is smoking which was also evident in our study.

Clinical manifestation varies from incidental bulla to severe respiratory distress. In our study, most patients were presented with respiratory distress which showed the positive role of surgery in approach to lung bulla.

The limitation of the current study is the lack prolonged follow up. As a result, there was not a chance to evaluate the long term outcome.

We highly suggest further studies in a case-control design with a more sample size and consideration of other variables as BMI.

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