



Research Article

Conservative Management of Primary Spontaneous Pneumothorax: Real-World Experience

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Abstract

Recent guidelines advocated for conservative treatment of primary spontaneous pneumothorax (PSP) regardless of size with conditional recommendation. We present audit data from a series of PSP patients managed conservatively. Patients aged 18 to 50 years who presented acutely with first onset unilateral PSP were observed for symptoms, hemodynamic stability and radiological progression of pneumothorax for 4 hours. If stable, they were managed conservatively. Audit of patient outcomes was conducted. Thirty-two patients were assessed. 2 patients were lost to follow-up and were excluded. 22 males and 8 females were audited. Average size of pneumothorax is 31.4%. 7 patients were admitted. Of 7 admissions, 3 had surgery. Average length of stay was 1.2 days. 23 (76%) had resolution of PSP without interventions. None returned to ED for life-threatening pneumothorax or haemothorax. Conservative management of PSP regardless of size, can be implemented with favourable patient centric and safety outcomes.

Introduction

Primary spontaneous pneumothorax (PSP) is presence of air in pleural cavity without obvious precipitating cause occurring in lung with no apparent abnormalities. Annual incidence is estimated to be 18 to 28 per 100,000 in men and 1.6 to 6 per 100,000 in women [1]. Management options span from conservative observational monitoring to interventions such as needle aspiration (NA), intercostal drain (ICD) with or without pleurodesis, and surgery. Due to paucity of high certainty evidence, PSP management is predominantly guideline based. In prior guidelines, [1] PSP size is a key consideration for conservative versus interventional management. PSP size of greater than 2cm as measured from chest wall to lung margin at the level of hilum, are recommended for intervention. For PSP size of less than 2cm or asymptomatic cases, conservative management with monitoring and discharge if stable is recommended [1].

In 2020, a non-inferiority multicenter trial by Brown et al, [2] randomized moderate and large sized PSP to conservative and interventional management. Primary outcome of radiological resolution of pneumothorax in conservative management was found to be non-inferior to interventional arm. However, in conservative management, notable favourable patient centric outcomes include shorter length of stay, less procedures, less complications, less adverse events, better patient satisfaction and potentially lower recurrence rate of pneumothorax at 1 year.

In the following year, in attempt to encourage conservative management of PSP and respond to need for more real-world data, we initiated a collaborative protocol (Figure 1) between Emergency Department (ED) and Respiratory and Critical Care Medicine (RCCM) to conservatively manage PSP in the acute setting. We hereby present audit data from our case series.

Figure 1. Conservative Management of Primary Spontaneous Pneumothorax

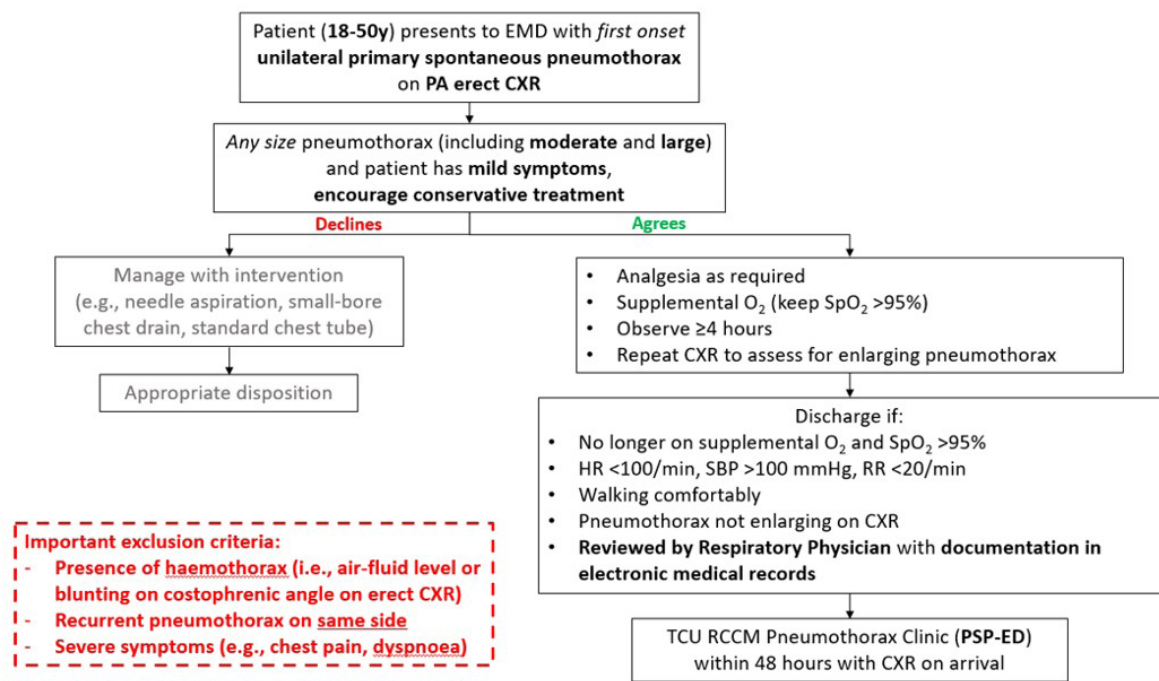


Figure 1: Protocol - Conservative Management of PSP

Methods

In our protocol, referenced on Brown at al study [2], patients aged 18 to 50 years presenting with first onset unilateral PSP on CXR are assessed by ED physicians. We excluded patients who declined participation, have high suspicion of haemothorax based on radiographic presence of air-fluid level on ipsilateral side of PSP and patients with severe symptoms. In clinically stable cases with minimal symptoms, conservative management of PSP entailing negligible risk of life-threatening tension pneumothorax, worsening of symptoms, and return to ED is explained. They are treated with oxygen and analgesia as required. After 4 hours of monitoring, re-assessment of symptoms, clinical stability and CXR is performed. If clinically worse, ED physicians will proceed with management and hospital admission as required. If stable after assessment, they are jointly discharged by ED and RCCM physicians. The patient is given return advice if symptoms worsen and an outpatient review within 48 to 72 hours is arranged.

As part of clinical quality, safety assurance and to guide practice, we conducted an audit of patients managed with our protocol from 2021 to 2024. Patient demographics, duration of symptoms, size of pneumothorax on chest radiograph based on Collins method, repeat visit to ED after discharge, length of hospital stay, patient satisfaction, number of chest radiographs and computed

tomography scans and number of patients requiring chest tube drainage and surgical interventions were reviewed. Except for patients who are recently recruited, recurrence of pneumothorax at 1 year was assessed by electronic records. Institutional ethics review board approval reference 2024-4303.

Results

Thirty-two patients were referred to the conservative management protocol where 2 patients were excluded as they were lost to follow-up after 1 outpatient clinic review. Baseline characteristics and outcomes are summarised in (Table 1). Mean age of 30 patients was 26.8 years with mean BMI of 19.8 and average duration of symptoms of 32.1 hours. 2 patients were active smokers. There were 22 males and 8 females with 14 right sided and 16 left sided pneumothorax. Based on Collins method, average PSP size was 31.4%. Of four repeat ED visits, 1 was discharged and 3 were admitted. In total, 7 patients were admitted. Of 7 admissions, 3 proceeded directly to surgery. Four had ICD insertion with 2 requiring surgery due to persistent airleak. Average length of stay was 1.2 days. A total of 4 computed tomography scans and average of 7 CXRs were done for our patient cohort. Out of 30 patients, 23 (76%) had resolution of PSP without interventions. There were no cases of life-threatening tension pneumothorax or haemothorax re-

turning emergently to ED after discharge. None of the successfully managed PSP cases had recurrent pneumothorax so far.

Gender	
Males	22
Females	8
Age, years (mean±SD)	26.8±9.5
Smoking history	2
BMI (mean±SD)	19.8±3.2
Duration of symptoms, hours (mean±SD)	32.1±28.9
Size of PTX* (mean±SD)	31.4±23.6
Site of PTX*	
Right	14
Left	16
Repeat ED visit	4
Hospital admission	7
Chest tube drainage	4
Surgery	5
Total length of stay, days (mean)	35 (1.2)
No. CT^ thorax	4
No. chest x-ray (mean)	188 (6)
No. of PTX* resolution without intervention (percentage)	23 (76)
*PTX abbreviation for pneumothorax ^CT abbreviation for computed tomography	

Table 1: Summary of baseline characteristics and outcomes

Discussion

Our audit demonstrates 76% success rate in conservative management of moderate to large PSP of size comparable to Brown et al study [2]. There are no known cases of recurrence thus far in our series. Our success rate is close to Stradling et al [7] 83% successfully managed “simple” pneumothorax as outpatient and could be seen as reflective of real-world success rates rather than results achieved under strict trial conditions.

Recent guidelines have advocated for conservative treatment of PSP regardless of size with conditional recommendation

[3,4]. Concerns of life-threatening pneumothorax together with penchant for expeditious resolution of pneumothorax drives clinicians’ tendency towards interventional drainage management, especially when equipment for ICD is readily available. Pooled data from clinical trials suggest that initial failure of conservative management of PSP has not led to major morbidity [5]. This is due to the contralateral lung not having poor function in PSP, hence, rarely causing life-threatening tension pneumothorax and significant symptoms [6].

Past and present clinical and physiological studies support conservative management of PSP. In the 1950s, Stradling et al [7] had managed spontaneous pneumothorax conservatively for more than a decade in an outpatient setting with a success rate of greater than 80% in cases of PSP. Kiely et al [8] performed NA to detect inhaled tracer gas in PSP cases on first presentation. In more than a third of cases, no tracer gas was detected, suggesting that air leak had sealed by time of presentation. In PSP cases where tracer gas was detected, more than a third had sustained improvement of PSP on subsequent CXR, supporting the postulation that NA created a pressure gradient leading to air leak which was in the process of self-healing. More recently, Chopra et al [9] shed insights on concept of drainage-dependent pneumothorax in post lung surgery patients on chest tube drainage. Pressure gradient created by drainage can result in persistent air leak in certain cases. Extrapolation of this concept to PSP management could help us understand why immediate ICD for PSP may not be the best option for all cases. Conservative management can allow slow re-expansion of lung, potentially leading to more optimal healing of pleural defect and account for lower rate of recurrence observed in the Brown et al study [2]. Remarkably, 8.8% recurrence rate [2] with conservative management is comparable to video-assisted thoracoscopic surgical pooled recurrence rate of 10%, obtained from recent meta-analysis [10].

In cost utility analysis of pooled data [5], conservative management with observation has been found to be of highest utility after consideration of cost and morbidity from intervention. It presents as a rare opportunity to implement a medical intervention that gives desirable patient outcomes at no added cost.

With regards to limitations, our study involves a single centre with small sample size and no comparator arm. We intend to have electronic medical record follow up of patients for at least 1 year as spontaneous pneumothorax can be associated with familial syndromes or female gender specific rare lung conditions, such as lymphangioleiomyomatosis (LAMS) [11,12]. Based on mathematical modelling by Hagaman et al, [11] routine use of CT screening for detection of LAMS in selected females presenting with first onset spontaneous pneumothorax, was reported to be cost effective. However, a recent study applying Bayes theorem to published data gives robust estimates that it will require more than 330 CT scans to detect 1 case of LAMS in females presenting with PSP [12], refuting claims of cost effectiveness.

In conclusion, protocol based conservative management of PSP regardless of size, was implemented in our series of patients with favourable patient centric and safety outcomes. In our case series, success rate is 76% with no known cases of pneumothorax recurrence thus far. Audit data will serve to guide clinical practice in selection of suitable patients for conservative management of PSP. Our study aspires to contribute real-world practice data to support conservative PSP management and encourage clinicians to decisively shift towards conservative management of PSP so that improved patient outcomes with no added cost can be achieved.

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