

# Primary spontaneous hemopneumothorax: A meta-analysis study

Fahmi Kakamad, Snur Othman

## ABSTRACT

Although primary spontaneous hemopneumothorax is a surgical emergency, it has not yet been outlined well in literatures. The current meta-analysis study aims to highlight this issue. The search in the medical literatures revealed 35 studies which included 358 patients. Nineteen cases were female. Mean age at presentation was 28.7 years. Most common presentation was chest pain. Plain chest X-ray was the diagnostic tool of choice in most of the cases. Clinical features, procedures and complications were presented in tables. Conservative management along is sufficient in certain conditions. Emergency operation were performed when the patient developed shock and/or presented with continuous fresh bleeding more than 100 cc/hr after initial drainage.

**Keywords:** Emergency operation, Hemopneumothorax, Primary, Spontaneous

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## INTRODUCTION

Primary spontaneous hemopneumothorax (PSHT) is a rare and critical disease which involves accumulation of air and blood within the pleural space without any sort of trauma or other obvious causes [1]. It is widely seen in young age group (mean age 27) [2]. The condition can be fatal due to hypovolemic shock [3]. Bleeding usually occurs because of vascularized adhesions, consisting of aberrant vessels between the parietal and visceral pleura. These adhesions are torn as the lung collapses following pneumothorax [4]. Physiological hemostasis by vasoconstriction and clot formation may be impeded by lung movement, changes in pleural pressure during respiration and absence of surrounding tamponade effect [5]. As reported in literatures, patients with PSHP have been managed initially with tube thoracostomy [6].

Although PSHT is a surgical emergency, clinical features have not been well studied in literatures to help health care professionals to recognize the condition early. The guideline for management has not yet been established. There are still several controversies about prevalence of the disease, definition of the condition, indications and ideal timing of surgical intervention. The current meta-analysis study aims to help health care staffs to overcome these issues in term of early recognition and timely surgical intervention for cases of PSHT.

## METHODS

### Eligibility criteria

For a paper to be included, it should address at least one specific aim (presentation, or management, or both) of PSHT. To include almost all papers regarding PSHT, it is defined as any hemothorax accompanying primary spontaneous pneumothorax. To reduce heterogeneity, any cases that did not have accompanying pneumothorax were excluded.

### Information sources and Search

PubMed, Web of Science and MEDLINE on OVID were searched for English-language studies published before August 1, 2016. Hemopneumothorax was used as a search term. The search was supplemented by references of the included articles.

### Data collection process

Data were taken directly from the articles. Investigators have not been contacted to obtain and confirm the data.

### Data items

The following data were extracted and pooled from full articles: sample size, socio-demographic characteristics of the patients, presentations, amount of drainage, diagnosis, type of managements, recurrence rate and complications.

### Summary measures and Synthesis of results

Data were calculated and analyzed totally. They are presented as mean values, 95% confidence intervals (CIs), percentages, and ranges of variation. The search in the medical literatures revealed 35 studies which included 358 patients.

## RESULTS

The literature search yielded 880 titles. To this, 60 titles were added from the references used by included articles. After screening, 35 articles met inclusion criteria (Figure 1).

The 35 studies included 358 patients, 19 cases were female (5.3%, CI: 2.98–7.62%). Age ranged from 13–80 years with mean age 28.7 years (CI: 27.97–29.46). Among 8799 cases of primary spontaneous pneumothorax, 289 patients developed PSHT, it means 3.3% (CI: 1.45–5.10%). Most common presentation was chest pain (98.8%, CI: 97.92–100.00%), followed by shortness of breath (SOB) (67.8%, CI: 61.45–74.15%), followed by shock (35.8%, CI: 30.53–40.87%). Table 1 gives

880 Records screened for eligibility.  
820 Identified by database searching.  
60 Identified by reference

25 Duplicates

855 Records screened

760 Excluded by title

95 Articles assessed

60 Excluded

51 Not primary  
9 not retrieved

35 Articles included in analysis of  
Both presentation and management of  
PSHT

Figure 1: Flow chart detailing the retrieval of included studies.

the reported signs and symptoms of PSHT. About past history, 6.1% (CI: 3.51–8.69%) have history of primary spontaneous pneumothorax (PSP). Thirty-three percent (CI: 28.25–46.07%) were smokers.

Plain chest X-ray was the diagnostic tool of choice in most of the cases (95.1%, CI: 92.75–97.45%), while in 4.9% (CI: 2.55–7.25%) Chest X-ray only showed pneumothorax and after thoracostomy tube insertion PSHT diagnosed. Almost all cases were treated initially by tube thoracostomy. Blood drainage from plural space ranged from 30–3770 cc (mean: 1121 ml, CI: 1037.13–1204.8 ml). Emergency operations (thoracotomy and VATS) were indicated in 47.8% of patients (CI: 42.37–53.43%) Table 2 gives the treatment choice of PSHT reported in literatures with their indications. Complications were rare. Only one case of recurrence PSHT has been reported in literatures. Table 3 gives reported complications.

Table 1: The reported signs and symptoms of PSHT

Signs and symptoms	No. of patients	Percentage
Chest pain	320/324	98.8%
Shortness of breath	141/208	67.8%
Shock state	118/330	35.8%
Cough	14/325	4.3%
Back pain	5/325	1.5%
Fever	3/325	0.9%
Abdominal pain	2/325	0.6%

Table 2: Various procedures of management of PSHT and their indications

Procedures	No. of patients	Percentage	Indications
Tube thoracostomy along	44/323	13.6%	Stability during presentation and follow up, little drainage, bleeding stopped in first the 24 hours. no surgical indications as mentioned in the next row [1–4, 7–13]
Tube thoracostomy with Thoracotomy	134/323	41.5%	Shock, continuous bleeding, lung collapse, prolonged air leak, clot evacuation. Pachypleuritis, or recurrent pneumothorax, contralateral pneumothorax [1,3–7, 10–12,14–25].
Tube thoracostomy with VATS	137/323	42.4%	Same as Tube thoracostomy with Thoracotomy [2, 3, 5–9, 11, 13, 14, 25–31].
Tube thoracostomy with VATS+MT	8/323	2.5%	Same as Tube thoracostomy with Thoracotomy [26].

Abbreviation: VATS Video Assisted Thoracoscopic Surgery, MT Mini Thoracotomy

Table 3: Reported complications of PSHT

Complications	No. of patients	Percentage
Recurrent PSP	4/325	1.2%
Contra lateral PSP	4/325	1.2%
Re-expansion pulmonary edema	2/325	0.6%
Re-Thoracotomy	1/325	0.3%
Recurrent PSHT	1/325	0.003%

## DISCUSSION

Controversies about PSHT start from its definition. Ohmori and associates regarded 400 ml of initial blood drainage as necessary criteria for diagnosis of PSHT [32]. Some authors accepted this condition and cited it in their works [3, 4, 6, 9, 10, 26]. Others reported cases of PSHT with initial drainage less than 400ml [1, 4, 14, 19]. Tay and his colleagues reported a case of PSHT with only initial drainage of 30 ml of blood [14]. All authors reported their PSHT cases in the background of the cases of primary spontaneous pneumothorax (PSP). In another term, almost all cases of PSHT reported in literatures accompanied by PSP [1–32, 36–39]. From this view, we can define PSHT as any hemothorax accompanying PSP. Even iatrogenic hemothorax caused by thoracostomy tube insertion during management of PSP, is safer to be regarded as PSHT and managed accordingly.

Although both PSP and PSHT are most commonly present with chest pain and shortness of breath, there are several differences between the two conditions, Table 4 shows some aspects of these differences [33, 34, 35]. Smoking has been reported less among patients with PSHT in comparison to PSP (33% and 90% respectively) [34]. This may be explained by the fact that smoking induces dense plural adhesion in some cases and prevents bleeding. Erect plain chest X-ray is the most sensitive and cost-effective diagnostic tool for PSHT [1–32, 36–39]. Chest computed tomography scan is used when diagnosis is questionable [2–4, 11, 16, 29]. Recurrence of PSHT has been reported in literatures only once [39]. The rare rate of PSHT recurrence might be due to successful pleurodesis and dense adhesions of inflamed pleura induced by oozing in the pleural cavity [40]. In spite of been critical condition, mortality has not been reported in literatures from late 1940s onwards [36]. Before this date, mortality reported to be around 25% of all cases diagnosed with PSHT [20]. This may be due to liberal offer of invasive procedures (thoracotomy and VATS) by health care professionals in latter have of 20th century [5, 6, 14]. Some authors recommend that once PSHT has been diagnosed, operation is indicated regardless of its presentation. They justify this rule because they think that if the patients with PSHT are initially treated conservatively, most of them ultimately

Table 4: Some differences between PSHT and PSP

Parameters	PSP	PSHT
male-to-female incidence	6.2:1 p1	17.8:1
Smoking habit	90% are smokers <sup>2</sup>	33% are smokers
Etiology	A familial incidence has not been reported. <sup>31</sup>	A familial incidence has not been reported. <sup>31</sup>
Bilateral occurrence.	Bilateral PSP occur in fewer than 10% of patients. <sup>33</sup>	Bilateral PSTH has not been reported.
Recurrence	Heavily dependent on treatment applied and it is around 30% .1	Recurrence is rare independent on treatment applied
shock	Rare and unusual	Common (35.8%)
Emergency operations (thoracotomy+ VATS)	Rare and unusual	47.9% needs emergency operation.
Aim of surgery	Aims to prevent recurrence +/- decortications	Used as a resuscitative procedure +/- decortications

VAST: Video Assisted Thoracoscopic Surgery

undergo operation for one of the following complications: refractory clinical deterioration (profuse blood loss), re-bleeding, and later complications (clot empyema, or persistent air leak). So delayed intervention puts the patients in unnecessary risks and prolongs hospital stay [2, 5, 6, 27]. Others believe that PSHT by itself is not an absolute indication for operation, and even when the initial blood drainage through the thoracostomy tube is large, some patients can still be managed non-operatively with careful monitoring of vital signs and drainage volumes [1, 3, 4, 7, 8].

Indication of operation by few authors is bleeding for more than 24 hours after initial drainage [2, 14, 11]. This is strongly rejected by what are reported in literatures as it is too long to wait for 24 hours while patients are bleeding [2, 5, 6, 16–19, 27]. Regarding the amount of thoracostomy tube drainage; it is reported that initial drainage even in large amount is not necessarily an indication for operation provided that patient being stable and replaced well [11, 40]. Hacıbrahimoglu et al. managed six cases of PSHT successfully with initial drainage reaching 3700 milliliters [11].

According to literature, indications for operation can be summarized as followings.

## Emergency Operation

- Any shocked patients [1–32, 36–39].
- Continuous fresh bleeding after initial drainage more than 100 ml/hour [1, 3, 5–7, 9, 10, 28].

## Elective Surgery

- Prolonged air leak (more than one week) [1–3, 5–10, 14, 15, 19, 26–29, 36]
- Impaired lung expansion [1, 3, 7, 8, 10, 11, 15]
- History of PSP [1, 3, 7, 8, 10, 15]
- Clot evacuation. It is recommended to evacuate chest cavity if it contains more than 1000 cc blood otherwise it may lead to complications like empyema [35].
- Simultaneous occurrence of contralateral pneumothorax [27].

There are several limitations and sources of biases in this study; First of all, some study could not be retrieved so that they were excluded. Second: All studies do not reported all variables. Third: The condition is rare and the number of cases is small, some study only reported one case. Fourth: The study designs are different some are case reports, others are case series.

## CONCLUSION

Primary spontaneous hemopneumothorax (PSHT) is a surgical emergency which is defined as any hemothorax accompanying primary spontaneous pneumothorax (PSP). Conservative management with tube thoracostomy along is sufficient in certain conditions. Emergency operation indicated when the patient developed shock and/or presented with continuous bleeding more than 100 cc/hr. Reporting of new cases and new case series by health care professionals is strongly advised.

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## Author Contributions

Fahmi Kakamad – Substantial contributions to conception and design, Acquisition of data, Analysis and interpretation of data, Drafting the article, Revising it critically for important intellectual content, Final approval of the version to be published

Snur Othman – Substantial contributions to conception and design, Revising it critically for important intellectual content, Final approval of the version to be published

## Guarantor

The corresponding author is the guarantor of submission.

## Conflict of Interest

Authors declare no conflict of interest.

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