Management of primary spontaneous pneumothorax
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The optimal management of primary spontaneous pneumothorax remains the subject of considerable controversy. During the last few years, however, interesting new data on pathogenesis and various treatment techniques have been published, which have led to the publication of some interesting and thought-provoking opinion articles. The author reviews the latest developments in pneumothorax pathophysiology and management.

Keywords
pneumothorax, primary, spontaneous, management, thoracoscopy


Primary spontaneous pneumothorax (PSP) is a common pathology with an age-adjusted incidence of approximately 10 cases per 100,000 population. Nevertheless, the exact pathophysiology of PSP remains unclear regarding the exact site of the air leaks, its underlying disease process, and its precipitating causes, and thus the optimal management techniques and strategy. Furthermore, the relative lack of prospective, comparative, randomized studies, and the differences in “management philosophy” between pulmonologists and surgeons (or other caretakers such as emergency physicians, internists, radiologists, and so forth) are some of the reasons for today’s controversies. I review recent advances in and current knowledge of the causes and management of PSP.

Management guidelines: are they up-to-date and are they being followed?
In 1993, the British Thoracic Society was one of the first to issue management guidelines for PSP [1], strongly favoring a conservative approach, with emphasis on observation without intervention in select patients, and on simple aspiration as a technique that is simple, safe, acceptable to patients, and effective. Simple observation was recommended as the initial procedure in all patients in whom intervention was considered necessary.

Two recent papers have evaluated the awareness, and the level of adherence to these guidelines. Jutley et al. [2] distributed a questionnaire in a Scottish district general hospital serving a population of 300,000 and involving 112 staff members, including all doctors involved in the evaluation and management of PSP. The questionnaire comprised a series of items based on the typical case presentation of a 25-year-old PSP patient. Only 32% of doctors were aware of the existence of pneumothorax management guidelines, only 36% of all staff graded the size of the pneumothorax correctly, and only 8% identified the British Thoracic Society-proposed plan of management correctly and graded the pneumothorax size accurately according to guidelines. There was a tendency to underestimate the size of the pneumothorax and to overtreat the condition with invasive chest drainage rather than simple aspiration. Mendis et al. [3] performed a retrospective case note audit of 59 episodes of PSP of all staff at Guy’s Hospital in London, followed by a questionnaire survey. Here, also, a significant proportion of attending physicians (27%) preferred chest tube drainage instead of the recommended simple aspiration as a first-line treatment attempt. The follow-up questionnaire also suggested a significant lack of familiarity with the existing guidelines.
What can be learned from these surveys? First, only a minority of practitioners caring for PSP patients in the United Kingdom (and most likely elsewhere as well) are aware of the existence of existing PSP management guidelines. Even though these guidelines were based on only few randomized controlled trials, and most often on expert opinion, this poor awareness should be considered alarming, taking into account the current importance attributed to “good clinical practice” and “evidence-based medicine.” Second, a majority of practitioners seem to have problems with the size estimation of pneumothoraces. In this respect the authors have recently shown that the easy-to-measure light index is an accurate size estimator of pneumothorax [4]. Third, pulmonologists as well as surgeons tend to overtreat simple PSP. There is now sufficient evidence that simple, manual aspiration is safe, effective, and well tolerated in approximately two thirds of patients with a first episode of PSP, even in large pneumothoraces [5•]. This simple maneuver should therefore be considered the first-line treatment in these patients [6].

This grade A evidence was not yet published at the time of publication of an expert-based consensus recommendation report on the management of spontaneous pneumothorax [7••], which used the Delphi technique to formalize the expert panel’s consensus process and explicitly state opinion, of another evidence-based review on the issue of chest tube drainage versus manual aspiration [8], which concluded that to date “no definite guidelines for the treatment of spontaneous pneumothorax can be given,” and of an evidence-based literature search on all treatment aspects of spontaneous pneumothorax [9].

In conclusion, current guidelines and recommendations are imperfect, and awareness and application among clinicians are poor. Researchers, experts, opinion leaders, and clinicians should unite forces to keep guidelines up-to-date, to reinforce their implications, and to increase their dissemination. A recent initiative [10] may serve these purposes.

Pathophysiology of primary spontaneous pneumothorax
Based on current knowledge, a review [11] and a pro/con debate [12•,13] pertaining to the pathophysiology of PSP have recently been published, emphasizing more specifically the uncertainties on the role of rupture of emphysemalike changes (ELCs; ie, blebs and bullae) and the impact of this ELC rupture paradigm on pneumothorax recurrence prevention treatment. In summary, actual air leakage at ruptured blebs or bullae is not observed in every patient undergoing thoracoscopy or thoracotomy (incidences vary widely: 3.6%, 25% and 73%); air leakage can be present in the lung area outside the blebs and bullae, or even when no blebs or bullae are present (“pleural porosity”); the actual site of air leakage cannot be predicted noninvasively in an individual patient; and systematic treatment of ELCs (bullectomy, blebectomy) in every PSP patient presenting with ELCs is not indicated.

This contrasts with pleurodesis, which has been shown consistently to reduce the recurrence rate significantly when added to bullae or bleb treatment [11,12•,13,14]. Therefore, although the presence of ELCs should at least be considered as a marker of the underlying lung disorder or mechanisms leading to PSP (ELCs have also been observed in nonsmoking dogs with spontaneous pneumothorax) [15], it is the treatment of the pleura (ie, pleurodesis) and not that of the lung (ie, bleb- or bullectomy) that should be considered the real cornerstone of recurrence prevention.

What caused the event?
The exact precipitating causes of the occurrence of an episode of PSP in an individual patient remains unknown. It is well-known that most episodes occur at rest and that some degree of clustering in time is present, which may be related to subtle changes in atmospheric pressure or temperature [11]. Added to this is the curious observation of a statistically significant accumulation of PSP 1 week before and 1 week after the new moon [16]! (If confirmed, this temporal association can probably be related to the lunar effects on climatic parameters.) Another interesting observation was made by Martin Martin et al. [17], who reported that type A behavior is significantly more prevalent in the patient with spontaneous pneumothorax compared with a control group. Although I do not agree with their conclusion that “type A behavior in SP patients should be reduced in order to improve outcome,” the personality type of the patient may have an influence on the choice of the treatment management plan (eg, whether a patient would prefer immediate recurrence prevention treatment after a first episode of PSP, which is unnecessary in two thirds of patients, but which offers approximately 95% certainty of absence of recurrence), or not, and simply await recurrence.

What is the optimal treatment strategy for PSP?
Current knowledge may be summarized as follows:

1. A small, asymptomatic PSP needs no treatment.
2. When air evacuation is indicated (ie, when the pneumothorax is large or symptomatic), simple manual aspiration should be tried first, allowing for complete lung reexpansion and patient discharge in two thirds of cases.
3. If manual aspiration fails, an air leak must still be present. In these cases, a small-caliber chest tube (12–16 Fr) can be inserted awaiting spontaneous closure of the leak, or an immediate thoracoscopy can be proposed. A recent randomized, prospective, com-
parative trial has shown that medical thoracoscopic treatment is more cost-effective than chest tube drainage in these cases [18]. Although this and other studies may suggest that immediate thoracoscopic should be considered in every patient, even after a first episode of PSP [19, 20], it should be remembered that two thirds will then undergo surgery for nothing because they would not have had recurrences anyway [13]. In this situation, the attending physician should inform the patient completely regarding the advantages and disadvantages of this more aggressive approach, and take into account the patient’s preference. Exceptions are flying personnel and divers, in whom immediate recurrence prevention treatment after a first episode of PSP is mandatory.

4. Medical or surgical thoracoscopy? Unfortunately, there has been as yet no head-to-head trial comparing these two options—a trial that is urgently needed. Both techniques have proved their value, and noncomparative efficacy results are similar [13, 18, 20–23]. Unless a prospective, large, randomized, long-term follow-up study comparing medical and surgical thoracoscopy in terms of efficacy, safety, postoperative pain and morbidity, and cost shows a significant advantage of one technique over the other, local preferences, habit, and availability will remain the main determinants of treatment choice.

5. Recurrence prevention: lung treatment (bleb- and bullectomy), pleura treatment (pleurodesis), or both? Pleurodesis reduces recurrence rates when added to bleb-/bullectomy [11, 13, 14, 21]. Pleurodesis alone is more effective than bleb-/bullectomy alone [24], and long-term results of pleurodesis obtained by medical thoracoscopic talc poudrage without bleb-/bullectomy are similar to those of pleurodesis plus bleb-/bullectomy [11, 18]. These data suggest that it is pleurodesis, and not bleb-/bullectomy, that is the cornerstone of recurrence prevention treatment. Unless a visible leak is present at blebs or bullae, they probably should not be touched (which is as I am told by my surgeon friends, very difficult for them, because they are trained in treating “the abnormal”).

Conclusions
Numerous questions remain unanswered: What is the underlying cause of PSP? (Clearly, the “P” of “primary” is no longer true: an abnormal lung is present.) What is the precipitating event? What is the best treatment strategy: immediate recurrence prevention or waiting for the first recurrence? What is the best recurrence prevention technique: surgical video-assisted thoracoscopic bleb- /bullectomy plus pleurodesis, or medical thoracoscopic talc poudrage? Unless some of these questions are answered by prospective, randomized, comparative trials, we will have to limit ourselves to (foremost, expert-opinion based) guidelines (which are poorly known and followed), pro/con debates (which are interesting, but are hypothesis generating rather than problem solving), and expert opinions (which reflect only the expert’s opinion).

This uncertainty should change: let’s perform those studies.

References and recommended reading
Papers of particular interest, published within the annual period of review, have been highlighted as:
• Of special interest
** Of outstanding interest

Editorial accompanying the article by Noppen et al. [5]. Excellent overview of management principles in first episodes of PSP.

Excellent overview of the pathogenesis of PSP (together with the article by Noppen [13]).
Unusual paper to read for a pulmonologist. Interesting observation that needs to be confirmed. Contains a complete reference list on true and mythical effects of the moon on humans.


