

A Healthy 24-Year-Old Man With Sudden Onset of Unilateral Chest Pain and Dyspnea

Ronald N. Rubin, MD^{1,2} —Series Editor

A previously healthy 24-year-old man was working at his job as an automechanic when he acutely developed pleuritic chest pain on the right side and dyspnea. The pain was initially sharp and prompted him to sit while the sharpness of the pain lessened. He went home early, but the symptoms did not resolve, even with resting or lying down. Therefore, he presented to the emergency department (ED).

In the ED, his vital signs revealed a pulse of 100 beats/min, a respiration rate of 20 breaths/min, and a blood pressure of 122/76 mm Hg. He was afebrile and, although uncomfortable, was not in acute distress. A pulse oximeter reading of oxygen saturation was 96% on room air.

On physical examination, several observers agreed there were decreased breath sounds as well as decreased vocal and tactile fremitus on the right side of the thorax. Chest radiography scanning revealed the presence of a visceral pleural line displaced from the chest wall, confirming a pneumothorax of approximately 35%. There were no blebs, infiltrates or other obvious pathology or abnormality seen on chest radiograph.

A more detailed history was unremarkable. He had no significant medical history except for appendectomy at age 10 years. He does not take any medication, has no allergies, and does not smoke. His symptoms occurred in the absence of any trauma. As recently as the previous weekend, he had been participating in significant physical activity (eg, yard work and jogging) with no respiratory symptoms.

Which of the following is the most appropriate initial management strategy for this patient?

- A. A chest tube should be placed since the pneumothorax is more than 15%, and interventions are essentially void of serious adverse events.
- B. Because there is no obvious underlying lung disease, recurrence is more likely, which justifies an early interventional strategy.
- C. A conservative initial strategy of careful monitoring and follow-up without intervention is an appropriate option in this setting.
- D. Conservative therapy may be adequate initially (8 weeks), but

recurrence risk is much higher over the following year compared with an interventional strategy.

Correct Answer: C.

A conservative initial strategy of careful monitoring and follow-up without intervention is an appropriate option in this setting.

The presented case is very classic and typical for the diagnosis of pneumothorax, one of the situations so often presented to us early in our training as it manifests very typical symptoms, signs, and physical findings on chest physical examination. The symptoms are usually quite clear: sudden onset of chest pain of the pleuritic (sharp) variety with acute dyspnea. There will almost universally be tachypnea and tachycardia to some degree (bearing in mind that the most common demographic remains a young adult man [see below] such that the vital sign changes may not be severe). Blood studies similarly reveal arterial hypoxemia with an A-a gradient while the chest radiograph will confirm and quantitate the presence of air in the pleural space.¹

The most common demographic remains young (aged 15-35 years), thin men with no previously known pulmonary disease. There has been a subtle but definite demographic shift to woman, even more so with age, which is attributed to not only the aging the population but also the increased incidence of lung pathology related to smoking and chronic obstructive pulmonary disease (COPD) in that population.²

Nomenclature schemes define different subsets of pneumothorax. First, is the pneumothorax spontaneous or not? Nonspontaneous forms include traumatic

AFFILIATIONS:

¹Lewis Katz School of Medicine at Temple University, Philadelphia, Pennsylvania

²Department of Medicine, Temple University Hospital, Philadelphia, Pennsylvania

CITATION:

Rubin RN. A healthy 24-year-old man with sudden onset of unilateral chest pain and dyspnea. *Consultant*. 2021;61(8):e18-e20. doi:10.25270/con.2021.08.00003

DISCLOSURES:

The author reports no relevant financial relationships.

CORRESPONDENCE:

Ronald N. Rubin, MD, Temple University Hospital, 3401 N Broad Street, Philadelphia, PA 19140 (blooddocrnr@yahoo.com)

(eg, penetrating or blunt force trauma) and iatrogenic as with barotrauma from ventilators or procedures such as pleural fluid aspiration. These will not be further addressed here. Returning to spontaneous forms, they may be primary, meaning no (known) clinical lung disease, or spontaneous secondary, which is pneumothorax complicating some form of clinically apparent lung disease (eg, COPD, sarcoidosis). There seems to be more of the secondary form currently, which is related to the previously mentioned demographic/age drift but also to the more detailed and refined diagnostic testing available (eg, computed tomography scanning) and increased use of video-assisted thoracoscopic surgery.^{1,2} The presented patient is a typical young man of the classic spontaneous primary demographic, and the remainder of the discussion will center on management options with focus on this type of case.

It is quite remarkable to the author that there is so much strong opinion and published guidelines for management of spontaneous primary pneumothorax, with sometimes quite opposing conclusions, to be found in the absence of current (or even remote) evidence availability. It is agreed that the goal of removal of the air is where we want to be. There is much disagreement as to which, if any, interventions are required and are best to do so. As an example of varying guideline, the British Thoracic Society guidelines advise needle aspiration to be tried and a chest tube placed only if needle aspiration fails, while the American College of Chest Physicians' guidelines recommend proceeding immediately with chest tube placement.³ Happily, a large, strong study with accompanying editorial has recently appeared in the literature, which compares "conservative" therapy (meaning initial observation without needle aspiration), small bore catheter, or full bore chest tubes at all with immediate interventions. The primary end point was full lung re-expansion at 8 weeks from diagnosis, and the very important secondary end points were serious adverse

events and recurrence rate at 12 months.⁴

As previously mentioned, traditional management, particularly in the United States, has been some form of interventional drainage. This strategy is not at all innocuous, as it involves a hospital stay and exposure to an array of adverse events. A strong and provocative alternative strategy of observation initially and reserving surgical intervention when clinical findings indicate was studied by Brown and colleagues.⁴ They randomly assigned 316 well-matched patients for early intervention or conservative management. The groups included the following demographic and clinical parameters: average age, 26 years; men, 85%-88%; pneumothorax size, 68%-64%; heart rate on initial evaluation, 74-78 beats/min; respiratory rate, 17 breaths/min; current smokers, 49.3%-42.5%; average oxygen saturation, 97%.

The interventional group had a small-bore French catheter immediately placed with water seal and were followed with a 1-hour repeat chest radiography scan with standard chest tube management maneuvers thereafter, depending on whether or not re-expansion was achievable.

The conservative group had a repeat chest radiography scan at 4 hours. If, at that time, there was no need for supplemental oxygen and the patient could comfortably ambulate, he or she was discharged to home care with close follow-up and chest radiography scanning at day 1 to 3 and then at 2-week intervals to week 8. Recurrence was assessed at 6 to 12 months. Of course, if there was clinical deterioration such as worsening pain/tachypnea, lowering of oxygen saturation below 90%, deterioration of vital signs, or expanding pneumothorax on chest radiograph, the intervention was initiated.⁴

The results were striking. In the conservatively treated group, 84.6% did not require any intervention. In the conservative group, 84.6% required no intervention and 15.4% required a secondary intervention. The conservative group as a whole had 94.4% full resolution at 8 weeks, while 100% of the patients who

had undergone a procedure initially had 98.5% full resolution at 8 weeks. This difference was noninferior statistically. In exchange for this small, nonstatistically significant difference in 8-week outcomes, the following benefits occurred to this conservative approach:

1. Hospital stay length was shortened with conservative treatment (1.6 days) vs interventional treatment (6.1 days).
2. The rate of any adverse event was lower in the conservative group (13%) vs the interventional group (26%); 3.7% of the conservative group vs 12% of the intervention group had experienced serious adverse events (eg, hemothorax, infections, severe chest pain, lung collapse).
3. Finally, and perhaps surprisingly, there was a far higher recurrence rate in the intervention group (16.8%) vs the conservative group (8.8%) occurring to the 12-month follow-up visit.

The study authors rather dryly comment that their data provides "modest evidence" that a conservative approach, which saves 85% of patients from a chest tube and less time in the hospital and out of work, is effective in moderate to large pneumothorax cases with essentially equal numbers of full resolution at 8 weeks and far less recurrence at 12 months and is indeed something to consider.⁴ A strong accompanying editorial agrees with this conservative strategy being a choice in the setting of primary spontaneous pneumothorax.³

A review of the above study makes answers A and D incorrect, as there are certainly an increased and significant number of adverse effects associated with interventions, and recurrences are actually more common at 12 months with intervention strategies. Answer C is, thus, the most appropriate one here.

Patient Follow-Up

The patient was given a diagnosis of primary spontaneous pneumothorax

TAKE-HOME MESSAGE

Spontaneous pneumothorax remains a common clinical entity. The classic demographic, as was presented in the case vignette, is young (aged 15-35 years), thin men who present with the typical symptoms of sudden onset dyspnea, an ipsilateral pleuritic chest pain, accompanied by signs of tachypnea, tachycardia, decreased breath sounds on the effected side, and diminished arterial oxygen saturation. The diagnosis and extent is confirmed by chest radiography scanning. Studies have demonstrated, not surprisingly, a subtle change in demographic with more cases now seen in older patients, in women, and in patients with abnormal lung pathology/physiology (eg, COPD) than was seen previously.² Management also seems to be evolving. It is common sense and common knowledge that patients with very large pneumothoraxes with worrisome levels of shortness of breath, tachycardia, and/or hypotension require urgent removal of air from their hemothorax using a variety of methods, including needle aspiration, small-bore catheters, or even chest tubes. But recent strong studies have clearly demonstrated that many cases of pneumothorax can safely and effectively be treated with no invasive intervention if acute stability is established and tight follow-up regimens are followed.³ Two authors' editorial comments that I cannot resist are (1) a distinct "more is better and hospital-centric" attitude and experience in the United States compared with elsewhere and (2) what will the effect be of the new, portable, handheld, programmable ultrasound devices already replacing stethoscopes and radiology in the EDs and intensive care units? Senior (meaning older!) physician that I may be, I too cannot wait to get one.⁴

based upon firm clinical and radiologic grounds. His clinical status was stable and satisfactory (eg, respiratory and pulse rates, blood pressure, arterial oxygen saturation). Management options were discussed, and the decision was made to proceed with conservative management. After 5 hours, the patient's re-evaluation revealed diminished pleuritic chest pain and dyspnea, respiratory rate of 14 breaths/min, pulse of 84 beats/min, arterial oxygen saturation of 97% on room air, and ability to ambulate comfortably. His chest radiograph results were unchanged with no increase in pneumothorax size. He was seen 36 hours later and reported further improvement in dyspnea and chest pain. A repeat chest radiography scan demonstrated the pneumothorax had diminished to 15% to 20%. Subsequent 2-week interval visits showed continued improvement clinically and radiographically with complete chest

radiograph resolution by week 8. He is currently 5 months out with no symptoms of recurrence.

REFERENCES

1. Sahn SA, Heffner JE. Spontaneous pneumothorax. *N Engl J Med*. 2000;342(12):868-874. <https://doi.org/10.1056/nejm200003233421207>
2. Hallifax RJ, Goldacre R, Landray MJ, Rahman NM, Goldacre MJ. Trends in the incidence and recurrence of inpatient-treated spontaneous pneumothorax, 1968-2016. *JAMA*. 2018;320(14):1471-1480. <https://doi.org/10.1001/jama.2018.14299>
3. Broaddus VC. Clearing the air - a conservative option for spontaneous pneumothorax. *N Engl J Med*. 2020;382(5):469-470. <https://doi.org/10.1056/nejme1916844>
4. Brown SGA, Ball EL, Perrin K, et al. Conservative versus interventional treatment for spontaneous pneumothorax. *N Engl J Med*. 2020;382(5):405-415. <https://doi.org/10.1056/nejmoa1910775>