Family Practice Grand Rounds

Spontaneous Pneumothorax—A Dilemma of Management

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DR. CURTIS ESHELMAN (*Chief Resident*): Over the past three months we have treated two patients with spontaneous pneumothorax which suggests that this problem is common enough to be of concern but uncommon enough that the family physician may be uncertain as to the correct and best management plan. Recourse to the textbooks has revealed a variety of opinions on management, from bedrest to insertion of chest tubes. Both our patients were female and began their illnesses in similar ways. However, the course of their management varied dramatically after the first few days. We have invited two consultants from the University of North Carolina at Chapel Hill to assist in our discussion: Dr. Mario C. Battigelli from the Division of Pulmonary Medicine, Department of Medicine, and Dr. Peter Starek, Division of Thoracic Surgery, Department of Surgery.

The first patient will be presented by Dr. Robert Uhren.

DR. ROBERT UHREN (*third year resident*): Ms. C. V. is a 24-year-old white woman, first seen in the Family Practice Center in July 1975 for routine health maintenance. Apart from being dissatisfied with her job, suffering from occasional migraine headaches, and smoking half a pack of cigarettes a day, she had no problems.

On August 26, 1976, she developed acute right-sided chest pain while brushing her hair. This was associated with dyspnea and pleuritic chest pain which radiated to the back. There was no

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prior history of trauma, sneezing, or coughing. The pain was relieved by her sitting forward. Clinical examination revealed decreased chest movement, hyperresonance, and tubular breath sounds on the right, suggesting a right-sided pneumothorax. A chest x-ray showed a 20 percent right-sided pneumothorax. Consultation was obtained from Dr. Battigelli at that time, and he will now comment on the problem as presented to him.

DR. MARIO C. BATTIGELLI (*Professor, Division of Pulmonary Medicine*): I see that you have set up a little trap for Dr. Starek and me, hoping perhaps that the blood will run! I will act as a dedicated coward and keep away from any serious confrontation with the surgeons but still get in my comments and opinions first!

The incidence of spontaneous pneumothorax is between 2 and 18 per 100,000 population. The presenting signs and symptoms in order of frequency include chest pain, dyspnea (a close second), and cough (far behind). Pneumothorax is an event which readily recurs in between 15 to 25 percent of all cases, with two thirds of the recurrences happening within two years of the initial onset. Seventy percent of cases occur during some sedentary activity, many times during sleep. Cough has an etiological contribution in only four percent of the cases.[1-2]

The functional effect consists of a sudden decrease in lung capacity with a loss of oxygen saturation, which then improves after 24 hours. The improvement is due to the parallel decline in lung perfusion, thus reducing the shunt which is responsible for the oxygen desaturation.[3]

The mean duration of a pneumothorax is 25 days with a wide variation depending on the degree of lung collapse, disease, and effects of thoracentesis. Radiologically there is an improvement of 1.5 percent expansion per day but this may not have parallel clinical significances. Eight percent of all cases do not heal and require corrective procedures to eliminate the pneumothorax permanently.[1,2]

I would like to impress upon you the fact that the terrifying prospect of a tension pneumothorax will only occur in two percent of cases, usually in older age groups. Pneumothorax carries a definite mortality of one percent which rises when the condition is secondary to pre-existing disease.[4] The cause of death, however, is usually due to the underlying pathology. So, having reviewed briefly the subject, my own opinion about the patient that we have discussed is that we should select conservative treatment—observation and rest only. Proper and alert care is always needed, and outpatient management should be limited to patients with uncomplicated cases who have no more than a 30 percent pneumothorax and who are below the age of 35.

DR. DANIEL VINSON (*third year resident*): Would you have hospitalized this patient?

DR. BATTIGELLI: Probably not. I fail to see any reason for it although I would base my decision on favorable blood gas levels and the reliability and compliance of the patient in following the physician's instructions.

DR. VINSON: Would blood gases even be necessary if the patient's condition was satisfactory?

DR. BATTIGELLI: In the present climate of liability and litigation, blood gases are a relatively innocuous test and provide a good baseline for following the patient.

DR. THOMAS METTEE (*Assistant Professor, Department of Family Medicine*): When would the blood gas level move you to initiate surgical intervention?

DR. BATTIGELLI: Remember first, that laboratory tests should be used in conjunction with the physical examination. Basing the decision on a magic number is to be avoided. Any severe reduction in blood gases, such as a pO_2 of 60 mm Hg, or any significant change in the previous baseline figures in a patient with chronic obstructive lung disease, will remind one of the need to insert a chest tube.

DR. UHREN: Let me quickly trace this patient's further course after the initial diagnosis. She was treated as an outpatient, given codeine for the chest pain, and advised to rest at home. A neighbor was instructed to monitor her pulse and respiration, and the patient was told to call the Family Practice Center in the event of any changes in symptoms. Daily contact was maintained by telephone. She was seen twice weekly. X-ray showed improvement so that she returned to work on the 14th day after initial pneumothorax.

DR. RUSSELL THOMAS (*third year resident*): Would there have been any value in giving oxygen to the patient?

DR. BATTIGELLI: Good question! I forgot about that point. The reabsorption of air in the pleural space can be greatly enhanced by giving

100 percent oxygen to the patient. This increases the nitrogen gradient considerably. There is also some advantage in not being too aggressive and delaying the too rapid re-expansion of the lung in order to allow the pleura to heal. As you suggest, 100 percent oxygen is a perfectly valid method of treatment. It must, however, be applied for some hours.

DR. ESHELMAN: Let me present the second woman, a patient of mine, age 25, who developed a sudden, sharp pain in the middle of the back while standing at her work. She felt as if she had been struck, and the pain radiated to the right breast. There was some slight dyspnea and anxiety. I saw her in the Emergency Room, where her vital signs were normal, including a respiratory rate of 24 per minute.

Physical examination suggested a left pneumothorax (hyper-resonant, decreased breath sounds on the left, and distant heart sounds). Blood gas results showed a pO_2 of 80 mm Hg, a pCO_2 of 30 mm Hg, and a pH of 7.42. The chest x-ray showed a 25 percent loss of lung volume. She was treated conservatively in the first 24 hours and on the second day the x-ray showed a 40 percent loss of lung volume on the left. A decision was made to admit her after consultation with a thoracic surgeon, and a chest tube was inserted. In spite of some initial reflation the tube did not function well, and she remained in the hospital for two weeks. She suffered a considerable amount of discomfort from the tube.

DR. PETER STAREK (*Associate Professor, Department of Surgery*): I cannot completely condemn the action of watching the patient with pneumothorax carefully and using only conservative measures. However, the patient may have extensive lung pathology and resorption may be very slow. The physician can never be certain that a potentially dangerous exacerbation will not complicate the patient's recovery, resulting in failure to expand the affected lung fully. The predominant practice of treating a pneumothorax with chest tubes stems from the opinion that this form of therapy is safer, particularly in the more extensive cases. It is easier for the physician to admit the patient to the hospital and insert a chest tube for the following reasons: (1) the air is removed from the pleural space, (2) fluid and blood can be removed, (3) the lung is expanded quickly, and (4) the tube causes some low-grade inflammation of the pleura and thereby increased adhesiveness during healing. The recurrence of pneumothorax in surgically managed cases is less frequent than in those managed conservatively.[5,6]

In assessing a pneumothorax one has to evaluate how big the pleural leak is. With 60 percent deflation of the lung, the atelectasis in association with underlying disease is more likely to end in some infectious process. The great advantage of inserting a chest tube is that the physician has control over the situation and can thereby prevent possible complications. The disadvantages to the patient of the operation include pain, admission to the hospital, and being restricted to bed and to the water seal. It is possible that quick re-expansion of the lung and re-establishment of negative intrapleural pressure may prolong the pleural leak, but at least the atelectasis of the affected lung will be avoided. This may be very important in the sick and rather unstable patient.

After the patient has had the tube removed and goes home, the recurrence rate is still 25 to 50 percent. After all, the blebs will still be there. After two recurrences the chance of a third is 80 percent, so our current recommendations for this problem include obliteration of the pleural cavity by pleural abrasion and stapling the pleural blebs. I cannot agree with conservative management. I still think the safest way to manage a case of pneumothorax is to insert a chest tube.[5,6]

DR. BATTIGELLI: I would like to quickly elaborate on two points made by Dr. Starek. First, air gets into the pleural cavity by being sucked in through the lung, mainly during inspiration. This increases the size of the pneumothorax—so do not let the patient take a deep breath. One must make sure that the patient is at rest.

Secondly, pneumothorax is only rarely associated with empyema. In an interesting article in the *British Medical Journal* in 1868, Lister showed that pleural fluids associated with spontaneous pneumothorax are rarely infected.[7] The risk of empyema developing from an effusion associated with pneumothorax is minimal. The situation differs when one tampers with drainage methods. I agree with Dr. Starek that if underlying pathology of the lung is present there is no question that conservative management is inappropriate.

DR. THOMAS: What about tension pneumothorax in young people?

DR. BATTIGELLI: I would hardly consider that with this age group. I have yet to be convinced that tension pneumothorax can occur with a normal lung.[8]

DR. METTEE: The question we would like to get at is, what is a significant pneumothorax? I wonder if there are other parameters that one can use to assess the need for admission or aggressive intervention. Interpreting chest x-rays, you tell us, is not the best way. Specifically, what would you suggest objectively or subjectively as evidence that would indicate the introduction of a chest tube? What evaluations can physicians make in such cases as these two young patients?

DR. STAREK: Any pneumothorax with over a 20 to 30 degree deflation on x-ray would, for me, automatically require a chest tube. I must admit that in a healthy person this may not always be necessary. I can tell a patient that, if a tube is inserted, the air will usually stop bubbling after 24 hours and the tube can be removed in three to four days.

DR. METTEE: If the lung and pleura heal spontaneously over time, why not wait for this to occur in five to six days and then just do a thoracentesis—aspirating the air?

DR. BATTIGELLI: All I can say is that over the last 60 years lots of people have been walking around with pneumothoraces suffering no problems. Pneumothorax was, after all, used as therapy for tuberculosis. It is symptomatic of the hip-shooting attitudes of today that most people feel that the gas in the pleural space has to be removed at all costs.

The insertion of a chest tube itself has a definite complication rate. Mills and Baisch in a 1965 issue of *Annals of Thoracic Surgery* quote the possible complications in rank order as follows: (a) hemothorax, (b) pulmonary edema, (c) bronchopleural fistula, (d) pleural leaks, (e) subcutaneous emphysema, (f) empyema, and (g) contralateral pneumothorax.[9]

Surely the possibility of complications needs to be presented to the patient prior to inserting the tube.

DR. STAREK: What we want is a patient with an expanded lung and a normal intrapleural pressure as soon as possible, and the only way to obtain this is to put in a tube. Conservative treatment may work but, in my opinion, is not as predictable and safe as chest tube insertion.

DR. ESHELMAN: This conference has illustrated, for us, a certain variance in the recommendations for management of this condition from our two consultants. Both our patients were nearly perfectly matched for age, sex, and size of pneumothorax. Yet one was treated at home on an ambulatory basis and was back to work in 14 days. The other was hospitalized for 14 days and was back at work much later. The cost for the first patient was in the range of $100 whereas the hospitalized patient was billed approximately $1,500. We can draw our own conclusions from these facts. The main point that needs to be made is that the family physician must retain some responsibility in guiding his or her patient into the most effective, least traumatic, and least costly route of care. To do this the physician must know and trust his consultants and must recognize when to step in and perhaps reject advice. The problem will lie in the willingness and the ability of the consultant to understand the family physician's stance and vice versa.

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