Autologous “Blood Patch” Pleurodesis for Persistent Pulmonary Air Leak*

Russell Dumire, M.D., CAPT, USAF, MC;
Mark M. Crabbe, M.D., MAJ, USAF, MC;
F. Greg Mappin, M.D., MAJ, USAF, MC; and
Larry J. Fontenelle, M.D.†

A persistent pulmonary air leak, whether as a result of pulmonary surgery or as a result of a traumatic or spontaneous pneumothorax, is a difficult and frustrating problem to manage. Several therapies have been employed, including thoracotomy and repair of the air leak, prolonged tube thoracostomy suction, and chemical pleurodesis. We report two cases in which patients with a prolonged air leak who were not candidates for thoracotomy had immediate successful treatment with an autologous “blood patch” pleurodesis. An autologous blood patch pleurodesis is, in our limited experience, a simple, painless, inexpensive, and effective treatment for patients with a persistent pulmonary air leak. (Chest 1992; 101:64-66)

A persistent pulmonary air leak is an infrequent problem that occurs as a result of pulmonary surgery and as a result of traumatic and spontaneous pneumothorax. Treatments usually employed include tube thoracostomy with prolonged suction or water seal (Heimlich valve) and thoracotomy with closure of the pulmonary leak. The latter therapy is usually employed at some predetermined time from onset of the air leak, ie, from five days to three weeks.

Chemical pleurodesis with tetracycline has been successfully used in the treatment of patients with spontaneous pneumothorax. However, this is usually done after the air leak has resolved. Almassi and Haasler1 have recently described a successful technique for chemical pleurodesis with tetracycline in the presence of a persistent air leak.

We report two cases in which patients had a prolonged air leak. Both patients were not candidates for surgery, and both had immediate successful treatment of their air leak with an autologous “blood patch” pleurodesis.

CASE REPORTS

CASE 1

A 63-year-old man with limited pulmonary reserve underwent a right thoracotomy, middle lobectomy, and a wedge resection of the right upper lobe for a stage I (T2N0M0) adenocarcinoma of the middle lobe. The upper lobe node was benign. The wedge resection and the middle lobectomy were accomplished with stapling devices.

Postoperatively, the patient had a small air leak, with coughing only. However, by the third postoperative day, he had developed a large continuous air leak. Two days later, a basilar pneumothorax was noted and was successfully treated with placement of a third chest tube; however, the large air leak persisted. A bronchoscopy was done that revealed an intact middle lobe stump. A balloon catheter was placed through the bronchoscope to occlude the middle lobe stump and each segmental bronchus. The air leak stopped with occlusion of the posterior segment bronchus of the right upper lobe, which was the site of the wedge biopsy.

The patient was a poor candidate for repeated thoracotomy and closure of the air leak. This was due, in part, to his limited pulmonary reserve and to his poor nutritional status, as he had had a squamous cell carcinoma of the soft palate irradiated one year prior to this surgery, and he had subsequently developed osteoradionecrosis of the mandible.

A tetracycline pleurodesis was performed in the intensive care unit using 250 mg of lidocaine and 20 mg/kg of tetracycline, as described by Almassi and Haasler. The patient required intravenous (IV) analgesia as well. The air leak did slow after this, but persisted.

At five weeks postoperatively, when his chest tubes were placed to water seal, there was still loss of pleural symphysis and development of a pneumothorax. A blood patch pleurodesis was accomplished on the ward using 50 ml of autologous blood. As soon as the blood was drawn from the patient, it was injected through a povidone-iodine (Betadine)-prepared portion of the rubber connecting tube that was attached to the posterior chest tube. The connecting tube was then raised 60 cm above the patient and left to water seal for 2 h. During this time, the patient was placed in different positions. No sedation was required.

When the patient was placed back on suction, there was no air leak. His chest tubes were successfully removed within 72 h. He has done well since with no recurrence of pneumothorax at 16 months.

CASE 2

A 62-year-old man with end-stage emphysema was transferred to our facility after he developed a spontaneous pneumothorax and had had a persistent air leak for three weeks after placement of a tube thoracostomy. A small basilar pneumothorax was noted on admission to our facility, and two additional chest tubes were required to resolve the pneumothorax.

After five weeks with tube thoracostomy suction (two weeks at our facility, with known pleural symphysis), a large continuous air leak was still present. The patient was not a candidate for surgical closure of the air leak. He underwent a blood patch pleurodesis using 50 ml of autologous blood as described in the first case. The air leak slowed, such that it was present with cough only. In addition,

*From the Department of Surgery, USAF Medical Center Wright-Patterson, OH.
†Chief, Surgical Service, VA Medical Center, Biloxi, Miss.
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a small basilar pneumothorax was again noted. A basilar chest tube was pulled back several centimeters, with subsequent resolution of the pneumothorax.

A repeated autologous blood patch pleurodesis was then accomplished. When the patient was placed back on suction 2 h later, there was no air leak. The chest tubes were successfully removed within 72 h, and the patient has done well since. He had no recurrence of pneumothorax on follow-up 13 months later.

**DISCUSSION**

A persistent air leak following pulmonary resection or as a result of a spontaneous pneumothorax is usually treated with tube thoracostomy drainage with suction and, at some predetermined interval, with thoracotomy and repair of the leak. This interval usually ranges from five days to three weeks. However, as in the cases described above, some of these patients are not candidates for surgery and other alternatives are needed.

Chemical pleurodesis for treatment of spontaneous pneumothorax, usually recurrent pneumothorax, is a well-accepted therapy. A variety of agents have been used, with most authors in this country describing their experience with tetracycline. However, a chemical pleurodesis is usually done after the air leak has stopped. Almassi and Haasler have described a technique and their subsequent experience with tetracycline pleurodesis in the presence of a persistent air leak.

Autologous blood has been successfully used for pleurodesis for recurrent and chronic spontaneous pneumothorax; however, the experience reported in the literature is limited to one study involving 25 patients. Autologous blood pleurodesis was successful in this study 85 percent of the time (21 of 25 patients), with a follow-up time ranging from two to 11 years. One of the patients who had a recurrence had one four years after autologous blood pleurodesis. Before our present cases were encountered, our experience with autologous blood pleurodesis was limited to one patient who was pregnant and had a recurrent spontaneous pneumothorax. She was successfully treated with an autologous blood pleurodesis; however, a recurrence developed in the same area eight years later.

In our patients, autologous blood pleurodesis was accomplished on the ward, “at the bedside,” without problems. Fifty milliliters of autologous blood was taken from the patient and immediately injected into a povidone-iodine-prepared rubber self-sealing segment of the connecting tube. The blood was not heparinized. The chest tube was left to water seal for 2 h, with the connecting tube, attached to an IV pole, elevated 60 cm above the patient. This obviated clamping the chest tube, as is usually done, such that there should be a better chance for pleural symphysis during the procedure. The patient was then placed in different positions.

No sedation was required with blood pleurodesis. Our experience with tetracycline pleurodesis for spontaneous pneumothorax is that, despite using 250 mg of lidocaine before instilling tetracycline, heavy IV sedation is necessary. As a result of problems with pain management, patients who undergo tetracycline pleurodesis for spontaneous pneumothorax have this done in our intensive care unit. On the other hand, patients who have a tetracycline pleurodesis done for a malignant effusion (not a pneumothorax) do not usually experience pain, probably because they have a thickened pleura.

In the series reported by Robinson, there was one pleural infection from an autologous blood pleurodesis, for an incidence of 4 percent. This was successfully managed with thoracentesis and antibiotics only. However, this complication should rarely occur, if ever, with minimal handling of the autologous blood. In our patients, after blood was withdrawn from the patient, it was immediately injected through a povidone-iodine-prepared portion of the rubber connecting tube. Heparin was not added, and the chest tube was never disconnected from the connecting tube for instillation of the autologous blood. In addition, the autologous blood should be instilled only once or as few times as possible, and not routinely one to three times as described by Robinson. In our limited series, an empyema did not occur following blood patch pleurodesis.

A potential concern of a tetracycline pleurodesis in the presence of a large air leak and bronchopleural fistula would be the refluxing of this sclerosing agent into the bronchus or trachea during its instillation. In theory, if this were to happen, blood would be a safer agent to use.

Pleural symphysis is necessary in order for a pleurodesis to work. In our second case, we believe the patient, in retrospect, did not have pleural symphysis when he underwent his initial blood patch pleurodesis. After the pneumothorax resolved, a repeated blood patch pleurodesis was successful.

The autologous blood patch pleurodesis probably works by two methods. Since, in both cases, there was immediate cessation of the air leak after instillation of autologous blood, there probably is a blood patch effect or direct sealing of the air leak with coagulated blood. The actual pleurodesis occurs afterwards, as suggested by Robinson, by inflammation and scarring.

The tetracycline pleurodesis works probably by only an inflammatory reaction and scarring, with no “patch” effect. In the series reported by Almassi and Haasler, after instillation of tetracycline for persistent air leak was accomplished, there was a gradual, not an immediate, cessation of the air leak. The air leak usually stopped within three to five days.

In both our patients, an autologous blood patch pleurodesis was attempted as a last-resort therapy.
Because of our initial success with this procedure, we plan to offer this at an earlier time, i.e., seven to ten days, as treatment for a persistent air leak in select patients.

Even though our experience with autologous blood patch pleurodesis is limited, these results are dramatic. In general, patients with a persistent pulmonary air leak are rarely encountered. For those select patients who are a high or unacceptable surgical risk, an autologous blood patch pleurodesis should be considered. This procedure is simple, painless, inexpensive, and effective.

REFERENCES

1 Almassi GH, Haasler GB. Chemical pleurodesis in the presence of persistent air leak. Ann Thorac Surg 1989; 47:786-87