



# Clinical Update

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## Treating Persistent Air Leak Following Lung Resection

Persistent air leaks (PAL) are a significant challenge following lung resection because they prolong hospitalization and significantly increase the cost of care. In fact, these air leaks are the most common complication after this type of surgery.

### PAL Management

PAL has been reported as a complication ranging in incidence from 3% to 25% following pulmonary resection. Surgeons have searched for the best way to manage postoperative PAL. Various studies have shown that placing the chest drain to gravity drainage reduces the risk, because chest drains connected to a vacuum source — creating suction — pull air through the initial leak, keeping it open<sup>1-3</sup>. Other approaches include chemical pleurodesis, in which a chemical is used to scar the pleural space, creating adhesions that block the hole; surgical repair of the leak; and prolonged tube thoracostomy. Chemical pleurodesis is generally avoided if further surgery may be necessary or if lung transplant might be needed for a condition other than cancer in the future. Surgical repair is problematic, exposing patients to surgical risks a second time. Maintaining thoracic drainage over the long-term is much more manageable in recent years with the introduction of mobile chest drainage. A miniaturized version of the standard chest drain, complete with safety devices, can be sent home with the patient, reducing the risk of prolonged hospitalization.

### Autologous Blood Patch: A New Approach

The concept of using the patient's own blood to patch a small opening in a body membrane was introduced into widespread practice in the 1960s, when a paper was published recommending epidural injection of the patient's blood to seal the dura after lumbar puncture for diagnostics or regional anesthesia. This technique is used to treat post dural puncture headache, which occurs in about 10% of patients and can be disabling. The headache occurs when a tiny opening in the dura allows cerebral spinal fluid to leak into the epidural space. A "blood patch" works because blood clots and seals the hole, stopping the leak.

### Using Blood Patch on the Lung

The first report of instilling a patient's own blood into the pleural space to seal a hole causing a pneumothorax was in 1987<sup>4</sup>. At that time, blood was considered a chemical pleurodesis, causing beneficial adhesions that would seal a leak in a patient with recurrent and chronic pneumothorax. Now it's evident that the clot seals the lungs and no adhesions form. In the intervening years, there have been anecdotal case series reports about the efficacy of this technique. One report<sup>5</sup> had 100% success rate with 11 patients treated for postoperative per-

sistent air leaks. This surgeon used 50mL of autologous blood injected through the chest tube that was then clamped for 30 minutes. While there were no complications reported, the risk for pneumothorax exists anytime a chest tube is clamped while a patient has an active air leak. In fact, there is a report on a complication of tension pneumothorax following a patch in a 19-year-old woman with cystic fibrosis and persistent air leak following a spontaneous pneumothorax<sup>6</sup>. It was initially decompressed with a 12Fr intercostal catheter, connected to an underwater seal drain. The blood draw took 2 minutes before the blood was injected into the 12Fr catheter. During the injection, the patient developed severe respiratory distress, and a clot blocking the catheter was discovered. A forceful installation of normal saline dislodged the obstruction, and the patient's breathing returned to baseline. Thus, two important rules are clear: blood draws must be done quickly, through large-bore catheters in large vessels, such as the basilic or cephalic vein in the antecubital space; and the installation must be done through a large bore thoracic catheter immediately after the blood draw to prevent clotting in the syringe or thoracic catheter.

A report from Italy published in 2006<sup>8</sup> described the surgeons' experience with 21 patients with PAL following pulmonary resection over a 7-year-period (4% incidence). The majority of patients were treated with a 150mL blood patch; two received 50mL and six received 100mL. Their success rate in resolving the leaks was 100%.

### First Randomized Controlled Study

The most recent published report is the first prospective randomized controlled trial of a blood patch to treat PAL<sup>8</sup>. Researchers in the UK randomly assigned patients with PAL following lobectomy into two groups. The study group was treated with a 120mL blood patch, while the control group was treated with tube thoracostomy alone. In 18 months their incidence of PAL was 6.9%, which yielded 20 patients for the research. After blood patch, the leak was sealed by the next day in 59% of patients. Patients in the study group had the leak seal in five days versus 11 for the controls; drain removal was after 6.5 days versus 12 in controls; and hospital discharge was 5.5 days sooner in the study group (all  $p < 0.001$ ).

Contraindications for blood patch include chest wound or any indication of chest infection. Blood is an ideal medium for bacterial growth; thus, strict aseptic technique is required. There is some discussion in the literature as to whether the blood should be instilled through the thoracic catheter later than post-op day 5 because of the increased likelihood of bacterial contamination of the catheter the longer it is in place.

In addition to treating PAL for post-operative patients, this blood patch technique may also have a place in managing patients who develop air leaks from maximal ventilatory support during treatment of adult respiratory distress syndrome. Since these patients are not surgical candidates, this approach offers a non-surgical approach to a potentially life-threatening complication.

Sources on page 2.

## Check Your Knowledge...

**Q.** Which type of lung resection is most likely to produce a post-operative air leak?

*Answer on other side*

*Clinical Update* is an educational newsletter provided by Atrium Medical Corporation and is edited by Patricia Carroll, RN,BC, CEN, RRT, MS.

## In The Literature

### Evidence-Driven or Old Wives' Tale?

If a patient drinks a hot or cold beverage, how long should we wait to measure an oral temperature with an electronic thermometer? Does tachypnea affect temperature accuracy? In the past, those questions were answered with consensus opinions, not backed up with a lot of evidence. Now, the current issue of *MEDSURG Nursing* contains a well-thought-out study of these phenomena. It took 23 minutes (mean) for subjects to return to baseline after drinking 30mL of a hot beverage, and 15 minutes (mean) after drinking 30mL of a cold beverage. Surprisingly, tachypnea did not affect the oral temperature. Researchers recommend waiting 30 minutes after ingestion of fluid to derive a more accurate oral temperature.

Source: Quatrara B, Coffman J, et.al.: The effect of respiratory rate and injection of hot and cold beverages on the accuracy of oral temperatures measured by electronic thermometer. *MEDSURG Nursing* 2007; 16(2):105-108.

### Are APNs Invisible Champions?

Ruth Kleinpell has written an interesting article in the current issue of *Nursing Management* in which she suggests that advanced practice nurses have a significantly positive impact in acute care hospitals, but organizations need to do a better job identifying those changes in outcomes most affected by their presence. In this quick-read, Kleinpell spells out how to develop an outcome management plan, and provides a timeline for outcome assessment of APN practice. While she focuses on collecting data to establish the value of APNs, this model can be used to develop any outcome measures you would like to track.

Source: Kleinpell R: APNs invisible champions? *Nursing Management* 2007;38(5):18, 20, 22.

### Is God in Your Unit?

The current issue of *Dimensions of Critical Care Nursing* contains an article describing how nurses collaborate with the hospital chaplain to allow the chaplain to be more visible in the units, and to incorporate the philosophy of spiritual care assessment for each patient in the critical care units. The authors cite a study from Press-Ganey that identified the number one unmet need of patients and families is their spiritual and emotional needs. By making the chaplain a full-time member of the care team, patients' needs are better met, and communication about end-of-life care is much more easily facilitated.

Source: Hughes B, Whitmer M, Hurst S: Innovative solutions: a plurality of vision integrating the chaplain into the critical care unit. *Dimensions of Critical Care Nursing* 2007;26(3):91-95.

Look for a new blog written by newsletter editor Pat Carroll. Called **Nurses' Wisdom From the Break Room**, the blog is designed for discussion of clinical topics, challenging situations, and as a place to get clinical questions answered.

You can find it at <http://nursing.advanceweb.com>  
In the navigation bar to the left, look for Community, then click on Nurse POV blog.

## Check Your Knowledge...

**A** Subsegmental resections, such as wedge resections, result in greater air leaks because the lung tissue is not dissected and removed along a natural anatomical plane, as is the case in lobectomy.

## On the World Wide Web



### Pandemic Flu Coming to a Computer Near You

Pandemic flu planning has become a greater focus of general disaster planning for acute care hospitals and the communities they serve. Each state handles emergency planning differently by using the Department of Public Health, the state's Department of Homeland Security and relationships with local government in various ways.

<http://www.pandemicflu.gov> is a "one stop shopping" site established by the US Department of Health and Human Services. Here, you can link to pages that identify what your state is doing with regard to state and local planning as well as resources for different community stakeholders, such as school planning, healthcare planning, workplace planning, and individual planning.

At [http://www.osha.gov/Publications/OSHA\\_pandemic\\_health.pdf](http://www.osha.gov/Publications/OSHA_pandemic_health.pdf) you'll find a brand new publication from OSHA providing guidance on preparation and response for health care workers and healthcare employers. Which staff members would continue to work during a pandemic? Which would stay home? What can employers do to make it more realistic for nurses to work? This resource is filled with checklists, sample plans and guidance to help organizations answer these key questions and establish a plan of action.

Have you been to the CDC lately? The Centers for Disease Control and Prevention debuted their newly designed Web site last month at <http://www.cdc.gov>. It is designed to be more user-friendly for different people looking for resources whether they be members of the general public, the press, or health care providers. You can take a virtual tour at <http://www.cdc.gov/vrtour.html> — be sure to turn your speakers on! For more specific information about pandemic flu, visit <http://www.cdc.gov/flu/avian/>

#### Sources from page 1:

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  4. Robinson CL: Autologous blood for pleurodesis in recurrent and chronic spontaneous pneumothorax. *Canadian Journal of Surgery* 1987;30(6):428-429.
  5. Lang-Lazdunski L, Coonar AS: A prospective study of autologous 'blood patch' pleurodesis for persistent air leak after pulmonary resection. *European Journal of Cardiothoracic Surgery* 2004;26(5):897-900.
  6. Williams P, Laing R: Tension pneumothorax complicating autologous "blood patch" pleurodesis. *Thorax* 2005;60A:1066-1067.
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  8. Shackcloth MJ, Poullis M, Jackson M, et.al.: Intrapleural instillation of autologous blood in the treatment of prolonged air leak after lobectomy: a prospective randomized controlled trial. *Annals of Thoracic Surgery* 2006;82:1052-1056. \*
- \* articles provide detailed descriptions of procedures to use "blood patch" technique