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A number of risks and complications are associated with traditional chest drainage systems. A trust decided to trial digital drainage systems, and found the new systems improved treatment time and patient mobility.

Chest drains are placed in the pleural space to evacuate an abnormal collection of air, fluid, pus or solids that may have collected as a result of injury, disease or surgical procedures (Allibone, 2005). They help to restore and maintain the negative pressure between the visceral and parietal pleural membranes, allowing full expansion of the lung.

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However, if the lung does not reinflate or a persistent air leak prevents re-inflation, high-volume, low-pressure thoracic suction in the range of 3-5 kPa may be used (Havelock et al, 2010; Laws et al, 2003).

The use of suction after thoracic surgery is controversial; some surgeons always use it while others feel it is hazardous. For example, a medical device alert was issued after a patient with a chest drain under active wall suction sustained a tension pneumothorax due to the incorrect use of suction systems with no reservoir in situ (MHRA, 2010).

Another issue with wall suction is the reliability of the pressure. In my clinical experience I have seen the dials fluctuate without being altered by the team. This is supported by Rathinam et al (2011), who noted the variability in flow in wall suction, which can depend on the length of tubing used between the wall suction and the bottle, and between the bottle and the patient.

Furthermore, Varela et al (2009) found a high level of disagreement among doctors on the indication to remove chest drains after lung resection. Using digital devices led to improved levels of agreement between medical staff of when to remove the drain.

The immobility that traditional chest drains cause for patients is a considerable source of morbidity (Joshi, 2009). When attached to wall suction many patients have to toilet and wash at the bedside. In fact, there is very limited evidence of the benefits of suction per se but despite this it continues to be used (Deng et al, 2010).

In trying to overcome some of the problems associated with an underwater seal drain and suction apparatus, we explored...
the concept and use of digital drains. Cerfolio and Bryant (2009) demonstrated that patient management is optimised when air leaks are scientifically evaluated.

Digital drainage systems

One study had identified the accuracy of Medela’s Thopaz digital drainage system (Cerfolio and Bryant, 2009).

As we had no previous experience in using digital drains we undertook a trial of a digital drainage system in 2010. The drains are lightweight, compact and easy for patients to carry after thoracic surgery. Rathinam et al (2011) found that both patients and staff supported this view. The drains also appeared simple to use, which made it easier to introduce them into the ward and theatre. They allow scientific monitoring of patients’ progress and a more scientific rationale for managing and removing the drain.

Patient mobility is also improved due to the light weight of the drains and ability to offer portable suction, which may reduce complications associated with decreased mobility, and improve privacy and dignity.

Trial of digital drains

The trial was undertaken on patients operated on by one thoracic surgeon. The machines were interrogated and provided information on the duration the drain was in situ and the flow rate.

The flow rate enables the size of an air leak to be quantified as a number in ml breath. This data was collected on 40 patients who had undergone various thoracic procedures, such as lobectomies and wedge resections. The drains were simple to use and posed no problems for nurses to develop competence. Since the systems were introduced there have been no clinical incidents related to them.

On examining the data it became apparent that drains were often left in situ for many hours longer than they needed to be, as patients’ lungs were fully inflated with no air leak present (Fig 1). The drains were left in situ for the “total treatment time”, but the reduction in flow is indicative that the lung was inflated and the drain could have been taken out after the “improved treatment time” period.

Although the data showed improvement in treatment times it did not offer a comparison between traditional and digital drains. However, the number of thoracic cases in our trust has tripled over the last year, with a reduction in length of stays since digital drains were introduced and changes in practice such as same-day discharge have been successfully adopted in our unit.

In addition, patients who, despite treatment, cannot reinflate their lung may be discharged home with them, which is being practised in one regional hospital. It may also allow patients to be successfully transferred to a ward level (progressive care) bed with a digital drain, freeing up a high dependency bed.

The increased mobility offered by digital drains may mean that medical patients admitted with a pneumothorax and needing suction to the drain may have reduced length of stay and fewer complications associated with immobility.

Other potential uses for digital drains

The use of digital drainage systems after thoracic surgery is becoming accepted as a safe method for draining air and pleural fluid (Mier et al, 2010; Papagiannopoulos et al, 2009; Cerfolio and Bryant, 2008) and has been successfully adopted in our unit.

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References


