Online Appendix 11 Ambulatory devices (Heimlich valves/integrated devices/drainage devices)

Attachable devices

There are three types of attachable device, which are designed to be attached to conventional chest drains for treatment of persistent air leaks:

1. Heimlich valve
2. Pneumostat™
3. Ambulatory chest drainage bag/drain

Traditional Heimlich Valves (Figure 1) have limited role in prolonged air leak due to inability to hold any fluid. As such their use is limited to iatrogenic pneumothorax post guided lung biopsy, where the air leak is expected to be short-lived.[1]

Figure 1: Heimlich valve attached to a pleural catheter

Figure 2: Pneumostat™ valve attached to a chest drain

Pneumostat™ valves have a small holding chamber which allows it to hold up to 30 ml of fluid (Figure 2). This allows them to be used for ambulatory management of primary and secondary pneumothoraces as well as early ambulation of patients with prolonged airleak post thoracic surgery.[2,3]

Ambulatory chest drain / drainage bags with inbuilt air vent (Figure 3) can handle larger volumes of fluid, which make them particularly useful in cases where there is prolonged air and fluid drainage, especially after thoracic surgery.

Figure 3: Ambulatory chest drain/drainage bag attached to a chest drain

A summary of the attachable device properties is shown in Table 1.

Operator – training/competence expectations

These devices can easily be attached to a pre-existing chest drain by any trained operator. It is however essential to adequately train the staff looking after the drains on the ward so that they are able to reliably care for them and deal with any complications.

Verbal Consent and Pre-procedure written patient information

As these devices are externally attached to the pre-existing drain no written consent is required. It is however useful to provide the patient with written information explaining the care of the devices.

General aseptic precautions

Care should be taken to observe aseptic precautions during the attachment and manipulation of the devices.

Technique

The attachment of these devices to the drains is quite straightforward and is no different to attaching a chest drain bottle with tubing to the drain. Appropriate male/female connectors are provided with the devices and these could be used as necessary to attach the devices to the chest drain.

Aftercare and follow up schedule

Advice about the care of the device and any daily routine checks should be provided to the patient, preferably in the form of a written leaflet. Patients with Heimlich valves post CT guided biopsy (CTGB) were generally followed up in 1-2 days, as these tend to heal quickly.[1] Patients discharged home with Pneumostat™ valves and ambulatory drainage bags can be followed up safely every 2-3 days with a chest x-ray (CXR)[2], either in person or over telephone. Patients should be given written information about how to seek advice and guidance out of hours.

Integrated devices

There are two types of integrated device designed for the ambulatory management of primary spontaneous pneumothorax:

1. Thoravent®
2. Pleuralvent™

Both have the ability to hold a small amount of fluid which can be emptied as necessary. The could also be used for the treatment of iatrogenic pneumothorax following CTGB.[4] There are also reports of the use of Thoravent® in small post traumatic pneumothorax/secondary spontaneous pneumothorax.[5] Recent trials have shown these devices to be as effective as conventional inpatient management for primary spontaneous pneumothorax[6], but data suggest Pleuralvent™ is not effective in secondary pneumothorax. A summary of the integrated device properties is shown in Table 1.

Operator – training/competence expectation/secondary spontaneous pneumothorax

The devices should be inserted by healthcare professional who is familiar with them. However not everybody would have prior experience of inserting them given the relative novelty of the devices. This should not deter one from using them as long as they are familiar with the manufacturer instructions, and they have been previously signed off for inserting other chest drains.

Consent and pre-procedure written patient information

As these are technically equivalent to chest drains, formal written consent should be obtained wherever possible although should not delay emergency treatment. Pre procedure written information should also be provided in line with any chest drain insertion.

Technique of insertion

These devices are designed for insertion in the second intercostal space anteriorly but may be inserted elsewhere. Pleuralvent™ (8F) is inserted in a similar fashion to any pleural catheter while Thoravent® requires minimal dissection before insertion due to its larger gauge (11F/13F). Both the devices are self-adhesive but should also be secured with a couple of sutures.

Aftercare

The immediate aftercare is similar to any chest drain insertion. After insertion patient should be given instructions and information about to how to care for the device and how to perform daily checks, preferably in the form of a written leaflet. Patients discharged home can be followed up safely every 1-2 days with a repeat CXR[2,6] either in person or over telephone.

Table 1: Summary of ambulatory device properties

Device	Self-contained	Fluid drainage capacity	Duration of drainage (longevity)	Fluid port patency
Heimlich valve 	No	-	Low	NA
Pneumostat™ 	No	30 ml	High	Medium
Ambulatory chest drain/drainage bag 	No	500-1500 ml	High	High
Thoravent® (11-13F) 	Yes	20 ml	Medium/High	Medium
Pleuralvent™ (8F) 	Yes	26 ml	Medium	Medium

Clinical practice points

- Build expertise by utilising the devices for early ambulation on the ward before establishing Ambulatory pneumothorax service.
- Pleural Nurse is an essential component of ambulatory pneumothorax services.

Research Questions

- Does early ambulation reduce Length of stay for patients with secondary spontaneous pneumothorax?
- Does use of low resistance ambulatory devices reduce the need for suction?
- What are the criteria for identification of patients with spontaneous pneumothorax who can safely managed on ambulatory pathway?
- What is the role of conservative management in patients with secondary spontaneous pneumothorax?

References

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