Neonatal chest drain insertion – an animal model

J O'B Hourihane, P A G Crawshaw, M A Hall

Abstract

Trainees rarely see a neonatal pneumothorax because of the combination of decreased doctors' hours, the use of surfactant, and modern ventilator techniques. An animal model, using a dead rabbit, is described that could be used to train doctors and others in the management of this serious complication of neonatal care.

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Neonatal pneumothorax is a serious, potentially fatal condition which occurs most commonly in sick infants, primarily those requiring assisted ventilation. The prevalence of pneumothorax among babies ventilated for the respiratory distress syndrome (RDS) was reported to be as high as 35% in 1985.[1] More recently, following improvements in ventilator techniques and the introduction of exogenous surfactant treatment, there has been a fall and the rates have fallen to as low as 4%.[2]

The management of neonatal pneumothorax is an emergency which, in ventilated neonates, usually requires the insertion of a chest drain. Chest drain insertion requires a certain level of skill and familiarity with the procedure. If it is performed in an inexpert manner it may have serious, even fatal, consequences. Complications include lung perforation, cardiac tamponade, gastric perforation, aortic compression, aorto-pleurocutaneous fistula and diaphragm paralysis.[3 4]

Pneumothorax may occur at any time and senior staff may not be immediately available. It is essential that junior doctors and others such as neonatal nurse practitioners, who are responsible for the care of newborn infants, should have adequate training in the management of pneumothorax and in particular in the technique of chest drain insertion.

The recent reduction in junior doctors' working hours along with the reduced incidence of neonatal pneumothorax means that both senior house officers (SHOs) and registrars may have minimal or no experience of neonatal pneumothorax.

In our unit, which serves an obstetric unit with 5500 deliveries a year, the incidence of pneumothorax in ventilated neonates over the past three years has been one or two during each six month period. Assuming that a five person shift system for SHOs is in place, this means that most would not be involved in the emergency management of a neonatal pneumothorax. A local informal survey of nine SHOs who recently completed a six month post in neonatal medicine found that six had had no first hand experience of chest drain insertion. This may reflect inexperience of the middle grade staff who are supervising these SHOs as the middle grade staff might have felt that they needed to perform the procedure to enhance their own personal experience.

SHO induction courses and neonatal nurse practitioner training and education use simulation models, such as resuscitation dummies for endotracheal intubation and cardiopulmonary resuscitation and the use of retrieved umbilical cords for the insertion of umbilical catheters.

Animal models that have been used before in America, for training in the management of pneumothorax, include anaesthetised cats[5] and rabbits.[6] These live animal models are forbidden in the United Kingdom under the *Animals (Scientific Procedures) Act 1986*. This prohibits the use of live animal models for the training and practice of clinical procedures or techniques. The only exception to this rule is the use of terminally anaesthetised animals for training in certain specified techniques of microvascular surgery.

Methods

The model used was a dead rabbit. These animals were bought in a high street butcher's shop (average cost per animal, £2.00). The animals were prepared by the butcher who removed the fur, skin, head and abdominal organs. The thoracic organs and diaphragm were left in situ. The skinned rabbit was a more realistic model than the shaved, intact animal, and proved more acceptable to trainees.

The usual equipment for chest drain insertion was available and an aseptic technique was followed. First, the trainer placed the rabbit in a lateral position and the surface of the animal was cleaned and draped. Next, a pneumothorax was simulated by the injection of air into the thorax via an intercostal space with a syringe, three-way tap, and a 23 gauge butterfly needle. Saline may be used at this stage to simulate the use of local anaesthesia, though the absence of skin makes this less realistic than some of the other features of the model. The insertion of the drain was performed using standard neonatal techniques.[4]

Of the first 30 trainees offered this model, 27 found the concept acceptable. Three declined

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to participate because they thought the use of a dead animal for the training procedure was unacceptable.

Discussion

The skinned rabbit model was more acceptable to trainees than a partially shaved animal. The skinned and draped model is very realistic. Standard techniques of drain insertion and fixation are easily demonstrated and practised with this model. The lack of respiratory movement is a drawback, but this can be simulated by cyclical injection and withdrawal of air into the thorax via an intercostal space. The absence of skin means the use of local anaesthesia can be discussed but not demonstrated well.

This model appears acceptable to most trainees. A few have reservations about using a dead animal. However, we feel that it is inappropriate for junior doctors and nurses to insert intercostal drains in an emergency without adequate preparation and training. We have designed what we feel is an easily available, cheap model that is realistic and acceptable to trainees.

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