ACCIDENTAL CLOSURE OF THE EXPIRATORY OUTLET IN THE ENGSTRÖM VENTILATOR (200) DURING ANAESTHESIA

A CASE REPORT

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THE ENGSTRÖM VENTILATOR has no doubt gained a reputation as one of the ideal volume controlled ventilators. It is a ventilator that gives the anaesthetist a feeling of confidence and security for the patient. During the past few years, the problem of bacterial contamination of ventilators has created the need for periodic sterilization with the ultrasonic nebulizer using ethanol (Figure 1). Sterilization of the Engström ventilator has become routine work and is done periodically. During one of these sterilization procedures the metal cork which seals the water humidifier was accidentally placed on the expiratory opening and the expiratory limb tubing was connected to the water humidifier opening (Figure 2 A, B). With this set up, the flow of gas during automatic ventilation is first directed to the water humidifier-expiratory limb tubing – goes to the patient – returns to the inspiratory limb tubing and back to the water humidifier, repeating the vicious cycle. In this situation there is no exit of gas. However, the manual ventilation is unaffected and functions normally.

FIGURE 1. Ultrasonic nebulizer sterilization with ethanol.

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FIGURE 2A. Correct connections:

- (a) inspiratory limb tubing connected to the inspiratory opening with the susskind flowmeter vaporizer.
- (b) water humidifier normally closed by detachable metal cork.
- (c) expiratory limb tubing connected to the expiratory outlet.

FIGURE 2B. Incorrect connections:

- (b) expiratory limb tubing erroneously connected to the water humidifier.
- (c) metal cork erroneously sealing the expiratory outlet.

CASE REPORT

A 24-year-old female patient underwent a gall bladder operation. She was aesthenic and weighed 56 kg. She had enjoyed good health until the last year when she suffered episodes of cholecystitis. Blood pressure was 120/80, pulse 80; ECG and chest X-ray were normal. Haemoglobin, scot, serum bilirubin and sedimentation rate were normal. She was premedicated with meperidine 50 mg, phenergan 25 mg and atropine 0.5 mg one-half hour before the operation. Induction was with 250 mg intraval, followed by 75 mg of succinylcholine and manual ventilation with oxygen. A no. 8 cuffed endotracheal tube was introduced. Ten mg of alloferin was then injected. Automatic ventilation was switched on and was maintained on oxygen 3L, nitrous oxide 5L and halothane 0.5 per cent. Auscultatory check demonstrated ventilation of both lungs. In less than a minute, the patient's blood pressure and pulse disappeared. There was no cyanosis. It was then noticed that there was no excursion of the thorax and that the abdomen had increased in size. The patient was immediately disconnected from the ventilator. A gush of air came from the endotracheal tube. A Boyle apparatus was substituted for the Engström and controlled manual ventilation was instituted. The patient's blood pressure and pulse returned (BP 150/90, pulse 100 regular). The operation lasted 30 minutes and was uneventful. The patient regained consciousness with no cardio-respiratory complications. Postoperative X-ray was normal. The Engström was put aside untouched and after close scrutiny the wrong connection of the expiratory limb tubing to the water humidifier opening and the sealing of the expiratory outlet were identified. Had the patient not been disconnected from the respirator in time, cardio-respiratory complications could have supervened.

DISCUSSION

In the present era of anaesthesia, ventilators are used more and more, rather than the conventional manual anaesthetic machines and particularly in thoraco-abdominal operations. In routine anaesthesia and especially in a busy hospital, mistakes are bound to occur sometime. Aneurysm of the internal lumen of the inspiratory limb tubing due to wear and tear¹ and misplacement of the expiratory valve leading to bilateral pneumothorax have been reported.² In our particular case, the fault is a defect in the engineering design of the metal cork. Had the metal cork been made in such a way that one end only fits the water humidifier opening and does not fit the inspiratory or expiratory openings whereas the other end fits the inspiratory and expiratory openings but not the water humidifier, it would be impossible to interchange the connections after a routine cleaning procedure.

SUMMARY

A case of an accidental closure of the expiratory outlet in an Engström ventilator (200) during anaesthesia has been presented. A female patient was anaesthetized for a gall bladder operation. Detection of the malfunction of the ventila-

tor was prompt and no cardio-respiratory complication occurred during the operation. Recovery of the patient was uneventful.

RÉSUMÉ

Ceci est le rapport d'un cas de fermeture accidentelle de la sortie d'expiration d'un respirateur Engström (200) durant une anesthésie. Le malade était anesthésié pour une cholécystectomie. L'erreur fut vite découverte de sorte qu'il ne se produisit pas de complication cardio-respiratoire durant l'opération. La guérison du malade fut sans histoire.

REFERENCES

1. COZANITIS, D. A. & TARKUNEN, O. Aneurysm of ventilator tubing. *Anaesthesia*, 26: 235-236 (1971).
2. DEAN, H. N., PARSONS, D. E., & RAPHAELY, R. C. Case report: Bilateral tension pneumothorax from mechanical failure of anaesthesia machine due to misplaced expiratory valve. *Anesth. & Analg.*, 50: 195-198 (1971).