

# Don't Close the Valve!-



## The Effect of Closing the Valve on Ventilation in Patients Undergoing ECT

Mark E. Nunnally, M.D., David B. Glick, M.D., M.B.A., Avery Tung, M.D., Michael F. O'Connor, M.D.

Department of Anesthesia & Critical Care, University of Chicago



### Introduction

Anesthesiologists providing sedation for electroconvulsive therapy (ECT) are commonly asked to hyperventilate patients to produce hypocapnia. Although a variety of equipment is available to ventilate these patients, the Mapleson D circuit is most commonly used. Many practitioners will close the valve on the Mapleson D circuit during periods of controlled ventilation, including when they have been requested to hyperventilate a patient undergoing an ECT. We used capnography to compare the effectiveness of a Mapleson D circuit with open vs. closed valves in producing hypocapnia during hyperventilation.

### Methods

A test lung producing carbon dioxide at a constant rate was attached to commercially available Mapleson D circuit. A capnograph/gas analyzer was attached to the test lung, which was then ventilated with a minute ventilation in the range of 10 liters/min (tidal volumes approximately 430mL) and an oxygen flow of 5 liters/min. The capnographs generated were then photographed and compared.

### Results

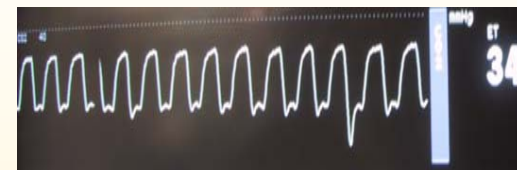
The capnograph of assisted ventilation using the open valve is shown in figure 1. The capnograph of ventilation with a closed valve is shown in figure 2. With the valve closed, the expected drop in end-tidal CO<sub>2</sub> is attenuated, and the value rises slowly.

### Discussion

Mapleson D circuits require high fresh gas flows to prevent rebreathing (1). Modern, commercially available circuits are often equipped with valves which are too small to prevent rebreathing even when utilizing appropriately high oxygen flows. Closing the valve in the Mapleson D circuit and vigorously ventilating the patient produces a relentless rise in the patient's carbon dioxide level. This effect is counterproductive to the intended goal of inducing hypocapnia. It is possible the closed valve alters the normal flow dynamics from the Mapleson circuit, causing rebreathing.

### Mapleson Circuit

### Figure 1: Valve open



### Figure 2: Valve closed



### Reference

1. Mapleson WW. The elimination of rebreathing in various semi-closed anaesthetic systems. Br J Anaesth 1954;26:323

