

CORRESPONDENCE

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Inadvertent Misconnection of the Scavenger Hose: A Cause for Increased Pressure in the Breathing Circuit

To the Editor:—Condensation of water vapor and accumulation of water in the breathing circuit of anesthesia machines may cause an increase in resistance to gas flow and its associated complications. We present a case of steadily increasing pressure in the breathing circuit after drainage of the water that had accumulated in the 19-mm hose that leads from the breathing system adjustable pressure limiting valve (through the absorber pole) to the 19-mm terminal on the scavenger interface. After the drainage of the water, the hose was reconnected by mistake, not to the 19-mm hose terminal from which it had been disconnected, but to the 22-mm adjustable needle valve (ANV) terminal on the closed reservoir scavenger interface of a North American Drager Narkomed 2B machine (Dräger Medical, Telford, PA).

A 33-yr-old man was scheduled for retroperitoneal lymph node dissection under general anesthesia. Five hours after induction of anesthesia, during maintenance with isoflurane 1-2% in a 50:50 nitrous oxide:oxygen mixture with a fresh gas flow of 1 l/min, a gurgling sound was noted during the expiratory phase of ventilation. A survey of the machine revealed the cause to be accumulation of water in the 19-mm hose connecting the ventilator relief valve to the scavenger interface, "hose A" (fig. 1). To drain "hose A," the ventilation was switched from automatic to manual mode; but while the patient was being ventilated manually, similar sounds were heard again, but now were emanating from the 19-mm hose that leads from the breathing system adjustable pressure limiting valve (through the absorber pole) to the 19-mm terminal on the scavenger interface, "hose B" (fig. 1). The water was drained from "hose A" and the ventilation was switched back to automatic mode to drain "hose B." However, during emergence 3 h later, while attempting to restore spontaneous ventilation through manual ventilation of the patient, the end-expiratory pressure continued to increase from 1 cm H₂O to a maximum of 8 cm H₂O in spite of the fact that the adjustable pressure limiting valve was opened completely. As an immediate remedy for this situation and to decrease the risk of barotrauma, the breathing circuit was disconnected from the Y-piece. At this time it became apparent that after drainage of the water, "hose B" had been reconnected by mistake to the 22-mm ANV terminal on the scavenger interface (fig. 2). Such a mistake would not have been possible if the wing nut type of the ANV had been present instead of the screw type.



Fig. 1. Photograph of the scavenger interface for suction systems of the Narkomed 2B anesthesia machine with screw type adjustable needle valve (ANV). The 5/8 inches hexagonal lock nut has been removed to demonstrate the screw type ANV. A = hose A, the 19-mm hose connecting the ventilator relief valve to the scavenger interface; B = hose B, the 19-mm hose connecting the breathing system adjustable pressure limiting valve to the 19-mm terminal on the scavenger interface; N = the 22-mm terminal on scavenger interface for the ANV; V = the vacuum hose attached to vacuum source terminal.

Discussion

The "screw" type ANV in Narkomed machine was changed to "wing nut type" by North American Dräger in 1982 to allow easier manual adjustment of gas flow through the scavenger system. This modification of ANV eliminates using a screwdriver for regulation of the waste gas exhaust flow. However, using the screw type ANV is still approved by North American Dräger for scavenging system.

To increase the safety of anesthesia and to decrease the chance of inadvertent improper connection of scavenger hoses and the resulting complications, we recommend changing all screw type ANV to a wing nut ANV in all Narkomed machines. The wing type ANV has a large

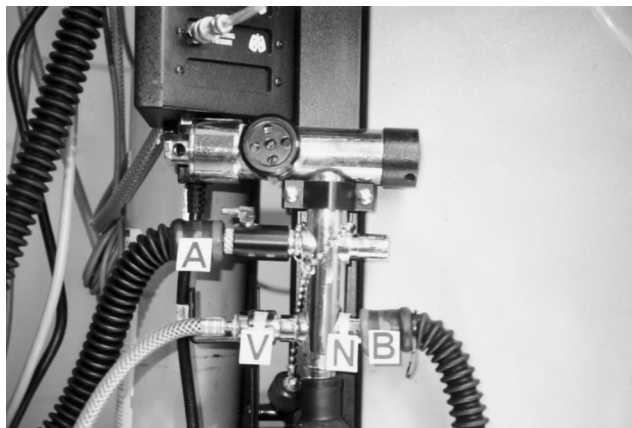


Fig. 2. Photograph of the scavenger interface for suction systems of the Narkomed 2B anesthesia machine. The 19-mm hose B has been connected by mistake to the 22-mm adjustable needle valve terminal on the scavenger interface. A = hose A; B = hose B; N = needle valve terminal; V = vacuum terminal.

plastic wing nut and one inch round metallic lock nut, which renders the 22-mm terminal for the needle valve even more incompatible with 19-mm scavenger hose. This modification can be accomplished with a cost of \$120.

Furthermore, we recommend that all components of the breathing circuit be clear and transparent. This would include endotracheal tubes, face masks, breathing tubes, ventilator bellows, breathing bags, scavenger hoses, and scavenger reservoir bags. The benefit of such change is twofold: to add the benefit of visualization of the interior content of breathing circuit and to improve hygiene by early detection of contamination on the exterior surface.

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In Reply:—The authors report that they connected a 19-mm hose to a 22-mm scavenger needle valve. A 19 mm—22 mm difference is the current standard for differentiating breathing circuit connections. In fact the needle valve is 7/8 inch, which is slightly larger than 22 mm. It is possible to overcome the intended incompatibility of 19 mm and 22 mm components if excessive force is used. The physical effort to make the misconnection described by the authors had to be as great or greater than connecting a 19-mm hose to a 22-mm connector, and we believe, should have drawn attention to the error. Extreme care must be used any time it becomes necessary to separate and reconnect any components of the breathing circuit while a patient is connected to the circuit.

The authors correctly report that the design of the scavenger needle valve was changed from a screw type to a wing nut type in 1982. However, Narkomed 2B anesthesia machines were first sold in mid 1987. Thus, relating this event to a Narkomed 2B is misleading. It is likely that an old absorber assembly which contained the screw type needle valve was attached to the Narkomed 2B some time after the Narkomed 2B was shipped from the factory.

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For clarification, the list price for the needle valve components is \$100.00; however, prices are subject to change. Labor and travel would be extra if the customer wants the valve components installed by Draeger Medical, Inc.

The authors state that using the screw type needle valve is still "approved by North American Draeger." It is ambiguous what the authors mean by that statement. The screw type scavenger needle valve has not been used in the manufacture of North American Draeger (Draeger Medical, Inc.) anesthesia machines since the design changed in 1982. The decision to use or not use medical devices of any type rests with the health care professional, not with the manufacturer.

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