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Avoiding failure in the checkout of anesthesia apparatus prior to use

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To the editor: The Checkout Procedures of Anesthesia Apparatus recommended by the Japanese Society of Anesthesiologists (CPAA-JSA) and the Anesthesia Apparatus Checkout Recommendations developed by the United States Food and Drug Administration (AACR-FDA) help to detect anesthesia machine problems preoperatively [1, 2]. We report a rare case of a breathing circuit obstruction caused by an invisible foreign body, which could have led to hypoxic injury in the patient if the CPAA-JSA or AACR-FDA had been performed inappropriately.

A nurse set up an anesthesia breathing circuit, including an elbow connector, a passive humidifier with a gas monitor sampling tube, a flowmeter attachment, a Y-piece, and corrugated breathing tubes. The semiautomatic leak test program integrated in the anesthesia machine (KMA-1300Vi; Acoma, Tokyo, Japan) was run and did not indicate any leakage in the breathing circuit. Immediately before the initiation of anesthesia, an anesthesiologist manually checked the breathing circuit and noticed that the intracircuit pressure had not returned to zero after the end of the elbow connector had been opened. He suspected an obstruction in the breathing circuit. Visual inspection revealed that a laboratory test-tube silicone rubber stopper, which was quite similar to the elbow connector in color, had plugged the lumen of the elbow connector (Fig. 1AB). The several minutes required to identify the cause of the problem would have been enough to cause critical hypoxic events during anesthesia.

It is generally accepted that the CPAA-JSA and AACR-FDA are highly effective, but only if they are well understood and followed precisely during the actual checkout process. We offer here two critical points to always keep in mind.

First, all accessory equipment (e.g., humidifier, gas monitor sampling tube, elbow connector) to be used during anesthesia should be placed so that it occludes only the end of the breathing circuit during a manual leak check; a test lung should be placed on the end of the circuit for the checkout of ventilation systems. If these recommendations are not followed, a critical leakage and/or occlusion of the accessory equipment may escape notice. It should be noted that Y-pieces are not always found at the ends of the breathing circuits of newer anesthesia machines, although the AACR-FDA specifies that one should, for the purpose of? "occlude Y-piece to perform leak check

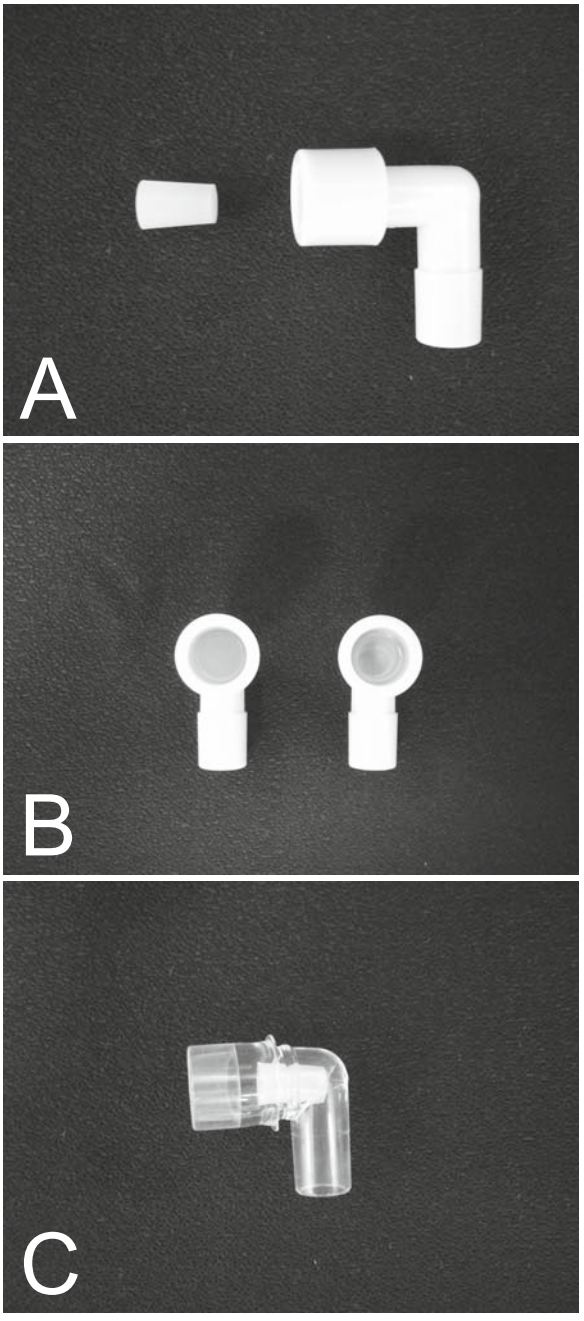

Fig. 1. **A** The elbow connector (*right*) and the silicone rubber stopper for a laboratory test tube (*left*) were of similar color. **B** The stopper (*left*) is not easily identified in the lumen of the elbow connector. **C** The lumen of a transparent elbow connector is plugged by the stopper

of the breathing system" and "place a second breathing bag on Y-piece to test ventilation systems and unidirectional valves"; similar specifications in the CPAA-JSA are somewhat more obscure. The use of the test lung is essential for checking anesthesia equipment prior to use, although busy anesthesiologists have been known to omit this step.

Second, semiautomatic self-testing systems, which are referenced in neither the CPAA-JSA nor the AACR-FDA, are not entirely adequate for pre-use checkout.

Finally, we recommend using transparent equipment that can facilitate the visualization of foreign bodies plugging the circuit (Fig. 1C).

In response to recent advances in anesthesia apparatus and monitoring systems, an effort to revise the AACR-FDA was initiated in the United States [3]. Our JSA should also consider developing new checkout recommendations to ensure high safety standards for anesthesia patients.

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