

Correspondence

PEEP with IMV Apparatuses

To the Editor:—The article, "A Variation of the Intermittent Mandatory Ventilation Assembly" (ANESTHESIOLOGY 44:182-184, 1976), left me a bit troubled. Dr. Cross describes an IMV inspiratory-limb T piece assembly that is simpler and much less clumsy than the standard CPAP assembly often used with IMV. Since the T-piece assembly is open to ambient air, Dr. Cross states that "this precludes its use with PEEP." He states that inspiration from ambient pressure is undesirable for a patient on PEEP. My clinical experience with PEEP and IMV contradicts these assumptions. If Dr. Cross' assumptions are widespread, some clarification of the basic nature of PEEP is worthwhile.

PEEP is positive end-expiratory pressure. Its proposed mechanism of action is to increase and maintain the functional residual capacity (FRC). CPAP (continuous positive airway pressure) is a type of PEEP, as is CPPV (continuous positive-pressure ventilation). But CPPV and CPAP are not the only forms of PEEP. They are, in fact, forms of *continuous* positive pressure on the lung. Simple, spontaneous PEEP (sPEEP) is pure PEEP. It is basic PEEP in the sense that it allows only a positive pressure against end-expiration, yet allows the recipient to begin each respiration from a point of elevated FRC. Inspiration from ambient pressure does not "preclude" the use of PEEP; it is PEEP if there is a positive end-expiratory pressure. Creation of a "negative" inspiratory pressure at the elevated FRC is consistent with effective PEEP. The actual effect of a CPAP set-up, when the reservoir bag is slightly collapsed during a patient's inspiration, is sPEEP, not CPAP at all. In practice, more adult patients probably receive sPEEP than CPAP with their IMV. From a cardiovascular standpoint, inspiration from ambient pressure during PEEP might be an advantage.

Dr. Cross is mistaken if he is suggesting that PEEP without CPAP is ineffective. His T-piece apparatus may be used in IMV with

PEEP. Whether in use with IMV (as with the IMV apparatus described) or in use alone, sPEEP is an effective application of PEEP and may be used in place of CPAP.

I personally began to use sPEEP without IMV in patients in early 1971 in Viet Nam, where there was a severe shortage of compressed gasses and respirators. Since April 1973, after my introduction to IMV by J. B. Downs, I have used sPEEP extensively with IMV with a T-piece set-up quite similar to that described by Dr. Cross. A PEEP with IMV by this method is clinically as effective as PEEP by IMV with a CPAP inspiratory assembly.

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(Accepted for publication May 20, 1976.)

To the Editor:—Although the volume of terminologies used to describe the various uses of end-expiratory pressure is cumbersome, Dr. Gillick raises a very important question that is more than mere semantics. The question is whether it is desirable to use an IMV system with positive end-expiratory pressure in which the patient's spontaneous inspirations begin at ambient pressures.

In such a system, the patient would exhale to a positive end-expiratory pressure, but to initiate spontaneous inspiratory air flow, he would have to generate an airway pressure down to at least ambient, and perhaps into negative ranges if the resistance of the valves, humidifiers, and remainder of the system is taken into account.

At the time my paper was written, I was unaware of any studies of the physiologic implications of such an IMV system. The beneficial effects of ambient inspiratory pressure with respect to cardiovascular physiology is a point well made. In addition, the functional residual capacity should not decrease in such a system. However, Dr. Gillick does not address the work of breathing.

Recent work by Dr. J. B. Downs (personal

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