IMV-Induced Positive Airway Pressure

To the Editor:

In a recent issue of *Chest*, Khan et al provide objective data which further serve to augment concerns that have been previously stated regarding the shortcomings in the current usage of IMV for weaning. What was demonstrated by Khan et al was that IMV circuitry available in conventional mechanical ventilators (Bennett MA-1 and MA-2, Bourns Bear 1) set at 0 rate with the patient breathing spontaneously can function in a retard capacity producing a configuration of positive airway pressure. The authors postulated that the higher peak and end-expiratory pressures thus obtained resulted from the intrinsic resistance of these IMV set ups. Both of these airway pressure determinations were significantly higher than those recorded with T-piece.

The inadequacies of these IMV systems having been objectively demonstrated, the authors emphasized the potential positive aspect of this phenomenon as it might relate to weaning. They observed that COPD patients who were stable on IMV set at 0 rate (without mechanical ventilation) desensitized when switched to a T-piece prior to extubation. They postulated that this IMV-induced positive airway pressure might be sufficient in possibly preventing premature airway closure and the ensuing hypoxemia that may occur when patients are placed on T-piece for weaning. In accordance with their observations, we are told that they no longer use a T-piece trial for weaning patients with COPD. Direct extubation or decannulation is performed once clinical stability is demonstrated at a low IMV rate.

An alternative approach to the weaning of COPD patients than that adopted as the apparent modus operandi of Khan et al certainly appears warranted. This is based on several important, and it seems obvious, unaddressed considerations and unanswered questions related to this recently appreciated phenomenon of IMV-induced positive airway pressure.

Firstly, if spontaneously breathing patients on IMV set at zero rate maintain positive airway pressure during expiration, at what low level of IMV (e.g., 2?, 4?, 6?) would this same phenomenon become clinically apparent? The advisability of allowing COPD patients to “stabilize” on low level IMV has previously been questioned. Allowing a patient with COPD to breathe through such IMV circuitry at low IMV rates could increase the work of breathing and lead to respiratory muscle fatigue. Although not measured either directly or indirectly, the work of breathing resulting from the standard IMV set ups used in this study may very well have been greater (especially for their COPD patients) compared to T-piece.

In individuals with normal lung and chest wall mechanics, the work of breathing with low levels of IMV-induced positive airway pressure would most probably be inconsequential. However, for the COPD population who have marginal respiratory muscle function and reserve, the increased work of breathing from IMV-induced positive airway pressure might be significant enough to counteract the postulated beneficial effects. This would, of course, be more significant for COPD patients who took longer to stabilize at low IMV rates.

Secondly, as a means of delivering positive airway pressure, the IMV circuitry available on demand value activated ventilators certainly appears suboptimal. From a work of breathing perspective, CPAP would certainly appear to be preferable. This raises the obvious question that if positive airway pressure is desired, why not administer CPAP directly? This should be accompanied by monitoring of airway pressure and technical adjustment to maintain constant airway pressure throughout the respiratory cycle in order to minimize muscular fatigue. In addition, the work of breathing would be minimized when high flow, low resistive circuits for both CPAP as well as IMV delivery are used. By administering CPAP in this fashion, the postulated good effects (prevention of airway closure) and the prevention of the potential bad effects (increased work of breathing) could be more optimally achieved.

In addition, it should be noted that the benefits of CPAP for adults being weaned from mechanical ventilation remain controversial. The importance of the glottic closure mechanism, as well as the concept of “physiologic” CPAP for intubated patients with COPD has not been directly studied in a prospective controlled fashion.

Until the data from more definitive studies are available, the following modus operandi for weaning patients with COPD is suggested: 1) if patients with COPD meet standard criteria, are hemodynamically and biochemically stable, a trial of T-piece weaning should be attempted; 2) if hypoxemia unresponsive to increased FIO2 occurs, a trial of carefully monitored CPAP, which preferably utilizes high flow-low resistive circuitry, should be administered; conversely, if CPAP is desired initially for weaning it should be delivered in a similar fashion: 3) if the patient is stable while breathing spontaneously on a CPAP system, he should be extubated directly from CPAP. Studies have shown that elimination of CPAP before extubation is contraindicated.

As stated by Khan et al, no attempt was made to compare the weaning efficacy of IMV at 0 rate vs T-piece in this small group of patients with varied pathophysiologic states. Their sole purpose was to compare airway pressures for IMV at 0 rate vs T-piece. In this they succeeded. Their observations would perhaps at best indirectly favor those who support CPAP for weaning. There is insufficient data generated from the study of Khan et al, however, to cause anything other than concern for the IMV circuitry itself and the manner in which IMV was used.

*Idelle M. Weisman, M.D., F.C.C.P.*

Division of Pulmonary-Critical Care,

William Beaumont Army Medical Center,

El Paso, Texas

The options or assertions contained herein are the private views of the writer and are not to be construed as official or as reflecting views of the Department of the Army and the Department of Defense.

Reprint requests: Dr. Weisman, 3231 Zion Lane, El Paso, Texas 79904

REFERENCES


5 Gibney RTN, Wilson RS, Pontoppidan H. Comparison of work of breathing on high gas flow and demand value continuous positive airway pressure. Chest 1982; 82:692-95

To the Editor:

The purpose of our study was to explain the reasons for the clinical observation of deteriorating clinical status of a small segment of COPD patients who fulfilled traditional weaning criteria, but decompensated on a T-tube set up, while they remained stable on an IMV set up at a zero rate. We certainly did not mean to leave the impression that IMV is our preferred mode of mechanical ventilation and weaning. We have extended our observation of the uselessness of a low level of positive airway pressure in patients with COPD and are currently investigating the application of low level of positive airway pressure in acute reversible airway disease—bronchial asthma. We agree with Dr. Weisman's modus operandi for weaning patients with COPD using low levels of CPAP and reemphasize the fact that while low levels of CPAP are beneficial in airway diseases, high levels of CPAP are poorly tolerated and can be dangerous.

Farooq A. Khan, M.D., F.C.C.P.
Chief, Pulmonary Division, Queens Hospital Center.
Jamaica, New York

REFERENCE


Thoracic Compression for Asthma

To the Editor:

This is a little-used physical method of treatment, the success of which is based upon theoretic considerations and practical experience. In spite of discussion with several colleagues and a search of the literature, I have neither heard nor read of it being used, and it is absent from several authoritative articles on the management of acute severe asthma. It is unrelated to other forms of therapy, requires no special equipment, can be administered by relatively unskilled personnel, and is potentially life-saving. I stress that it is an additional rather than an alternative form of therapy and is not intended to displace nor delay conventional therapy with sympathomimetics, etc.

Principles

1. Asthmatic patients have difficulty moving air, especially during exhalation.

2. If an open flexible vessel containing air is compressed, the air is expelled.

Practice

Applying these principles to the asthmatic subject, I have found that by manually compressing the patient's chest during exhalation, the forced expiratory volume can be increased by about 30 percent.

The exactness of the manner in which compression is applied does not appear to be very important, except, of course, that compression must be confined to the period during which the patient is exhaling. With a large subject I get behind and encircle the chest with my upper limbs, giving a sort of bear-hug. With small patients, I place my hands on the sides of the chest and play it like an accordion. In case of a patient who was lying unconscious and moribund, I knelt over and compressed the chest with my outstretched hands.

Advantages

This method has the following advantages:

1. It is simple. I teach it to the parents of some asthmatic children.

2. It is rapid. Faster than any drug, it acts with the first breath.

3. It is effective. Forced expiratory volume increases by about 30 percent.

4. It provides rest for the expiratory muscles. Respiratory demand is thus reduced and exhaustion averted.

5. It provides reassurance. Children who have experienced it remain calm, whereas giving an injection may cause distress, struggling and hence increased respiratory demand.

6. It improves the administration of inhaled medications, including oxygen.

7. It does not interfere with other methods of treating asthma.

8. It appears to be safe. I have used it on scores of cases over three years without observing any disadvantage.

9. It appears to reduce the airways deficiency in some cases.

Disadvantages

The only disadvantage appears to be risk of physical trauma.

I should be very grateful for feed-back from your readers in terms of comments, criticisms and reports of the use of this method. I am sorry if I have failed, inadvertently, to acknowledge any previous report of the method.

J.I.M. Watts, F.R.C.S.
Minyip, Australia

Toxic Oil Syndrome

Some Considerations in Pulmonary Disease

To the Editor:

With reference to the article by Esteban et al on “ARDS due to ingestion of denatured rapeseed oil” (Chest 1983; 84:166-69) we would like to comment on certain points.

In the initial acute stage, the lung was the organ predominantly affected, and the following data relate to 1,500 patients selected at random:

<table>
<thead>
<tr>
<th></th>
<th>1st week (%)</th>
<th>4th week (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Localized interstitial</td>
<td>17.3</td>
<td>5.5</td>
</tr>
<tr>
<td>pattern</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diffuse interstitial</td>
<td>48.8</td>
<td>6.7</td>
</tr>
<tr>
<td>pattern</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Localized alveolar</td>
<td>5.8</td>
<td>1</td>
</tr>
<tr>
<td>pattern</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diffuse alveolar pattern</td>
<td>12.5</td>
<td>1.1</td>
</tr>
<tr>
<td>Unilateral pleural</td>
<td>10.1</td>
<td>1.7</td>
</tr>
<tr>
<td>effusion</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bilateral pleural</td>
<td>12.1</td>
<td>1.3</td>
</tr>
<tr>
<td>effusion</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

CHEST / 86 / 3 / SEPTEMBER, 1984 505