such as nasal prongs, face masks (Hudson Soft Elongated Aerosol Mask) and face tents (Hudson Face Tent No. 1095; Hudson Company, Wadsworth, Ohio). The subjects maintained a defined breathing pattern with specified tidal volume, peak inspiratory flow rate, and minute ventilation. The sensing catheter led to a continuously-sensing medical mass spectrometer. A surprising finding of their study was that the face tent appeared to provide more oxygen (88 per cent) than the face mask (54 per cent) when both were supplied with 15 l/min of pure oxygen from an Ohio Deluxe nebulizer during normal breathing.

The interest in wider use of the face tent generated by this report prompted us to attempt to duplicate and expand upon these data. We have used essentially the same experimental model as Gibson et al., except that we placed the sensing catheter into the trachea transnasally, employing direct laryngoscopy under topical anesthesia. An MMS-8 (Scientific Research Instruments, Inc., Baltimore) mass spectrometer sampled from the catheter continuously at 1 ml/sec; output signals (\(P_{CO_2}\) and \(P_o\)) were recorded on a Grass polygraph (Grass Instrument Co., Quincy, Mass.). The trained subject maintained a fixed breathing pattern at a tidal volume of 500 ml and a frequency of 12/min. The stability of this pattern was assured by intermittent spirometry and by observation of a constant end-expiratory \(P_{CO_2}\). The subject was fitted alternately with face mask and face tent supplied with various oxygen concentrations from a calibrated Ohio Deluxe nebulizer primed with 15 l/min oxygen (table 1).

The face mask in every case supplied a higher peak tracheal oxygen concentration than the face tent. Similar results were obtained with the subject sitting erect and with the head elevated 45 degrees. Grouped data (nine comparisons) were analyzed using a non-parametric sign test. Concentrations achieved with the face tent were significantly lower than those achieved with the face mask (\(P < 0.01\)).

The face tent has been shown to have greater deadspace than the plastic face mask. The amount of rebreathing that occurs increases sharply when the oxygen flow fails or is decreased. Healthy persons can increase minute ventilation to maintain normal alveolar \(P_{CO_2}\) in this situation; however, debilitated patients may not be able to compensate in this manner.

Data from studies such as this cannot predict the \(F_{IN}\) that will be presented to, or the arterial oxygen tension which will be produced in, a given patient. We believe these data suggest two reasons the face mask may be a more prudent choice than the face tent in certain clinical situations. First, the inspired oxygen concentration more closely approximates that nominally delivered by the device; second, the mask causes less rebreathing should it become disconnected from the oxygen supply.

<table>
<thead>
<tr>
<th>(F_{IN})</th>
<th>Face Mask</th>
<th>Face Tent</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.4</td>
<td>39</td>
<td>29</td>
</tr>
<tr>
<td>0.6</td>
<td>41</td>
<td>33</td>
</tr>
<tr>
<td>1.0</td>
<td>54</td>
<td>46</td>
</tr>
</tbody>
</table>

**Assessment of Coma and Severity of Brain Damage**

*To the Editor:* Having devised a scale for assessing impaired consciousness in patients with brain damage,\(^1\) we are pleased to find Dr. Marsh and his colleagues\(^2\) and others\(^3,4\) advocating its use. However, Marsh et al. criticize the Glasgow Scale as being an incomplete measure of responsiveness of vital functions. We have previously emphasized that this scale forms only part of the assessment of brain-damaged patients, whether monitoring coma at the bedside,\(^5\) or describing severity of injury in a series of patients, as in our international collaborative study.\(^6\) The relationships between the coma scale responses and other aspects of coma (pupil reactions, eye movements and autonomic abnormalities) have been analyzed in detail by us in a series of 700 patients.\(^7\) The alacrity with which the scale has been adopted in many centers

**REFERENCES**


(Accepted for publication April 27, 1978)
throughout the world indicates that our objectives in describing it have been achieved: to fill a gap left by previous systems for assessing level of consciousness. We have never recommended using the Glasgow Scale alone, either as a means of monitoring coma, or to assess the severity of brain damage or predict outcome.

Graham Teasdale, F.R.C.S.
Senior Lecturer in Neurosurgery
Bryan Jennett, F.R.C.S.
Professor of Neurosurgery
Department of Neurosurgery
Institute of Neurological Sciences
University of Glasgow
The Southern General Hospital
Glasgow G51 4TF, Scotland

Anesthesiology
49:226, 1978

Cylinder Caution: Open Slowly to Minimize Recompression Heat

To the Editor:—Feeley et al.\textsuperscript{1} reported that medical compressed gas cylinders are potential hazards to patients and medical personnel. They recorded 120 (1.2 per cent) potentially hazardous irregularities out of a total of 14,500 cylinders delivered to Beth Israel Hospital over a four-year period (actually 0.83 per cent). While all of the irregularities described are potential hazards, it seems that the hazard with the highest potential for injury or damage is not discussed. The hazard I speak of is “opening a cylinder valve too fast,” and in particular an oxygen cylinder fully charged to 2,200 psi.

For the last 18 years, I have been involved in the design of aircraft oxygen breathing equipment and inhalation anesthesia equipment. Since this equipment is used in conjunction with medical gas cylinders, I have become familiar with the hazards associated with compressed gas cylinders. My observations indicate to me that personnel involved in the everyday handling of medical gas cylinders in conjunction with other medical apparatus do not receive adequate instructions regarding the safe handling and use of these cylinders. Even those that do receive adequate training tend to become complacent about safe handling procedures, apparently because thousands of cylinders are handled every day without incident. Even trained and experienced personnel do not gain respect for the potential hazard of opening an oxygen cylinder valve too quickly unless they have been involved in or observed the results of a disastrous fire that occurred because the cylinder valve was not opened SLOWLY.

Instructional material such as CGA Pamphlet P-1\textsuperscript{2} and labels on cylinders instruct the user to open the cylinder valve slowly. However, the reason for doing this is not stated, and therefore this instruction tends to be forgotten or disregarded. The potential for future accidents would be decreased considerably if instructions and instructors would change the statement from “open cylinder valve slowly” to “open cylinder valve slowly to minimize recompression heat.”

Ronald J. Czajka
Engineering Manager
Fraser Sweatman, Inc.
5490 Broadway
Lancaster, New York 14086

Anesthesiology

Prevention of Ventilator Accident

To the Editor:—There are several points to be made about Dr. Waterman’s report of accidental ventilator-induced hyperventilation.\textsuperscript{1} First, while wall oxygen is supplied at 50 psi, there is a pop-off valve in the ventilator to prevent large quantities of oxygen at this high pressure from being delivered to a patient. A pressure of 50 psi is equivalent to more than 3,500 cm H\textsubscript{2}O,\textsuperscript{2} certainly in excess of the pressure limit of the ventila-

References


(Accepted for publication May 3, 1978.)

Anesthesiology
49:226, 1978

References

2. Safe Handling of Compressed Gases. Pamphlet P-1, Compressed Gas Association, 500 Fifth Avenue, New York, 10036

(Accepted for publication May 3, 1978.)