

midazolam infusion should be reduced gradually.

The present case illustrates that sudden withdrawal of narcotic drugs is an important cause of new-onset seizures in ICU patients and should also be kept in mind in case of weaning difficulties [5].

References

1. Shafer A, Doze V, White P (1990) Pharmacokinetic variability of midazolam infusions in critically ill patients. *Crit Care Med* 18:1039–1041
2. Finley PR, Nolan PE (1989) Precipitation of benzodiazepine withdrawal syndrome following sudden discontinuation of midazolam. *DICP* 23:151–152
3. Mets B, Horsell A, Linton M (1991) Midazolam-induced benzodiazepine withdrawal syndrome. *Anesthesia* 46:28–29
4. Boisse NR, Quaglietta N, Samoriski GM, Guarino JJ (1990) Tolerance and physical dependence to a short-acting benzodiazepine, midazolam. *J Pharmacol Exp Ther* 252:1125–1133
5. Wijdicks EF, Sharbrough FW (1993) New-onset seizures in critically ill patients. *Neurology* 43:1042–1044

Ph. Hantson (✉)
Département des Soins Intensifs,
Cliniques Universitaires St-Luc,
Avenue Hippocrate, 10,
B-1200 Brussels, Belgium

J.L. Clemessy · F.J. Baud
Réanimation Toxicologique,
Hôpital Fernand Widal,
F-75475 Paris, France

L. Gaitini
S. Vaida
S. Krimerman
A. Werczberger
J. Smorgik
M. Naum
M. Somri

External high-frequency ventilation in patients with respiratory failure (external ventilation)

Received: 7 October 1993
Accepted: 16 June 1994

Sir: We present 3 cases in which external high-frequency ventilation (EHFV) was

applied using the Hayek oscillator (Flexco Medical Instruments, Oberengstringen, Switzerland) in patients with respiratory failure on mechanical ventilation. EHFV has several advantages: it does not require intubation, is quick and easy to apply, does not compromise cardiac output [1], and has physiotherapeutic effects that facilitate the removal of secretions [2]. The Hayek oscillator is a fully computerized, noninvasive respiratory, providing pulmonary ventilation by externally applied high-frequency oscillation. It consists of a flexible, light-weight cuirass, connected to a power unit, the oscillator, which creates cyclic pressure changes within the chest enclosure, around a negative baseline. The keyboard enables adjustment of frequency (up to 999 cycles/min). I/E ratio, and inspiratory and expiratory pressure.

Case 1

A 65-year-old woman was admitted to the ICU with complete bilateral diaphragmatic paralysis after coronary artery bypass. She was placed on intermittent mandatory ventilation (IMV) for 36 days.

Tracheostomy was performed after 15 days of mechanical ventilation. EHFV was applied 16 h daily to facilitate weaning from mechanical ventilation. Frequency was initially 120 cycles/min, gradually decreasing to 50 cycles/min, each day. The I/E ratio was 1:1, inspiratory pressure (IP), -20 cm H₂O, and expiratory pressure (EP), 7 cm H₂O. After 12 days of EHFV, the patient was weaned from the ventilator. Although she was discharged with tracheostomy, there was a significant improvement in diaphragmatic function.

Case 2

A 71-year-old man was admitted to the ICU with acute exacerbation of chronic obstructive pulmonary disease (COPD) due to right lower lobar and pneumococcal sepsis. After intubation, control-mode ventilation (CMV) was implemented. Attempted weaning from ventilatory support using IMV ended prematurely with self-extubation after 13 days of mechanical ventilation. A decision was taken to ventilate the patient with EHFV. The Hayek Oscillator was used with an initial frequency of 120 cycles/min, gradually reduced to 25 cycles/min, an I/E ratio of 1:1, an IP of -22 cm H₂O, and an EP of 10 cm H₂O, resulting in a significant improvement in the clinical state of the patient and a gradual improvement in arterial blood gases (ABG). Following EHFV, the patient expectorated a large amount of sputum. He was discharged 13 days after extubation.

Case 3

A 39-year-old paraplegic man (following poliomyelitis contracted in childhood) was admitted to the ICU with acute respiratory failure due to pneumonia. He was intubated and ventilated with CMV and IMV for 14 days. It was impossible to wean the patient from the ventilator with conventional methods (SIMV, pressure support), therefore EHFV was implemented for 7 h starting with a frequency of 120 cycles/min gradually decreasing to 30 cycles/min, an I/E ratio of 1:1, an IP of -25 cm H₂O, and an EP of -8 cm H₂O.

The patient expelled a large amount of mucus through the endotracheal tube. After 4 days, he was able to breathe spontaneously, ventilation was discontinued, and extubation was performed.

EHFV was successfully applied in each of our 3 cases. Reventilation was achieved within seconds and the hazards of reintubation were eliminated. EHFV is an additional mode of mechanical ventilation in patients with respiratory failure. In our limited experience, it was virtually free from complications.

References

1. Hayek Z, Sohar E (1993) External high frequency oscillation-concept and practice. *Intensive Care World* 10:36–40
2. King M, Phillips DM, Gross D (1983) Enhanced tracheal mucus clearance with high frequency chest wall compression. *Am Rev Respir Dis* 128:511–517

L. Gaitini (✉) · S. Vaida · S. Krimerman
M. Naum · M. Somri
Department of Anesthesia
and Intensive Care,
Bnai-Zion Medical Center, P.O. Box 4940,
Haifa 31048, Israel

A. Werczberger
Bikur Holim Hospital, Jerusalem

H. Smorgik
Meir Hospital, Kfar Saba