



“The Death Rattle” in the Intensive Care Unit After Withdrawal of Mechanical Ventilation in Neurological Patients

Erwin J. O. Kompanje*

Department of Intensive Care and Department of Neurosurgery, Erasmus MC University Medical Center, Rotterdam, The Netherlands

Abstract

The noise produced by oscillatory movements of secretions in the oropharynx, hypopharynx, and trachea during inspiration and expiration in unconscious terminal patients is often described as “the death rattle.” The secretions are produced by the salivary glands and bronchial mucosa. These patients are usually too weak to expectorate or swallow the migrating secretions. Sputum usually only accumulates in these areas if there is a significant impairment of the cough reflex, as in deep coma or near death. Reported incidence of death rattle in terminal patients varied between 6 and 92%. Death rattle was most commonly reported in patients dying from pulmonary malignancies, primary brain tumors, or brain metastases, and predicts death within 48 hours in 75% of the patients.

After withdrawal of artificial ventilation from the intensive care unit, excessive respiratory secretion resulting in a rattling breathing during the last hours of life is not uncommon, especially not in pulmonary and neurological patients. The distressing experience and negative influence in the bereavement process indicates an ethical demand to treat this symptom from the perspective of others merely than that of the patient.

Key Words: Death rattle; neurocritical care; withdrawal of mechanical ventilation; ethics; anticholinergic drugs.

(Neurocrit. Care 2005;3:107-110)

*Correspondence and reprint requests to:

Erwin J. O. Kompanje
Department of Intensive Care
(Intensive Care
Centrumlocatie),
Erasmus MC University
Medical Center,
P.O. Box 2040,
3000 CA Rotterdam
The Netherlands.
E-mail:
e.j.o.kompanje@erasmusmc.nl

Introduction

The noise produced by oscillatory movements of secretions in the oropharynx, hypopharynx, and trachea during inspiration and expiration in unconscious terminal patients is often described as “the death rattle.” The secretions are produced by the salivary glands and bronchial mucosa. These patients are usually too weak to expectorate or swallow the migrating secretions. Sputum usually only accumulates in these areas if there is a significant impairment of the cough reflex, as in deep coma or near death. Reported incidence of death rattle in terminal patients varied strongly: 6 to 92% (1-10). Most of the

patients observed in these studies were dying from cancer and most of them were admitted to palliative care units and hospices. Death rattle was most commonly reported in patients dying from pulmonary malignancies, primary brain tumors, or brain metastases, and predicts death within 48 hours in 75% of the patients (2).

Patients are usually not aware of their noisy breathing and, as long as they do not suffer, there is no ethical demand to treat the symptom judged from the perspective of the patient. Once consciousness is reduced to a point that a patient no longer has cough reflexes, it is unlikely that the patient is aware



of or distressed by the oscillatory movements of secretions in upper airway and trachea. The primary aim of treating the noisy and rattling breathing therefore is to reduce the distress of relatives, friends, other patients, and caregivers. Some relatives are unable to stay with a dying patient with a death rattle, and others are haunted by the disturbing and unnerving noise long into the bereavement period (4).

Some authors (2,9) mention the important distinction between a rattle caused by nonexpectorated (or nonswallowed) salivary and/or bronchial secretions (the *real* death rattle) and a rattle produced by respiratory pathology (a pseudo-death rattle). The *real* death rattle, which is seen in dying patients, generally responds well to anticholinergic therapy by antimuscarinic drugs. The pseudo-death rattle does not seem to respond well to these medications. Mixed cases can occur in patients dying from pulmonary pathology, such as lung cancer or severe pneumonia.

After withdrawal of artificial ventilation from the intensive care unit (ICU), excessive respiratory secretion resulting in a rattling breathing during the last hours of life is not uncommon, especially not in pulmonary and neurological patients. The shift from the regular and reassuring sound of the mechanically produced inspiration and passive expiration through the ventilator in the period when the patient was intubated and sedated on the mechanical ventilator to the irregular and disturbing death rattle can be a very distressing experience for relatives and caregivers. There are limitations on (1) information on the etiology of the death rattle, (2) the occurrence in intensive care patients after withdrawal of therapy, and (3) death rattle treatment. A recent monograph on the management of death on intensive care only pays attention to the problem in two sentences (11). A recent and influential article on recommendations for end-of-life care in intensive care does not mention the symptom and its treatment at all (12). The distressing experience and negative influence in the bereavement process indicates an ethical demand to treat this symptom based on the perspective of others merely than that of the patient.

Etymology of the Term “Death Rattle”

In his two-volume classic work, *De l'auscultation médiate ou traité du diagnostic des maladies des poumons et du coeur, fondé principalement sur ce nouveau moyen d'exploration*, published in 1819, Théophile René Hyacinthe Laënnec (1781–1826), described the two varieties of normal breath sounds (vesicular and bronchial) and various *bruits étrangers* (adventitious sounds). He used the term *râle* (rattle), but as he thought the resemblance to *le râle de la mort* (the death rattle) might frighten patients, he used the Latin term *ronchus* when speaking at their bedside. The American Thoracic Society and the American Association of Respiratory Care have argued against the use of the terms “rales” and “rhonchi.” Instead, they recommend the term “crackles.” This put the term *râle* (rattle) again, where it was originated: *le râle de la mort* (the death rattle).

Cases

Case 1

A 43-year-old Caucasian male patient was diagnosed with a left temporal glioblastoma multiforme. He underwent craniotomy, in which subtotal resection was achieved.

Postoperatively, he deteriorated clinically within 4 hours after the end of surgery. A computed tomography (CT) scan revealed a massive intracerebral hematoma in the left temporal lobe. The patient underwent a second craniotomy, in which the hematoma was evacuated. Postoperatively, the patient was admitted to a neurosurgical ICU. Following discussion with the family, withdrawal of mechanical ventilatory support and subsequent removal of the endotracheal tube was initiated 3 days after the second craniotomy. After extubation, the patient developed prolific respiratory secretions resulting in a loud death rattle. The patient was deeply unconscious. Positional changes, gentle nasopharyngeal suctioning, and the administration of 20 mg of morphine and 15 mg midazolam had minimal effect. The loud death rattle remained. Both intensivist and intensive care nurses claimed that this was all they could do. The patient's relatives became very distressed during the patient's last hours. The patient died after 5 hours of extubation. In addition to the actual death, the dying process itself had become a source of grief for the spouse, the 15-year-old daughter, and the parents of the patient.

Case 2

A 52-year-old Caucasian male patient was admitted to the neurological ICU after he had been found unconscious in the garden by his wife. A CT scan revealed a massive subarachnoid hemorrhage with left temporal intracerebral hematoma. The patient was intubated, connected to mechanical ventilation, and remained in a deep coma. The physician decided to withdraw ventilatory support after 6 days of intensive treatment.

In anticipation of withdrawal of mechanical ventilation and extubation, intravenous fluids were reduced, and 150 mg of hydrocortisone iv and 400 µg hyoscine hydrobromide SC were administered. Because of the deep coma, no sedatives were given. A continuous infusion of 1.2 mg hyoscine hydrobromide/24 hours was initiated. Three hours later, the patient was weaned from the ventilator and extubated. No stridor or death rattle occurred. The patient died peacefully 5 hours after extubation in the presence of his spouse and three children.

Treatment

Treatment of death rattle consists of:

1. Withdrawal of parenteral fluids
2. Gentle suction in the nasopharynx and trachea
3. Postural drainage
4. Anticholinergic drugs.

Furthermore, it has to be explained to the relatives that the death rattle in a patient with decreased level of consciousness is unlikely to be distressing for the patient.

The anticholinergic drugs include the natural belladonna alkaloids (atropine, belladonna, hyoscyamine, and scopolamine) and related products. Scopolamine (hyoscine hydrobromide) is an alkaloid, $C_{17}H_{21}NO_2$, obtained from the roots of *Scopolia atropoides*. It acts on the autonomic nervous system and prevents muscle spasm, and is frequently included in premedication to dry up pulmonary secretions and as a postoperative sedative. Hyoscine blocks receptors called muscarinic (or cholinergic) receptors that are found in the vomiting center in the brain. This prevents the vomiting center from sending nerve messages to the stomach that would normally cause vomiting. A side effect of hyoscine, and other

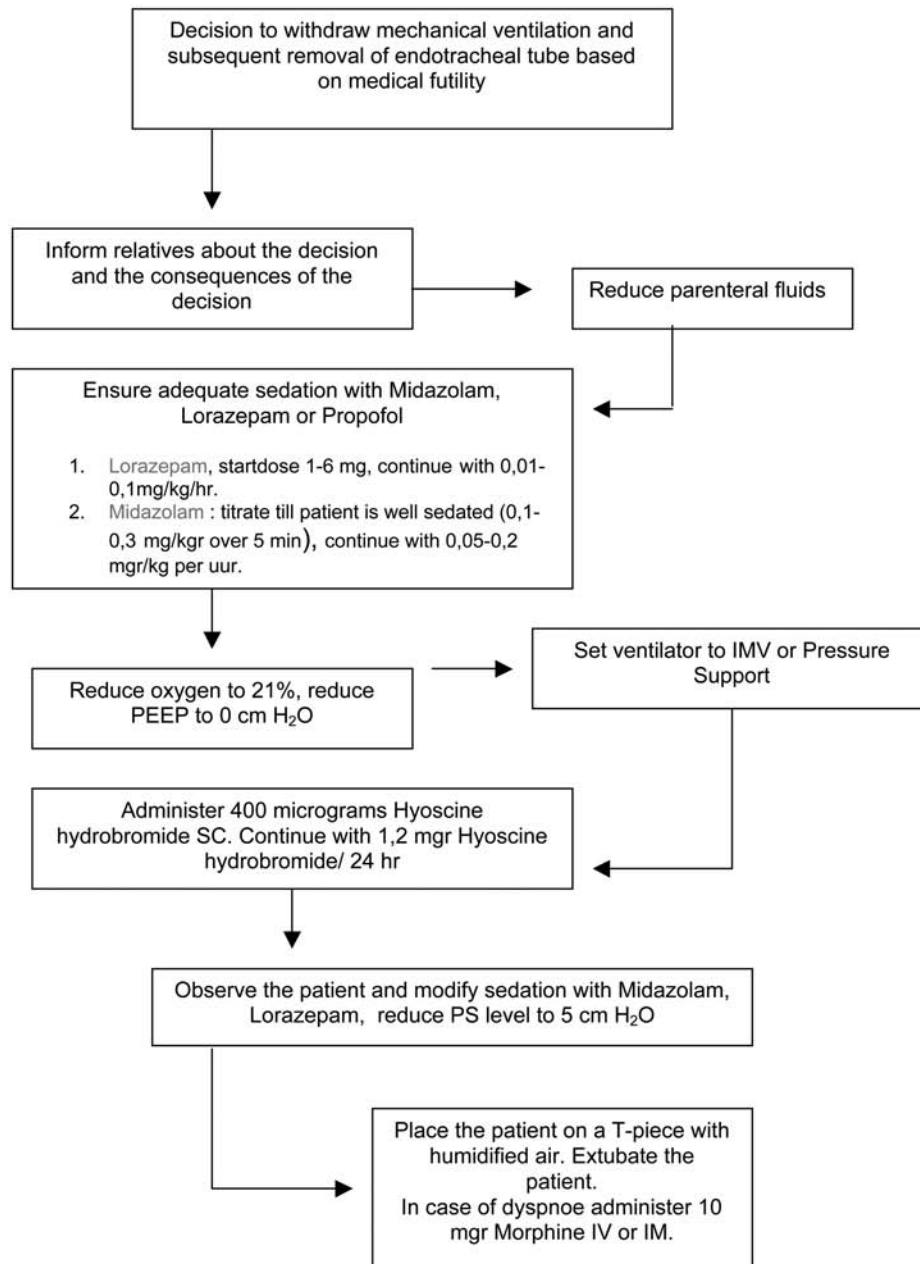


Fig. 1. Flow chart of withdrawal of mechanical ventilation in anticipation of death rattle.

such anticholinergic drugs as atropine is a dry mouth, which is why this anticholinergic drug is used for treatment of the real death rattle. The patient's mouth and lips should be wiped periodically with moistened gauzes. Desirable effect for the treatment of death rattle is shown in 50% (4), 80% (9), and >90% (2). Another study shows a 56% decrease of rattling respiration 30 minutes after one injection of hyoscine (6). Important is that relief of relatives' distress improved by 90% (4). Other anticholinergic drugs used for treatment of death rattle are hyoscine butylbromide and glycopyrrolate bromide. Both drugs offer shorter efficacy and show a lesser effect than hyoscine hydrobromide (6,9) in the treatment of death rattle. Although glycopyrrolate bromide crosses the blood-brain

barrier, it does so poorly; therefore, the use of it in end-of-life care may lead to an increased need for other sedative and antiemetic medication, which is not the case in the use of hyoscine bromide, which passes the blood-brain barrier and can cause central effects as sedation (6). Furthermore, glycopyrrolate bromide is slower in onset, but produces less tachycardia than atropine and scopolamine, but this is not of real concern in end-of-life care.

Discussion

One of the "Statements on Challenges" in end-of-life care in the ICU (made at the fifth International Consensus Conference in Critical Care: Brussels, Belgium, April 2003 [13])

aimed at optimal care for patients in a dying process in the ICU. This included the awareness that provision of comfort should involve the family as well as the patient. Caring includes attention to the effect of the patient's condition on the family and loved ones. Families of patients in the ICU report being anxious and depressed regarding the illness of their relative, suggesting considerable vicarious suffering (14–16). In order to provide optimal care, the ICU team must feel responsible for the well-being of both family and patient. This should be regarded as an ethical demand. Relatives overwhelmingly endorsed pain and symptom management during the dying process (17). In the case of the occurrence of a death rattle in a dying patient after withdrawal of mechanical ventilation in anticipation of death, the well-being of the family should be paramount. Noisy and rattling breathing forms a source of great distress for the relatives present.

There are limitations on (1) information on the etiology of the death rattle, (2) the occurrence in intensive care patients after withdrawal of therapy, and (3) death rattle treatment. Intensivists and intensive care staff must be trained to take appropriate care of this symptom. We can learn from our colleagues working in palliative care and hospices (18). Withdrawal of intensive care must be carefully planned and possible undesirable symptoms, as death rattle should be anticipated (Figure 1). The low incidence of death rattle in one study (23%) was explained by the authors as a possible result of very restrictive management of parenteral fluids (2). Withdrawal of parenteral fluids before withdrawal of mechanical ventilation can reduce the possibility of excessive respiratory secretion. Pulmonary malignancies (2,3,5,8) and brain tumors (2,5,19) showed to be independent risk factors for the development of death rattle. Mechanical ventilation and endotracheal intubation are the most common considerations for withdrawal of life support in the case of a patient with a cerebral catastrophe beyond hope. In dying patients with cerebral conditions, neurogenic pulmonary edema may be the cause of pulmonary secretions and subsequent death rattle (19). Withdrawing treatment in patients with these conditions should include appropriate anticipation on the development of death rattle. Real death rattle disappears in 50–90% of the patients after subcutaneous or intramuscular administration of scopolamine (hyoscine hydrobromide). This should be the first drug of choice. Standardized early (before terminal weaning from the ventilator in high-risk patients) administration of scopolamine should become common practice in palliative intensive care in anticipation of death after withdrawal of intensive treatment. There is no contraindication to the use of anticholinergic agents in anticipation of death rattle in dying patients. None of the described side effects will affect a patient in the terminal phase of his or her life. Hyoscine hydrobromide usually also has a sedative effect, which is desirable in palliative intensive care. The fact that

relatives were relieved in almost all cases in which a positive effect was obtained makes treatment with scopolamine in anticipation of death rattle an ethical demand.

References

1. Morita T, Tsunoda J, Inoue S. Contributing factors to physical symptoms in terminally-ill cancer patients. *J Pain Symptom Manage* 1999;18:338–346.
2. Wildiers H, Menten J. Death rattle: prevalence, prevention and treatment. *J Pain Symptom Manage* 2002;23:310–317.
3. Morita T, Hyodo I, Yoshimi T, et al. Incidence and underlying etiologies of bronchial secretion in terminally ill cancer patients: a multicenter, prospective, observational study. *J Pain Symptom Manage* 2004;27:533–539.
4. Hughes AC, Wilcock A, Corcoran R. Management of “death rattle”. *J Pain Symptom Manage* 1996;12:271–272.
5. Morita T, Tsunoda J, Inoue S, Chihara S. Risk factors for death rattle in terminally ill cancer patients: a prospective exploratory study. *Palliat Med* 2000;14:19–23.
6. Back IN, Jenkins K, Blower A, Beckhelling J. A study comparing hyoscine hydrobromide and glycopyrrolate in the treatment of death rattle. *Palliat Med* 2001;15:329–336.
7. Lichter I, Hunt E. The last 48 hours of life. *J Palliat Care* 1990;7:7–15.
8. Käss RM, Ellershaw J. Respiratory tract secretions in the dying patient: a retrospective study. *J Pain Symptom Manage* 2003;26:897–902.
9. Bennett M, Lucas V, Brennan M, Hughes A, O'Donnell V, Wee B. Using anti-muscarinic drugs in the management of death rattle: evidence-based guidelines for palliative care. *Palliat Med* 2002;16:369–374.
10. Ellershaw JE, Sutcliffe JM, Saunders CM. Dehydration and the dying patient. *J Pain Symptom Manage* 1995;10:192–197.
11. Curtis JR, Rubenfeld GD, eds. *Managing death in the intensive care unit. The transition from cure to comfort.* Oxford, Oxford University Press, 2001.
12. Truog RD, Cist AFM, Brackett SE, et al. Recommendations for end-of-life care in the intensive care unit: the Ethics Committee of the Society of Critical Care Medicine. *Crit Care Med* 2001;29:2332–2348.
13. Carlet J, Thijs LG, Antonelli M, et al. Challenges in end-of-life care in the ICU. Statement of the 5th International Consensus Conference in Critical Care: Brussels, Belgium, April 2003. *Intensive Care Med* 2004;30:770–784.
14. Cook D, Rocker G, Heyland D. Dying in the ICU: strategies that may improve end-of-life care. *Can J Anesth* 2004;51:266–272.
15. Engström Å, Söderberg S. The experience of partners of critically ill persons in an intensive care unit. *Intensive Crit Care Nurs* 2004;20:299–308.
16. Pochard F, Azoulay E, Chevret S, et al. Symptoms of anxiety and depression in family members of intensive care unit patients: ethical hypothesis regarding decision-making capacity. *Crit Care Med* 2001;29:1893–1897.
17. Steinhauser KE, Christakis NA, Clipp EC, et al. Factors considered important at the end of life by patients, family, physicians, and other care providers. *JAMA* 2000;284:2476–2482.
18. Voltz R, Bernat JL, Borasio GD, Maddocks I, Oliver D, Portenoy RK, eds. *Palliative care in neurology.* Oxford, Oxford University Press 2004.
19. Macleod AD. Neurogenic pulmonary edema in palliative care. *J Pain Symptom Manage* 2002;23:154–156.