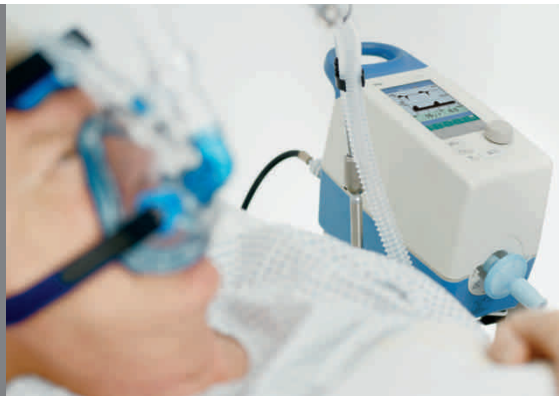
Dräger Carina®
The device for non-invasive ventilation

Dr. Anke Jansen, head of the intensive care unit at Städtisches Krankenhaus Kiel, presents the following case study to report on her experiences with Carina® when used on seriously ill patients with acute respiratory distress syndrome (ARDS) to prevent intubation.



APPLICATION OBSERVATION

The medical intensive care unit in the Städtisches Krankenhaus Kiel primarily focuses on the field of cardiology, but also cares for patients with an entire range of diseases which require complex intensive care, for example patients with hematological diseases post-transplant. This intensive care unit has more than 10 years of successful experience using non-invasive ventilation (NIV) for the early treatment of ARDS. In 2010, 34 percent of all ventilation cases at the Städtisches Krankenhaus Kiel were treated with NIV.

DETAILED COMMENTS

The use of non-invasive ventilation in intensive care is controversial. For example, Esteban et al.[1] questions the use of NIV therapy following extubation. His study focuses on the risk of failing to perform re-intubation in an expeditious manner.

However, the use of NIV for patients with compromised immune systems is generally accepted. In 2001 Hilbert et al. was able to demonstrate a clear decrease in mortality rates when patients with compromised immune systems were treated with non-invasive ventilation, compared to those treated with invasive ventilation.[2]

Oxygenation and ventilation must be ensured. Momentary interruptions of the non-invasive ventilation must be minimized for the patient to benefit from NIV.

The advantage of NIV, when compared to intubation, is that the patient receives his/her own respiratory toilet. In order to ensure that the patient fully benefits from this method, coughing, enteral nutrition and mobilization of secreations should be possible under light sedation.

In practice, it is often the case that a brief respite from the ventilation device is sufficient to feed, and rinse the mouth and respiratory toilet, before desaturation and physical exhaustion ensues.

Due to the patient's breathing fatigue, it is often the case that the amount of time the patient is off the ventilator is too narrow of a time frame to mobilize secretions in the airway.

MT-0768-2008

The clever-compact Carina, with its advanced NIV functionality, portability and ease of operation will help you put your patients on the road to recovery - quickly and comfortably.

PROFESSIONAL BACKGROUND

17.10.01	She became a specialist in internal medicine.
From 10/01	Senior physician in the field of intensive care and dialysis. She oversaw the establishment of non-invasive ventilation practices within the 14-bed intensive care unit. Her responsibilities include routine teaching within the frame-work of specialists involved in the care of anesthesia and intensive care.
16.07.03	She acquired additional qualifications in internal intensive care.
14.02.07	She became a specialist in nephrology.
18.11.08	She was granted further educational authority for internal intensive care at the Städtisches Krankenhaus Kiel.
Since 2/08	She holds an executive leadership role in the nephrology section of the medical clinic at Städtisches Krankenhaus Kiel.

DR. ANKE JANSEN
Head of intensive care unit
at the Städtisches Krankenhaus Kiel

In practice, we prefer helmet ventilation[1] for patients requiring ventilation for long periods. We are happy to convert to mask ventilation for mobilization purposes. The facemask we use is easy to remove, thus allowing better attempts to swallow, to cough and to take simple, liquid nutrition. Ventilation mostly takes place in CPAP/PS mode; in the case of extremely compromised patients, BIPAP ventilation is also possible.

CASE STUDY

A 72-year-old female patient with acute myeloid leukemia (AML) M5b, according to FAB (human genetics 46 XY without chromosome aberration), with an initial leukocyte figure of 168/nl presented herself to the emergency room. The patient was admitted to the intensive care unit, as she had developed respiratory insufficiency under a leukostasis syndrome typical to this clinical picture. The situation was critical from a respiratory and hematological oncology point of view. However, the patient had a stable circulation without catecholamine therapy, and was awake and cooperative throughout.

Furthermore, the patient developed an intravascular disseminated coagulopathy, which can be a consequence of the severity of the clinical picture (systematic inflammatory response syndrome), as well as the leukemia itself. At the time of the stay, catecholamine was obligatory. The arterial blood-gas analysis displayed an arterial pO2 of 55 mmHg, a pCO2 of 39 mmHg and a bicarbonate of 27 mmol/l, resulting in a pH of 7.40. This blood-gas analysis was performed under 15 liters of oxygen per minute.
The patient was showing signs of fatigue and had a respiratory rate of 30/min. Respiratory exhaustion was a real threat. Chest X-Rays showed a solid lung parenchyma consolidations and were apparent in both lungs, which is keeping with a pronounced leukostasis syndrome in case of acute AML. Non-invasive ventilation, via the Carina system, was applied directly before admission to the intensive care unit. Ventilation took place via the Dräger Novastar mask (full-face mask) and the SPN-PS mode (spontaneous pressure support) with volume guarantee (controlled, consecutive pressure increase until the target volume is achieved) was selected.

1) System compatibility certificate for Dräger ventilation devices with helmet not available

The continuous pressure support was specified at 10 mbar, the volume guarantee was defined at 450 ml, and the alarm limit for the upper pressure limit was configured at 28 mbar. The PEEP was escalated from 10 mbar to 12 mbar. During the night, the patient was ventilated during the night from 8pm until 7am using the helmet in PC-BIPAP mode with an Evita 4 ventilator, in order to allow sleep under sedation.
The patient was monitored and given comprehensive intensive care: invasive blood pressure monitoring, saturation monitoring, hourly BGA checks and heart rate recording.
As the patient's stay progressed, it became apparent that Carina offered the patient a high degree of comfort during mask ventilation. It was found to be synchronous with the patient's spontaneous efforts and be more comfortable than other devices. The pressure lesions in the nasal area, which cannot always be avoided and are described in the literature, did not occur with the Dräger Novastar mask in the case of the thrombopenia patient with disseminated, intravenous clotting. Very low inspiratory support pressures could be selected, and the amount of leakage was very low. The small, easily transportable ventilation device meant that the patient was mobile within the room and could be interrupted and briefly arranged in order to sufficiently recruit the basal lung portions.
The patient could be removed from the mask for periods of 10 minutes, in order to take on nutrition and medication. The blood gases under this form of ventilation resulted in the following values after four days of 45 percent oxygen: pO2 131 mmHg, pCO2 36 mmHg, pH 7.46, current bicarbonate 26 mmol/l, base deviation standard.
Non-invasive ventilation was required for 7 days.
After this, the patient could be moved to our oncology clinic without respiratory support, where the chemotherapy could be continued as planned until the discharge date after a month-long stay in hospital.

GENERAL DISCUSSION

The clinical picture of leukostasis syndrome within the framework of an AML is, on the one hand, a challenge for pulmonary medicine on the intensive care unit. Conversely, it constantly improves the pulmonary clinical picture under adequate chemotherapy. When choosing the Carina, we selected a ventilation device that completes these varying tasks with a very good level of success.

Of particular note is the high degree of patient comfort with excellent trigger sensitivity, which the patient found to be extremely comfortable and resulted in a high degree of patient acceptance. In this case, absolutely no sedation was required during the day. The patient tolerated the ventilation phases without any untoward difficulty, meaning that, situation permitting, mobilization of secretions and breathing exercises could be performed, depending on the schedule of nurses and patient options.

Non-invasive ventilation is already a standard with respect to the uncomplicated ventilation of COPD patients or patients with cardiogenic pulmonary edema who must be treated on a general med-surg ward or intensive care unit. This case demonstrated impressively that Carina can also be used on an interim basis with seriously ill ARDS patients with compromised immune systems.
We have already used Carina successfully for mobilization and respiratory exercises with patients having compromised immune systems, as well as for short-term nutritional intake.

The patient comfort, good mobility and user-friendliness of the device are impressive.
Dräger's consistent operating philosophy means that all users of the Evita series can easily operate the Carina, so that, with the right training and experience, the Carina can be used in the non-invasive ventilation area on the intensive care unit without difficulty. This results in a high degree of user acceptance, including many of the nursing staff.
This user-acceptance is a prerequisite of a successful NIV therapy, particularly when providing seriously ill patients with care involving various medical devices.

Städtische Krankenhaus Kiel GmbH is a hospital for acute cases, maintained 100% by the regional capital of Kiel. It has over 640 beds and employs about 1,500 members of staff. Städtische Krankenhaus Kiel Service-GmbH and the Städtische MVZ Kiel GmbH are GmbH (limited company) subsidiaries.

REFERENCES

[1] Esteban et al. Non-invasive positive pressure ventilation for respiratory failure after extubation. N Engl J Med 2004; 350:2452-2460

[2] Hilbert et al. Non-invasive ventilation in immunosuppressed patients with pulmonary infiltrates, fever and acute respiratory failure. N Engl J Med 2001;344:481-7

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