

Beneficial effects of humidified high flow nasal oxygen in critical care patients: a prospective pilot study.

AIM:

To investigate the effects of high-flow nasal cannula (HFNC) oxygen therapy on respiratory parameters and outcomes in intensive care unit (ICU) patients with acute respiratory failure (ARF).

METHOD:

This prospective, observational study included patients admitted to the ICU for ARF or persistent signs of respiratory distress. All patients were switched from conventional oxygen therapy given via a high fraction of inspired oxygen (FiO₂) nonbreathing facemask (Hudson RCI; Teleflex Medical) to HFNC oxygen therapy given using the Optiflow™ system (Fisher & Paykel Healthcare). All procedures were part of routine clinical care.

Respiratory, haemodynamic and clinical variables were assessed at baseline and at specific times over the first 48 hours after switching to HFNC. Arterial blood gases were measured at baseline and after 1 and 24 hours.

Device noise and patient discomfort were measured throughout HFNC oxygen therapy using a visual numeric scale ranging from 0-10.

RESULTS:

Thirty-eight patients (mean age 54.2 years) were included. The mean Simplified Acute Physiology Score (SAPS II) was 39 ± 10. The three most common causes of ARF were community-acquired pneumonia (n = 15), H1N1 influenza infection (n = 5) and cardiogenic pulmonary oedema (n=5). Mean duration of HFNC therapy was 2.8 ± 1.8 days.

Compared to baseline, switching to HFNC oxygen therapy was associated with statistically significant reductions in respiratory rate (p = 0.009) and pulse oximetry (p <0.005) after 15 min, and in dyspnoea score, supraclavicular retraction and thoracoabdominal asynchrony after 30 min (all p < 0.05). Statistically significant reductions in heart rate were seen 6 hours after switching to HFNC.

Changes in arterial blood gases are reported in the following table.

MEAN ± SD	BASELINE	HFNC OXYGEN THERAPY		P VALUE
		1h	24h	
PaO ₂ (mm Hg)	141 ± 106	95 ± 40		0.009
PaO ₂ /FiO ₂ ratio	169 ± 108	187 ± 86	102 ± 23	0.036
PaCO ₂ (mm Hg)	38 ± 11	37 ± 11	38 ± 10	0.77
pH	7.43 ± 0.09	7.44 ± 0.07	7.41 ± 0.07	0.87

FiO₂ = fraction of inspired oxygen; PaO₂ = partial pressure of oxygen; PaCO₂ = partial pressure of carbon dioxide; SD = standard deviation.

There was no change in noise or nasal discomfort scores from the beginning to the end of the study.

No patient discontinued NFHC oxygen therapy because of intolerance. Secondary intubation and mechanical ventilation was required in 9 patients. Significant predictors of intubation were no decrease in respiratory rate, a high level of thoracoabdominal asynchrony, and lower SpO₂, PaO₂ and PaO₂/FiO₂ ratio after initiation of HFNC oxygen therapy.

DISCUSSION:

HFNC oxygen therapy is widely used in neonates, but fewer data are available on its usefulness in adults. Data from this prospective trial confirm that HFNC is well tolerated in adults, and is associated with early, sustained and beneficial effects on oxygenation and clinical parameters. In addition, predictors that may assist in identifying patients who are most likely to require intubation were identified. The results indicated that non-invasive ventilation, or intubation and mechanical ventilation, might be avoided in more than 75% of patients receiving HFNC. This pilot study provides sufficient rationale to justify conducting a randomized controlled clinical trial to investigate the potential of HFNC oxygen therapy to reduce the intubation rate in patients with hypoxaemic ARF.

CONCLUSION:

HFNC oxygen therapy had a beneficial effect on oxygenation and clinical outcomes in patients with ARF in the ICU.

KEY POINTS:

- HFNC oxygen therapy is associated with early and sustained beneficial effects on clinical respiratory parameters in patients with acute respiratory failure.
- HFNC oxygen therapy improves oxygenation in adult ICU patients with acute respiratory failure.
- HFNC oxygen therapy is well tolerated in adult ICU patients with acute respiratory failure.
- HFNC oxygen therapy may be associated with a reduction in the requirement for mechanical ventilation.
- Respiratory rate may be a useful early predictor of HFNC oxygen therapy failure.

inScience Communications

© 2012 Fisher & Paykel Healthcare Ltd. Independently written by inScience Communications, Springer International Publishing AG, on behalf of Fisher & Paykel Healthcare Ltd. All rights reserved. No part of this publication may be reproduced by any process in any language without written consent of the copyright holder. Although great care has been taken to ensure that the information in this publication is accurate, neither inScience nor Fisher & Paykel Healthcare shall be held responsible or in any way liable for the continued accuracy of the information, or for any errors, omissions or inaccuracies, or for any consequences arising therefrom.

© 2020 Fisher & Paykel Healthcare Limited