Rescue Therapy by Switching to Total Face Mask After Failure of Face Mask-Delivered Noninvasive Ventilation in Do-Not-Intubate Patients in Acute Respiratory Failure*

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Abstract

Objective:

To evaluate the impact of switching to total face mask in cases where face mask-delivered noninvasive mechanical ventilation has already failed in do-not-intubate patients in acute respiratory failure.

Design and Setting:

Prospective observational study in an ICU and a respiratory stepdown unit over a 12-month study period.

Intervention:

Switching to total face mask, which covers the entire face, when noninvasive mechanical ventilation using facial mask (oronasal mask) failed to reverse acute respiratory failure.

Patients:

Seventy-four patients with a do-not-intubate order and treated by noninvasive mechanical ventilation for acute respiratory failure.

Main Results:

Failure of face mask-delivered noninvasive mechanical ventilation was associated with a three-fold increase in in-hospital mortality (36% vs. 10.5%; $p = 0.009$). Nevertheless, 23 out of 36 patients (64%) in whom face mask-delivered noninvasive mechanical ventilation failed to reverse acute respiratory failure and, therefore, switched to total face mask survived hospital discharge. Reasons for switching from facial mask to total face mask included refractory hypercapnic acute respiratory failure ($n = 24$, 66.7%), painful skin breakdown or facial mask intolerance ($n = 11$, 30%), and refractory hypoxemia ($n = 1$, 2.7%). In the 24 patients switched from facial mask to total face mask because of refractory hypercapnia, encephalopathy score (3 [3–4] vs. 2 [2–3]; $p < 0.0001$), $PaCO_2$ (87 ± 25 mm Hg vs. 70 ± 17 mm Hg; $p < 0.0001$), and pH (7.24 ± 0.1 vs. 7.32 ± 0.09; $p < 0.0001$) significantly improved after 2 hrs of total face mask-delivered noninvasive ventilation. Patients switched early to total face mask (in the first 12 hrs) developed less pressure sores ($n = 5$, 24% vs. $n = 13$, 87%; $p = 0.0002$), despite greater length of noninvasive mechanical ventilation within the first 48 hrs (44 hrs vs. 34 hrs; $p = 0.05$) and less protective dressings ($n = 2$, 9.5% vs. $n = 8$, 53.3%; $p = 0.007$). The optimal cutoff value for face mask-delivered noninvasive mechanical ventilation duration in predicting facial pressure sores was 11 hrs (area under the receiver operating characteristic curve, 0.86 ± 0.04; 95% confidence interval 0.76–0.93; $p < 0.0001$; sensitivity, 84%; specificity, 71%).

Conclusion:

In patients in hypercapnic acute respiratory failure, for whom escalation to intubation is deemed inappropriate, switching to total face mask can be proposed as a last resort therapy when face mask-delivered noninvasive mechanical ventilation has already failed to reverse acute respiratory failure. This strategy is particularly adapted to provide prolonged periods of continuous noninvasive mechanical ventilation while preventing facial pressure sores.