

Testing Respiratory Function and Mechanics

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THE OXYGEN CONCENTRATIONS DELIVERED BY DIFFERENT OXYGEN THERAPY SYSTEMS

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PURPOSE: To test the oxygen concentrations delivered by some of the available oxygen therapy systems in normal subjects.

METHODS: Two different groups of ten healthy volunteers participated in two parts of this study. Nasal cannula (NC) O₂ delivery was tested in the first group Simple masks (SM) and non-rebreathing (NRB) masks were tested in the second group. Each subject had a # 8 French nasal catheter inserted through a nare with the tip positioned immediately behind the uvula. The nasal catheter's proximal end was connected to a syringe stopcock "T" piece system with the oxygen analyzer in line. Oxygen was administered via the high flow NC (model ref 1600, Salter Labs, Alvin, Ca) at flows 6-15 L/min. For the SM (Hudson RCI, Temecula, Ca), oxygen was administered at 6-12 L/min, and for the NRB mask (Hudson RCI, Temecula, Ca), the flow was 6-15 L/min. At each different oxygen flow the subject breathed normally for five minutes. Using the oxygen sampling system, three gas samples (60 mL each) were withdrawn from the pharynx during inspiration and directed to the oxygen analyzer. The average FiO₂ delivered was recorded for each one of the oxygen flows administered with the different systems.

RESULTS: Table 1 shows the means \pm SD for each device. Figure 1 shows the comparison between the different devices.

CONCLUSION: The HFNC was able to provide higher mean FiO₂ than the SM at flows of 6-10 L/min; at 12 L/min the delivered FiO₂ was equal. HFNC compared to NRB mask delivered equal mean FiO₂ at flows 8-15 L/min, and was superior at 6 L/min. Both masks will deliver less variable FiO₂ than HFNC.

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CLINICAL IMPLICATIONS: If needed, HFNC can deliver similar FiO₂ than NRB mask. Medical personnel should be aware of the high FiO₂ variability this system may deliver. When switching from HFNC to SM, a higher O₂ flow should be selected to achieve similar delivered FiO₂. The simple rule for estimating delivered FiO₂ with different oxygen systems is not accurate.

Table 1

O ₂ flow (L/min)	Nasal cannula FiO ₂ % (mean ± SD)	Range FiO ₂ %	Simple Mask FiO ₂ % (mean ± SD)	Range FiO ₂ %	Non-rebreather FiO ₂ % (mean ± SD)	Range FiO ₂ %	Predicted FiO ₂ %
6	54 ± 13	35-89	43 ± 2.6	38-47	45 ± 2.9	40-49	45
8	58 ± 14	33-87	41 ± 2.6	37-47	57 ± 4.6	51-65	53
10	66 ± 13	40-88	57 ± 3	52-63	68 ± 2.3	64-71	61
12	69 ± 13	37-93	69 ± 3.3	64-74	68 ± 2.7	64-73	69
15	75 ± 13	39-98	Not tested		74 ± 2.4	68-77	77

DISCLOSURE: Juan Garcia, None.

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