Comparison of Nasal Catheter and Nasal Cannula in Patients Recovering from General Anesthesia

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Arterial hypoxemia is a frequent occurrence in the immediate postoperative period.[1, 2] For this reason many patients are given supplemental oxygen after operation. A common method of delivering oxygen is with a catheter placed through one nostril and extended into the oropharynx. An alternative method is the use of a nasal cannula with a short prong in each nostril. Comparisons of these two methods have been made in healthy volunteers[3] and in patients with chronic pulmonary disease.[4, 5] These studies have indicated that oxygenation is nearly the same with either device, even in the patient who breathes primarily through his mouth.

We have compared these two methods in a group of postsurgical patients. Sixteen patients were selected at random for study during the immediate postoperative period. Each patient received O_2 by both a catheter and a cannula. In half of the patients the catheter was placed first, and in the other half the cannula was placed first. Eight patients received O_2 at a 6 l/min flow and eight received O_2 at a 3 l/min flow. Blood was drawn through an arterial cannula into a heparinized syringe after 15 to 20 minutes of breathing room air. Two subsequent samples of arterial blood were obtained from each patient, one drawn after 15 to 20 minutes of oxygen administration via the catheter and the other after 15 to 20 minutes of oxygen administration via the cannula. The samples were immediately iced. Oxygen tension was measured with a Clark electrode within two hours of collection.

The results are summarized in table 1. A majority of patients did have low arterial oxygen tensions when breathing air in the immediate postoperative period. The average Pa_{O_2} during breathing of room air was 66 mm Hg. Oxygen delivered by either method with both flow rates uniformly improved oxygen tension. With the 6 l/min O_2 flow via catheter, the average Pa_{O_2} was 120 mm Hg while the cannula resulted in an average Pa_{O_2} of 115 mm Hg. The averages with the 3 l/min O_2 flow were 112 mm Hg with the catheter and 101 mm Hg with the cannula. Pa_{O_2} values of less than 78 mm Hg were seen in three patients with both the cannula and the catheter at the 3 l/min flow level. Breathing primarily through the mouth had little effect on Pa_{O_2}.

The nasal cannula offers several advantages over the nasal catheters. There is less discomfort in the placement. The use of the cannula has not produced gastric distention

TABLE 1. Comparative Blood-Gas Values with the Nasal Catheter and the Nasal Cannula

Patient	Air	Pa_{O_2} (mm Hg)	
		6 l/min O_2 Catheter	6 l/min O_2 Cannula
1	53	119	80
* 2	80	205	170
3	54	91	78
* 4	61	97	128
5	72	123	110
6	65	150	77
* 7	78	101	113
8	90	138	147
MEAN	69.0	128.0	115.0
	Air	Pa_{O_2} (mm Hg)	
		3 l/min O_2 Catheter	3 l/min O_2 Cannula
9	76	103	99
10	68	93	86
11	70	189	169
* 12	72	152	113
* 13	70	160	147
* 14	48	56	54
15	48	76	70
* 16	51	70	66
MEAN	63	112	101

* Mouth breathers.

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or mediastinal emphysema, which may occur with the catheter. It is probable that a better-humidified oxygen mixture is delivered to the lungs with the cannula, because a greater portion of the natural humidifying mechanisms of the upper airway is bypassed with catheters.

We found a slightly higher Pa_{O_2} with the catheter than with the cannula. Both, however, gave adequate Pa_{O_2} values (> 78 mm Hg) with a 6 l/min flow. With a 3 l/min flow, there were a few low Pa_{O_2} measurements (50–70 mm Hg) with both the catheter and the cannula. The nasal cannula, therefore, compares favorably with the nasal catheter as a means of oxygenating patients in the post-operative period. Comfort and convenience recommend the cannula in preference to the catheter.

REFERENCES

1. Marshall, B. E., and Millar, R. A.: Some factors influencing postoperative hypoxemia, Anesthesia 20: 408, 1965.
2. Nunn, J. F., and Payne, J. P.: Hypoxemia after general anesthesia, Lancet II: 631, 1962.
3. Kory, R. C., Bergman, J. C., Sweet, R. D., and Smith, J. R.: Comparative evaluation of oxygen therapy techniques, J.A.M.A. 179: 767, 1962.
4. Cherniack, R., and Hakimpour, K.: The rational use of oxygen in respiratory insufficiency, J.A.M.A. 199: 178, 1967.
5. Cullen, J., and Kaemmerlen, J. T.: Effect of oxygen administration at low rates of flow in hypercapnic patients, Amer. Rev. Resp. Dis. 95: 116, 1967.

A New Laryngoscope Blade Designed to Facilitate Difficult Endotracheal Intubation

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Difficulty with exposure of the glottis in the patient with large, protruding upper incisor teeth who also has a receding lower jaw stimulated a search for an improved laryngoscope blade design. Occasionally it is impossible to elevate the epiglottis in these patients with the conventional straight blade because the upper incisor teeth act as a fulcrum which, together with the limiting element of the receding lower jaw, forces the tip of the blade to make an acute angle with the posterior pharyngeal wall (fig. 1).† Persistence in attempts to elevate the epiglottis in this situation frequently results in damage to the upper incisor teeth because of pressure exerted at the fulcrum point of the straight blade.

It was believed that a blade designed to eliminate contact with the upper incisor teeth and also to have its theoretical fulcrum at a lower point within the pharynx might simplify elevation of the epiglottis and exposure of the larynx. With this in mind, a new type of laryngoscope blade was developed (figs. 1 and 2).

The blade has two right-angle bends which place the functional portion at a point within the oropharynx while the proximal part need not come in contact with the teeth. Once the glottis is exposed it is necessary to insert the endotracheal tube from the right side of the mouth since the same conditions which prevent exposure of the glottis with a straight blade also prevent the endotracheal tube from being inserted in the midline of the mouth. It may be necessary to prop the mouth open with a bite block and retract the lateral angle of the mouth so as to gain full direct vision of the larynx.

This blade has been used in 12 patients in whom intubation was difficult; in two of these it was impossible to expose the cords with any of the currently available straight blades. Additional experience was gained by using this blade merely to prevent damage to loose or capped teeth. In a few patients in whom

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† The Orr laryngoscope blade is manufactured by Foregger Hospital Equipment, 680 Old Willets Path, Smithtown, N. Y. 11787.