Methods of Oxygen Delivery During Upper Gastrointestinal Endoscopy

T. J. Borody
Centre for Digestive Diseases, Sydney, Australia

Many patients become significantly hypoxic during gastrointestinal endoscopic procedures (1–4). Since cardiopulmonary complications account for more than half of the deaths associated with upper endoscopic procedures (4–12), and cardiac arrhythmias occur more frequently during hypoxic episodes (13–18), theoretically at least, optimization of arterial oxygen saturation coupled with adequate monitoring ought to minimize the risk of cardiopulmonary deaths (19). To achieve this, various methods have been put forward to minimize hypoxia. These include: 1) minimizing or avoiding sedative drugs; 2) avoiding combinations of opioids and benzodiazepines; 3) using smaller-diameter instruments to reduce upper airway obstruction; 4) ensuring that "high-risk" patients only receive endoscopic treatment from an experienced endoscopist (20,21). Although such methods do have their merits, and should be applied whenever possible since they constitute good clinical practice, supplemental oxygenation during endoscopy has exerted by far the greatest impact on the reduction of the incidence of hypoxia in gastrointestinal endoscopy.

Duncan Bell and his group from Ipswich were among the first to demonstrate, in 1987, that oxygen desaturation during upper gastrointestinal endoscopy could be largely prevented by supplemental oxygenation, even at a flow rate of 2 l/min (22). These findings have now been amply confirmed (13,23–25), and there is little doubt that supplemental oxygen should be used at least in high-risk patients, whose oxygenation level should also be monitored by a pulse oximeter (26). What, then, is the best method of delivering oxygen to the sedated patient undergoing upper gastrointestinal endoscopy?

Much of the work in gaining a solution to this question has again been carried out by Bell's group, who examined the contribution of nasal and oral breathing during endoscopy. Using the oral thermistor technique, they showed that the majority of patients breathe through the mouth rather than the nose as soon as the endoscope is passed into the esophagus (27). However, when examining in practice the importance of oral versus nasal oxygen delivery, Bell et al. (28) could show no significant advantage of oxygenating via the oral route. Bell's group then developed a modified endoscopy mouthpiece (bite-guard), which provided side holes for oral oxygenation, and with this instrument they demonstrated marginally improved oxygenation when compared with nasal oxygen delivery (19).

In the present issue of the journal, Hebbard et al. examine the question of the relative importance of the nose versus the mouth for oxygen delivery during endoscopy by using a methodology different from that of Bell (28). In Hebbard's trial, oxygen was delivered either via nasal prongs or a pharyngeal catheter, thus eliminating, as far as possible, the effect of mouth breating. They conclude that, "despite any propensity of patients to mouth breathe during endoscopy, there may be no advantage in terms of maintenance of a safe arterial oxygen saturation to methods of oxygen delivery that rely on mouth rather than nose breathing". Although this effect may indeed be partially attributable to preoxygenation, it is clear that, even at low oxygen flow, nasal cannulas can usually deliver sufficient oxygen to prevent hypoxia (28).

It would appear that use of either oral or nasal delivery of oxygen achieves equivalent oxygenation during upper gastrointestianl endoscopy. The recently described endoscopic mouthpiece capable of simultaneously delivering oxygen both nasally and orally (29) combines both routes of delivery, and might be seen to settle any arguments as to the optimal route of oxygen delivery, especially since oxygenation becomes part of normal routine with the insertion of the mouthpiece (30). The ultimate choice of either nasal cannulas or the oxygenating mouthpiece will depend on practical issues, such as cost and ease of usage.

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Endoscopy 1994; 26: 320–321

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Corresponding Author
T. J. Borody, M.D.
Centre for Digestive Diseases
144 Great North Road
Five Dock, N.S.W. 2046
Australia