Oxygen desaturation during endoscopy in the elderly

ABSTRACT—Arterial oxygen desaturation during oesophago-gastro duodenoscopy (OGD) is well recognised. It has been suggested that severe desaturation (greater than 7%) may predispose patients with cardiopulmonary disease and the elderly to cardiac arrhythmias. During OGD, of 106 elderly patients 26 developed ventricular and/or supraventricular ectopics, but these were not related to the degree of oxygen desaturation induced in this study. Apart from one episode of vasovagal syncope, which responded to intravenous atropine, no serious arrhythmias were recorded. Arterial oxygen desaturation during OGD was easily preventable with oxygen administration via nasal cannulae and was not associated with any adverse haemodynamic effects. Continuous cardiac and oxygen saturation monitoring should be routine practice in order to identify such problems.

Arterial oxygen desaturation during oesophago-gastro duodenoscopy (OGD) has been well documented and is believed to be due to the combination of partial upper airway obstruction by the gastroscope and respiratory depression induced with sedatives [1–7]. Periods of maximum oxygen desaturation tend to be associated with cardiac ischaemia and arrhythmias, especially in patients with cardiopulmonary disease and in the elderly who are considered to be at special risk [7–10]. The administration of oxygen via nasal cannulae during OGD has been shown to prevent oxygen desaturation and is recommended in patients with the above risk factors [10]. This study examined the cardiovascular effects and significance of oxygen desaturation during OGD in elderly subjects and the role of prophylactic oxygen administration.

Patients and method

In this study 114 consecutive elderly patients aged 65 and over undergoing elective diagnostic OGD were invited to take part. The study was approved by the local ethical committee and all patients gave informed written consent. The following data were recorded on a standard proforma (copy available on request): age, sex, past medical history, indication for OGD, findings, full blood count, urea and electrolytes. OGD was performed by AKB in an endoscopy suite using an Olympus GIF.XQ 20 flexible gastroscope, with the patients in the left lateral position.

All patients had their pharynx sprayed with lignocaine and were sedated with diazepam (Diazemuls Kabi-Vitrum, mean dose 6 mg, range 4–8) given as a slow intravenous injection over 2 min. At baseline, during, at extubation and 5 min after OGD, the following measurements were performed: blood pressure using a Dinamap; oxygen saturation in the right earlobe using an Ohmed Biox 3700e ear oximeter; and cardiac rhythm recorded from a Kotron Minimon 7131 ECG monitor connected to three chest leads. Using a table of random numbers, half the patients were given 2 l/min of oxygen via nasal cannulae throughout the procedure and 5 min into the recovery period; the others were left as control air group. Three patients were excluded because of repeated intubation, and another five because intubation was unsuccessful due to oesophageal stenosis.

Statistical analysis

Student's t tests for paired and unpaired observations were used to compare differences within and between the two groups. Categorical variables were compared by Chi-squared where appropriate. Results are given as means (standard deviation) unless otherwise stated.

Results

One hundred and six patients (33 men, 73 women: mean age 79 years, range 68 to 91) completed the study. The procedure was well tolerated without major complications despite the advanced age of the patients: 19 (18%) were between 65–74, 63 (60%) between 75–84, and 24 (22%) aged 85 and over. Apart from age, additional 'risk factors' identified were history of ischaemic heart disease in 25 (24%), chronic bronchitis 9 (8%), anaemia (Hb < 10gm/dl) 19 (18%) and cerebrovascular disease 10 (9%). The two randomised groups were similar in age, sex distribution, history of risk factors and vital signs at baseline (Table 1).

Oxygen saturation

Administration of 2 l/min of oxygen significantly increased the patients' mean oxygen saturation by

S. A. SOLOMON, MRCP(UK)
Senior Registrar, Department of Cardiology, Wythenshawe Hospital, Manchester
T. ISAAC, MRCGP, *Clinical Assistant*
Arup K. BANERJEE, FRCP
Consultant Physician, Department of Medicine for the Elderly, Bolton General Hospital

Table 1. Comparability of randomised groups. IHD = ischaemic heart disease, COPD = chronic obstructive airways disease

Characteristics	Oxygen group ($n = 58$)	Air group ($n = 48$)
Mean age years (range)	80 (68–91)	78 (70–91)
Sex (male/female)	17/41	16/32
Blood pressure (mm Hg)	166/89	158/86
Pulse (bpm)	86	87
Haemoglobin (SD) gm/dl	11.8 (2.3)	11.3 (2.3)
Haematocrit (SD) %	35.6 (9.5)	35.7 (11.5)
Oxygen saturation (range) %	91.6 (79–98)	92.8 (82–97)
Diazemuls mg (range)	6.0 (4–8)	6.3 (5–8)
Medical history 'risk factors' (%)		
IHD/heart failure	15 (26)	10 (21)
COPD	3 (5)	6 (13)
Stroke/Parkinson's disease	6 (10)	4 (8)
Anaemia (Hb<10gm/dl)	9 (16)	10 (21)

2.5% (95% confidence interval (CI) 1.1 to 3.9%; $p < 0.001$) from baseline. This was maintained throughout the examination despite slight dips after sedation and during OGD (Table 2). In contrast, in the group on air only arterial desaturation occurred at all stages of the procedure with the maximum drop of –3% (95% CI –1.5 to –4.5; $p < 0.001$) during OGD. The changes in oxygen saturation from baseline were significantly different between the two groups at all stages during the examination (Table 2). Five minutes after extubation, the mean oxygen saturation in the control air group still had not returned to baseline and was significantly lower compared to the group ($p < 0.001$) who received oxygen for 5 min into the recovery period.

Blood pressure, heart rate and arrhythmias

No significant changes were observed in blood pressure and heart rate during OGD in the two groups. The insignificant transient increase in heart rate in the air group during OGD was not observed in the oxygen group. At baseline, 8 (7.5%) patients were observed to have supraventricular and/or ventricular ectopics. This increased to 34 (32%) during OGD and resolved spontaneously after the procedure. No significant differences were noted between the two groups or in those with or without risk factors (Table 3).

During OGD, one patient with hiatus hernia in the air group developed profound bradycardia and hypotension which responded to atropine and was not associated with hypoxia. No other serious arrhythmias or prolonged periods of cardiac ischaemia were recorded.

Clinical findings

Investigation of iron deficiency anaemia, gastrointestinal bleeding and dyspepsia were the main reasons for

Table 2. Changes in oxygen saturation. Unpaired t test compared changes from baseline between groups: + $p > 0.1$, * $p < 0.001$.

	Oxygen group ($n = 58$) mean (sd) range	Air group ($n = 48$) mean (sd) range	Differences between groups (95% CI)
Baseline	91.6(3.9)79–98	92.8(3.1)82–97	–1.2(–2.6 to 0.2) +
On oxygen	94.1(3.6)81–98		2.5(1.1 to 3.9)*
After sedation	93.5(4.6)73–100	91.3(3.6)81–98	3.4(1.8 to 4.9)*
During OGD	92.2(4.2)82–99	89.8(4.1)78–97	3.6(1.9 to 5.3)*
At extubation	93.1(4.4)80–100	90.6(4.3)79–98	3.7(2.0 to 5.4)*
After 5 min	93.9(3.9)79–100	90.6(4.3)77–100	4.5(2.9 to 6.1)*

Table 3. Arrhythmias recorded. No risk factors noted. Oxygen saturation 97% during syncope*

Arrhythmia	Oxygen group ($n = 17$) Baseline	During OGD	Air group ($n = 18$) Baseline	During OGD
Supraventricular ectopics	0	2	1	5
Ventricular ectopics	5	10	2	9
Vasovagal syncope		0		*1
Total		12		15
Patients with risk factor(s)	9(53%)		11(61%)	
Patients without risk factors	8(47%)		7(39%)	

Table 4. Indications for oesophago-gastro duodenoscopy and findings

	Oxygen group ($n = 58$)	Air group ($n = 48$)
Indications for OGD (%)		
Anaemia+/−gastrointestinal bleed	26(45)	26(54)
Dyspepsia+/−weight loss	32(55)	22(46)
Findings		
Peptic ulcer	7(12)	7(15)
Gastric erosions+/−duodenitis	16(28)	17(35)
Oesophagitis+/−hiatus hernia	14(24)	13(27)
Malignancy	3(5)	0
Normal	17(29)	10(21)

performing OGD in the majority of patients. Diagnoses which influenced management were found in 75% of patients, while no abnormalities were recorded in 25% of patients (Table 4).

Discussion

Oxygen (2 l/min) administered via nasal cannulae prevents arterial oxygen desaturation during OGD in younger subjects [10].

The absence of serious arrhythmias in our study is similar to the findings in middle-aged subjects [3,11] and the elderly [4,12]. In studies where periods of maximum arterial desaturation during OGD [3,4,8] or bronchoscopy [13] have been associated with cardiac arrhythmias, none were life-threatening, even in patients with moderate to severe COPD [8] or history of cardiac disease [11,13]. In contrast, Lieberman *et al* found serious arrhythmias, including one case of ventricular tachycardia, five cases of supraventricular tachycardia and one of atrial fibrillation in 146 patients. These were more likely to develop in patients who had a history of cardiac disease, poor tolerance of the procedure and oxygen desaturation greater than 7% during OGD [7]. There was no indication in that study whether or not these arrhythmias were sustained and required treatment. In this study the absence of severe oxygen desaturation and serious arrhythmias in both groups may be related to the small dose of diazepam sedation (mean 6 mg, range 4–8), the short duration of OGD (mean 7 min, range 4–15), the experience of the endoscopists and the relatively small diameter of the scope (9.8 mm)—factors well documented to influence oxygen desaturation during OGD [1,5–7,14].

Conclusion

This study confirms the high diagnostic yield and the safety of OGD in elderly subjects if recommended standards for sedation and monitoring are followed [15]. Although some arterial desaturation occurred during OGD, it was easily preventable by oxygen administration and did not seem to have any adverse haemodynamic effects. Whether more dangerous arrhythmias could be prevented by oxygen administration would only be demonstrated if continuous cardiac and oxygen saturation monitoring became standard practice during OGD in all patients.

Acknowledgements

Technical assistance from the nursing and theatre staff of the endoscopy suite, Bolton General Hospital, and statistical advice from Mr S. Fox are gratefully acknowledged.

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Address for correspondence: Dr S. A. Solomon, Department of Cardiology, Wythenshawe Hospital, Southmoor Road, Manchester M23 9LT.