Pulse oximetry monitoring during non-sedated upper gastrointestinal endoscopy

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Summary

Fifty consecutive patients judged fit for non-sedated upper gastrointestinal endoscopy were monitored by pulse oximetry before, during and after the procedure. Transient hypoxia developed during intubation in five subjects (10%) but treatment was not required nor was the test halted. Only one patient with pre-existing respiratory problems became hypoxaemic to the extent that oxygen had to be given and the procedure halted. The chance of hypoxia was unrelated to age, sex, smoking, anxiety, or the duration of intubation. Routine pulse oximetry is not necessary for non-sedated gastroscopy but oximetry monitoring may be important in selected cases.

Keywords: pulse oximetry, gastrointestinal endoscopy, sedation

Upper gastrointestinal endoscopy is generally perceived to be a safe diagnostic investigation. However, procedure-related deaths may occur in up to 1 in 2500 cases.^{1,2} In the UK, the majority of tests are carried out using so-called conscious sedation, where the patient is usually given an intravenous benzodiazepine. This group of drugs can cause hypotension and respiratory depression, and the risk of hypoxia is further increased if the investigation is prolonged or if larger diameter endoscopes are used.³ It is possible to carry out upper gastrointestinal endoscopy without sedation⁴ and many patients find this acceptable.⁵ An increasing number of units are performing routine non-sedated diagnostic gastroscopy, but the risk of hypoxia in such patients has not been investigated. We therefore decided to carry out a prospective study of the usefulness of pulse oximetry monitoring during upper gastrointestinal endoscopy in patients who did not receive sedation.

Patients and methods

Fifty consecutive patients were studied. Thirty four of these were referred from the hospital out-patient clinics and 16 as part of a direct-access gastroscopy service provided to local general practitioners. All were judged fit for non-sedated endoscopy on the basis of prior clinical assessment or information derived from a standard direct-access protocol form.

The study group comprised 28 men and 22 women with a mean age of 54 years (range 25–77).

After informed consent for the investigation had been obtained, a questionnaire was completed relating to previous cardiorespiratory disease and smoking habits. Each patient was asked to indicate his or her anxiety about the test on a 10-cm visual analogue scale⁶ graded from 'not worried' on the left to 'terrified' on the right and scored from the left-hand end.

A pulse oximetry transducer was then attached to the patient's right middle finger, and three recordings taken at one-minute intervals. Ten metered 10-mg aerosol doses of lignocaine (total 100 mg) were sprayed into the mouth and pharynx and the subject asked to gargle for one minute, after which a further oximetry reading was taken and the anaesthetic swallowed. Eight further 10-mg metered doses (total 80 mg) were given, retained in the mouth for another minute, swallowed and another oxygen saturation reading noted.

The upper gastrointestinal endoscopy was then performed in a standard fashion by one of two experienced endoscopists. The total time of intubation was recorded as was the lowest oxygen saturation measured during the procedure.

After completion of the test, three further oximetry recordings were taken at one-minute intervals during recovery.

Results

All 50 patients had pre-test oxygen saturations in the range 91–99% while breathing room air. The pharyngeal lignocaine spray produced no appreciable fall in any subject, and there was no consistent pattern to the minimal changes in the oximeter readings that occurred during this phase of the study.

Six patients (12%) developed significant oxygen desaturation during the test, with oximeter readings between 84–89%, but in five of these cases (four women and one man) this was a transient finding during intubation and rapidly recovered to within the normal acceptable range without treatment while the endoscopy was continued. In one man with a past history of ankylosing spondylitis and chronic obstructive airways disease, a more prolonged hypoxic episode with a lowest saturation reading of 85% necessitated termination of the investigation and oxygen administration by nasal cannula. The mean

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duration of intubation for the endoscopy was 278 seconds (range 121–685 seconds).

There was no obvious relationship between the duration of intubation and the lowest recorded oxygen saturation, nor was oxygen desaturation particularly likely to develop in elderly patients. The mean overall anxiety score on the visual analogue scale was 42.6 (range 0–96); in men the mean was 30.9 (range 0–84) and in women, 57.8 (range 0–96). The scores for the two sexes were not significantly different at the 5% level when assessed by the Mann–Whitney U-test. Anxiety scores did not correlate with the tendency to become hypoxic during endoscopy.

Twelve of the 50 patients were cigarette smokers. None developed appreciable hypoxia during the endoscopy.

In all 50 subjects the first post-test reading after extubation was more than 90% saturation. No later falls in oxygen saturation were observed.

Discussion

Many of the common hazards of upper gastrointestinal endoscopy are related to hypoxia induced by intravenous sedation. Consequently, non-sedated endoscopy in selected patients has the potential to increase the safety of the procedure. During normal sleep, oxygen saturation may fall by 4% or so without ill effect.⁷ However, when surgical procedures are carried out under sedation, oximetry readings of less than 90% reflect a significant degree of hypoxaemia and usually require treatment.⁸

Although non-sedated diagnostic upper-gastrointestinal endoscopy is becoming more widely used, there have been no studies to date of oximetry monitoring in patients undergoing this type of investigation. We have found that significant hypoxia in patients judged fit for non-sedated investigation is unusual, and most commonly only occurs transiently during intubation. However, in occasional subjects with pre-existing respiratory problems, a clinically important degree of oxygen saturation can develop. The occurrence of hypoxia was not predictable in the study by the patient's

Pulse oximetry in gastrointestinal endoscopy

- pulse oximetry should be available in all endoscopy units
- oximetry monitoring is mandatory in all patients investigated using a 'conscious sedation' technique
- hypoxia is particularly likely to develop during prolonged complex investigations such as endoscopic retrograde cholangiopancreatography; the risks can be reduced by prophylactic oxygen administration
- pulse oximetry is only one aspect of the adequate clinical monitoring of patients during endoscopic procedures. Its principles and limitations should be understood by all medical and nursing staff working in endoscopy units. The technique should be part of a defined protocol for patient care

Learning points

- significant hypoxia is unusual in selected patients undergoing non-sedated upper gastrointestinal endoscopy
- pulse oximetry monitoring may be advisable in patients with pre-existing respiratory disorders

age, perceived anxiety level before the test, duration of the examination, or smoking habits.

While non-sedated gastroscopy seems relatively safe in terms of the avoidance of significant hypoxaemia, and routine monitoring is probably not essential, it seems prudent to advise that oximetry should be used in subjects with any pre-existing documented respiratory disorder. In such patients, the development of hypoxia may be prevented by the elective use of oxygen supplements administered via nasal cannulae.⁹ The most important factors in minimising the risks of non-sedated gastroscopy remain the careful selection of patients for the test and effective observation—both clinical and, where appropriate, oximetric—during the procedure.

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