Short reports

Arterial oxygen saturation during bronchography via the fibroptic bronchoscope

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Bronchography is indicated in the investigation of recurrent or chronic respiratory infection and haemoptysis,¹ and is used to assess the extent and location of suspected or known bronchiectasis.² Use of the fibroptic bronchoscope to introduce contrast medium has the advantages over the conventional nasotracheal catheter of allowing inspection of the airways for any occluding lesion and collection of microbiological specimens or cilia from specific bronchi. Continuous monitoring of arterial oxygen saturation (Sao₂) in patients during bronchoscopy has shown that they may be at risk of desaturation.³ Furthermore, conventional bilateral bronchography via a nasotracheal catheter may cause falls in Sao₂ of up to 15%.⁴ The aim of this study was to measure Sao₂ during bilateral bronchography performed via the fibroptic bronchoscope.

Methods

We studied eight patients undergoing bilateral bronchography. Their mean age was 43 years; three were female. Premedication with 0.6 mg atropine was given one hour before the procedure, and local anaesthesia was achieved

with lignocaine. An Olympus BF type B3 bronchoscope was used to examine the bronchial tree and subsequently 10-20 ml of aqueous propyliodone (Dionosil, Glaxo) was injected via the suction channel with radiographs taken under the supervision of a radiologist. Intensive physiotherapy was performed before and after the procedure.

Sao₂ was measured with an Ohmeda Biox III Ear Oximeter accurate to $\pm 2.5\%$ down to an Sao₂ of 60%. Recordings were made on a Linseis paper writer for one hour before bronchography, during the procedure, and for further three hours afterwards. Baseline Sao₂ was calculated by taking the mean value of estimates of Sao₂ for each minute of the preoperative trace. During the procedure the record was marked on introduction of the bronchoscope through the vocal cords, and on injection of contrast medium into the left and right bronchial tree. The lowest value of Sao₂ reached after each of these interventions (but before the next) was calculated. The duration of the period of desaturation below baseline Sao₂ after completion of the procedure was noted. Patients were studied in the supine posture, except for brief periods during the bronchography when erect films were taken.

Spirometry was performed on each patient, before and one hour after the bronchogram, with a single breath wedge spirometer (Vitalograph) accurate to $\pm 2\%$ at BTPS, the best of three measurements being taken.

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Effect of fibroptic bronchoscopy and bilateral injection of aqueous contrast medium into the bronchial tree on arterial oxygen saturation, measured with an ear oximeter (patient No 1). FOB—fibroptic bronchoscope inserted.

No	Age (y)	Sex	Baseline Sao_2 (%)	Maximum falls in Sao_2 (%) below baseline values			Time (h) to regain baseline Sao_2	FEV_1 after bronchography (% baseline)	FVC after bronchography (% baseline)
				After introduction of bronchoscope	After unilateral contrast	After bilateral contrast			
1	28	F	98	6	30	34	1	58	66
2	40	M	99	8	17	23	3*	39	45
3	43	M	98	2	6	8	2	59	45
4	38	M	96	6	11	14	1	49	64
5	65	F	97	11	8	19	3*	38	42
6	57	M	95	3	9	13	3*	49	55
7	40	F	97	4	12	19	3*	48	49
8	56	M	96	3	8	35	1	42	44

*Desaturated at 3 hours when recordings ceased.

Sao_2 —arterial oxygen saturation; FEV_1 —forced expiratory volume in one second; FVC—forced vital capacity.

Results

The baseline Sao_2 in these patients was 95–99%. Before bronchography the spirometric values in seven of the eight were within the predicted normal range.⁵ Patient 6 had an FEV_1 of 83% predicted and a forced vital capacity (FVC) of 70% predicted. The figure shows a record of Sao_2 for one of the patients; the data for all eight are shown in the table. The fall in Sao_2 after bilateral injection of contrast ranged from 8% to 35%, with a mean (SD) of 20.5% (9.5%). These episodes were brief and Sao_2 improved by 50% of the total fall over a period of 1–10 (mean 4) minutes. The time necessary to regain baseline Sao_2 , however, was more than three hours in four of the patients. Both FEV_1 and FVC dropped to about half of their baseline levels one hour after bronchography. A diagnosis of bronchiectasis was made in patients 1, 3, and 5; the remainder had clinical evidence of chronic bronchial sepsis without bronchiectasis. The effect of the procedure on Sao_2 was similar regardless of diagnosis.

Discussion

We have shown that injection of contrast medium into each side of the bronchial tree has a cumulative effect on Sao_2 . In the eight patients studied unilateral injection caused a mean desaturation of 12.5% and bilateral injection a mean of 20.5%. Motley and Tomashefski⁴ studied 25 patients undergoing bilateral bronchography with an oily contrast medium via a nasotracheal catheter, and found a mean drop in Sao_2 of 8%. We would suggest that our figure of 20.5% desaturation after bronchography via the fiberoptic instrument was due either to the physical presence of the bronchoscope within the bronchi or to a difference in the properties of oily and aqueous contrast media. In this study bronchography resulted in decreases in FEV_1 and FVC by

around 50% one hour after the procedure. Zavod⁶ described a 35% drop in FEV_1 one hour after bilateral bronchography while Christiforidis *et al*⁷ found a drop of 33% in FVC; they both, however, used oily contrast medium injected via nasotracheal catheter.

The average fall in Sao_2 of 20% in our patients with normal baseline levels represents a mean fall in arterial oxygen tension from 12.2 to 5.4 kPa, on the assumption of a normal oxygen dissociation curve and a pH of 7.4.⁸ We therefore recommend that arterial blood gas tensions are measured before this type of bronchography is performed. In the presence of preoperative hypoxaemia the procedure is contraindicated and a limited approach should be considered. Those submitted to the full procedure should receive continuous oxygen treatment.

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