

PublisherInfo		
PublisherName	:	BioMed Central
PublisherLocation	:	London
PublisherImprintName	:	BioMed Central

## High perioperative FiO<sub>2</sub> and absorption atelectasis

ArticleInfo		
ArticleID	:	4164
ArticleDOI	:	10.1186/ccf-1999-2222
ArticleCitationID	:	2222
ArticleSequenceNumber	:	23
ArticleCategory	:	Paper Report
ArticleFirstPage	:	1
ArticleLastPage	:	4
ArticleHistory	:	RegistrationDate : 1999-11-16 OnlineDate : 1999-11-16
ArticleCopyright	:	Current Science Ltd1999
ArticleGrants	:	
ArticleContext	:	1305422

## Keywords

Anesthesia, pulmonary function, pulmonary shunt, radiology, surgery

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## Comments

This is an interesting paper for anaesthetists and also has importance for those looking after postoperative patients in the ICU or HDU. The important points are that 80% oxygen was used and not 100%, which may have a bearing on the results. It suggests that absorption atelectasis is a short-term problem after administration of high levels of perioperative  $FiO_2$ ; however, how these data can be extrapolated to the first 24 or 48 h following surgery, especially in an immobile and/or ventilated patient, is worthy of further investigation.

## Introduction

Brief periods of inhalation of high concentration oxygen causes atelectasis and has been thought to be an important part of postoperative morbidity. Conversely, high inspired oxygen ( $FiO_2$ ) may be beneficial in allowing a safety margin for anaesthesia, improving wound healing and being anti-emetic.

## Aims

To test the hypothesis that atelectasis and pulmonary dysfunction on the first postoperative day are comparable in patients receiving either 30% or 80%  $FiO_2$  during and for 2 h following colon resection.

## Methods

Thirty patients undergoing colonic resection were studied. These patients were amongst 500 participating in the multicentre Study of Oxygen and Surgical Wound Infection. Anaesthesia was induced following preoxygenation and maintained with isoflurane in nitrogen (not nitrous oxide) to

achieve the desired  $\text{FiO}_2$ . Standard ventilation parameters were used and the  $\text{FiO}_2$  maintained for 2 h postoperatively unless the oxygen saturation fell below 92% (at which point supplementary oxygen was given). Arterial blood gases were taken 1 h after induction of anaesthesia, and after 2 h in recovery. Chest radiographs (CXR) were taken preoperatively and on postoperative day one before mobilisation; these were graded 1 to 5 for atelectasis. Computer tomography scans were performed on postoperative day one, and the data from them were expressed as a percentage area that was atelectatic. Spirometry was performed, and demographic and pain score data were recorded.

## Results

Atelectasis was not identified on any preoperative CXR, in 36% of those receiving 30% oxygen, and in 44% receiving 80%. Mean CXR severity values were similar in the two groups. Spirometric values showed a decrease of around 50% but were similar in each group. CT scans showed similar areas of atelectasis and poorly aerated lung. There was poor correlation between the alveolar-arterial (A-a) oxygen difference and the amount of atelectasis on CT.

## Discussion

Postoperative atelectasis is multifactorial and a function of anaesthetic and surgical factors. One of the strategies used to limit atelectasis, positive end expiratory pressure (PEEP), has been shown to be useful, but atelectasis occurs as soon as PEEP is removed. High  $\text{FiO}_2$  has been shown to produce atelectasis but presumably the effect is short lived. The two groups were equally matched even before mobilisation or physiotherapy. Using A-a difference as a marker of shunt, there was a slightly increased value on postoperative day one. However, the magnitude of this was unlikely to be clinically important, and there were no differences between the two groups. Whilst no detrimental effects were seen in this study with 80% oxygen, 100%  $\text{FiO}_2$  may have worse effects due to direct pulmonary toxicity. In summary, lung volumes, atelectasis and alveolar gas exchange were comparable in patients given 30% or 80% oxygen during, and for 2 h after, colonic resection. This suggests that patients who may benefit from a higher  $\text{FiO}_2$  should not be denied it due to worries about atelectasis.

## References

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