From the authors:

We thank P.S. Santos and co-workers for their interest in our study [1], and appreciate the opportunity given to us to further discuss our data.

First, we fully agree that fibre-optic bronchoscopy with bronchoalveolar lavage (FB-BAL) carries the risk of worsening hypoxaemia. This is precisely why we thought to investigate the potential for high-flow nasal cannula (HFNC) oxygen in this specific context. Its mechanisms of action have been discussed [2]: the high flow rates generate a mild positive expiratory pressure, with a high inspiratory oxygen fraction (F_{IO_2}). In hypoxaemic respiratory failure, its use improved intensive care unit (ICU) and day 90 survival rate in comparison to low-flow oxygen therapy or combined with noninvasive ventilation (NIV) [3]. We therefore considered HFNC as an interesting tool to ensure procedure safety.

Second, P.S. Santos and co-workers underline the severity of the subjects included in our study in terms of hypoxaemia, with a median arterial oxygen tension (P_{aO_2}) of 68 (57–90) mmHg in the failure group. However, these were baseline values. When the procedure was actually performed, all patients had a pulse oximetry of >92% under HFNC, in line with published guidelines [4]. In addition, it is our experience to use HFNC in very hypoxaemic patients, such as those with acute respiratory distress syndrome patients [5] in whom median P_{aO_2}/F_{IO_2} was of 137 (88.5–208.5) mmHg. Furthermore, these levels of hypoxaemia, when related to the administered F_{IO_2}, compare fairly to the P_{aO_2}/F_{IO_2} ratios reported by Maitre *et al.* [6] and Cracco *et al.* [7] in ICU hypoxaemic patients requiring FB-BAL. Finally, although baseline P_{aO_2} and P_{aO_2}/F_{IO_2} were lower in the procedure failure group, this difference did not reach significance. The question that remains unanswered is whether or not NIV performs better than HFNC in the most severe patients. Although our results do not answer this question, they provide interesting data in feasibility of FB-BAL under HFNC. The study by Simon *et al.* [8] does not fully answer the question for two reasons: there was no difference in intubation rate between NIV; and high-flow patients and high-flow may have been disadvantaged for reasons detailed in our study.

Identification of high-risk patients is a difficult task and, although it would be intuitively appealing to consider that the profounder the hypoxaemia, the greater the risk of oxygenation deterioration during BAL, this has not been confirmed. Cracco *et al.* [7] found that only chronic obstructive pulmonary disease or immunosuppression were significantly associated with the need for intubation in the multivariable analysis of their study of 169 fibre-optic bronchoscopy in critically ill patients whereas none of the baseline physiological parameters, including the P_{aO_2}/F_{IO_2} ratio, was associated with intubation [7]. During long-term use of high flow, reasons for HFNC failure in hypoxaemic acute respiratory failure have been recently discussed [9] and some may be applicable to FB-BAL.

Obviously, had we already made a diagnosis, we wouldn't have performed BAL in the first place.

We are convinced that HFNC offers a major advantage of simplicity, tolerance and possibility of use in the ICU for the most severe patients, and outside the ICU. Several studies are currently ongoing, for patients undergoing bronchoscopy (*e.g.* NCT02606188, NCT02253706, NCT01650974) and are detailed in table 1. We look forward to having the results of these studies.

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High flow oxygen maintains adequate oxygenation during fibre-optic bronchoalveolar lavage and prevents desaturation http://ow.ly/4mQDHq

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Received: March 18 2016 | Accepted: March 28 2016

Conflict of interest: Disclosures can be found alongside the online version of this article at erj.ersjournals.com

References

1 La Combe B, Messika J, Labbé V, *et al.* High-flow nasal oxygen for bronchoalveolar lavage in acute respiratory failure patients. *Eur Respir J* 2016; 47: 1283–1286.
2 Ricard J-D. The high flow nasal oxygen in acute respiratory failure. *Minerva Anestesiol* 2012; 78: 836–841.

TABLE 1 Summary of studies, ongoing or not yet open, investigating high-flow oxygen therapy during bronchoscopy

	Design	Inclusion criteria	Intervention arm	Control arm	Outcomes assessed	Estimated enrolment	Status
NCT02606188 Modified HFNC oxygen in patients undergoing bronchoscopy (China)	Randomised trial	Bronchoscopy required; baseline S_{pO_2} ⩾90%	Modified high-flow nasal cannula oxygen therapy	Conventional nasal cannula oxygen therapy	Time of bronchoscopy; lower S_{pO_2} during bronchoscopy	136 subjects	Not open
NCT02253706 Oxygen supplementation during bronchoscopy: high-flow *versus* low-flow oxygen (Israel)	Randomised trial	Scheduled bronchoscopy for diagnostic purpose	High-flow nasal oxygen therapy with 50 L·min^{-1} flow, and F_{iO_2} of 0.35	Low-flow nasal oxygen	Oxygen desaturation of 4%; S_{pO_2} cumulative time below 88%; number of bradycardia and tachycardia episodes; changes in expired end-tidal CO_2; time with S_{pO_2} <88%; patient comfort during procedure	100 subjects	Not open
NCT01650974 High-flow nasal oxygen therapy in high-risk patients of hypoxia undergoing diagnostic bronchoscopy (South Korea)	Randomised trial	P_{aO_2} <60 mmHg or S_{pO_2} <90% in room air and S_{pO_2} ⩾95% or P_{aO_2} ⩾75 mmHg with low flow oxygen; need for a diagnostic bronchoscopy	High flow nasal oxygen therapy with a 40 L·min^{-1} flow, and a F_{iO_2} of 0.4	Conventional nasal oxygen therapy with nasal prongs, with F_{iO_2} of approx. 0.4; sham comparator: high-flow device with low-flow settings, and F_{iO_2} 0.4	Success rate of bronchoscopy; total duration of hypoxia; frequency of hypoxia; switch to oxygen therapy method; change in respiratory symptoms	152 subjects	Recruiting

HFNC: high-flow nasal cannula S_{pO_2}: pulse oxygen saturation; F_{iO_2}: inspiratory oxygen fraction; P_{aO_2}: arterial oxygen tension.

3 Frat J-P, Brugiere B, Ragot S, *et al.* Sequential application of oxygen therapy via high-flow nasal cannula and noninvasive ventilation in acute respiratory failure: an observational pilot study. *Respir Care* 2015; 60: 170–178.
4 Society BT. British Thoracic Society guidelines on diagnostic flexible bronchoscopy. *Thorax* 2001; 56: Suppl 1, i1–i21.
5 Messika J, Ben Ahmed K, Gaudry S, *et al.* Use of high-flow nasal cannula oxygen therapy in subjects with ARDS: a 1-year observational study. *Respir Care* 2015; 60: 162–169.
6 Maitre B, Jaber S, Maggiore SM, *et al.* Continuous positive airway pressure during fiberoptic bronchoscopy in hypoxemic patients. A randomized double-blind study using a new device. *Am J Respir Crit Care Med* 2000; 162: 1063–1067.
7 Cracco C, Fartoukh M, Prodanovic H, *et al.* Safety of performing fiberoptic bronchoscopy in critically ill hypoxemic patients with acute respiratory failure. *Intensive Care Med* 2013; 39: 45–52.
8 Simon M, Braune S, Frings D, *et al.* High-flow nasal cannula oxygen versus non-invasive ventilation in patients with acute hypoxaemic respiratory failure undergoing flexible bronchoscopy-a prospective randomised trial. *Crit Care Lond Engl* 2014; 18: 712.
9 Messika J, Ricard J-D. Evaluation of risk factors for high flow nasal oxygen failure: a means to avoid disillusion. *J Crit Care* 2016; 32: 222–223.

Eur Respir J 2016; 48: 590–592 | DOI: 10.1183/13993003.00565-2016 |