Author's response to reviews

Title: Measurement of endotracheal tube secretions volume by micro computed tomography (MicroCT) scan: an experimental and clinical study

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Author's response to reviews: see over
Response to Reviewers’ comments for the manuscript entitled: “Measurement of endotracheal tube secretions volume by micro computed tomography (MicroCT) scan: an experimental and clinical study”

Reviewer: Gennaro De Pascale
Reviewer’s report:
The authors present a study examining the capability of MicroCT scan to measure the amount and distribution of endotracheal tube secretions volume. The paper is very interesting, well written and detailed. This study improves the knowledge about this technology and its applications in the field of invasive mechanical ventilation associated complications. I also consider very interesting the microbiologically data reported and the observed absence of correlation with secretions amount, as it is known that tracheal secretions quantitative is not a reliable predictor of microbiologically positive results from lower respiratory samples.

- We thank the reviewer for his positive comments.

Discretionary Revisions
• Are the authors able to report which species of Candida did they isolate? since C. albicans and C. parapsilosis have been already observed to may efficiently produce “slime” upon vascular devices (Tumbarello et al. PlosOne 2013).

- We have reviewed the results of the microbiological tests performed on ETT lavage fluids. Among the 6 Candida isolations, 5 were C. Albicans and 1 C. Tropicalis. We have now reported the different species in Table 1. We thank the reviewer for his suggestion of this interesting paper, which supports the recent literature focused on the role of Candida in the development of biofilm. We have added this reference in the discussion section. Future studies with larger sample sizes might elucidate the relevance of Candida spp. in ETT biofilms.

• Candida isolation from BAL has been observed to be a risk factor for pseudomonas VAP (Azoulay Chest 2006). May the authors provide their hypothesis upon the lack of Pseudomonas spp. presence in collected samples?

- We do not have a definitive explanation for the lack of P.Aeruginosa isolation in the ETT lavage fluids. It is possible that the results obtained from BAL samples might not exactly overlap the ones obtained from ETT lavage fluids, due to the different environments (distal airway mucosa vs. proximal plastic surface). Another reason might be related to the fact that in our study a delay between extubation and microbiological samples collection was always present. In fact, MicroCT scan was performed before microbiological tests by study design. We might speculate that, shortly after extubation, P.Aeruginosa colonies present on the ETT lumen lost their ability to grow in cultures, while Candida grew thanks to a higher resistance in an unfavorable environment. We thank the reviewer for the interesting question; however, the limited sample size of our study allows us only to propose the aforementioned speculations, while a definitive answer would require larger studies.
Reviewer: Alberto Zanella

Reviewer's report:
The manuscript entitled: "Measurement of endotracheal tube secretions volume by micro computed tomography (MicroCT) scan: an experimental and clinical study" by Andrea Coppadoro et al. is the first attempt in literature to quantify the volume of secretions presents into the ETT by mean of a micro computed tomography (MicroCT).
This work seems to indicate a new tool to study the inner side of ETTs, and I foresee, among may possible applications, the use of MicroCt to assess the effectiveness of devices to clean the inner side of ETTs, and the role of passive/active humidification.

- We thank the reviewer for his positive comments.

Minor comments:
In the Methods - Observational ex-vivo study-, you should specify the number of ETTs collected.

- We have now added the number of collected ETTs (11)

Figure 1, and E1: mLs of gel volume should be written with dots not commas.
- We have now corrected the figures

Figure 2, and E2: in both figures the secretions seems to be positioned on one side of the ETT, it would interesting to clarify if the images are oriented in same dependent/non-dependent position as they were into the patients.

- The question appears very interesting; however, some confounding factors might influence the findings. It is, indeed likely that the asymmetry noted by the reviewer could be due to the effect of gravity. However our data do not allow answering this question. First the position of the tube while in the patients airway can remarkably change due to the position of the tube itself and to the positioning of the patient (supine vs sitting), a data which was not recorded and which likely changed during the days. Moreover there was a certain time interval between the patient extubation and the execution of the CT scan, during which the secretions might have moved. Finally, while performing the CT scan we did not use a standard orientation of the tube over the longitudinal axis. Thus, our data are not adequate to respond, and future studies might elucidate if gravity has a relevant impact on the axial distribution of secretion within the ETT.

Figure E3: “biofilm” should be “secretions amount”

- We have corrected the axis label