Reviewer's report

Title: Monitoring of oxidative and metabolic stress during cardiac surgery by means of breath biomarkers: an observational study

Version: 1 Date: 3 July 2007

Reviewer: Ingolf Schimke

Reviewer's report:

General comments

Pabst et al. (corresponding author Schubert J.K.) present a study using breath sampling for analysis of volatile substances in patients who underwent heart surgery with extracorporeal circulation. The aim of this study is to find out whether volatile biomarkers exhaled intra-operatively can be used to reflect the well known excessive metabolic stress observed during heart surgery with extracorporeal circulation. The main result of this study is the finding that selected volatile biomarkers detected using GC-MS change during heart surgery (increase). These changes in volatile substances correlate with markers from clinical chemistry well established as indicator of structural and functional heart alteration.

To substantiate their project, the authors remark that breath markers could offer - compared with markers of clinical chemistry – the advantage of a non-invasive approach for intra-operative control of the metabolism. In my view, this is only an artificial advantage because stepwise and multiple sampling of blood for clinical chemistry during surgery is no problem and established praxis during surgery.

In my view, it is more important that exhaled substances could be less dependent from hemodilution, infusions and other confounders than blood markers. Furthermore, the authors suppose, that breath testing can be outclass markers of clinical chemistry due to their time and money consuming and non-satisfactory sensitivity and specificity for early recognition of the metabolic stress. Also this argumentation, I think, is artificial. Based on the whole money consumption of heart surgery, cost for clinical chemistry is marginal. Additionally, modern clinical chemistry with bed-side-testing is an effective strategy to minimize time consuming. In my view, measurement of volatile substances for intra-operative control would then overclass clinical chemistry if devices were constructed enabling measurement of volatile substances continuously or by multiple measurements. very close meshed. The authors should point out that realizing such a concept for intra-operative control by volatile markers, first of basic research and especially feasibility studies are necessary to find out which and when breath markers are able to mirror special metabolic stresses intra-operatively. I this context, the present study, which the authors should clearly indicate as feasibility study, is a hopeful going forward. Even though many different markers were already tested, I agree to focus the present study on acetone, pentane and isoprene which are founded by the authors.
Specific comments

Although the word count (> 300) of the abstract seems to be in agreement with the journal instructions, the authors should check that later in Pubmed the abstract will not be in a truncated form. If yes, I suggest shortening of the abstract.

Following my general comments to indicate the study as a feasibility study, the methodological aspects should be extended. So, it would be very nice to learn from pre-study experiments about the time regime which must be met between breath sampling and measurement of the sample. Is it possible to transport the fulfilled syringe? If possible, insert according data or if already published the reference. Do you have data on reproducibility and variation? If you sample multiple and very close meshed (e.g. within 1-2 min), how is the variation of the results.

Because no individual patient time courses were demonstrated, the personalized data description in table 1 and 2 are unnecessary. I suggest summarizing the data for the whole study population.

Because correlations between breath markers and data from clinical chemistry were demonstrated, the exact concentration and activity time causes, respectively for the clinical chemistry marker should be inserted as done for the breath marker in table 3.

Is there a chance to separate 2 patient groups based on duration of aortic clamping or ECC?
If yes, I suggest inserting analysis of such groups concerning all data.

The legend of the figures should be more explanatory (e.g. no abbreviation).

What next?: Accept after discretionary revisions

Level of interest: An article of importance in its field

Quality of written English: Acceptable

Statistical review: No, the manuscript does not need to be seen by a statistician.