Reviewer's report

Title: In vivo thyroid vibro-acoustography: a pilot study

Version: 1 Date: 21 February 2013

Reviewer: Marek Ruchala

Reviewer's report:

Discretionary revision

The aim of this pilot study was to estimate the value of a novel technique and to describe its limitations in comparison to other visualization methods; vibroacoustography (VA) in thyroid imaging. The study consisted of two parts. The first part of the study consisted of in vitro imaging of excised thyroid specimens, which were randomly selected from autopsies and then were compared through the utilization of three different visualization methods: x-ray imaging, B-mode USG and VA. This part of the study confirmed that VA provides high resolution images with accurate detection of thyroid structures and with an accuracy comparable to conventional USG. The second part of the study involved further comparison of VA and USG, but in human subjects with thyroid nodular goiter. In vivo examinations revealed that VA is highly accurate in the detection of calcifications (100%). However, not all of the nodules were identified in comparison to USG (91%).

Vibroacoustography (VA) seems to have the potential for becoming one of the additional tools used in thyroid imaging. VA images not only estimate ultrasound properties of the visualized structure, but also its dynamic behavior at low frequencies. Thusly, VA offers information that is not available with conventional ultrasound. However, present findings do not indicate the replacement of conventional methods in the future: USG and FNAB.

In vitro examination revealed that VA provides higher resolution of detected structures in comparison to conventional USG. Contrastly, in vivo studies revealed that 2 of 22 lesions visible on USG, were not assessable on VA. As mentioned by the authors, such findings may be the effect of body motion artifacts observed during breathing. This may be hard to avoid due to its relatively lengthy duration of examination (2min). It seems that the low resolution of images obtained in this part of study decreases the potential of using VA in clinical practice. However, system artifacts may be eliminated in the future with the improvement of equipment.

As mentioned by the authors, VA visualization is based upon image contrast. When taking into consideration its detailed structure, the lack of quantitative parameters of the examined lesion seems to discriminate it in comparison to shear wave elastography. On the other hand, as described in the current paper, in comparison to ES and USG, VA provides a detailed and accurate visualization of micro- and macrocalcifications, which are commonly seen in malignant lesions. Further studies are necessary to prove this theory.
Due to the observations listed above, it seems that the vibroacustography may have the potential to become a diagnostic method, which in some cases may complement the visualization of structures previously observed in USG, especially when the lesion has calcifications. However, in my opinion, thyroid USG and FNAB still remain the first line diagnostic tools for thyroid lesions.

In conclusion, the paper „In vivo thyroid vibro-acoustography: a pilot study” should be accepted for the publication in BMC Medical Imaging Journal, as a pilot study. The paper construction includes an interesting introduction, with a good quality review of thyroid imaging techniques, an accurate and detailed methodological section, and constructive but critical discussion. Authors are aware of most of the limitations of this method and plan to continue their research in the future. Statistical assessment of a larger number of subjects may determine the real value of VA in thyroid visualization.

**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.

**Declaration of competing interests:**

I declare that I have no competing interests