REPORT ON THE CONFERENCE OF THE EUROPEAN SOCIETY FOR MAGNETIC RESONANCE IN MEDICINE AND BIOLOGY (ESMRMB), 3–5 OCTOBER 2013, TOULOUSE, FRANCE

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This year's meeting, in which about a thousand scientists, technicians, radiologists, and physicists from Europe and beyond took part, was the 30th meeting in the history of the society. The World Hearing Center of the Institute of Physiology and Pathology of Hearing was represented by Tomasz Wolak and Mateusz Rusiniak (Figures 1, 2) who presented works on "General linear model for fMRI analysis based on EEG time domain data: towards assessment of correlation between fMRI and EEG signal spatial distributions", "The relation between EPI sequence parameters and electroencephalographic data during simultaneous EEG-fMRI registration: an initial report", and "Semantic decisions in patients with Asperger syndrome – fMRI studies".

The conference agenda included 3 plenary lectures, 8 didactic sessions, 6 radiographic sessions, 13 scientific sessions concerning clinical applications, and 22 scientific sessions concerning preclinical trials and basic sciences. In addition, 6 educational courses were conducted covering in total 15 lecture sessions concerning: knee imaging using magnetic resonance, neuroimaging quantification, imaging biomarkers, abdominal cavity imaging, and devices for vascular wall imaging. Traditionally, there were also the popular events for society meetings: "Hot topic debates" and "Round table discussions". There was also a novel "poster madness" session, during which the authors of posters could talk for two minutes about their work. It is also worth mentioning a regular item on the agenda – seminars given by sponsoring companies: Siemens, Phillips, Toshiba, and GE, which were at a very high level.

Prof. G.P. Krestin gave the conference opening lecture under the title "Population imaging for disease prevention". It concerned a population study carried out in Rotterdam and its neighborhood, the "Rotterdam Project", which aimed to determine biomarkers on magnetic resonance images for early detection or prediction of population-specific diseases. Among the results presented there were also reports on invisible minor cerebral hemorrhages. It was demonstrated that taking aspirin aggravates the risk of these kind of occurrences and it was proved that the occurrence of such hemorrhages considerably increases the risk of dementia in older persons. It was also presented that, on the basis of hippocampus structure, numerous diseases may be recognised or predicted. For example, accelerated atrophy of this brain region is related to

Figure 1. Employees of the World Hearing Centre at the 30th ESMRMB conference

Figure 2. Mateusz Rusiniak during the presentation of his work on a general linear model for fMRI analysis based on EEG time domain data

the development of Alzheimer's disease and its shape provides diagnostic information on dementia before its symptoms appear. The presented material revealed the need for research involving large numbers of people to detect high-risk groups and strengthen preventive measures. It should be emphasised that the Rotterdam Project played an important role in creating the European Union's "Human Brain Project" announced in 2013.

The hot topic debate, which took place on the second day, concerned the brain resting state studies for clinical application. Prof. R. Achten, as the moderator, and Dr M. Walter and Prof. S. Williams took part in the discussion. Dr. Walter stated that the functional research on the brain resting state may soon find clinical application, and cited numerous works demonstratinga relationship between changes in resting state networks and disease entities (e.g. Alzheimer's disease, dementia). He also emphasised that various functional magnetic resonance methods connected with cognitive tasks are already applied clinically, and in this regard research on the resting state is simpler – it does not require interaction with the person examined. On the other hand, Prof. Williams presented a completely different standpoint. First of all, he challenged the lack of control over the patient's condition during the examination. The MRI resting state examination lasts 5 to 10 minutes. During this time a person may fall asleep, and the question whether sleep is a resting state remains open. An additional doubt is raised by the fact that, according to its definition, the brain's resting state is a state of no external stimulation, and for an MRI examination this condition cannot be fulfilled due to the considerable noise (above 100 dB) caused by operation of the device (switching of its gradient coils). Moreover, he stressed that the results obtained during the restingstate by use of the fMRI technique are not completely comprehensible. There are publications showing that some resting state networks may not be related to brain activity, but only reflect an artificial signal fluctuation related to breathing or heart activity.

Another interesting topic addressed at the conference concerned examination of the fetus in the mother's womb by use of MR scanners. Work on anatomy, as well as, surprisingly, brain function were presented. The basic problem in fetal imaging is the fact that there is no possibility to control its movement (in standard MRI examinations a patient is asked to stay still). Thus, the majority of new work concerns new, fast imaging sequences. One of the lectures,"Resting state fMRI in the moving fetus: a robust framework for motion correction" by Dr G. Ferrazzi,was rewarded by the organisers with the prestigious "Magna Cum Laude" prize for his motion correction method. The results presented prove that this problem has to a large extent been solved (Figure 3). The presentation of development of the brain resting state of a fetus, revealed by use of the fMRI examination repeated at one-week intervals, made a tremendous impression. Thanks to the new method it is now possible to follow the development of networks andformation of functional connections in the fetal brain.

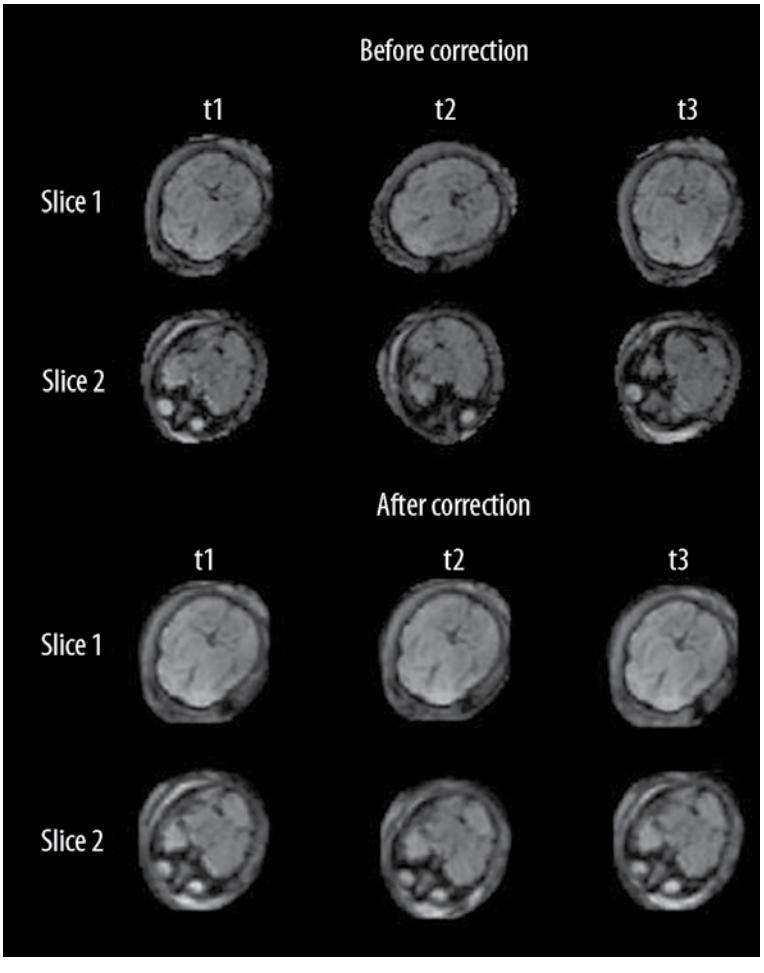

Figure 3. Effect of a motion correction algorithm for fetal images. Consecutive columns show volumes in time, the two upper rows show images before correction, and the two lower rows show images after correction (G. Ferrazzi)

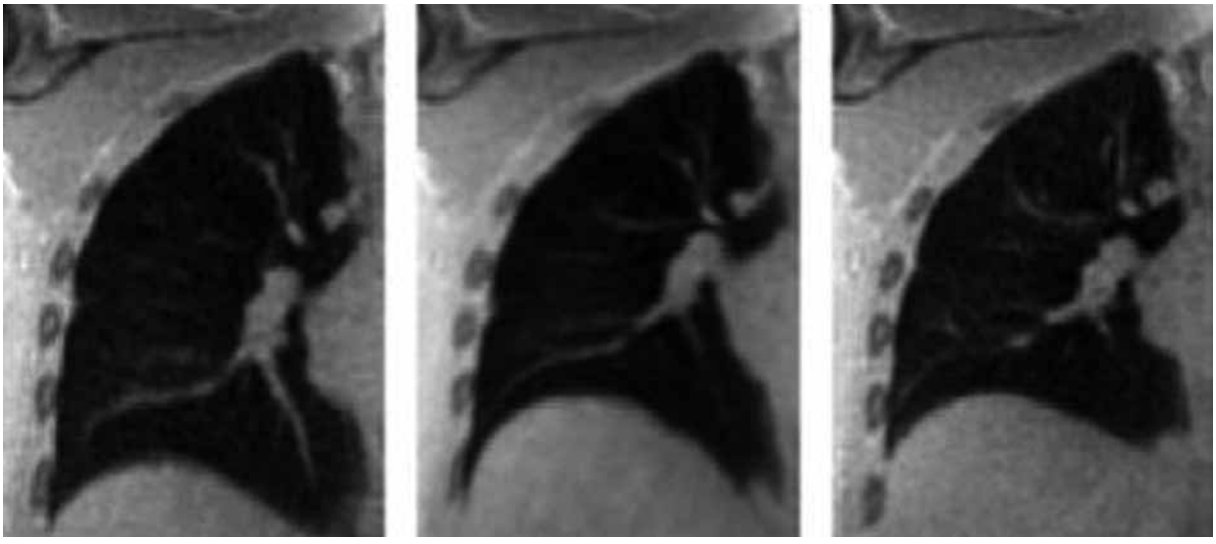

Figure 4. MRI images of lungs showingsequential breathing stages obtained with zero TE sequences (A. Menini)

Every year at the ESMRMB conference suggestions concerning new imaging sequences are discussed. Among many interesting ideas the work on "Free-breathing, zero TE MRI for 3D respiratory motion quantification" presented by Dr A. Menini was outstanding. With appropriate settings of the MR scanner, the research group from Université de Lorraine was able to obtain very high quality proton density dependent images. This makes it possible to create structural images of permanent tissues, such as bones or lungs, by the use of a MR scanner which are similar in quality to thoseobserved by computerised tomography. As a consequence it is possible to image certain structures of the human body without the need to expose a patient to X-rays. What is more, the examination can be repeated multiple times. Additionally it is possible to obtain motion sequence – e.g. different breathing stages (Figure 4).

To sum up, this year's ESMRMB meeting was very interesting and at a high level. We hope that the "poster madness" session will be continued as it greatly simplifies spotting particularly interesting work among the huge number of the posters presented.