Clinicians’ insights for new pediatric MRI receiver coils

GE Healthcare revealed its latest receiver coil technology for magnetic resonance imaging (MRI) in 2016. This so-called adaptive imaging receive (AIR) technology enables both flexible and lightweight innovative design concepts of receiver coils. Such coils would be especially beneficial in pediatric MRI. In his master’s thesis project, Aleksi Pradere-Koskiahde investigates what kind of pediatric receiver coils clinicians would like to get. Results suggest that two types of versatile blanket-like receiver coil would be most beneficial, as pediatric patients include a wide range of different patients, especially from the size standpoint. However, prototyping these coil design concepts is still necessary to determine their exact specifications and feasibility.

Receiver coils constitute an essential part of every MRI system. In fact, they are the antenna which detects the signal from the patient during MRI examinations. Current MRI receiver coils are mostly designed for adults and therefore are mismatched to small pediatric patients. In turn, this leads to suboptimal imaging performance and challenges to acquire diagnostic pediatric images. Despite the significant advances in coil technology, only few pediatric designs are commercially available to this day.

When designing coils, often technological limitations are emphasized at the expense of practical aspects. Therefore, Aleksi Pradere-Koskiahde conducted a qualitative research reported in his master’s thesis entitled “Design concepts for pediatric magnetic resonance imaging receiver coils”. To capture the most challenging aspects of pediatric MRI and convey clinicians’ insights about most beneficial pediatric coil design concepts, he performed an empirical field study in all five Finnish university hospitals as well as the Children’s Hospital Queen Silvia in Göteborg, Sweden. More specifically, he held theme interviews with experienced pediatric MRI clinicians, including radiographers, physicists and radiologists.

Subsequently, data generated throughout interviews was analyzed to identify similar patterns and practices between different hospitals and make generalizations about the most mentioned coil designs. Results show that there is most demand for small children of under 7 years of age, i.e. schooling age. Eventually, coil design concepts were established based on perceptions of clinicians. These coil concepts include a blanket-like coil in two different forms: one flexible coil array incorporated in a blanket that is suitable for covering larger areas and another flexible coil array that is incorporated in a positioning vacuum pad to immobilize the region of interest, e.g. wrist or ankle.

New pediatric design concepts would address the known issues in pediatric MRI, i.e. signal insufficiency, poor suitability to children and anxiety. However, the design concepts still need to be further developed into prototypes to demonstrate their feasibility. Still, this study provides valuable first-hand information about the demand for new pediatric coil designs that should be taken into account when designing new receiver coils.

Author: Aleksi Pradere-Koskiahde
Organization: GE Healthcare Finland Oy
Email: aleksi.pradere-koskiahde@ge.com