RF shield coat for mother to be in the magnet with her child.

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Introduction

Although pediatric imaging is a very important technique not only clinically but scientifically, there are uncontrollable risks for both parents and staffs, like motion, fear-feeling or anesthesia risk. Recent wide-bore scanners permit one feasible solution, being with the mother or a staff in the bore during the scan to monitor and ease the child, that is, accompanying scan. In order to avoid its extra-large FOV problem, there can be two ways, the high-cost one is to develop a dedicated coil whose sensitivity field is restricted the inside of the coil, and the low-cost one is to wear a RF-shield coat which completely suppresses signals from the body [1].

In this study, we investigated the latter by producing the coat with a RF shield mesh sheet and by examining its usefulness on a 3T scanner.

Materials and Methods

The RF shield mesh (Mac Corporation, Ltd., Osaka, Japan) is a net of nylon fiber covered with 99% silver. The RF-shield coat was made by three-layer cloth, the mesh sandwiched with 100% cotton cloth, which reduces NMR signal to about 0.026%. A baby phantom filled with PVA gel and a volunteer wearing the coat were put in the bore of a whole-body 3T scanner (Trio, Siemens, Germany) (Fig.1) and scanned with various sequences, i.e., gradient echo, balanced SSFP (bSSFP), GRE-EPI and DWI (b=1000 sec/mm^2), using the body coil. In order to avoid peripheral nerve stimulation (PNS), the volunteer was asked to be at the center with getting together the phantom and imaging parameters were adjusted with milder slew rates. SNRs were calculated on the images measured with/without the volunteer and compared.

Results

Three volunteers were scanned and there was no heating problem. However, because of PNS at their back and lumbar, slew rates had to be suppressed to about the half (~ 100 T/sec/m).

Figure 2 shows the bSSFP images obtained with/without the volunteer and their SNR ratio map. Although, on every image, no signal from the volunteer's body was observed, SNR were reduced by 25 ~ 75 % because of the volunteer's body with the coat.

Discussion

Considering that transmit electromagnetic wave must be adjusted for the correct flip-angle, the cause of the SNR reduction is thought that the coat hamper the NMR signal. Therefore, a dedicated receiver coil must be solve this problem. PNS is a intrinsic problem on this accompanying scan. To solve this, not only imaging parameter adjustment but selection of smaller accompanying person and her pose must be effective.

In spite of these problems, the accompanying scan should be considered to be one feasible solution for pediatric imaging to avoid the risks.

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References 1.Urayama S. et al, 17th ISMRM, 2980, 2009;

Fig.1 The baby phantom and the volunteer on the scanner bed

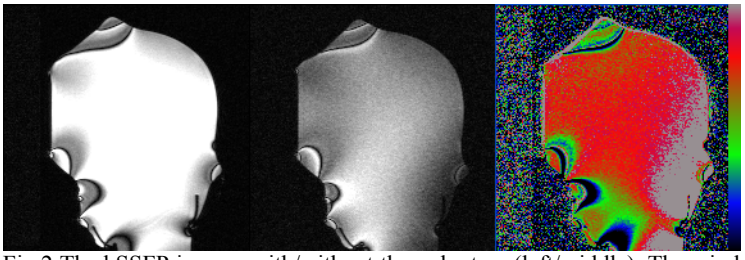

Fig.2 The bSSFP images with/without the volunteer (left/middle). The window level was normalized with the standard deviation of the background noise. The LUT bar of the SNR ratio map (right), which is the ratio map of both SNR maps, indicates the range from 1.0 (black) to 3.0 (gray).