

A Preliminary Study of 3D Rat Spine Imaging by Using Wideband MRI Technique

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Introduction

Wideband MRI is a technique that can either speed up the scan time or increase image resolution by acquiring images of multiple locations simultaneously [1]. 3D spin echo spine imaging provide the good contrast in spine and was able to detect its pathology while spine injuries. However, 3D spine imaging always took a long time for a spin echo scanning. In this study, we demonstrate a preliminary result on 3D spine spin echo imaging by using 4x acceleration ($w=4$, acquired 4 distinct slab simultaneously) Wideband MRI on a rat brain and spine. All images were acquired without other accelerating methods such as parallel imaging or partial k-space method.

Materials and Methods

Rat spine and brain imaging was conducted on a 7T Bruker Biospec 70/30 system using a transmit and receive quadrature volume coil with the experiment settings listed below: High resolution: $0.15 \times 0.15 \times 0.25 \text{ mm}^3$, the total coverage was $2.1 \times 2.1 \times 8 \text{ cm}$, the Wideband factor $W=4$ which indicated that acquired 4 slabs simultaneously, matrix size for each slab was $140 \times 140 \times 80$, the sequence was and TR/TE was 1300/52.1ms, the total scan time for these $80 \times 4 = 320$ slices was 10m24s including the gating of respiration.

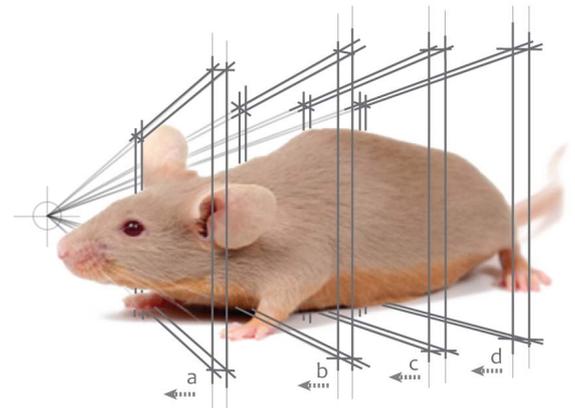


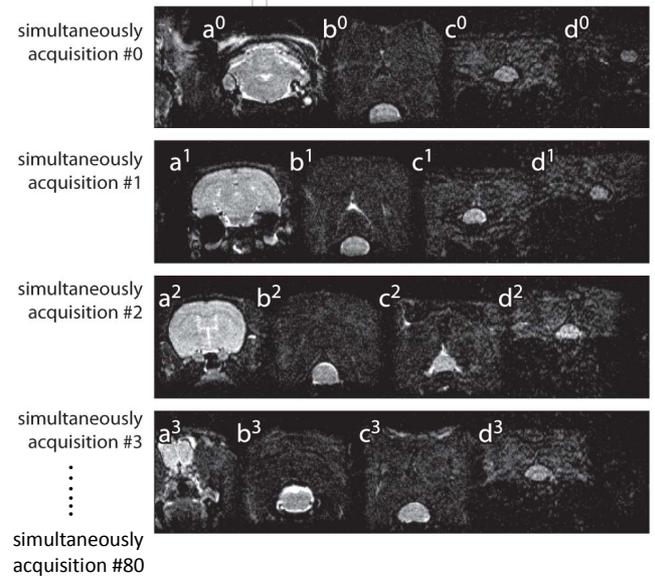
Fig1, the $W=4$ Wideband MRI technique acquired the 4 slabs simultaneously. Each slab contains 80 slices and cover 2cm. The dark band on the imaging was due to the multi-tripilot scanning

Results

By using the $W=4$ Wideband MRI technique, each row demonstrate the simultaneously acquisition results. The first slab (Fig 2. a) demonstrates the rat

brain, and the other slabs (Fig 2. b, c, d) demonstrate the spine. The total scanning time was 10m24s, which reduced 4 times with the normal spin echo scanning.

Fig2, the $W=4$ Wideband MRI technique acquired the 4 slabs simultaneously.



Discussion & Conclusion

Our preliminary result demonstrate the 3D scanning of rat spine by using $W=4$ Wideband MRI technique, which can reduced the scanning from 40 minutes to 10 minutes. Although the SNR of this result is not perfect due to imperfect motion reduction and imperfect saturation of outer slices. IT can be optimized in the future. In summary, we have shown the feasibility to complete the 3D spine imaging within 10 minutes which will be exceptionally valuable in future's clinical study. At the same time, spine DTI would be considerable in the future as wel based on this high resolution technique.

References

[1] 3D Isotropic Brain Imaging Using Wideband MRI, Edzer L. Wu et al. Proc. Intl. Soc. Mag. Reson. Med. 17 (2009)