Clinical utility of ultra-fast T2-weighted SENSE imaging in stroke protocols

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INTRODUCTION

Stroke is the one of the leading neurological diseases causing death and disability world wide (1). A rapid and accurate stroke MI imaging protocol would be desirable to facilitate diagnosis and triage in these patients who are frequently ill and prone to movemer artifact. In our institute, this consists of a T2 Fast Spin Echo (T2 FSE, 122sec), MR angiography sequence (MRA, 294sec), diffusion weighted imaging (DWI, 53sec) and Gradient Recalled Echo (GRE, 50sec) sequences. However, only patients arriving within th subacute period (less than 3 hours) get an additional 100sec-long dynamic susceptibility contrast-based perfusion scan. To decreas total scan time, fast Echo Planar Imaging (EPI) techniques have been proposed to obtain T2-weighted sequences but these suffer fror unacceptable geometric distortion and loss in image resolution and contrast (2). Therefore, we studied the possibility to use sensitivit encoding (SENSE) (1) to obtain fast T2-weighted images and compare image quality and artifacts with standard T2 FSE.

MATERIALS AND METHODS

48 consecutive patients with suspected stroke were enrolled in this study. All were subjected to a new Ultra-Fast T2 SENSE sequenc (10015/80, Fat Sat SPIR, and SENSE factor of either 4 or 2.5) in addition to the routine stroke protocol. All studies were done on 3 Philips Intera Magnet with following protocols: T2 FSE (TR4500ms/TE100ms), GRE (740–980/25–40, 20° flip angle), DWI (singl shot, EPI, 10000/88.4, NEX=1, b=1000sec/mm^2 and SENSE factor = 2). was also performed. Initially we used a SENSE factor of (first 19 patients), and then this was decreased to 2.5 for the subsequent 29 patients. Two neuroradiologists compared the quality c standard T2 FSE and new T2 SENSE images by consensus, assessing the image quality (same or worse), lesion conspicuity (bette comparable or worse) and presence of artifacts (motion & susceptibility).

RESULTS

Average time of acquisition for the ultra-fast T2 SENSE sequence was 10 sec compared to 122 sec for T2 FSE (92% decrease). The total imaging time for the entire stroke protocol was reduced by 22%. We studied 48 patients (29 males, 19 females, age range 26 – 79 years. 13 out of 48 (27%) of these suspected stroke patients revealed no abnormality on imaging studies. 12 out of 48 (25%) had acute infarction (i.e. within 24 hours), 4 (8%) presented with haemorrhagic stroke and the remaining 19 patients (40%) showed old infarcts or chronic ishcemic damages. Image quality with T2 FSE was better than T2 SENSE, except in one case where motion artifact compromised the quality of T2 FSE more than T2 SENSE. 13 out of 19 studies with SENSE factor 4 demonstrated an artifact in the centre of the image that compromised the evaluation of midline structures (fig.1). Subsequent studies using SENSE factor 2.5 did not show this artifact, and lesion conspicuity and detectibility on T2 SENSE sequence was comparable to T2 FSE (Fig 2a & b). None of the clinically significant lesions were missed on T2 SENSE sequence.

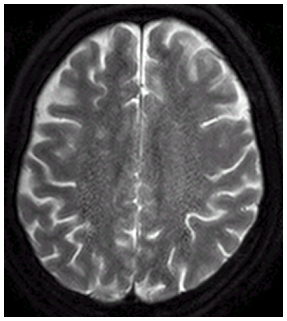

Fig.1 Ultra Fast T2 SENSE image at SENSE factor 4 showing paramedian artifact, precluding confident diagnosis of small ischemic infarctions in the frontal white matter.

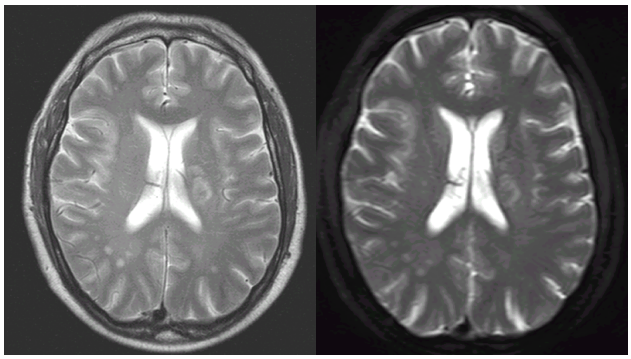

Fig. 2 T2 FSE (left) ultra fast T2 SENSE (SENSE factor 2.5, right) showing acute infarct in left corona radiata.

CONCLUSIONS

Ultra-fast T2-weighted SENSE sequences at 3 T at may be useful to replace FSE T2 in emergency stroke imaging thereby reducing imaging time to half without loss of relevant diagnostic information. The SENSE factor can be optimised at 2.5 for best results.

REFERENCES

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