Ultrashort TE imaging after percutaneous vertebroplasty

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Introduction

Percutaneous vertebroplasty is a minimally invasive procedure that provides pain relief and stability for osteoporotic compression fractures. Most of the complications of this treatment relate to cement leakage such as pulmonary embolism and worsening of spinal canal compromise. Multi-detector row computed tomography (MDCT) has been used to evaluate cement distribution after procedure.

Ultrashort echo-time (uTE) imaging allows direct visualization of tissues with very short T2s (<1ms) that are invisible on any other types of MR images. This unique imaging method has been used to evaluate bones and other connective tissues. Our purpose was to assess the feasibility of uTE imaging in the visualization of the bone cement after percutaneous vertebroplasty.

Materials and Methods

MRI studies were conducted using a 3.0 T clinical unit (Achieva Nova Dual, Philips Medical Systems) with a SENSE-spine coil. For each subject, the treated vertebrae were imaged using a 3D uTE imaging sequence with radial trajectory and the following parameters: FOV=240×240×240 mm^3, matrix=256×256, flip angle=7°, TR/TE =8.0ms/0.2ms, acquisition voxel size=0.94×0.94×0.94 mm^3, NSA=1, imaging time=6min42s.

This study included 7 patients (5 women and 2 men; age range, 72-89 years; median, 79 years) with osteoporotic compression fractures (26 vertebrae). The locations and numbers of the treated vertebrae were as follows: T7 (n = 1), T8 (n = 2), T9 (n = 1), T10 (n = 1), T11 (n = 3), T12 (n = 7), L1 (n = 6), L2 (n = 4), and L3 (n = 1). MDCT and uTE were obtained after procedure. Multiplanar reformation with axial, sagittal and coronal sections was obtained. Cement leakage and estimated amount of cement injected were evaluated.

Results

In all subjects, cement was clearly visualized as low signal intensity structure on uTE. All cement leakage into seven disk spaces and three paravertebral soft tissues seen on MDCT were also observed on uTE. However, because of their small amounts, only one of ten leakages into paravertebral veins and two of five leakages into epidural spaces were observed on uTE. Mean estimated amount of cement injected was 5.6ml on MDCT and 5.7ml on uTE without statistically significant difference ($P > 0.05$).

Discussion

We demonstrated the feasibility of uTE imaging of the bone cement injected after percutaneous vertebroplasty. To our knowledge, this is the first report of the use of this technique for this treatment. Currently, high-resolution CT is commonly used for evaluation of the cement distribution. Our results revealed that the cement can be evaluated without radiation exposure.

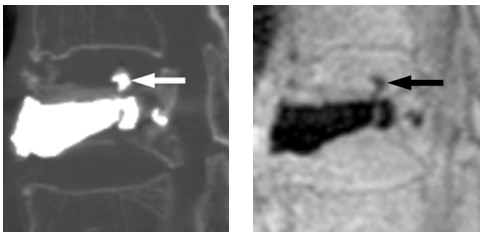

Fig. 1: 74-year-old female with compression fracture at T12. Sagittal reformatted CT (left) shows treated vertebra with an intradiskal leakage (arrow). Intradiskal leakage is well visualized on uTE (right).

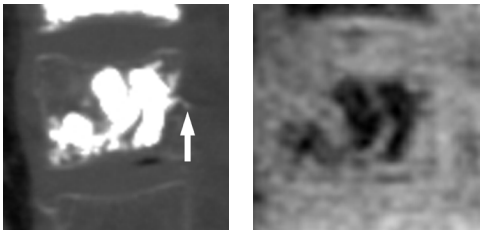

Fig. 2: 72-year-old female with compression fractures at T9. Coronal reformatted CT (left) shows treated vertebra with an intravenous leakage (arrow). Intravenous leakage is not visualized on uTE (right).

References

1. Robson MD et al. J Comput Assist Tomogr. 2003. 825-846. **2.** Galibert P, et al. Neurochirurgie. 1987. 166-168.