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Objectives Atherosclerosis and its complications are the major cause of mortality all over the world. It is reported recently that profilin-1, an intracellular actin-binding protein, plays a pivotal role on progression of atherosclerotic lesions. The rationale of our study was to use a novel molecular imaging probe to assess atherosclerotic plaque invasively by MRI. This probe was constructed through conjugating profilin-1 antibody with quaternised chitosan encapsulated magnetic nanoparticles (QC-MNPs).

Methods QC-MNPs were characterised by transmission electron microscopy (TEM) and the mean particle size and size distribution were measured by laser light scattering technique. Profilin-1 antibody was conjugated to QC-MNPs via carboxyl and amine condensation. The probe was purified by high speed centrifugation. Zeta potential and absorption band of probe were detected by zeta potential analysis and UV (ultraviolet)-Vis absorption spectroscopy respectively to testify whether profilin-1 antibody was successfully conjugated to nanoparticles. Twenty New Zealand white rabbits were fed western diet for 16 weeks after balloon injury. 3.0 T MRI was performed to visualise atherosclerotic lesions of abdominal aorta on both T1- and T2- weighted spin-echo images before and after the probe was injected into ear veins of rabbits respectively. B-mode ultrasound imaging and histological analysis were applied to evaluate the effectiveness of the probe on assessment of atherosclerotic plaque.

Results The results revealed that the mean size of QC-MNPs was 35.7 nm, and the distribution of particles size ranged from 20 nm to 70 nm. Compared with unlabelled QC-MNPs, the mean zeta potential of probe changed from -47.1 mv to -2.17 mv. UV (ultraviolet)-Vis absorption spectroscopy showed that the absorption band of probe was between 250–300 nm, while unlabelled QC-MNPs had no absorption band. In vivo 3.0 T MRI revealed that after probe injection, the area of atherosclerotic plaque in abdominal aorta exhibited lower T2 signal intensity compared with the signal before probe injection. The result of MRI was confirmed by ex vivo histological analysis and in vitro B-mode ultrasound imaging.

Conclusions Profilin-1 antibody labelled QC-MNP, a novel molecular imaging probe, provides potential for noninvasive assessment of atherosclerotic plaque by MRI.

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MOLECULAR IMAGING OF ATHEROSCLEROTIC PLAQUE VIA PROFILIN-1 ANTIBODY LABELLED QUATERNISED CHITOSAN ENCAPSULATED MAGNETIC NANOPARTICLES

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