Imaging Tracking of Mesenchymal Stem Cells Labelled with Lipid-PLGA Nanobubbles

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Background, Motivation and Objective

Stem-cell-based therapy has drawn considerable attention because of its substantial benefit to patients suffering a wide range of diseases and injuries. However, knowledge about their underlying mechanism of action is much less well understood. One important reason lies in the absence of imaging tools which can be used for real-time imaging tracking of these deep-seated transplanted stem cells. Our study provides a strategy to realize real-time ultrasound imaging tracking of stem cells, paving the way for underlying mechanism investigation and future clinical application of stem cell therapy.

Statement of Contribution/Methods

Lipid-PLGA nanobubbles(LPNs) were prepared by double emulsion evaporation process and vacuum freeze method with PLGA and lipid as film-forming materials. Mesenchymal stem cells (MSCs) were incubated with different concentrations of LPNs for 6h. Confocal fluorescence microscopy was used to detect the endocytosis effect of stem cells on LPNs. The result of CCK-8 cytotoxicity experiment, in vitro ultrasound performance and confocal fluorescence microscopy imaging was used to select the LPNs co-incubation concentration with the best endocytosis effect. Finally, we next monitored the temporal stability of labelled MSCs in vitro and in vivo via ultrasound imaging.

Results/Discussion

Here we developed a kind of lipid-PLGA nanobubbles (LPNs) as probes which have nanoscale size, good compatibility, and strong ultrasound contrast-enhanced signals. Due to their nanoscale particle size, cellular labelling of MSCs can be achieved through incubating them with LPNs. Significantly enhanced ultrasound sonograms for these labelled stem cells could be obtained in vitro and in vivo. More importantly, long duration up to 5 days for these labeled stem cells can be tracked by ultrasound imaging.

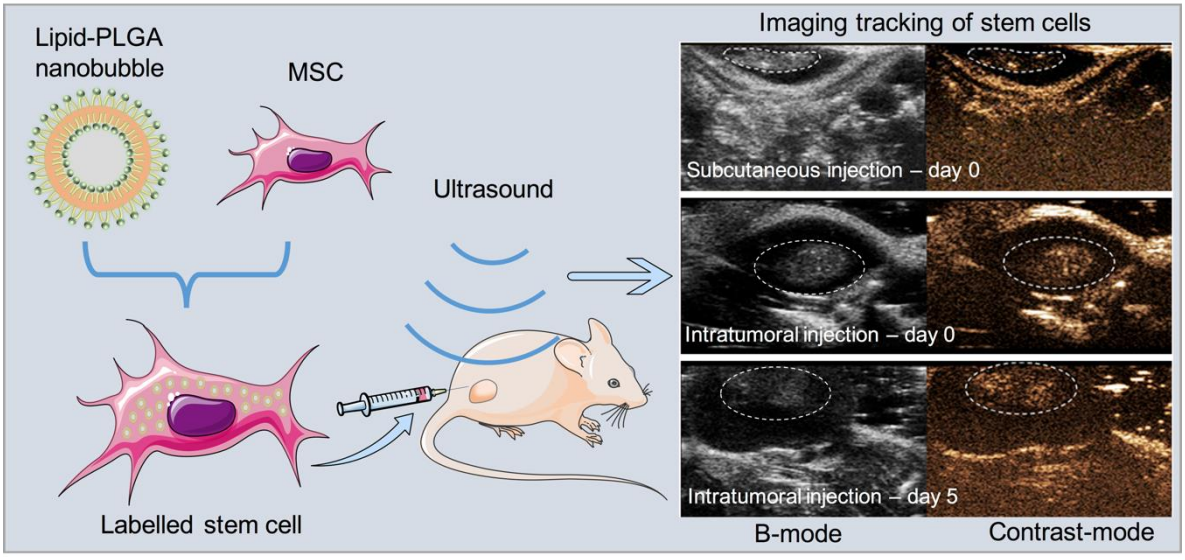

Fig.1. A strategy for real-time ultrasound imaging tracking of stem cells. 2×10^6 labelled MSCs were intratumorally injected into the tumors and monitored by ultrasound imaging for 5 days, confirming the feasibility of LPNs for long-term *in vivo* cell tracking.