Medical Applications

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Synchrotron radiation coronary angiography for the detection of vascular regeneration in infarcted rat heart

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Introduction

Although the diameters of vessels which relate to arteriogenesis and angiogenesis are less than 200 μm, conventional coronary angiography cannot visualize these vessels. Synchrotron radiation can provide extensively high resolution in comparison to conventional X-rays. We conducted to visualize the change of vessels in infarcted rat heart.

Method

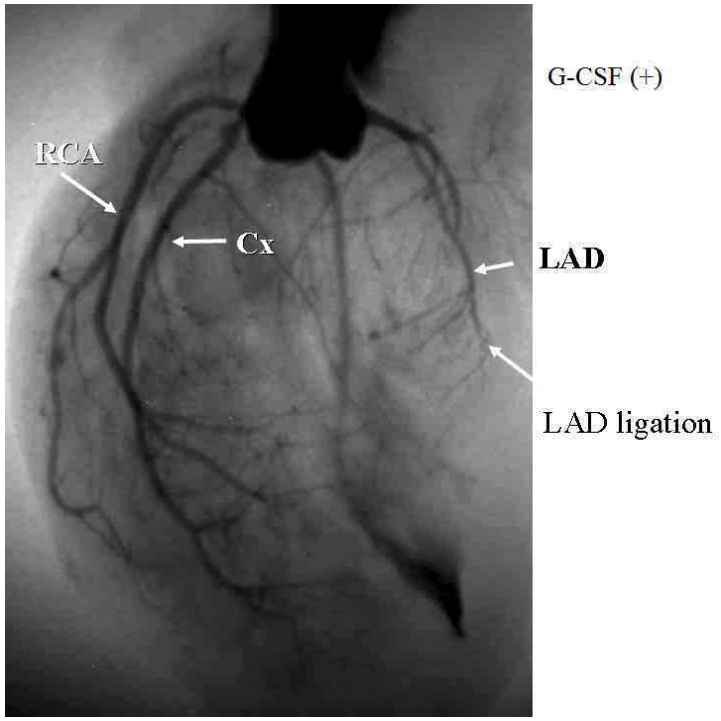
Ligation of left anterior descending artery (LAD) of rat heart was performed for the induction of myocardial infarction. Four weeks after surgical procedure, coronary angiography was taken using the heart with Langendorff perfusion. 1 ml of contrast material (32% of iodine) was injected into ascending aorta at a speed of 1.0 ml/sec. Imaging was taken under the following conditions: photon energy; 33.3 KeV, exposure time; 150 ms, resolution; 26 μm/pixel, and visual field; 26×26 mm.

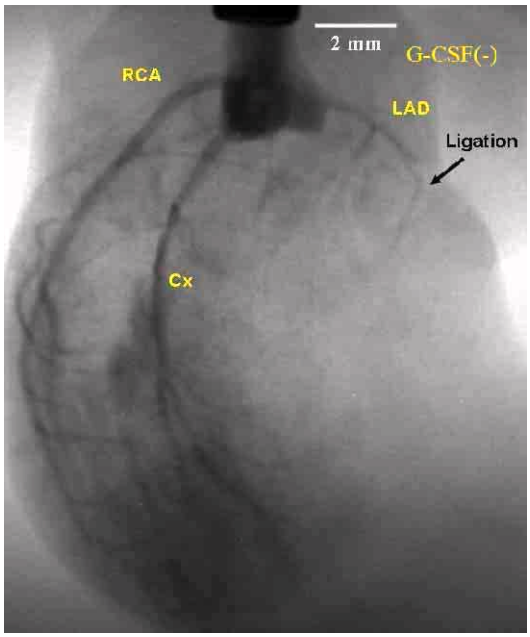
Results

Minimum diameter of identified the artery was around 50μm, which is comparable to the diameters of arteriogenesis. Avascular area in coronary angiography was corresponding to infarcted area of the heart. Many small arteries down to 50μm in diameter were extended from right coronary artery (RCA) and circumflex artery (Cx) towards the center of avascular area. The use of G-CSF (a cytokine to promote angiogenesis) enhanced the collateral formation compared with the control group.

Conclusion

Arteriogenesis but not angiogenesis could be e directly valuated using synchrotron radiation coronary angiography and our animal model.





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