

Evaluation of rat peripheral and coronary arteries by microangiography using synchrotron radiation

Shinji AKISHIMA^{1*}, Shonosuke MATSUSHITA², Yuzuru SAKAKIBARA², Kazuyuki HYODO³

¹ Doctor Course, Univ. of Tsukuba

² Institute of Clinical Medicine, Univ. of Tsukuba, Tsukuba, Ibaraki 305-8575, Japan

³ KEK-PF, Tsukuba, Ibaraki 305-0801, Japan

Introduction

Conventional angiographic system cannot identify the peripheral artery at less than 200 microns in diameter. However, applying a new angiographic system using monochromatic synchrotron radiation with a high-definition CCD video camera system, we can identify the smaller arteries up to 50 microns so far.

Method

Microangiography was performed in hind limbs *in vivo* and hearts using the Langendorff perfusion apparatus in rat. The morphological changes of peripheral and coronary arteries were investigated under the physical and the pharmacological vasoactive interventions.

Results and Discuss

1. Rat peripheral arteries about 50 microns in diameter were identified by this microangiographic system.
2. A great number of collateral vessels were observed in ischemic hind limbs that were operated as the ischemic model.
3. Constriction of peripheral arteries influenced by acute smoking was observed in most cases.
4. The cold stimuli to rat peripheral arteries showed distinct dilatation in all cases (Fig.1). It was considered to be a phase of reactive hyperemia.
5. Rat coronary angiography with this angiographic system including a high-definition CCD video camera was able to visualize the second or the third branch of coronary arteries under the Langendorff perfusion apparatus with a special attention to immobilize the heart that was rapidly beating more than 300/min.
6. With the use of potassium channel blocker (potential promotor of membrane depolarization in vascular smooth muscle cell), coronary blood flow decreased less than the half of normal value using Langendorff perfusion apparatus. In microangiography by synchrotron radiation, vasospasms were observed at main branches of coronary artery (Fig.2).
7. The pathogenesis of coronary spasm was explained either hypercontraction of vascular smooth vascular cell or dysfunction of endothelial derived vasodilation. This was the first angiographic demonstration of coronary spasm induced by hypercontraction in rat.
8. These angiographic results in small animals will be of help to gene therapy research for coronary vasospasm.

* akishima-ths@umin.ac.jp

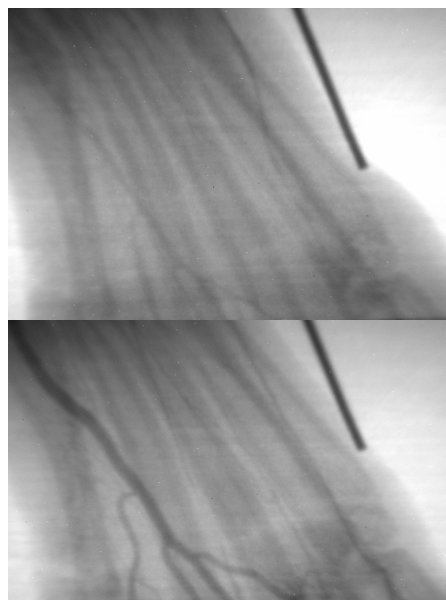


Fig.1 : normal(above), after cold stimulation(below)

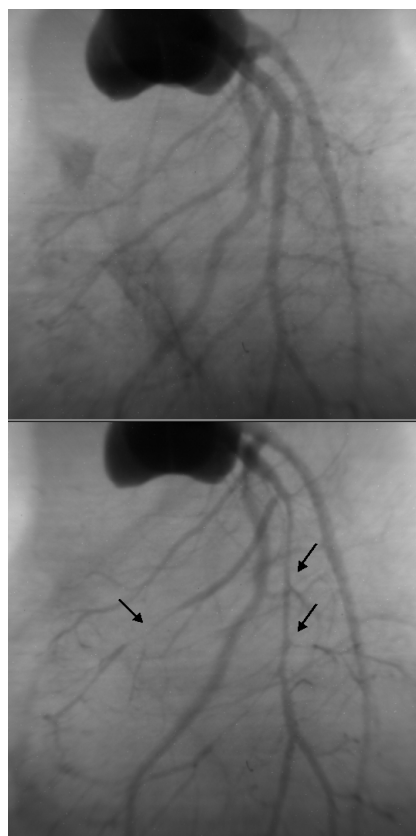


Fig.2 : normal(above), coronary spasm(below; arrow)