ORIGINAL ARTICLE

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Potential of an adenosine A_{2A} receptor antagonist [^{11}C]TMSX for myocardial imaging by positron emission tomography: a first human study

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In previous *in vivo* studies with mice, rats, cats and monkeys, we have demonstrated that [7-methyl-^{11}C]-(E)-8-(3,4,5-trimethoxystyryl)-1,3,7-trimethylxanthine ([^{11}C]TMSX) is a potential radioligand for mapping adenosine A_{2A} receptors of the brain by positron emission tomography (PET). In the present study, we studied the potential of [^{11}C]TMSX for myocardial imaging. Uptake of radioactivity by the heart was high and gradually decreased after an intravenous injection of [^{11}C]TMSX into mice. In metabolite analysis, 54% and 76% of the radioactivity in plasma and heart, respectively, were present as the unchanged form of [^{11}C]TMSX 60 min postinjection. The myocardial uptake was reduced by carrier-loading and by co-injection of an adenosine A_{2A} antagonist CSC, but not by co-injection of an adenosine A_1 antagonist DPCPX. Pretreatment with a high dose of a non-selective antagonist theophylline also reduced the myocardial uptake of [^{11}C]TMSX. These findings demonstrate the specific binding of [^{11}C]TMSX to adenosine A_{2A} receptors in the heart. Finally we successfully performed the myocardial imaging by PET with [^{11}C]TMSX in a normal volunteer. A graphical analysis by Logan plot supported the receptor-mediated uptake of [^{11}C]TMSX. Peripherally [^{11}C]TMSX was very stable in human: >90% of the radioactivity in plasma was detected as the unchanged form in a 60-min study. We concluded that [^{11}C]TMSX PET has the potential for myocardial imaging.

Key words: adenosine A_{2A} receptor, [^{11}C]TMSX, heart, human, positron emission tomography