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Shock wave irradiations avoiding fluid flow evoke intracellular Ca2+ signaling TORU TAKAHASHI, AKIRA TSUKAMOTO, SHIGERU TADA, National Defense Academy of Japan — Shock wave irradiation accelerates therapeutic effects including angiogenesis. One mechanism underlying those effects is cellular responses evoked by shock wave irradiation. Fluid flow is one of major physical phenomena induced by shock wave irradiation. Cellular responses evoked by fluid flow are similar to those evoked by shock wave irradiation. Thus, fluid flow could be responsible for cellular responses evoked by shock wave irradiation. However, it is obscure whether fluid flow is required for the cellular responses evoked by shock wave irradiation. In this study, intracellular Ca2+ signaling was observed in cells seeded in down-sized chambers. In the down-sized chambers, fluid flow was supposed to be suppressed because size of chambers (6 mm in diameter, 1 mm in thickness) was analogous to size of shock wave focus region (3mm in diameter). Dynamics of polystyrene microbeads suspended in the chambers were visualized with a CCD camera and analyzed with a particle image velocimetry (PIV) method to quantify fluid flow in the chamber. As a result, shock wave irradiation evoked intracellular Ca2+ signaling. However, fluid flow was not observed in the chamber due to shock wave irradiation. Thus, it was suggested that physical mechanics, not fluid flow, are further required for evoking intracellular Ca2+ signaling following to shock wave irradiation.

Toru Takahashi
National Defense Academy of Japan

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