



VISUALIZATION OF THROMBOGENIC PROCESS IN ARTIFICIAL HEART USING ELECTRICAL RESISTANCE TOMOGRAPHY

A. SAPKOTA^{1,c}, Y. ASAKURA¹, M. TAKEI¹, O. MARUYAMA², R. KOSAKA², T. YAMANE^{2,3}

¹Division of Artificial Systems Science, Chiba University, Chiba, 263-8522, Japan

²Human Life Technology Research Unit, AIST, Tsukuba, 305-8564, Japan

³Department of Mechanical Engineering, Kobe University, Kobe, 657-8501, Japan

^cCorresponding author: Tel.: +81432903212; Fax: +81432903212; Email: sapkota@chiba-u.jp

KEYWORDS:

Main subjects: artificial heart, thrombosis

Fluid: biological flows, bio fluid

Visualization method(s): tomography

Other keywords: coagulation, electrical impedance of blood

ABSTRACT: Many of the heart patients are benefitted with the emergence of prosthetic devices like ventricular assist device (VAD) and the total artificial heart (TAH). Naturally, when blood comes in contact with artificial systems it tends to clot more. Hence, blood clotting is the major issue in these devices. That is why the patients take regular medicine. The frequent use of such a medicine results to the other consequences. Due to this, the optimum use of medicine is desirable. To address this issue, we have made an assessment of an instrumentation system based on electrical resistance tomography which can monitor the blood and detect the thrombogenic activities in the early stage. The experimental results obtained by monitoring the bovine blood under thrombogenic conditions are shown in Figure 1. The figure shows the tomograms representing cross-sectional resistivity distribution in a tube containing bovine blood. As shown in Figure 1(a), under normal condition, the resistivity decreases gradually from center to the wall of the tube. The same pattern is not conserved (some low resistivity regions are noticed near the wall) during thrombogenic activities as shown in figures 1(b) and 1(c). These findings can be very useful in the process of developing a reliable thrombosis detecting device.

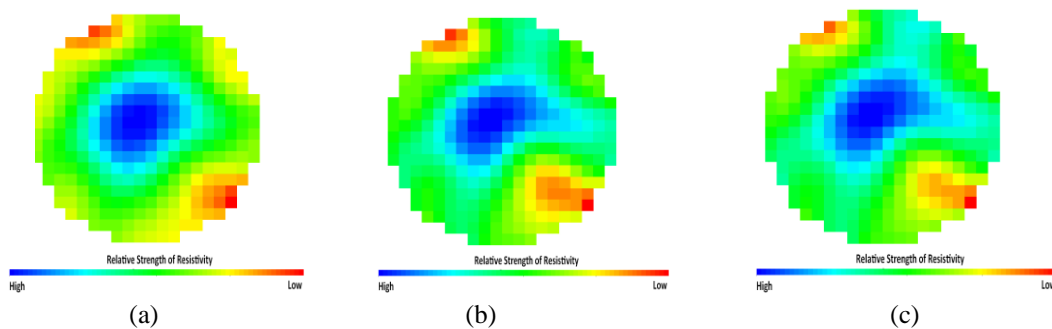


Figure 1. Electrical resistance tomograms of a tube containing bovine blood a) before clotting b) 5 minutes after activating the clot (5 mins) c) 10 minutes after activating the clot