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From Tissue Damage to Lost Beats: Modeling Infarction in the SAN

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A cellular automaton model reproduces the microstructure and bioelectric conduction within the sinoatrial node (SAN), incorporating cellular heterogeneity (cardiomyocytes, fibroblasts, collagen) and the presence of connexins (Cx43, Cx45, Cx40). The model simulates infarction which is related ischemia in the SAN head as a growing gradient of biochemical and electrical disturbances, leading to connexin degradation and altered cellular properties.

The results show that the progression of ischemia leads to conduction abnormalities, interruption of the signal transmitted to the atria, and activation of an escape rhythm originating from the AV node. The model also reveals phenomena not previously described in the context of the SAN.

[1] Beata Jackowska-Zaduniak. Ischemic Mechanisms after Myocardial Infarction in a Cellular Model of the Cardiac Conduction System *in print*