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Optimization of Cardiac Function after Acute Infarction, by Pacing at Various Sites, in Acute Sheep Model.

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Background: Many patients with inhomogeneous ischemic heart do not exhibit improvement with cardiac resynchronization therapy. The study suggests that lead position should be optimized in the inhomogeneous heart, and the optimal excitation sites should be defined based on energetic considerations. Methods: The study investigated the local and global effects of opposing strategies: pacing in vicinity of ischemic zone or at a remote site. Infarction was created in the anteroseptal region, in sheep (n=8). LV volume and regional shortening were measured by sonocrystals. Local pressure-segment length loops and global LV functions were assessed at baseline and after infarction, during three pacing modes: normal sinus, anteroseptal and remote lateral pacing. Coronary flow and arterial-venous oxygen difference were measured to assess cardiac energetics. Results: The infarction extended the segment's end-diastolic length (8%, p=.001), stretched the weak region during systole, decreased the local work (-49.6%, p<.001) and yielded overt post-systolic shortening (PSS, 5.4%, p<.005). Pacing in the vicinity of the ischemic region eliminated the systolic stretch, decreased the work of the ischemic region (-26.4%, p<.005) and diminished the PSS work (-38.6, p<.02). Remote lateral pacing slightly increase the ischemic region work and increased the PSS work. Conclusions: The study introduces the energetic concept of "workload redistribution" rather than the conventional electrical or mechanical resynchronization. Pacing in the ischemic region shifts the workload from the ischemic region, improves the balance between the regional demands and energetic capabilities and improves diastolic function by reducing the wasted PSS work.