

Evaluation of a New Catheter Sensor for Real-Time Measurement of Tissue Contact

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Introduction: Tissue contact, an essential determinant of ablation lesions has until now been impossible to determine objectively and/or in real time. We evaluated in vitro a new catheter mounted sensor designed to provide precise and real-time measurement of contact force.

Methods: A sensor equipped irrigated tip ablation catheter was positioned in contact with a weighing balance platform at an angle of 20°. Static tip force was increased by lowering the catheter with the balance fixed. Dynamic contact produced by contractile motion was simulated by a motorized up and down movement. Static and dynamic contact force (sensor output in grams) was correlated with the balance reading. Lesion size was evaluated on a piece of beef as a function of increasing RF power from 10 to 40W (during continuous irrigation at 20 cc/min) and contact force from 1 to 20 g – both static and dynamic.

Results: Contact sensor output showed a strong linear correlation with the balance reading, ($r = 0.94$, $p < 0.001$) with only $8 \pm 6\%$ overestimation. A similar correlation was observed during simulated contractile motion. Under static conditions lesion volume varied directly as a function of contact force (till 20g) for intermediate power (20 & 30W) but at 40W, plateaued beyond 8-9 g force (fig). Lesion volume increased linearly with increasing RF power for all levels of contact force but was smaller during simulated motion with sustained contact and even smaller during simulated motion with intermittent contact (for same power and similar force).

Conclusions: In this in vitro setup, an irrigated catheter mounted force sensor accurately measures contact force both when immobile and during cardiac-like motion. Lesion size correlated with contact force at intermediate power but at higher power levels, contact force beyond 8 g did not increase lesion size. Both sustained and intermittent forms of dynamic contact produced smaller lesions.

