

INVESTIGATIVE UROLOGY

Enhanced renal cryoablation with hilar clamping and intrarenal cooling in a porcine model

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Objectives: To evaluate the effects of renal vascular control and intrarenal cooling on the size of renal lesions attainable with a 3.4-mm cryoprobe.

Methods: Three groups of pigs underwent unilateral laparoscopic renal cryoablation with a 3.4-mm cryoprobe inserted to a depth of 1 cm. An 8-minute double-freeze cycle was used. One week later, an acute contralateral cryolesion was created before killing the animal. In group 1 (n = 6), bilateral cryolesions were created without hilar clamping or intrarenal cooling. In group 2 (n = 6), the cryolesions were created after hilar clamping alone. In group 3 (n = 6), the cryolesions were created after both hilar clamping and application of intrarenal cooling with saline ice-slush infused into the renal pelvis. After nephrectomy, the gross diameters were determined for each cryolesion. The mean diameters of the zones of complete and partial necrosis were determined by histopathologic examination.

Results: In group 3, the cortex cooled from 36.9°C to a mean of 24.8°C. Acutely, no statistically significant difference was found between the lesions produced with clamping alone (37.6 mm) and intrarenal cooling (40.4 mm); however, both were significantly larger than the control cryolesions (28.7 mm). At 1 week, the area of complete necrosis produced with intrarenal cooling (34.3 mm) was significantly larger than the areas of necrosis produced by clamping alone (27.8 mm) or conventional cryoablation (23.9 mm; ALPHA = 0.05, Tukey's honestly significantly different [HSD] test).

Conclusions: Enhanced cryolesion necrosis was achieved with intrarenal cooling with a 3.4-mm cryoprobe. Intrarenal cooling may be a valuable adjunct to cryoablation in selected cases.

Editorial Comment

The authors evaluated the ability of intrarenal cooling (retrograde intracavitary ice-cold saline perfusion) and hilar clamping to increase the area of renal necrosis attainable with a single cryoprobe.

The authors noted a significantly increased gross cryolesion diameter with occlusion of both renal artery and vein. Additionally, it was observed that the mean diameter of complete central necrosis was 4 mm larger with hilar occlusion alone than it was with conventional cryoablation. Intrarenal cooling with hilar clamping produced necrotic cryolesions that were an average of 10 mm larger than standard cryolesions and 6 mm larger than cryolesions with hilar occlusion alone.

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Improvement in relaxation response in corpus cavernosum from trained rats

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Objectives: To evaluate the contractile and relaxing responses in rat corpus cavernosum (RCC) from rats after 8 weeks of run training, because erectile function is highly dependent on nitric oxide (NO) from nitrergic fibers or endothelium. Physical activity enhances NO production and improves endothelial function, with beneficial effects on cardiovascular disease.

Methods: The training program consisted of 8 weeks of run training, 5 days/wk, and each session lasted 60 minutes. The RCC was isolated, and concentration-response curves to NO, acetylcholine, sodium nitroprusside, phenylephrine, and endothelin were obtained. The excitatory and inhibitory effects of electrical field stimulation (2 to 32 Hz) were also evaluated.

Results: NO (0.1 to 100 μ M) and sodium nitroprusside (0.01 to 1000 μ M) produced a relaxing effect in RCC in a dose-dependent manner, with the maximal responses to NO (control $62\% \pm 4\%$, trained $88\% \pm 3\%$) and sodium nitroprusside (control $83\% \pm 3\%$, trained $95\% \pm 2\%$) significantly enhanced after 8 weeks of run training. However, acetylcholine-induced relaxations were not affected by exercise. Similarly, electrical field stimulation-induced relaxations were significantly increased in RCC from trained rats at 2 Hz (control $2.4\% \pm 0.3\%$, trained $4.2\% \pm 0.5\%$) and 4 Hz (control $5.3\% \pm 1.2\%$, trained $12.5\% \pm 1.7\%$). The contractile sensitivity of RCC to phenylephrine (0.01 to 100 μ M) and endothelin (0.01 to 100 nM) was not modified by training exercise.

Conclusions: Our findings suggest that run training enhances functional responses in rat RCC that involves increases in the NO-cyclic guanosine monophosphate signaling pathway by endothelium-independent mechanisms that is not accompanied by changes in contractile sensitivity.

Editorial Comment

Previous studies have associated the beneficial effect of regular physical activity on cardiovascular diseases, with improvement in endothelium-derived relaxing factor production, reduction of sympathetic drive, and increases in parasympathetic activity to the peripheral tissues.

The authors perform the present experience aiming to evaluate the functional responses to both vasodilating agents (sodium nitroprusside [SNP], acetylcholine [ACh], NO) and vasoconstricting agents (phenylephrine [PE] and endothelin-1 [ET-1]) in rat corpus cavernosum (RCC) after 8 weeks of treadmill training.

The authors demonstrated objectively by the first time that physical training has beneficial effects on functional responses of RCC, because the run training program for 8 weeks increased the relaxation response to NO, SNP, and EFS.

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