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Veldtman et al. Catheterization and Cardiovascular Interventions. 65:556-563; Aug 2005 DOI: 10.1002/ccd.20328

Radiofrequency Perforation and Conventional Needle Percutaneous Transseptal Left Heart Access: Pathological Features

INTRODUCTION

- ▶ This study compared the nature and extent of tissue injury and subsequent healing response to perforating radiofrequency (RF) energy compared with mechanical needle puncture.

METHODS

- ▶ Transseptal puncture was performed on piglets using either RF energy (Baylis Medical*) or a conventional mechanical needle, and were sacrificed at one hour (acute response) or one month (chronic response).
- ▶ Intentional RF perforation of the aortic root was performed on separate animals, representing a complication of any percutaneous transseptal access, which were sacrificed at one month.
- ▶ Gross and histopathological analyses were performed on harvested tissues.

RESULTS

Acute findings

- ▶ Gross RF lesions were similar to needle puncture characterized by subendocardial hemorrhage in the tissue margins with limited extension into the adjacent pericardial and pleural spaces, consistent with mechanical trauma due to sheath and dilator insertion.
- ▶ Mechanical needle injury pattern comprised of a mural thrombus surrounding the newly-created lumen, areas of hemorrhage and tissue edema consistent with acute inflammatory response, and focal contraction band necrosis in the adjacent myocardium.
- ▶ RF injury pattern consisted of minimal mural thrombus, thermal injury zone in the myocardium adjacent to the neolumen, and a halo of contraction band necrosis. This wound response fell short of classic coagulative necrosis characteristic of ablative RF.

Chronic findings

- ▶ A residual lumen was found in two of three animals at one month after mechanical needle puncture. Only one animal had a circumferential collagenous scar surrounding a region of residual granulomatous inflammation.
- ▶ A residual lumen was found in only one of three animals following RF puncture. All animals had well-developed circular scarring with homogenous fibrosis, neovascularization, and minimal residual inflammation.
- ▶ In the aortic perforation cases, dense collagen scar formation was observed with no residual patent defect or inflammation.

DISCUSSION AND CONCLUSIONS

- ▶ Similar extent of acute atrial tissue injury between RF and mechanical needle puncture, with well-developed healing at one month.
- ▶ All animals survived intentional aortic perforation, with healing and no evidence of inflammation at one month.
- ▶ Findings support the safety and clinical utility of RF energy for interatrial septal tissue puncture.

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EP-1583204-AA