Visualization of myofiber architecture in the left ventricular myocardium: re-evaluation of Lunkenheimer’s pneumo-myocardium technique

Hiroshi Nagamine *, Yushi Kawase, Nobuhiro Tanaka, Hiroiku Hara

Department of Thoracic and Cardiovascular Surgery, Yokohama Sakaey Kyoai Hospital, Yokohama, Japan

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Lunkenheimer’s method, ‘transcoronary pneumatic spreading of the myocardial network,’ was revived using the latest advanced imaging techniques: multidetector-row computed tomography and high-performance image processing.

Three-dimensional multi-planar reconstruction (Fig. 1) and dynamic display of image sequences (Videos 1 and 2) clearly visualized the myofiber architecture (Fig. 2) in the postmortem porcine myocardium.

Appendix A. Supplementary data

Supplementary data associated with this article (Video 1 and Video 2) can be found, in the online version, at doi:10.1016/j.ejcts.2011.02.004.

* Corresponding author. Address: Department of Thoracic and Cardiovascular Surgery, Yokohama Sakaey Kyoai Hospital, 132 Katsura-cho, Sakaeku, Yokohama, Kanagawa 247-8581, Japan. Tel.: +81 45 891 2171; fax: +81 45 895 8351.

E-mail address: hiroshi-nagamine@arion.ocn.ne.jp (H. Nagamine).

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Fig. 1. Three-dimensional orthogonal multi-planar reconstruction images of postmortem porcine pneumo-myocardium. In 1984, Lunkenheimer et al. reported a trans-coronary pneumo-myocardium technique to visualize myocardial architecture in Investigative Radiology. Pneumo-myocardium was produced with continuous transcoronary air injection at 600 mmHg. Capillary vessel walls were dissected and myocardial fibers were gently separated. (A) Mid-ventricular slice in the axial plane. (B) Long-axis three-chamber view. (C) Long-axis two-chamber view.

Fig. 2. (A) Myofiber architecture perceived from a dynamic short-axis image sequence (Video 1). Reciprocal spirals: a right hand helix in the inner layer and left hand helix in the outer layer were clearly confirmed. (B) Myofiber architecture perceived from a rotated long-axis image sequence (Video 2). Ascending swirls spread from the epicardium toward the basal endocardium and descending swirls spread from papillary muscles toward the apical epicardium. Each continuous swirl spread transmurally, and no boundary layer separating the inner from outer layer was detected. Abbreviations: APM: anterior papillary muscle; PPM: posterior papillary muscle; Ao: aorta; LA: left atrium; RV: right ventricle.