

POSTER PRESENTATION

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Characterization of peri-infarct zone by cardiac magnetic resonance: validation compared to ex-vivo imaging and post-mortem histology

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Background

Assessment of peri infarct zone (PIZ) by late gadolinium enhancement (LGE) is limited by the spatial resolution of in vivo LGE in the z direction, resulting in partial volume effect. Although the assessment of infarct size by LGE has been validated, characterization of PIZ has not been validated against histopathological findings.

Objectives

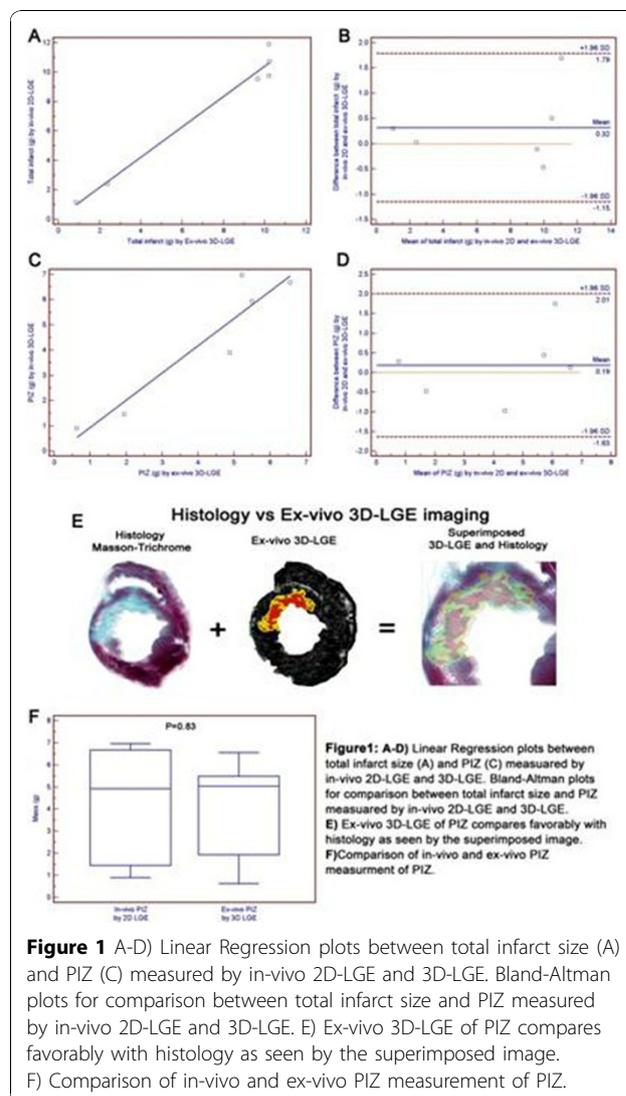
We seek to characterize the PIZ by LGE in comparison with histology in an ischemia reperfusion model of myocardial infarction (MI).

Methods

Adult sheep (40kg) were subjected to ischemia reperfusion injury (LAD for 45 min). Six animals underwent in vivo CMR 10 days after surgery and were euthanized on the next day for ex vivo CMR and histopathological examination. In vivo CMR included: black blood T2 and 2D LGE (in-plane resolution 2mm). Animals were euthanized 10 min after injection of Gadolinium. Heart specimens were sliced and imaged ex vivo using a high resolution 3D LGE (isotropic resolution of 0.6mm). Heart specimens were then fixed for histological analysis (HE and Masson trichrome).

Results

Infarct and PIZ mass were measured of the in vivo and ex vivo LGE using a previously described criterion (FWH 50%). In vivo MI size (mean 7.58 ± 4.59 g) and ex vivo MI size (7.26 ± 4.4 g) showed strong correlation ($R^2 = 0.99$, $p < 0.001$) and agreement (figure 1A-B). In vivo



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(4.31 ± 2.65 g) and ex vivo PIZ mass (4.12 ± 2.31 g) were not different ($p=0.8$) (Figure 1F) and were strongly correlated ($R^2=0.87$, $p=0.006$, Figure 1CD). Morphology and distribution of MI and PIZ ($n=6$) by ex vivo 3D LGE correlated well with matching short axis pathologic sections (Figure 1E). Superimposed 3D LGE and pathologic images demonstrated that the PIZ consisted of a layer of viable myocardium, approximately 6-8 myocytes thick.

Conclusion

CMR imaging of PIZ compares favorably with histology. Clinically available 2D LGE technique provides robust measurement of infarct size and PIZ. The agreement between in vivo 2D and ex vivo 3D LGE suggests that slice thickness has no relevant effect on PIZ measurement.

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