Background: Peak early-diastolic mitral annulus velocity (E’) by tissue Doppler imaging (TDI) has been introduced as a marker of diastolic function. This study investigates mechanisms of changes in E’ during acute changes in LV preload.

Methods: In 7 anaesthetised dogs with pressure catheters we measured E’ and systolic long-axis shortening (SS) by sonomicrometry and TDI. Preload was increased by volume loading and reduced by caval constriction. In 8 healthy humans we measured E’ by TDI and SS by M-mode echocardiography. Preload was reduced by lower body negative pressure at 40 mmHg (LBNP).

Results: In dogs, LV end-diastolic pressure decreased from 5.5±1.4 (mean±SD) at baseline to -0.9±0.5 (P<0.01) during caval constriction and increased to 15.3±2.2 mmHg (P<0.01) after volume loading. Changes in peak E’, SS and tau are shown in Fig. 1. There were marked changes in E’ and SS, while there was no significant change in tau. Peak E’ correlated well with SS by sonomicrometry (R=0.88, P<0.01). Measurements of E’ by TDI showed similar changes. In humans, LBNP decreased LV stroke volume from 71±11 to 42±12 ml (P<0.01), and there were marked reductions in peak E’ and SS (Fig. 2). Peak E’ correlated well with SS (Fig. 2).

Conclusions: Load dependent changes in E’ could not be explained by changes in rate of LV relaxation, but were accounted for by changes in systolic shortening. These observations indicate a tight coupling between systolic and diastolic function in the intact LV, and challenge the concept that E’ is a marker of LV relaxation.