

**Noninvasively measured global wasted myocardial work allows for quantitative assessment of typical left ventricular mechanical dyssynchrony pattern in patients with left bundle branch block**

**Authors:**

E Surkova<sup>1</sup>, J Aalen<sup>2</sup>, E Samset<sup>3</sup>, J Bidviene<sup>4</sup>, P Aruta<sup>1</sup>, G Romeo<sup>1</sup>, F Sambugaro<sup>1</sup>, L P Badano<sup>1</sup>, D Muraru<sup>1</sup>, <sup>1</sup>University of Padova, Department of Cardiac, Thoracic and Vascular Sciences - Padua - Italy, <sup>2</sup>Oslo University Hospital, Institute for Surgical Research and Department of Cardiology - Oslo - Norway, <sup>3</sup>Center for Cardiological Innovation - Oslo - Norway, <sup>4</sup>Lithuanian University of Health Sciences, Department of Cardiology - Kaunas - Lithuania,

**Topic(s):**

Determinants of left ventricular performance

**Citation:**

European Heart Journal Supplements ( 2016 ) 17 ( Supplement 2 ), ii75

**Funding Acknowledgements:**

Dr Elena Surkova has received the EACVI Training Grant and the ESC Research Grant

**Background.** Despite the presence of wide QRS with left bundle branch block (LBBB) morphology in electrocardiogram (ECG) 30-40% of patients do not respond to cardiac resynchronization therapy (CRT). The typical mechanical dyssynchrony pattern including septal flash (SF) and apical rocking (AR) is considered independent predictor of response to CRT in patients with LBBB. However, the visual assessment of these markers used in many CRT studies has significant limitations, such as inability to recognise low-amplitude SF/AR, inability to assess timing of SF and difficulties in differentiation from other abnormal septal motion patterns.

**Purpose:** to compare the amount of left ventricular (LV) global wasted work (GWW) in LBBB patients with different QRS morphology and its relationships with both the QRS duration and the presence of typical mechanical dyssynchrony pattern.

**Methods.** Thirty-two patients with complete LBBB (65 (95%CI 60-71) years, 56% male) and no history of coronary artery disease were examined using 2D and 3D echocardiography. LV myocardial work was calculated from non-invasive LV pressure and strain assessed by speckle tracking echocardiography. LV segments that shorten in systole do constructive (positive) work, whereas segments that lengthen perform wasted (negative) work. During isovolumetric contraction shortening was considered wasted work. GWW was calculated as the average wasted work for the entire LV. Presence of AR was assessed visually on 2D apical views, whereas SF was assessed by both 2D and tissue Doppler M-mode imaging.

**Results.** Fifteen patients had strict LBBB electrocardiographic criteria proposed by Strauss and 17 presented with conventional ECG criteria. Mean QRS duration was 141 ms (95% CI 136-147 ms). No significant correlations between GWW and ECG pattern, QRS duration, LV volumes or ejection fraction were observed. Both SF and AR were present in 20 patients. GWW was significantly higher in these patients in comparison with those having either SF or AR or none ( $337 \pm 31$  mmHg% vs.  $233 \pm 26$  mmHg%,  $p=0.027$ ).  $GWW > 260$  mmHg% predicted the complete mechanical dyssynchrony pattern with the sensitivity of 75% and specificity of 80% (area under the curve of 0.74, 95% CI 0.56–0.93).

**Conclusion.** In LBBB patients, GWW was strongly associated with the presence of specific LV mechanical dyssynchrony patterns (SF and AR), but not with electrical ones (QRS morphology and duration). This novel quantitative parameter may help to identify which LBBB patients have significant mechanical dyssynchrony. Further studies will assess if GWW can improve our ability to identify patients who will benefit from CRT.

