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The relative role of echocardiography and magnetic resonance imaging in identifying critical lesions in patients with single-ventricle physiology, prior to bidirectional cavo-pulmonary connection (BCPC).

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Introduction: This study compared the ability of simultaneous, pre-operative echocardiography and magnetic resonance imaging (MRI) to predict the need for intervention on lesions at the time of bidirectional cavopulmonary connection (BCPC) or during the 6-month postoperative period.

Methods: All patients were included who had undergone BCPC for single ventricle palliation between 2007 - 2012, and who had pre-operative assessment with echocardiography and MRI. The outcome measure was the need for surgical or catheter intervention on additional lesions at the time of BCPC or within 6 months.   The indices assessed were: MRI and echocardiography dimensions of right pulmonary artery (RPA) and left pulmonary artery (LPA) (indexed for body surface area using z-score), coarctation of the aorta (COA), adequacy of interatrial communication, and degree of atrioventricular valve regurgitation (AVVR). A 4-point scoring system was used to grade the adequacy of interatrial communication and AVVR. Binary logistic regression analysis was used to identify imaging covariates associated with the need for intervention.

Results: A total of 72 patients satisfied the inclusion criteria. Their median age at BCPC was 160days, (IQR 121-284).   Echocardiographic measurements were inferior to MRI for predicting the need for additional intervention on RPA, LPA or aortic arch. The MRI z-score for RPA dimensions predicted intervention, OR 1.77 (95% C.I. 1.12-2.79, p=0.014). LPA intervention was associated with both MRI LPA z-score, OR 1.45(1.04-2.00, p=0.027) and MRI report conclusion (OR 1.57 (1.06-2.33, p=0.025). The MRI report conclusion predicted aortic arch intervention OR 11.5 (3.5–37.7, p=0.00006). The need for additional AV valve repair was associated with MRI regurgitation score, OR 22.4 (1.7-295.1, p=0.018), but not echocardiographic assessment. Echocardiography assessment was superior to MRI for predicting the need for intervention on the interatrial septum, OR 27.7 (6.3-121.6, p=0.00001).

Conclusion: This study demonstrates that for branch pulmonary artery, aortic arch, and AVVR, MRI parameters more reliably predict the need for intervention. However, the adequacy of interatrial communication was more accurately identified by echocardiography. The complete assessment of patients with single ventricle physiology approaching BCPC, requires the cumulative strengths of multi-modality imaging. The relative strengths of MRI and echocardiography should be acknowledged when recommending intervention.