

Does 3D/4D spatiotemporal image correlation (STIC) echocardiography improve diagnostic accuracy and predicting surgical approach in fetuses with double outlet right ventricle?

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Background:

DORV is a complex form congenital heart disease which is heterogeneous with respect to location of interventricular communication(IC) and the relationship of the great arteries.

Aim:

To analyze the incremental benefit of 3D/4D STIC fetal echocardiography with offline processing in improving diagnostic accuracy and predict surgical approach in fetuses with DORV.

Methods:

Our database was reviewed retrospectively from January 2008 to October 2018. Cases which underwent termination of pregnancy and those without postnatal data were excluded. 3D/4D STIC fetal echocardiography with offline analysis was included in the protocol after October 2015. Fetal diagnosis was compared with post-natal echocardiography with respect to situs, IC, great artery relationship to IC, outflow tract anatomy & presence/absence of two ventricles. The incremental benefit of 3D/4D STIC fetal echocardiography on diagnostic accuracy ($\geq 4/5$ parameters) when compared to conventional fetal echocardiography was studied. The accuracy of fetal echocardiography in predicting the surgical approach was analyzed.

Results:

Of the total 138 cases with diagnosis of DORV in fetal echocardiography during the study period, 61 (44%) were delivered in our centre and had post-natal evaluation. The mean gestational age was 30.1 ± 5.7 weeks. Of these, 35 had only conventional fetal echocardiography while 26 had in addition 3D/4D STIC imaging also. Ten patients (7 in conventional and 3 in 3D/4DSTIC) were deemed not suitable for biventricular repair and were excluded from further analysis. The comparison of diagnostic accuracy of conventional vs. 3D/4D STIC for various anatomic components is as follows:

Variable	Conventional	3D/4D STIC
Situs	91%	95.6%
VSD location	65%	87%
Great artery relation	56%	87%
Outflow obstruction	87%	100%
Biventricular anatomy	65.7%	88%

The overall diagnostic accuracy was superior with 3D/4D STIC compared to conventional fetal echocardiography (88% vs. 60%; $p = 0.020$). Accurate prediction of single staged biventricular repair was made in 60% of cases with conventional echocardiography and all cases (100%) with 3D/4D STIC imaging ($p=0.024$).

Conclusion:

Addition of 3D/4D STIC fetal echocardiography to the conventional imaging provides incremental diagnostic accuracy in fetuses with Double Outlet right ventricle, thereby aiding in counseling and planning surgical approach.