Opinion

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Interpretation of Examinations by Those with Specialized Fetal Cardiology Training

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Description

Over the course of four decades, fetal echocardiography has developed to the point where prenatal diagnoses of the majority of major Congenital Heart Disease (CHD) are now possible. The authors investigated the diagnostic accuracy of fetal echocardiography in defining major fetal CHD. Between 2007 and 2018, all fetuses with major fetal CHD at a single institution were identified. Reports from fetal echocardiography, postnatal imaging, and surgical or autopsy reports were compared, and the following conclusions were drawn: category 1, with no errors; category 2, with minor errors that have no effect on care and are regarded as accurate; category 3, with minor errors that affect the surgical approach; and errors in category 4 that have a significant impact on neonatal care or outcomes are deemed inaccurate. Age, gestational age at first fetal echocardiography, serial fetal echocardiography, maternal weight, and reviewer level of training were also examined for their contributions. Fetal echocardiography has a high diagnostic accuracy for major CHD, especially when performed by fetal cardiology-trained professionals. Diagnostic accuracy is affected by general, lesion-specific, modifiable, and unmodifiable factors. This was a 12-year retrospective, single-centre investigation of the accuracy of fetal echocardiography at a tertiary program for fetal cardiology. Patients were identified using the database of the University of Alberta Fetal & Neonatal Cardiology Program following approval from the research ethics board. Women who were carrying fetuses that had been identified as necessitating surgery or catheter intervention within the first year of life and had either an autopsy met the inclusion criteria. During the 12-year study period, when nearly 12,000 distinct pregnancies were examined in our program from 2012 to 2018, 827 fetuses were prenatally diagnosed with major CHD, and 589 had the diagnosis confirmed (573 live births, 16 fetal autopsies).282 of these 589 patients came from other fetal cardiology services in southern Alberta and the provinces that bordered it.In keeping with the current diagnostic era, our institution has taken the approach of performing a comprehensive fetal echocardiogram, which is highly accurate in identifying crucial anatomic details associated with major fetal Ch.B. identifying significant lesion-specific areas for improvement in the prenatal detection of major CHD, our work contributes to the expanding body of knowledge regarding the accuracy of fetal echocardiography.

Non-Modifiable and Modifiable Factors

In addition, we have identified key non-modifiable and modifiable factors that influence our examination accuracy. In the modern era, dedicated fetal echocardiography is extremely accurate, allowing for the identification of significant fetal cardiac anatomy in 90% of fetuses with major CHD.Errors are more likely to occur in lesions like DORV, TA, and HS. Early referral for fetal echocardiography, serial assessment, and examination interpretation by specialized fetal cardiologists can help reduce errors. Fetal echocardiography is a major diagnostic imaging modality for prenatal detection of critical heart disease present at birth. In order to plan the delivery and care for the new-born appropriately, diagnostic accuracy is essential. Diagnostic error and study comprehensiveness are not well understood to be linked. The purpose of this study was to test the hypothesis that a low rate of diagnostic error would be correlated with a comprehensive fetal echocardiographic study. The potential causes, contributors, and clinical significance of diagnostic errors were further characterized. Discordant fetal and postnatal diagnoses were defined as diagnostic errors. The fetal cardiology program database was used to identify fetuses with critical congenital heart disease who had undergone fetal echocardiographic examinations at Lucile Packard Children's Hospital and were anticipated to require postnatal surgical or catheter intervention within the first year of life. A fetal echocardiography comprehensiveness score (FECS) was assigned to the initial fetal echocardiographic images for this cohort. To determine whether there had been a mistake in the diagnosis, the initial fetal echocardiographic images and reports were compared to postnatal diagnoses that were confirmed by transthoracic echocardiography, other imaging studies, or surgery. Multivariable logistic regression was used to examine the connection between FECS and diagnostic error. Of the 304 initial fetal echocardiographic studies, 92 had diagnostic error (false negative or false positive).Low FECS was associated with procedural conditional contributors and false negatives, whereas high FECS was associated with diagnostic error. The majority of errors were attributed to cognitive factors. Diagnostic error had nothing to do with the fetal echocardiographic studies' comprehensiveness. Cognitive factors were the main causes of errors. Through quality improvement initiatives, echocardiography laboratories can work to reduce cognitive

error that can be avoided. The study sample consisted of LPCH fetal echocardiographic examinations performed on infants born with critical CHD between August 2008 and September 2016.Around 1,400 fetal echocardiographic studies are carried out on site annually at LPCH, a major academic referral centre for paediatric cardiac surgery. In contrast to a small number of referrals for suspected fetal CHD, this investigation revealed that there was no difference in the FECS between concordant and discordant prenatal and postnatal diagnoses. A large proportion of fetal echocardiographic examinations referred to LPCH are for maternal screening purposes. The idea that accuracy in echocardiographic diagnosis is determined by a number of factors is brought up again by these findings. On three fronts, ideal conditions are thought to result in optimal diagnostic accuracy, cognitive performance, technical performance, and procedural/conditional factors.

Comprehensiveness on Fetal Echocardiography Diagnostic Accuracy

There are many ways that cognitive performance can be affected: Due to a lack of knowledge, this is the first study to evaluate the effect of study comprehensiveness on fetal echocardiography diagnostic accuracy. Discordance between fetal and postnatal diagnoses was not found to be associated with the comprehensiveness of the initial fetal echocardiographic study. Cognitive factors outside of the expected procedural/conditional factors and technical factors related to limited imaging contributed to fetal diagnosis errors. Fetal echocardiography is an essential and comprehensive examination method for the detection of fetal heart anomalies. Efforts to mitigate traits that impair cognitive performance precise segmentation of the cardiac chambers can make it easier for cardiologists to analyse the morphology of the heart and diagnose heart disease. The segmentation of a single cardiac chamber, such as the left ventricle or left atrium was the primary focus of previous research. In order to accurately and simultaneously divide the four cardiac chambers, we propose a general framework based on instance segmentation. There are three branches to the proposed Category Attention Instance Segmentation Network: a category attention branch for learning category information of instances, a mask branch for segmenting the cardiac chambers, and a category prediction branch for predicting the semantic category. When the category branch misclassifies an instance, the category attention branch is utilized. Experiment results in our dataset, which includes four-chamber views of echocardiography images of 319 fetuses, demonstrate that our method outperforms current approaches for segmentation. For the four cardiac chambers, our model achieves Dice coefficients of 0.7956, 0.7619, 0.8199, and 0.7470 using fivefold cross-validation, with an average precision of 45.64 percent. The structure of our Category Attention Instance Segmentation Network's network. In order to generate FPN feature maps P2–P6, the input image enters the backbone network. First, we use the size of each feature map level as the input feature map for the category and mask kernel branches after interpolating it to that size. Second, to get the fusion of feature maps, we up sample the original image size and then add them. It will serve as the input feature map for the category attention branch and the mask feature branch, respectively. Thirdly, the predicted mask is obtained by combining the output of the mask kernel branch with that of the mask feature branch. The corrected category confidence is then obtained by multiplying the feature map without the background channel with the output feature map of the category attention branch and then performing softback on the interpolated feature map in the direction of the channels. The confidence in the corrected category defines the mask's category. In the field of computer vision and even more so in the context of medical image processing, image segmentation continues to be one of the most crucial tasks. Memory and computation efficiency are frequently overlooked in favour of image segmentation quality, limiting the practical application of power-hungry models. A novel framework that combines the effectiveness of attention-based encoder-decoder architecture, atrous spatial pyramid pooling and highly efficient dimension-wise convolutions is the focus of this paper. On two publicly accessible kidney and TNBC breast H&E stained histopathology image datasets, it was demonstrated that the proposed Kidney-SegNet architecture's segmentation results outperform current cutting-edge deep learning techniques. In addition, our simulation experiments demonstrate that our proposed architecture outperforms current state-of-the-art deep learning techniques for nuclei segmentation of H&E stained histopathology images in terms of computational complexity and memory requirements.