

EP08.30. The value of fetal cardiothoracic ratio z-scores in predicting homozygous a-thalassemia fetuses during early pregnancy

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Objectives Globally, Asia has the highest carrier rate for α -thalassemia, and homozygous α -thalassemia is a lethal condition. The objective of this study is to investigate the value of the cardiothoracic ratio z-scores in predicting fetal homozygous a-thalassemia.

Methods

We performed ultrasound examinations on singleton fetuses at 11 to 13⁺⁶ gestational age at risk of homozygous a -thalassemia. The cardiothoracic ratios [including cardiothoracic diameter ratio (CTDR), cardiothoracic circumference ratio (CTCR) and cardiothoracic area ratio (CTAR)] were measured and calculated, then converted into z-scores base on our previous study, and the predictive efficacy for homozygous a-thalassemia were analyzed.

Results

1. 363 high-risk fetuses were enrolled, including 91 affected cases (25.1%) and 272 non-affected cases (74.9%);
2. Compared with the non-affected group, the affected group exhibited higher cardiothoracic ratios (CTDR, CTCR and CTAR) and their corresponding calculated z-scores, with statistically significant differences ($t=3.705\sim21.320$, $P<0.001$);
3. AUC analysis revealed that the z-scores for cardiothoracic ratios was consistently higher than that for the corresponding cardiothoracic ratios, with AUCs values ranked as follows: CTDR z-score > CTDR > CTAR z-score > CTCR z-score > CTAR > CTCR. Among these, the CTDR z-score demonstrated the highest predictive efficacy (with an optimal cutoff value of 1.10, AUC=0.959, sensitivity and specificity of 94.5% and 90.4%, respectively).

Conclusion

The fetal cardiothoracic ratios z-scores demonstrate superior predictive efficacy compared to their corresponding cardiothoracic ratios, serving as new effective biomarkers for predicting homozygous α -thalassemia in 11 to 13^{+ 6} gestational weeks,especially in popular countries and regions.

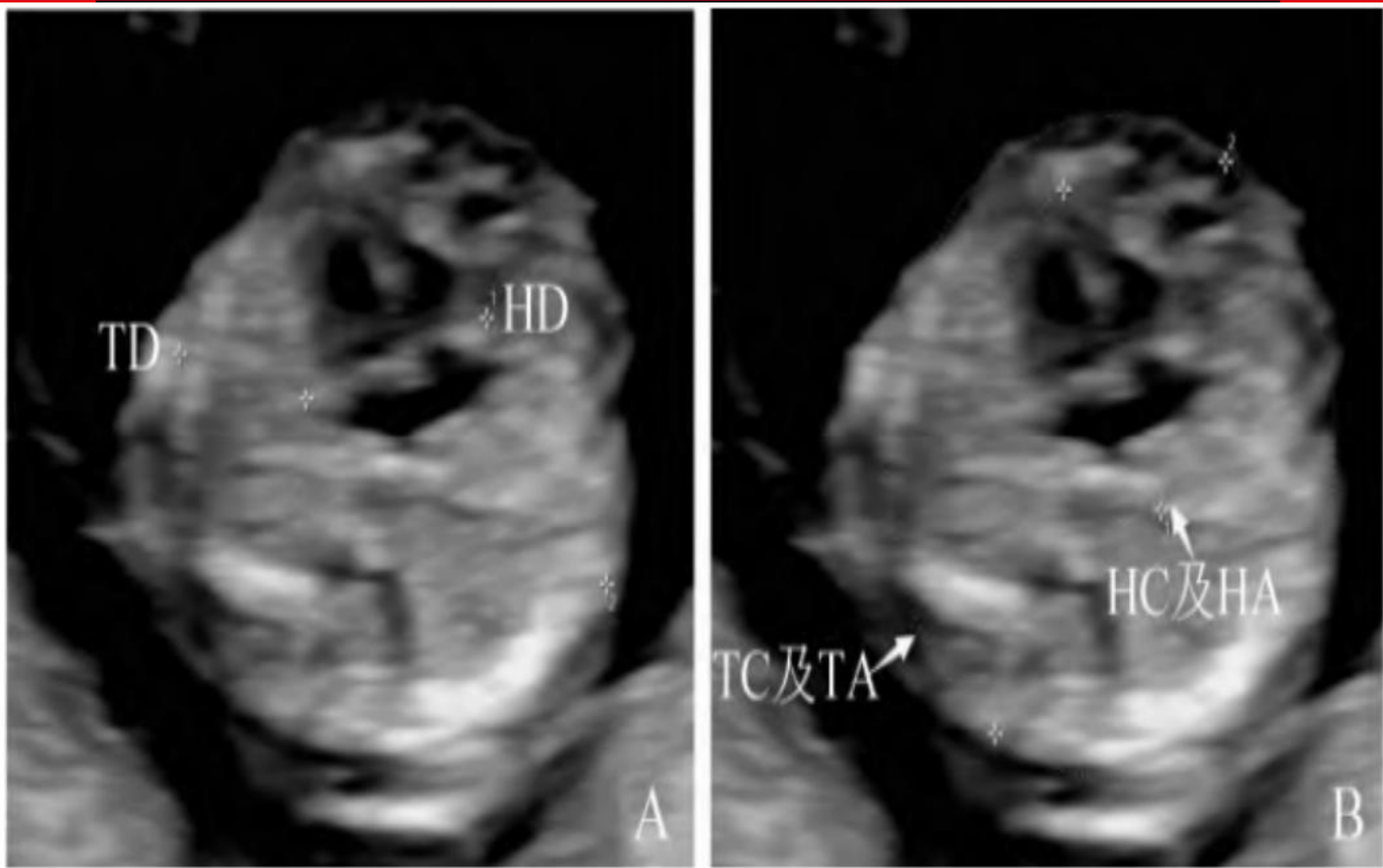


Figure 1. The Cardiothoracic ratio measurement methods.

Index	AUC	95% CI	Optimal cutoff value	Sensitivity (%)	Specificity (%)	Positive predictive value (%)	Negative predictive value (%)
CTDR	0.957	0.931~0.976	0.48	90.1	94.9	85.55	96.62
CTDR Z-score	0.959	0.932~0.977	1.10	94.5	90.4	76.74	98.00
CTCR	0.855	0.814~0.889	0.49	84.6	77.9	56.20	93.79
CTCR Z-score	0.861	0.821~0.895	0.82	82.4	82.7	61.48	93.34
CTAR	0.858	0.818~0.893	0.25	75.8	89.0	69.78	91.65
CTAR Z-score	0.864	0.825~0.898	0.99	81.3	85.7	65.58	93.10

Figure 2. The predictive efficacy of various fetal cardiac-to-chest ratios in forecasting homozygous α -thalassemia