Screening for Duct-Dependent Congenital Heart Disease with Pulse Oximetry: A Critical Evaluation of Strategies to Maximize Sensitivity.

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Aim

To evaluate the feasibility of detecting duct-dependent congenital heart disease before hospital discharge by using pulse oximetry.

Method

Design: Case-control study. *Setting:* A supra-regional referral centre for paediatric cardiac surgery in Sweden. Patients: 200 normal term newborns with echocardiographically normal hearts (median age 1.0 d) and 66 infants with critical congenital heart disease (CCHD; median age 3 d). *Methods:* Pulse oximetry was performed in the right hand and one foot using a new-generation pulse oximeter (NGoxi) and a conventional-technology oximeter (CToxi).

Results

With the NGoxi, normal newborns showed a median postductal saturation of 99% (range 94-100%); intra-observer variability showed a mean difference of 0% (SD 1.3%), and inter-observer variability was 0% (SD 1.5%). The CToxi recorded a significantly greater proportion of postductal values below 95% (41% vs 1%) in the normal newborns compared with NGoxi ($p<0.0001$). The CCHD group showed a median postductal saturation of 90% (45-99%) with the NGoxi. Analysis of distributions suggested a screening cut-off of <95%; however, this still gave 7/66 false-negative patients, all with aortic arch obstruction. Best sensitivity was obtained by adding one further criterion: saturation of <95% in both hand and foot or a difference of >+/-3% between hand and foot. These combined criteria gave a sensitivity of 98.5%, specificity of 96.0%, positive predictive value of 89.0% and negative predictive value of 99.5%.

Conclusion

Systematic screening for CCHD with high accuracy requires a new-generation oximeter, and comparison of saturation values from the right hand and one foot substantially improves the detection of CCHD.