

Blood markers could help predict outcome of infant heart surgery

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Baby toes stretch. Credit: Scott Sherrill-Mix

New research suggests it may be possible to predict an infant's progress following surgery for congenital heart disease by analysing a number of important small molecules in the blood.

The study, published today in the journal *Critical Care Medicine* and carried out at Royal Brompton Hospital, followed [children](#) undergoing [surgery](#) for congenital [heart disease](#), and found that by analysing metabolites in the blood – molecules created as a result of metabolism – it was possible to predict a child's clinical outcome.

Congenital heart disease is relatively common, affecting between 4 and 14 babies in every 1,000 live births. Around one third of affected children require surgery during early childhood. However, surgery itself can cause complications, affecting inflammation (how the body responds to injury and infection), the endocrine system (which regulates metabolism, growth and development, tissue function, sleep, and mood, among other things) and metabolism itself. Congenital heart disease is known to affect children's growth, and surgery and chronic disease can affect their metabolism and ability to absorb essential nutrients.

In a study funded by the British Heart Foundation, a team of UK researchers followed 28 children (with a median age of 6.6 months) who were undergoing surgery for [congenital heart disease](#). The children were part of a wider trial looking at management of blood sugar in 1,300 critically ill children and hence 15 of the children had their blood sugar levels tightly controlled using insulin, whilst the remaining 13 underwent the standard [blood sugar control](#) treatment. The researchers took blood samples from before surgery through to 48 hours afterwards, and analysed the various molecules present using nuclear magnetic resonance (NMR).

The researchers found a link between certain metabolites found in the blood and a child's clinical outcome. The greater the presence of ketone bodies – chemicals produced when the body does not have enough insulin in the blood and must break down fat instead of the sugar for energy – correlated with better outcomes. However, the presence of other metabolites such as citrate, lactate and alanine correlated with

poorer outcomes. This supports previous research in adults with critical illness.

The researchers found no difference in clinical outcome between those patients whose [blood sugar levels](#) were tightly controlled and those who received the standard [blood sugar](#) control treatment.

Dr Nazima Pathan from the Department of Paediatrics at the University of Cambridge, who led the study, says: "We've shown that the presence of certain molecules in a child's blood following heart surgery can help predict how well a child will recover in the crucial hours and days immediately following surgery. This opens up the possibility of us being able to identify those children at greatest risk following surgery and target them with the appropriate critical care management."

Co-author Professor Elaine Holmes of Imperial College London adds "Early metabolic differences in the type and scale of response to surgery may provide the basis of predicting downstream health outcomes in these children. We are now in a position where it is technically possible to analyse biofluid and tissue samples during surgery, which may provide a window of opportunity for tailoring therapeutic strategies in paediatric cardiac surgery."

Professor Jeremy Pearson, Associate Medical Director at the British Heart Foundation, which helped fund the study, said: "Over 4,000 babies are born with a [congenital heart defect](#) in the UK every single year. Research has helped us make progress that means many more babies survive heart surgery than ever before. But more research is needed to ensure that those babies live long, healthy lives. Complications from surgery can derail a child's progress.

"This study has shown a possible new way to assess children recovering from [congenital heart surgery](#) by measuring certain molecules in the

blood. By identifying children who might be struggling sooner, doctors could intervene with treatments earlier. More research is now required to see whether such a test could give doctors that early warning sign that urgent treatment is needed."

Provided by University of Cambridge

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