

PEACOCK Lay Summary

Heart surgery starts a major inflammatory response in the body. The 'inflammatory response' is a set of reactions which when localised, such as by a twisted ankle, can help with rapid healing of the injured part. When the injury is larger, such as in major surgery, this set of reactions can affect all tissues of the body. This generalised inflammation can cause problems with multiple organs and in some cases lead to death. One of the hormones that protects against this uncontrolled inflammatory response is the steroid hormone cortisol. Some hospitals give synthetic cortisol type drugs routinely to children having heart surgery, to try and reduce this inflammatory response. However, it is currently unclear if this is associated with better outcomes.

Humans produce their own cortisol in a diurnal rhythm; it is high when you first wake in the morning and lowest in the late evening. This rhythm is made up of approximately hourly pulses of cortisol (an *ultradian rhythm*). It has been shown by our group that these pulses change dramatically after adult heart surgery. However, no-one has investigated changes in the ultradian rhythm of cortisol after heart surgery in new-borns, infants and children.

PEACOCK was an observational study looking at what happens to these pulses of cortisol when children and babies undergo heart surgery. The study looked at two groups of children; one group were having open heart surgery, and the other group were having heart catheter investigations under general anaesthetic. Cortisol levels were measured every 20 minutes for 24 hours in both groups. The aim was to understand the cortisol response in children after heart surgery, to see whether additional steroids are needed.

Patients took part in the trial between September 2017 and September 2021 and were recruited from two NHS hospitals in England. Patients could take part in the **surgical group** of the study if they were aged 0-5 years or 10-16 years, undergoing heart surgery using cardiopulmonary bypass (a heart-lung machine) and weighed above 2kg. Patients could take part in the **heart catheter group** of the study if they were ages 0-5years or 10-16 years, undergoing heart catheter investigations with general anaesthetic and weighed above 2kg. Consent/assent to participate was received according to the age of the patient.

We found that children who were having open heart surgery produced much less cortisol both during and after the operation than patients having heart catheter investigations. Very young babies (less than one month old) processed cortisol in a different way than older children, leading to more reduced levels of cortisol than we would expect. Using this data, we were able to map out how cortisol is metabolised in children and how it changes with age. This will help us to work out which ages of patients it might be useful to give extra cortisol to at the time of surgery.

The PEACOCK study results are being written up for publication.

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