

# Use of 3D printing for complex renovascular surgeries in children allows better planning and enhances safety.



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## Background

3D organ printing allows better surgical planning and enhances safety for complex cardiac and renal transplant surgeries in adult and paediatric patients. We present the use of 3D printing of abdominal organs and vessels for two paediatric patients with complex renovascular disease who underwent aortic graft bypass and renal autotransplant. To our knowledge, this is the first use of 3D printing for this cohort of patients.

## Methods

We used 2D abdominal MRI to create a 3D model of kidneys, abdominal aorta, IVC and pancreas. Models were printed in 3D laboratory at Great Ormond Street Hospital for Children.

## Results

The first patient was a 7 year old girl with a background of neurofibromatosis type 1 who underwent left nephrectomy and had 7 angioplasties on the remaining right kidney. An aortic bypass was performed and the kidney was successfully auto-transplanted onto the right iliac vessels.

The second patient was a 2 year old boy with middle aortic syndrome in which a bypass was performed from the thoracic aorta to the aortic iliac bifurcation with successful bilateral renal auto-transplantation. 3D models allowed the team for better planning of surgical approach and in the first case, initially planned surgical approach was amended once the model was reviewed. Patients and families commented that seeing the model made them better understand the operation and it contributed to better patient information and consenting pathway.

## Conclusion

This is the first report on the use of the 3D printing for planning of complex vascular surgeries involving major arteries in children with renovascular hypertension and associated severe middle aortic syndrome. Both cases were successfully performed and 3D printing brought benefits both the surgical and medical teams, since there was better planning and communication between the team members; as well as for family understanding of the complexity of the procedure and the expected outcomes.

