

Heart Centered

3D Print Bureau Creates Intricate Cardiac Models

As heart surgeries become increasingly intricate and complicated, planning patient-specific care for challenging cases has become more difficult using traditional methods.

“When you are dealing with a complex situation where different organ systems are abnormal, each one needing its own specialist team with real-time decision making at the time of surgery, it becomes very difficult to coordinate, plan and make decisions,” said Rajesh Krishnamurthy, M.D., section chief of radiology research at Texas Children’s Hospital.

More physicians are relying on 3D printed medical models to help facilitate a comprehensive pre-surgical planning process and give all decision makers time to address specific challenges before the patient is on the table.

Game Changer

3D Print Bureau of Texas, a service bureau in Houston, partners with several area hospitals to create patient-specific medical models for pre-operative planning and testing. The service bureau previously produced the anatomical medical models using stereolithography, but the models were limited to a single hardness and color.

By moving to PolyJet™ technology, 3D Print Bureau of Texas can 3D print outer layers of heart models in a clear material and arteries in color for much greater clarity. The service bureau also prints materials of different hardnesses for a realistic feel that is suitable for physical testing.



Medical models on display at Houston Methodist DeBakey Heart and Vascular Center

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Chad Devine

3D Print Bureau of Texas

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“We realized the potential benefits of the Connex3 [3D Printer] right away and medical customers love the results,” said Chad Devine, operations for 3D Print Bureau of Texas.

The only limiting factor was the time needed — around eight hours for complex anatomical models — to manually remove support material from internal cavities.

But that number has been greatly reduced after 3D Print Bureau of Texas adopted SUP706 soluble support material. Now technicians use a pressure washer to remove the bulk of the support material, then submerge the part in an alkaline solution to dissolve the rest away. Technicians’ hands-on time is now just two hours.

“The new SUP706 support material is a game-changer for making medical models,” said Devine. “It drastically reduces the time required to remove support from complex geometries and internal passageways.”

Complexity Made Simple

Since switching to PolyJet and soluble support, 3D Print Bureau of Texas has partnered with physicians at Houston Methodist Hospital to create cardiac models for applications such as assessing the size and attachment site of a right atrial malignancy. Accurate physical replications of patient anatomy can even undergo testing in a dynamic system such as replicating the severity of aortic stenosis using flow testing.

3D Print Bureau of Texas also worked with Houston Methodist DeBakey Heart and Vascular Center on a complex case involving a young patient born with a wide-open leaking pulmonary valve. The patient could not take blood transfusions and had been turned down by two medical centers concerned she would not make it through surgery.

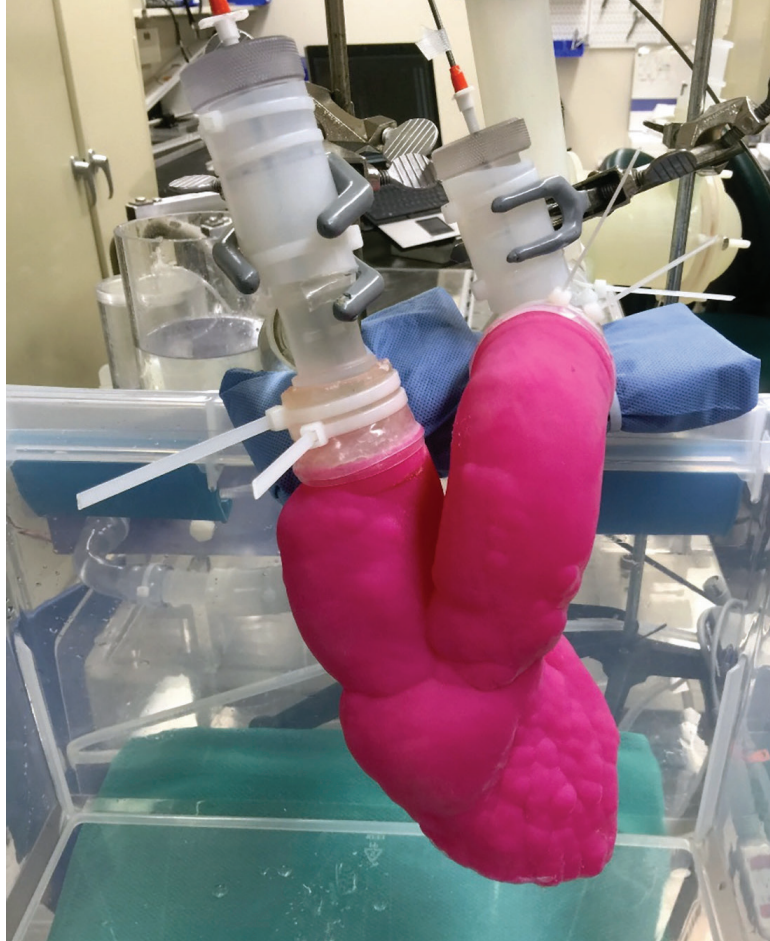


A key advantage of PolyJet is its ability to produce models in multiple colors and materials.

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“Without the 3D printed models, we wouldn’t have been able to come up with a way to do the procedure in advance,” said C. Huie Lin, M.D., an adult congenital and interventional cardiologist.

With a 3D printed model of the patient’s heart, Lin devised a plan that required very little blood loss, which resulted in a successful operation for the little girl.



Aortic stenosis flow testing performed on a patient-specific 3D model.

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