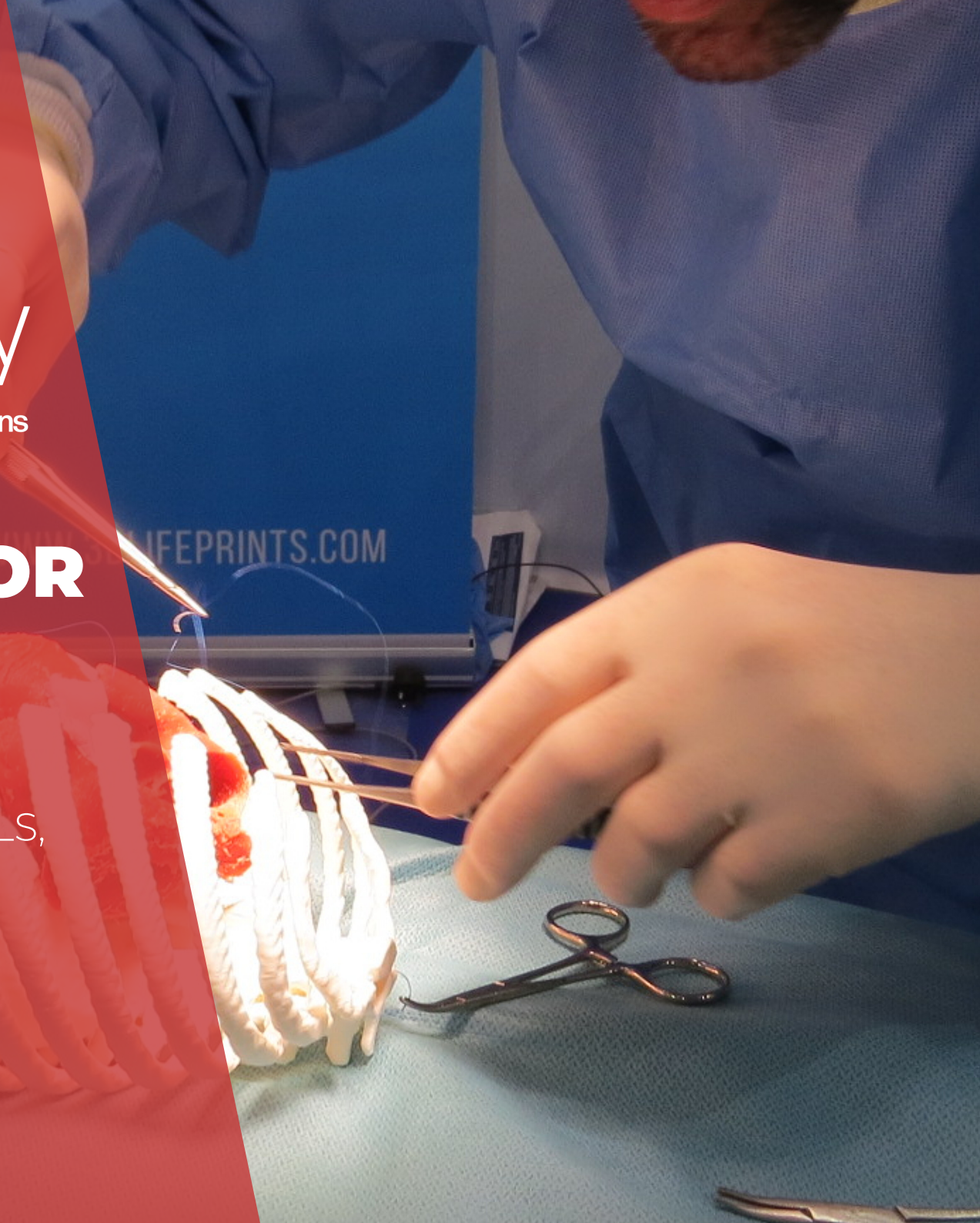
insight surgery

Digital Planning & Personalized Solutions

3D SOLUTIONS FOR PEDIATRIC CARDIOLOGY BROCHURE

3D PRINTED ANATOMICAL MODELS, VIRTUAL MODELLING, TRAINING SIMULATORS



www.insightsurgery.com

Case Summary

A surgeon and his team at a children's hospital were required to treat a patient in need of an Aorto-Left Ventricular Tunnel (ALVT) repair. ALVT, an extremely rare congenital defect involving an extracardiac channel connecting the ascending aorta, above the sino-tubular junction, to the left or right ventricular cavity. Without surgical intervention, heart failure is highly likely.

A patient-specific anatomical model was requested to assist the team's pre-surgical planning and communication.

Description

Insight Surgery segmented the MRI scan of the patient's heart structure before calculating the blood volume flowing through it.

The model was then 3D printed in a white and rigid material for the surgical team, enabling them to fully visualise the condition of the patient's heart, and formulate the best plan of approach for the upcoming repair.

INSIGHT SURGERY
CASE STUDY

PEDIATRIC CARDIOLOGICAL PRE-SURGICAL PLANNING

SPECIALITY: CARDIOLOGY
PROCEDURE: AORTO-LEFT VENTRICULAR TUNNEL REPAIR
DEVICE: 3D PRINTED PATIENT-SPECIFIC ANATOMICAL MODEL

OUTCOME / BENEFITS

This condition has an incidence rate as low as 0.001% of all congenital heart diseases. The facilitated in-depth planning for a complex and unfamiliar procedure which led to reduced overall planning time.

The model was described as being of great use in explaining this rare congenital condition to nurses, cardiologists, and to the patient's family. 3D printing in this case provided a superior method of communication than 2D scans alone.

Case Summary

The cardiology team at a children's hospital needed to treat a very young patient with a ventricular septal defect (VSD), patent ductus arteriosus (PDA) and pulmonary atresia (PA).

The treatment plan would involve the placement of a stent into the ductal area to maintain communication between the pulmonary artery. A model was requested to assist in pre-surgical planning and simulation of this important procedure.

Description

Insight Surgery segmented the patient's scan data and provided a hollow heart model to accurately capture both the internal and external patient-specific morphology of the heart. The model was printed in soft material to mimic the tissue of the heart.

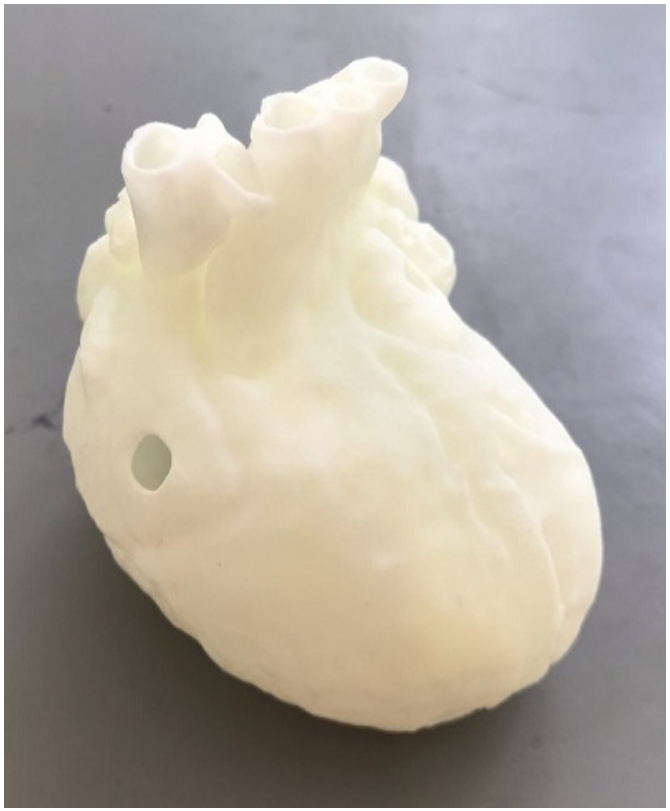
The surgeon was then able to use the model to realistically simulate the insertion of the stent prior to theatre.

INSIGHT SURGERY

CASE STUDY

PEDIATRIC CARDIOLOGICAL PRE-SURGICAL PLANNING AND SIMULATION

SPECIALITY CARDIOLOGY
PROCEDURE SURGERY FOR PULMONARY ATRESIA, VSD AND PATENT DUCTUS ARTERIOSUS
DEVICE 3D PRINTED PATIENT-SPECIFIC ANATOMICAL MODEL



OUTCOME / BENEFITS

Simulation with the anatomically accurate model meant the surgeon could practice their approach and insertion of the stent through the vessels with precision and confidence.

The surgery was successful and was carried out without any complications incurred and the patient is recovering well.

Case Summary

A pediatric patient presented to this Hospital with multiple ventricular septal defects (VSD). The treatment plan for this congenital heart defect was comprised of multiple surgeries.

A unique model of the patient's anatomy was requested to support the team's surgical planning ahead of live theatre.

Description

Insight Surgery segmented the patient's data and produced a model based on the volume of blood within the heart's chambers rather than the heart itself. It was 3D printed in rigid white material for clear visualisation and handling by the whole team.

The model marked a significant innovative step as Insight Surgery moved beyond providing a copy of the heart to create something highly specific to this type of operation, proving to be of even greater use to the surgeon.

INSIGHT SURGERY
CASE STUDY

PEDIATRIC CARDIOLOGICAL PRE-SURGICAL PLANNING

SPECIALITY: CARDIOLOGY
PROCEDURE: MULTIPLE VENTRICULAR SEPTAL DEFECT PATCHING
DEVICE: 3D PRINTED PATIENT-SPECIFIC ANATOMICAL MODEL

OUTCOME / BENEFITS

The volume modelling application of 3D printing is an extremely useful technique to indirectly image malformations of the heart by printing the blood volume within structural cavities. The surgeon said *"this is a very impressive and imaginative way to use 3D printing for organ imaging. In this case, we were able to complement the visualisation of the cardiac defects and make the decision that it might be possible to perform a less invasive procedure"*.

The team decided no further patching of the perforations was necessary and these decisions resulted in a second surgery that was shorter, less complex and held lower risk.

Case Summary

A pediatric patient at a children's hospital was in need of urgent surgery to close a ventricular septal defect (VSD). The cardiac surgeon required a more thorough visualisation of the patient's heart structure prior to surgery, to help ensure a more successful outcome.

A patient-specific anatomical model was requested by the surgical team to aid in determining the location, shape and size of the ventricular septal defect.

Description

Insight Surgery segmented the patient's CT scan to develop the 3D rendering of the heart. It was then 3D printed in transparent, soft material. The model was sectioned into three parts to provide the team with internal insight into the defect.

In this case the model was delivered within 24 hours of the request due to the urgency of this procedure.

INSIGHT SURGERY
CASE STUDY

PEDIATRIC CARDIOLOGICAL PRE-SURGICAL PLANNING

SPECIALITY: CARDIOLOGY
PROCEDURE: VENTRICULAR SEPTAL DEFECT REPAIR
DEVICE: 3D PRINTED PATIENT-SPECIFIC ANATOMICAL MODEL

OUTCOME / BENEFITS

Pre-determining the exact nature of the VSD in the planning phase resulted in a more confident surgical approach to this complex case.

The model will also be used as part of the department's future training of cardiologists and cardiac surgeons who may need to treat patients with similar congenital heart conditions such as VSDs.

Case Summary

In this case, a surgeon at a children's hospital requested a patient-specific anatomical model in retrospect, as a way to capture and demonstrate an extremely rare pathology of the heart.

The patient presented with Truncus Arteriosus, a congenital condition which occurs when the blood vessel coming out of the heart fails to separate completely and leaves a connection between the aorta and pulmonary artery. Their condition was also complicated by the failure of the aorta to form completely, resulting in an Interrupted Aortic Arch (IAA).

Description

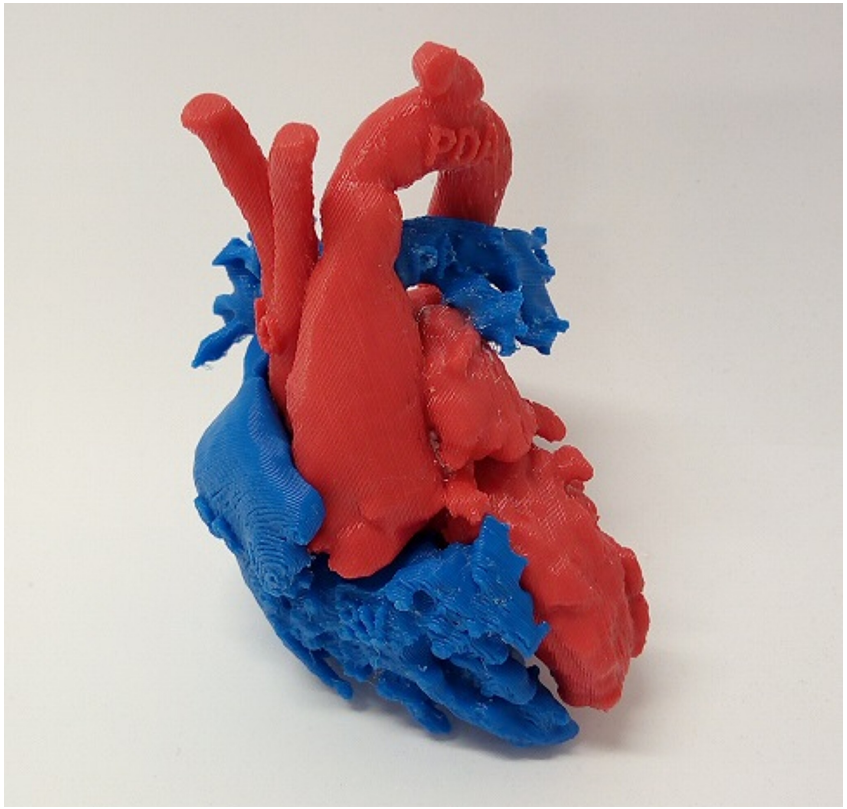
Insight Surgery segmented the patient's data and developed a virtual model of their heart. This was then 3D printed in dual colour, to clearly define the flow of oxygenated (red) and deoxygenated (blue) blood.

Following surgery, the surgeon used the model to help educate surgeons who may encounter a similar condition in the future. It was also used to aid discussions with the patient's parents regarding future treatment.

INSIGHT SURGERY
CASE STUDY

CARDIOLOGICAL POST-SURGICAL REVIEW

SPECIALITY: CARDIOLOGY
PROCEDURE: TRUNCUS ARTERIOSUS AND INTERRUPTED AORTIC ARCH REPAIR
DEVICE: 3D PRINTED PATIENT-SPECIFIC ANATOMICAL MODEL



OUTCOME / BENEFITS

3D modelling and printing of complex pathologies such as this provide an effective adjunct to traditional surgical education and skill development methods. Rare cases can be captured for repeatable future training, ensuring high-level knowledge is transferred through a medium that combines 3D visualisation with haptics.

The model's use in conversations with the patient's parents allowed for a more detailed explanation, providing them with a greater understanding of their child's condition and what future treatments would involve.


insight surgery
Digital Planning & Personalized Solutions