3D LIFEPRINTS

3D PRINTING FOR CARDIOLOGY

3D LifePrints UK Ltd

CLINICAL USE: SIMULATION / TRAINING

SILICONE MODELS, REPAIR OF CONGENITAL HEART DEFECTS

LOCATION:	ARAB HEALTH 2017
MODEL SOURCE:	CT SCAN OR GENERIC DATA
DESCRIPTION:	The heart model for this simulation was 3D printed in silicone and intentionally softened to replicate the consistency of an infant's cardiac tissue. The model was nested in a set of 3D printed ribs to further increase the realism to the surgeon. The simulation included the closure of an atrial septal defect (ASD) in the 3D printed heart.
OUTCOME / BENEFITS:	The surgeon encouraged participation from the attendees, and several of them were able to practice the suturing techniques that are necessary for this procedure. 3D printed anatomical models for surgical simulation are made to order, either from stock data or from patient specific scans and can include bespoke elements so a range of surgical skills can be assessed. The use of 3D printed models for surgical training is on the rise due to the barriers in creating high fidelity simulations using cadaveric or live animal models. 3D printed models avoid any such issues.

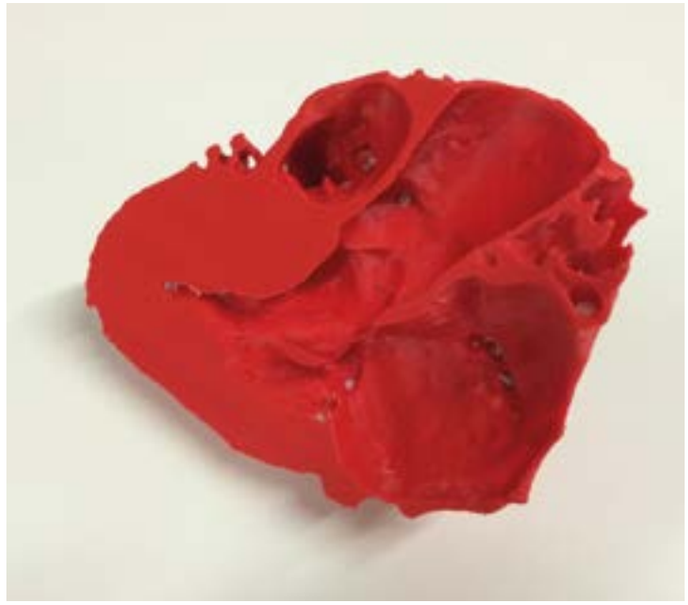
CLINICAL USE: SURGICAL PLANNING

MULTIPLE VENTRICULAR SEPTAL DEFECT : BLOOD VOLUME MODEL

LOCATION:	ALDER HEY CHILDRENS HOSPITAL, CARDIAC DEPARTMENT
MODEL SOURCE:	CONTRASTED TRI-PLANAR CT SCAN, ANGIOGRAM
DESCRIPTION:	This model was printed based upon the volume of the blood within the heart's chambers rather than the heart itself a "Blood Volume Model". This new application of 3D printing has become an extremely useful technique to indirectly image malformations of the heart by printing the blood volume within the cavities. Mr Guerrero 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."
OUTCOME / BENEFITS:	This model is a significant innovative step as 3D LifePrints and the surgeon have moved away from simply providing a copy of the heart to create something that is specific to this type of operation and is of greater use to the surgeon. In this case Mr Guerrero and his team assessed the images of the heart and decided that it was likely that no further patching of the perforations was necessary. The patient directly benefited from the provision of the model in that the second surgery was not as long or complex.

CLINICAL USE: PRE SURGICAL PLANNING

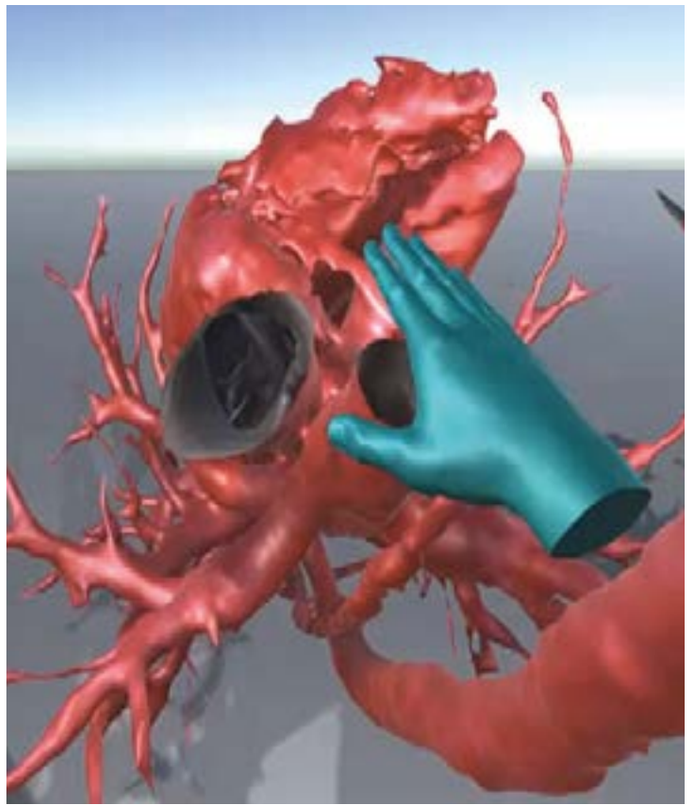
3D PRINT MODEL TYPE: HEART CARDIOMYOPATHY AND DEVICE SIZING

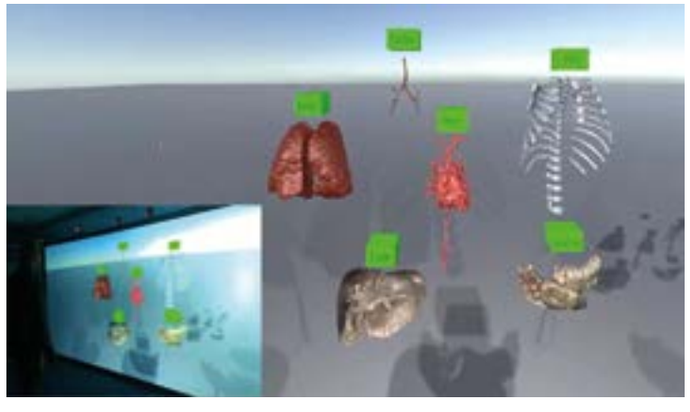


LOCATION:	LIVERPOOL CHEST & HEART HOSPITAL, LIVERPOOL, ENGLAND
MODEL SOURCE:	CONTRASTED TRI-PLANAR CT SCAN, ANGIOGRAM
DESCRIPTION:	A 3D printed model was created to provide surgeon Robert Cooper and his team with information on the heart wall thickness in both the relaxed and the contracted stages of the heartbeat for preparation for an alcohol septal ablation.
OUTCOME / BENEFITS:	A study consisting of nine further models has been commissioned based on the success of this model. Patients are currently being identified to participate in the study. The hospital have also commissioned a study into the use the 3D printed anatomical models to simulate the placement of a device to plug the holes in a septum The simulation of the placement of a cardiac device in a 3D printed model will allow surgeons to determine the exact size and type of device to use.

CLINICAL USE: PRE SURGICAL PLANNING / TRAINING

3D PRINT MODEL TYPE: 3D VIRTUAL REALITY





LOCATION:	VIRTUAL ENGINEERING CENTRE, LIVERPOOL UNIVERSITY, ENGLAND
MODEL SOURCE:	MRI SCAN
DESCRIPTION:	This product allows a surgeon to manipulate a handheld and patient specific 3D print of an organ, such as a heart, to virtually navigate its internal structure and external surroundings using a virtual reality headset. 3D LifePrints and the Virtual Engineering Centre has applied for a Patent for the product as the combination of a patient specific 3D printed model with a VR system is believed to be novel.
OUTCOME / BENEFITS:	The system allow the user to combine the tactile nature of a 3D printed model within virtual reality. The VR system allows dynamic features that the model would not permit while the model ensures that the user does not lose a sense of perspective or scale. The Virtual Engineering Centre commented: “We are developing an exciting collaboration with 3D LifePrints, bringing together the specialist expertise of both organisations in 3D printing and immersive virtual reality to support the medical sector.

CLINICAL USE: MEDICAL RESEARCH

3D PRINT MODEL TYPE: RABBIT HEART ATRIAL WALL

LOCATION:	JOHN MOORES UNIVERSITY, LIVERPOOL, ENGLAND
MODEL SOURCE:	MICRO CT SCANNER
DESCRIPTION:	In this study a post-mortem rabbit heart was scanned by micro CT to identify the electrical conduction system that controls the heart rhythm. The prints were commissioned by Professor Jonathan Jarvis and Dr Robert Stephenson with support from The Alder Hey Children's charity, and working with their clinical colleagues Dr Caroline Jones and Dr Rafael Guerrero. The models were printed on a multi-jet printer which allowed several colours to be incorporated.
OUTCOME / BENEFITS:	Feedback from Dr. Robert Stephenson: "Working with 3D LifePrints we have produced high resolution 3D prints of the heart of unprecedented quality and detail. Generated from high resolution micro-CT data sets such prints have brought our virtual data to life, and serve to improve our understanding of the 3D micro-anatomy of the heart." A further series of 3D printed models based upon human hearts is planned which will increase the scope of this project.

Please contact us below for any further information

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