



3D Printing in Medical Reference Publications and Articles

Select Publications

Zein NN, Hanouneh IA, Bishop PD, et al, Three-dimensional print of a liver for preoperative planning in living donor liver transplantation. Liver Transplantation. 2013 Dec; 19(12):1304-10.

Cleveland Clinic protocol to 3D-print synthetic livers (along with their complex networks of vascular and biliary structures) in support of LDLT surgery. Study population of native livers of six patients: three living donors and three respective recipients who underwent LDLT.

Weinstock P, Prabhu S, Flynn K, et al, Optimizing cerebrovascular surgical and endovascular procedures in children via personalized 3D printing. J Neurosurg Pediatr. 2015 Jul 31:1-6.

Boston Children's Hospital experience with customized 3D printed models of pediatric CV lesions summarizing four pediatric cases (3 AVMs and 1 VOGM). The use of 3D models was associated with a 30-minute reduction in operative time in two cases compared with matched controls.

Li C, Yang M, Xie Y, Chen Z, et al, Application of the polystyrene model made by 3-D printing rapid prototyping technology for operation planning in revision lumbar discectomy. J Orthop Sci. 2015 May;20(3):475-80

Two-arm study comparing pre-surgical planning with 3D models vs. usual treatment in 37 patients undergoing revision lumbar discectomy. The model group had a significantly shorter operation time (106.53 ± 11.91 vs. 131.92 ± 10.81 min, $P < 0.001$) and less blood loss (341.67 ± 49.45 vs. 466.77 ± 71.46 ml, $P < 0.001$).

C. Ionita et al, Treatment planning for image-guided neuro-vascular interventions using patient-specific 3D printed phantoms. SPIE. 2015 Mar;(3):9417.

Summary of the workflow to create 3D printed phantoms to enable physicians to prepare for minimally invasive endovascular image-guided interventions (EIGIs). Various Circle of Willis and cardiac arterial geometries were used. The phantoms were tested for ischemic stroke treatment, distal catheter navigation, aneurysm stenting and cardiac imaging under angiographic guidance.

Waran V, Narayanan V, Karuppiah R, et al, Neurosurgical endoscopic training via a realistic 3-dimensional model with pathology. Simul Healthc. 2015 Feb;10(1):43-8.

Hydrocephalus model created using 3D printing. The models were qualitatively assessed in the various steps involved in an endoscopic third ventriculostomy and intraventricular biopsy procedure, by 15 study participants. Overall score for the ventricular model realism was above average and scored 4.0 to 4.6 of 5 for every individual step of the procedure.

Riesenkampff E, Rietdorf U, Wolf I, et al, The practical clinical value of three-dimensional models of complex congenitally malformed hearts. J Thorac Cardiovasc Surg. 2009 Sep;138(3):571-80

Used 3D printing for 11 patients with complex congenitally malformed hearts to facilitate surgical planning where the team was not able to gain consensus on the surgical approach. Examination of the models provided invaluable additional information that supported the surgical decision-making. The anatomy as shown in the models was confirmed during surgery.



Select Press Stories

“A New Face for Violet”, New York Times, Jan. 26, 2015

Dr. John Meara at Boston Children’s hospital, and his staff, employs a Stratasys Objet500 Connex2™ 3D Production System to create surgical planning models that guide the treatment of Violet Pietrok’s Tessier facial cleft. Benefits of 3D printing in shortening procedures, improving outcomes and operating with confidence are discussed.

<http://www.nytimes.com/2015/01/27/science/off-the-3-d-printer-practice-parts-for-the-surgeon.html>

“How a 3-D-printer changed a 4-year-old’s heart and life”, CNN, Oct 6, 2015

Physicians at Nicklaus Children’s Hospital (Miami) use 3D printing to guide surgery on pediatric double aortic arch surgery. Dr. Redmond Burke attributes the model to saving two hours of operating time, making a smaller incision and faster recovery than without the model.

<http://edition.cnn.com/2015/10/06/health/3d-printed-heart-simulated-organs/>

“Printing a 3-D heart to save a heart”, Cincinnati.com, Feb. 22, 2015

Overview of the collaboration between Cincinnati Children’s Hospital and UC’s College of Engineering and Applied Science use of 3D models to guide surgery. At Cincinnati Children’s, more than 20 heart patients in the past year have been treated after doctors studied 3D models of their hearts to plan surgeries.

<http://www.cincinnati.com/story/news/2015/02/21/printing-heart-save-heart/23825279/>

“12 NHS Hospitals Using 3D-Printed Models to Test Implants Before Surgery”, International Business Times, Aug. 27, 2014

3D printing hub for 12 NHS hospitals in the UK to enable surgical planning across a range of therapeutic areas including jaw bones, for facial reconstruction surgery; elbows; hip revision models, to rehearse repairing hip replacements; forearms, to repair deformed bones; and cranial plastics. Stratasys’ Objet24™ and Objet30™ 3D Printers were employed.

<http://www.ibtimes.co.uk/12-nhs-hospitals-using-3d-printed-models-test-implants-before-surgery-1462862>

“3D printing helps doctors safely deliver baby”, CBS News, Oct. 9, 2015

3D printed model based on neonatal imaging prepares physicians at C.S. Mott Children’s Hospital at the University of Michigan Health System to prepare for the birth and surgical options to treat a child with a congenital facial defect. This was the first time 3D printing technology was used in utero.

<http://www.cbsnews.com/news/3d-printing-helps-doctors-safely-deliver-baby/>