XVI[e] Séminaire de Cardiologie Pédiatrique

DOUBLES DISCORDANCES

sous la direction de

Jean Kachaner et Daniel Sidi

avec le concours privilégié de

MEDTRONIC FRANCE

Echo Multidimensionnelle

Un simple gadget ?

Imaginer demain

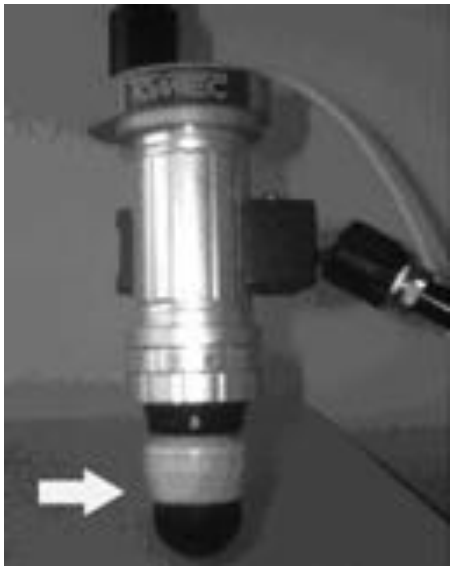
Direction de la Recherche et de l'Innovation

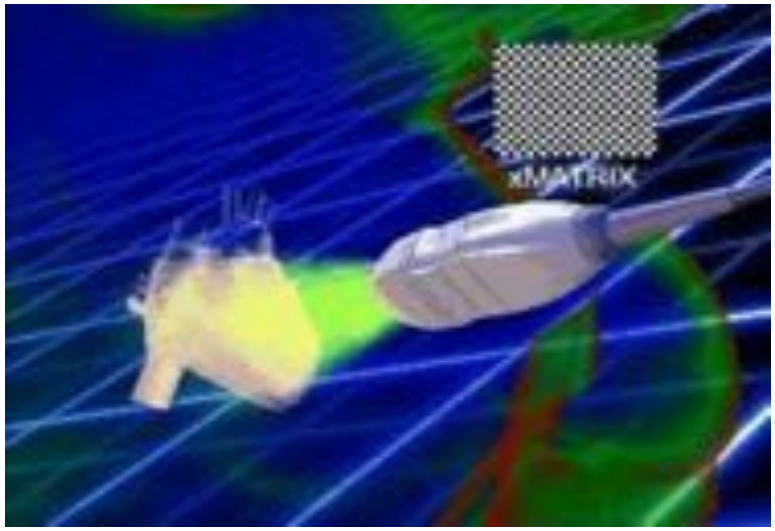
PHILIPS

La Région Occitanie Pyrénées - Méditerranée

2D Doppler 3D Speckle *Fusion Impression*

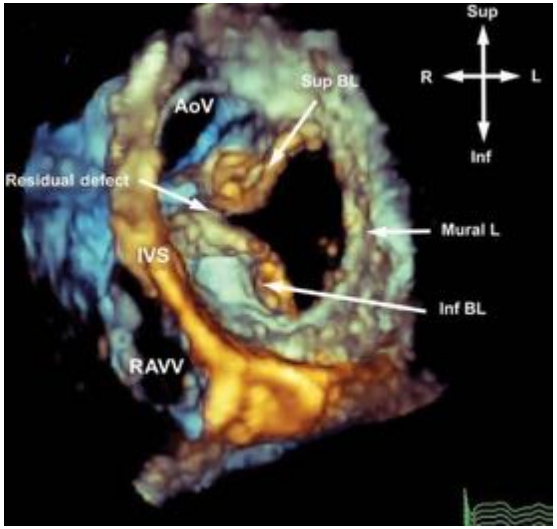
1980 1990 2000 2010 2020

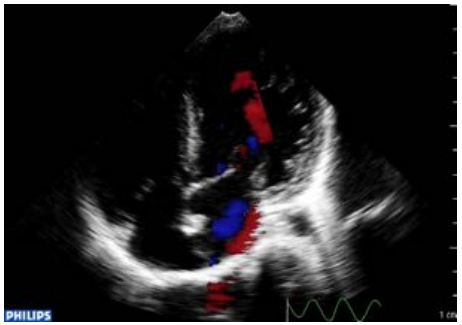


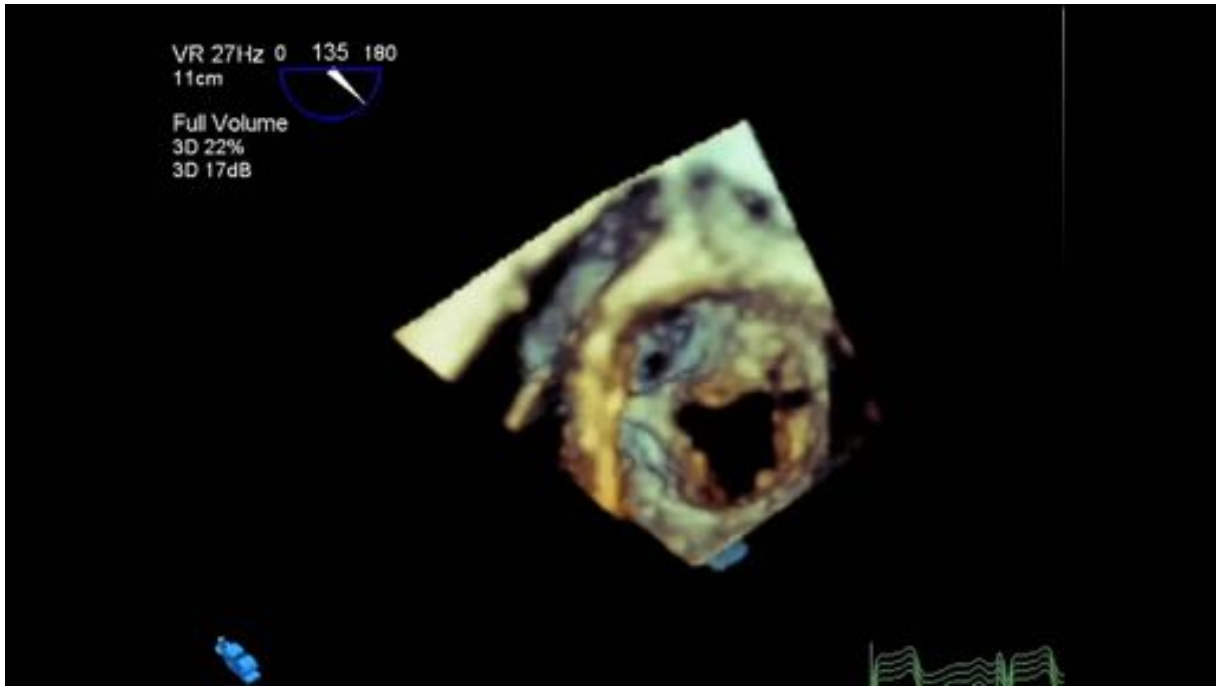


AVSD

Simpson et Acar EHJCI 2017

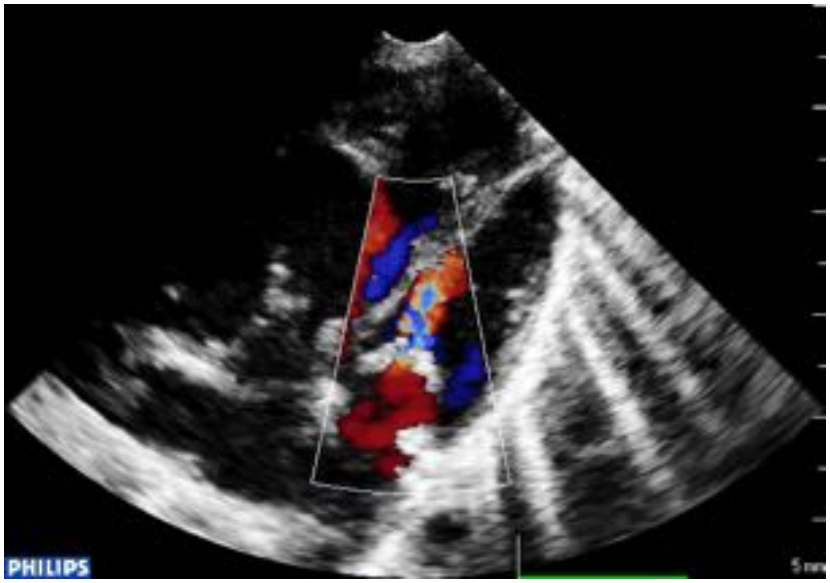


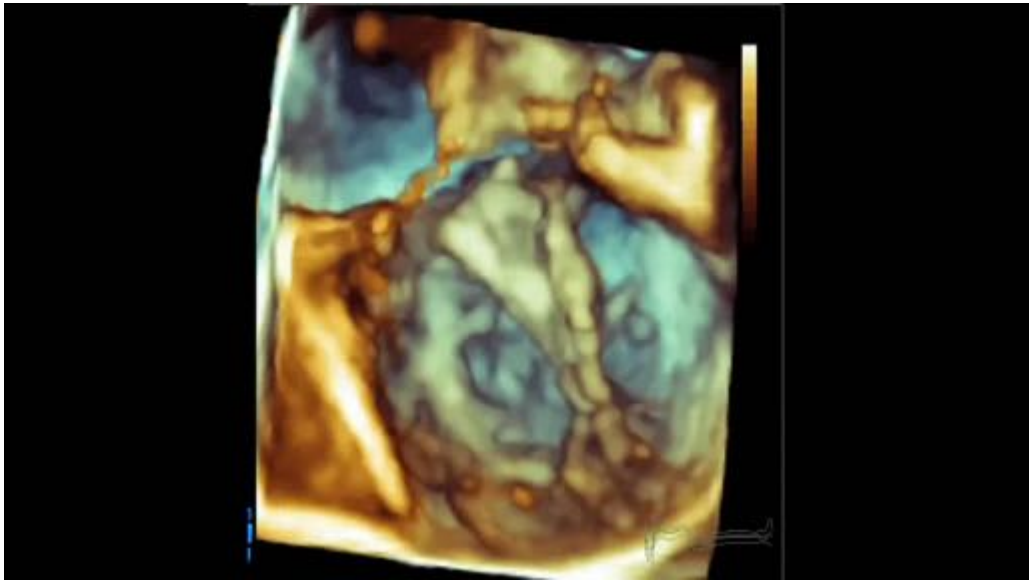




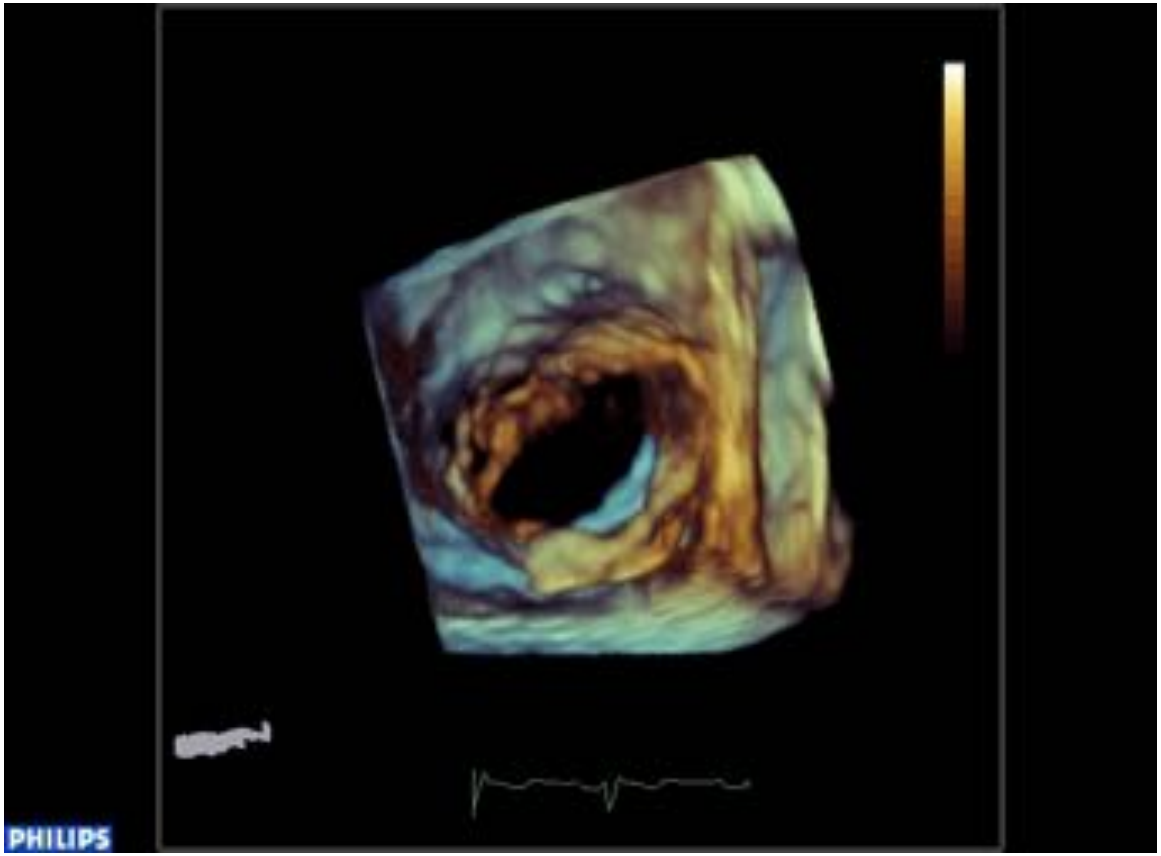
3D MV Stenosis

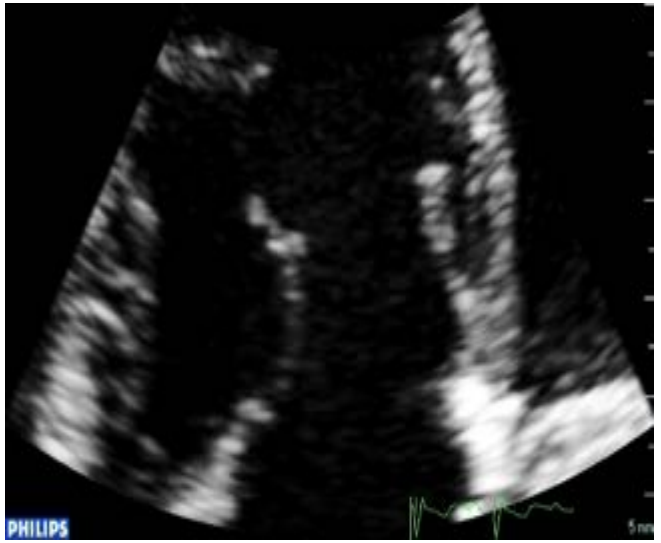
Hadeed et al. JASE 2016





3D TV Ebstein



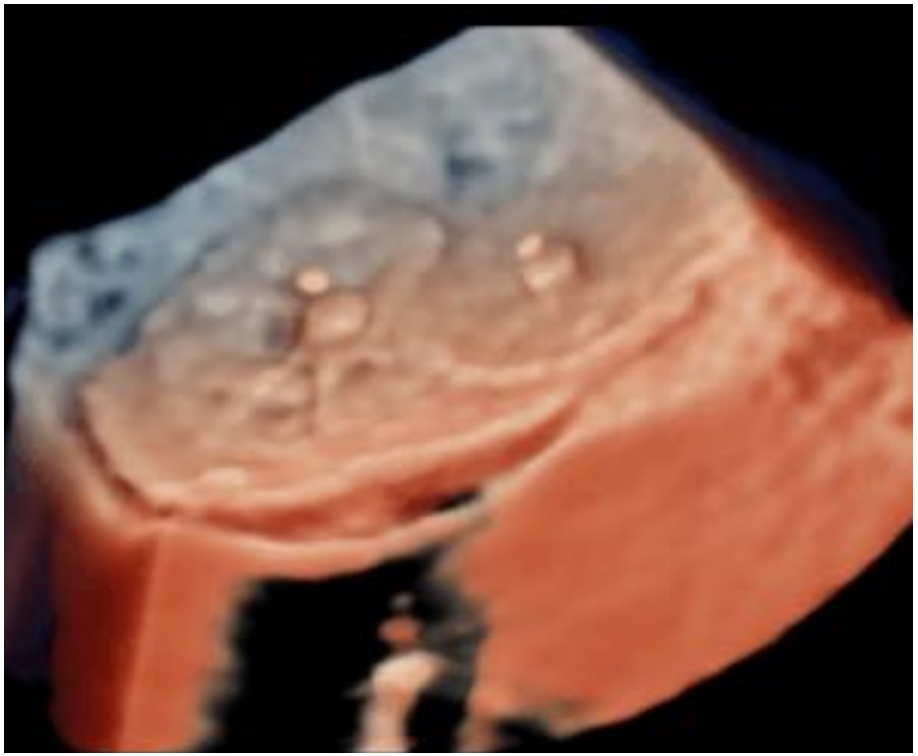


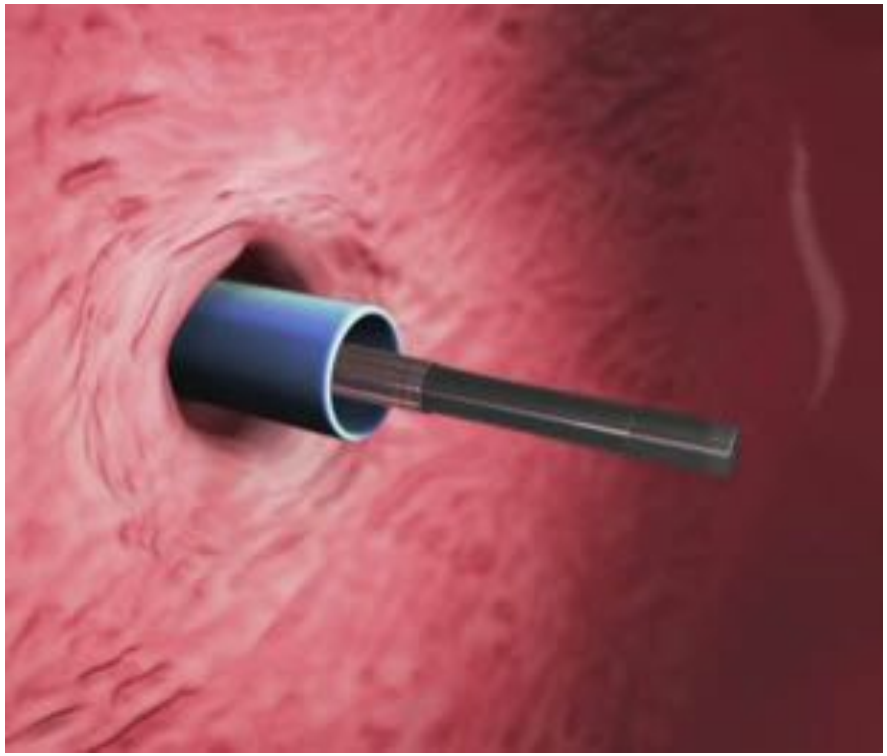
Hadeed et al. Echocardiography 2014

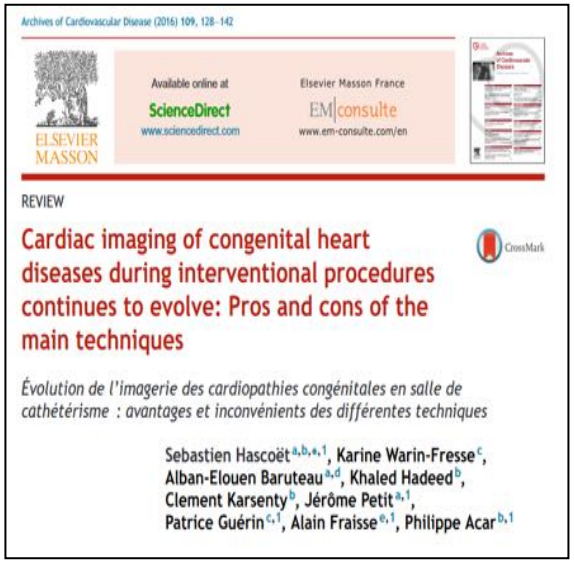
Arch Cardiovasc Dis. 2018 Jun - Jul;111(6-7):392-394. doi: 10.1016/j.acvd.2018.03.003. Epub 2018 Apr 13.

Interventional catheterization and echocardiography: An indefectible link illustrated by atrial septal defect closure.

Karsenty C[1], Hadeed K[2], Acar P[2].







Archives of Cardiovascular Disease (2016) 109, 128–142

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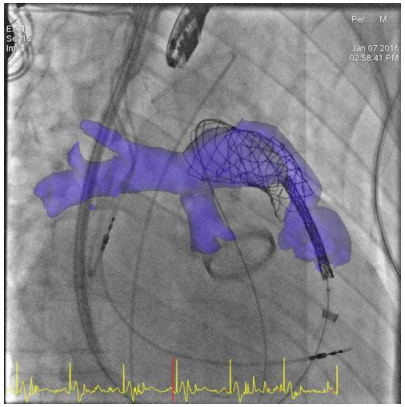
ELSEVIER MASSON

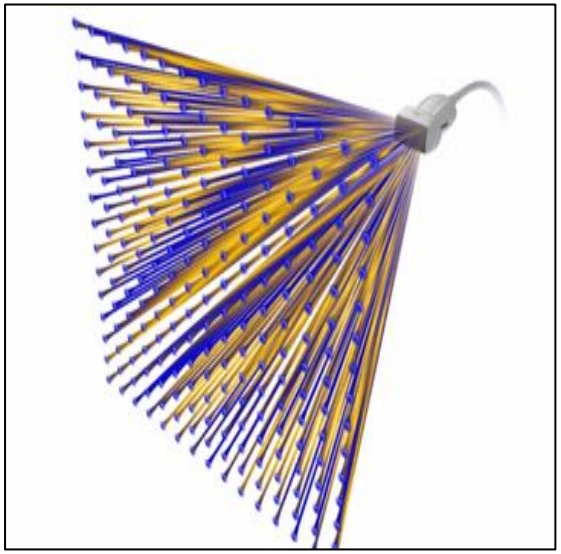
REVIEW

Cardiac imaging of congenital heart diseases during interventional procedures continues to evolve: Pros and cons of the main techniques

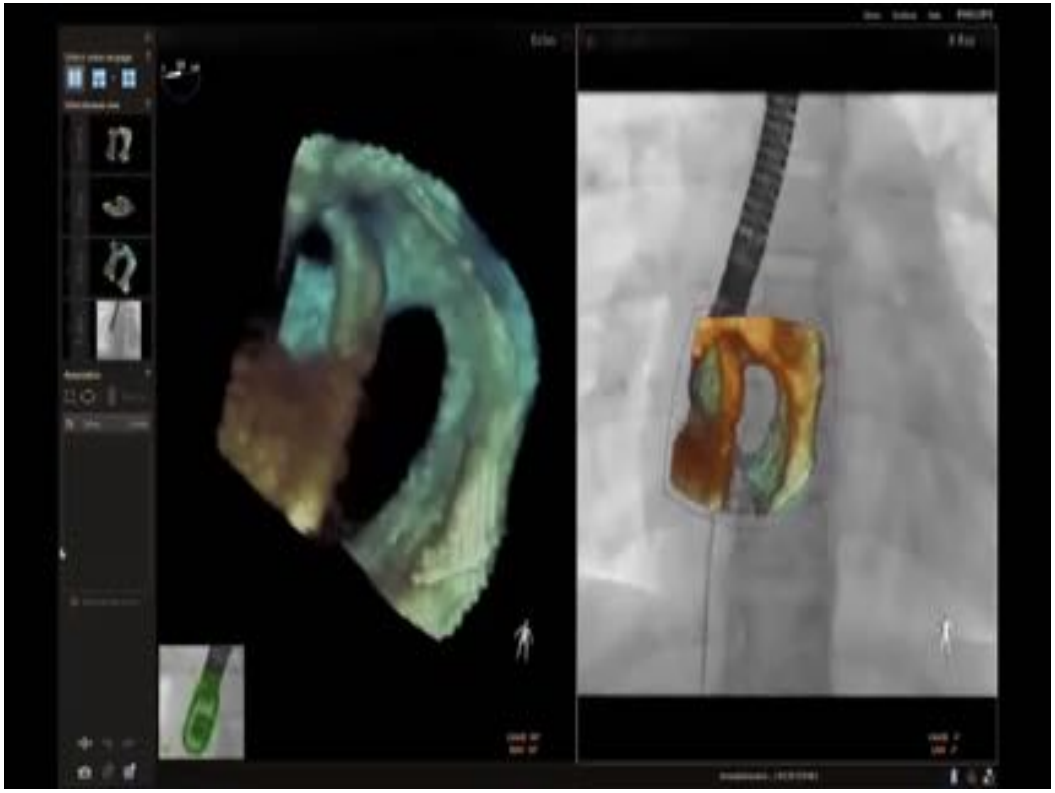
Évolution de l'imagerie des cardiopathies congénitales en salle de cathétérisme : avantages et inconvénients des différentes techniques

Sebastien Hascoët[a,b,*,1], Karine Warin-Fresse[c], Alban-Elouen Baruteau[a,d], Khaled Hadeed[b], Clement Karsenty[b], Jérôme Petit[a,1], Patrice Guérin[c,1], Alain Fraisse[e,1], Philippe Acar[b,1]





Fusion Echo-Scopy Echonavigator™



ASD closure
VSD closure
Fontan fenestration closure / opening
Baffle leak / stenosis
Tricuspid / Mitral valve
Aortic valvuloplasty

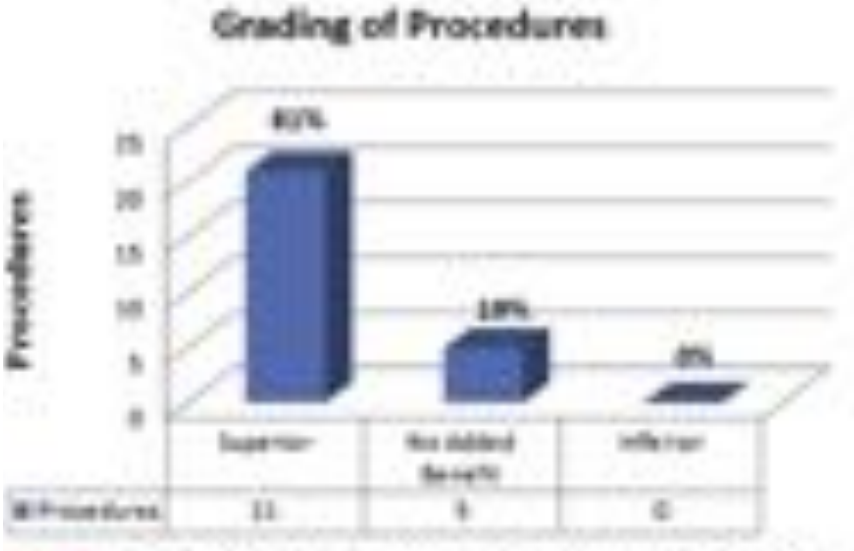
JASE JOURNAL OF THE AMERICAN SOCIETY OF ECHOCARDIOGRAPHY

Feasibility and Safety of Using a Fused Echocardiography/Fluoroscopy Imaging System in Patients with Congenital Heart Disease

Pei-Ni Jone, MD, Michael M. Ross, MD, MS, John A. Bracken, PhD, Matthew J. Mahvelich, MS, Michael V. Di Maria, MD, and Thomas E. Fagan, MD, Aurora, Colorado, and Bronxville, New York

Table 3 Comparison of closure of ASDs with and without FEX system

	Mean	95% CI Lower	95% CI Upper	P
Fluoroscopy time (min)				.0006
Control	19.62	15.69	21.55	
Case	12.61	10.98	14.24	
Procedure time (min)				.1145
Control	94.52	86.09	103.94	
Case	107.33	92.49	122.11	
Radiation dose (mGy · cm²)				.0291
Control	12,114.73	7,908.91	16,870.58	
Case	8,916.43	4,905.07	8,912.79	

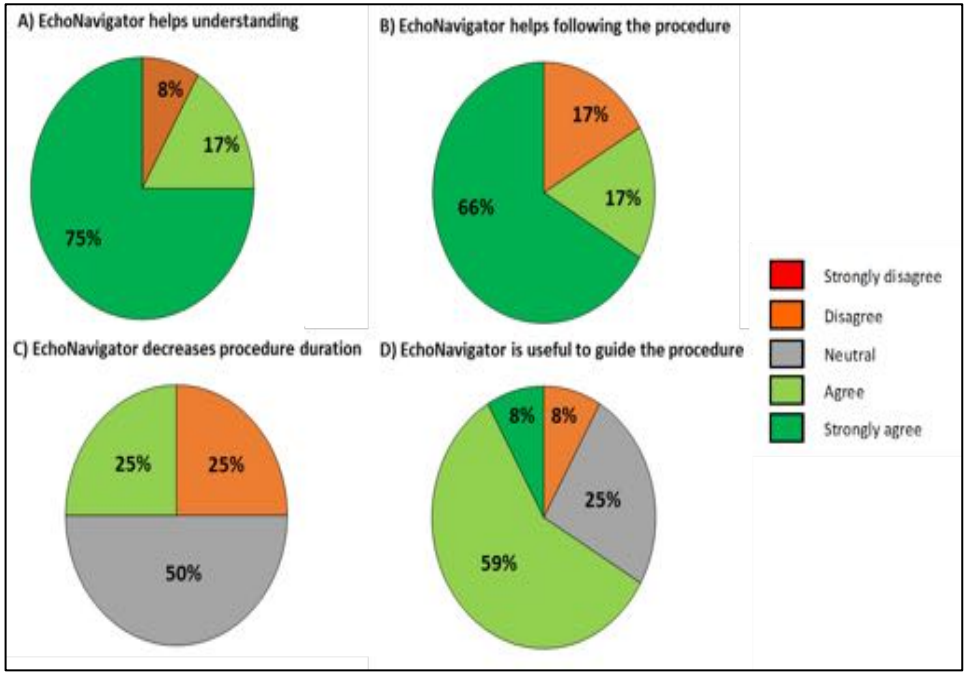


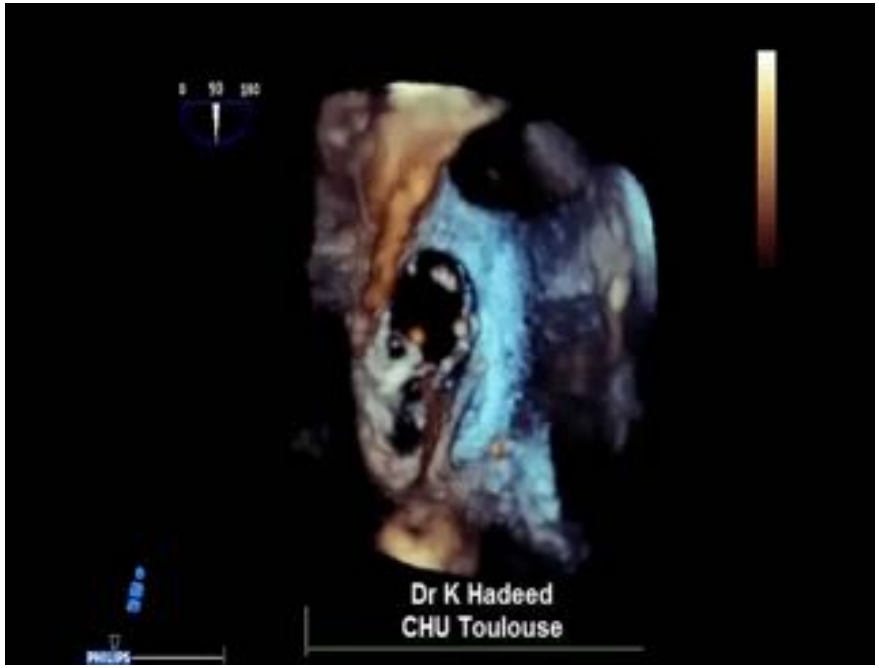
Journal of the American Society of Echocardiography
Volume 31, Issue 11, November 2018, Pages 1229-1237

Clinical Investigation
Fusion Imaging in Children

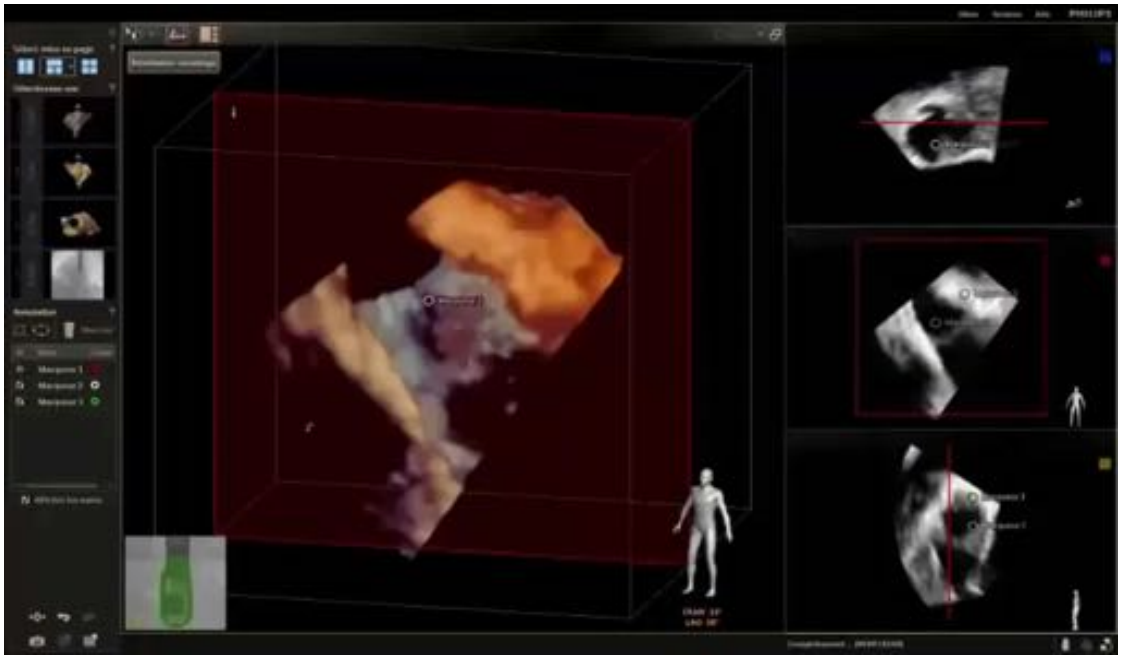
Feasibility, Safety and Accuracy of Echocardiography-Fluoroscopy Imaging Fusion During Percutaneous Atrial Septal Defect Closure in Children

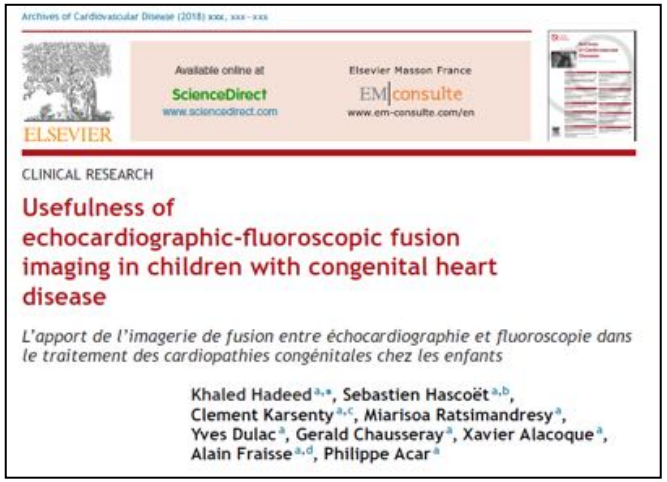
Sebastien Hascoët MD [a, b], Khaled Hadeed MD [a, j], Clement Karsenty MD [a, c, d], Yves Dulac MD [a], Francois Heitz MD [a, e], Nicolas Combes MD [a], Gerald Chausseray MD [a], Xavier Alacoque MD, PhD [a], Francoise Auriol RN [f], Pascal Amedro MD, PhD [g], Alain Fraisse MD, PhD [h], Philippe Acar MD, PhD [a]





Fusion
Ao Valve Dilatation





Archives of Cardiovascular Disease (2018) xxx, xxx–xxx

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ELSEVIER

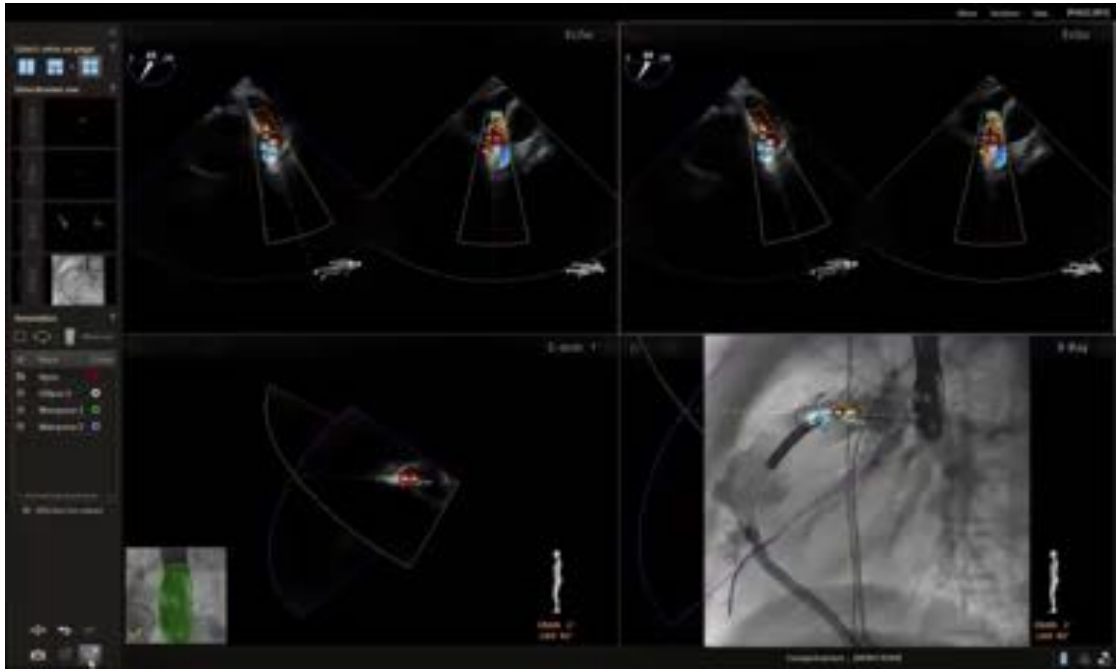
CLINICAL RESEARCH

Usefulness of echocardiographic-fluoroscopic fusion imaging in children with congenital heart disease

L'apport de l'imagerie de fusion entre échocardiographie et fluoroscopie dans le traitement des cardiopathies congénitales chez les enfants

Khaled Hadeed[a,*], Sebastien Hascoët[a,b], Clement Karsenty[a,c], Miarisoa Ratsimandresey[a], Yves Dulac[a], Gerald Chausseray[a], Xavier Alacoque[a], Alain Fraisse[a,d], Philippe Acar[a]

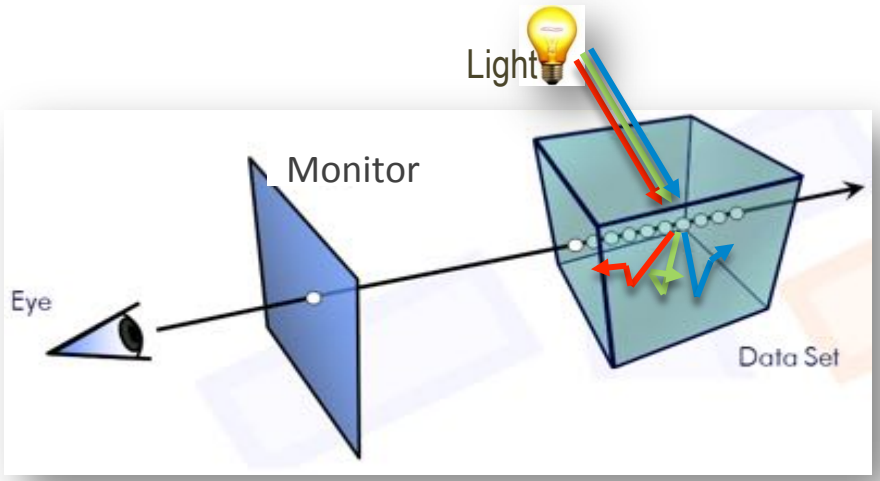
Fusion
Pulm Valvulation

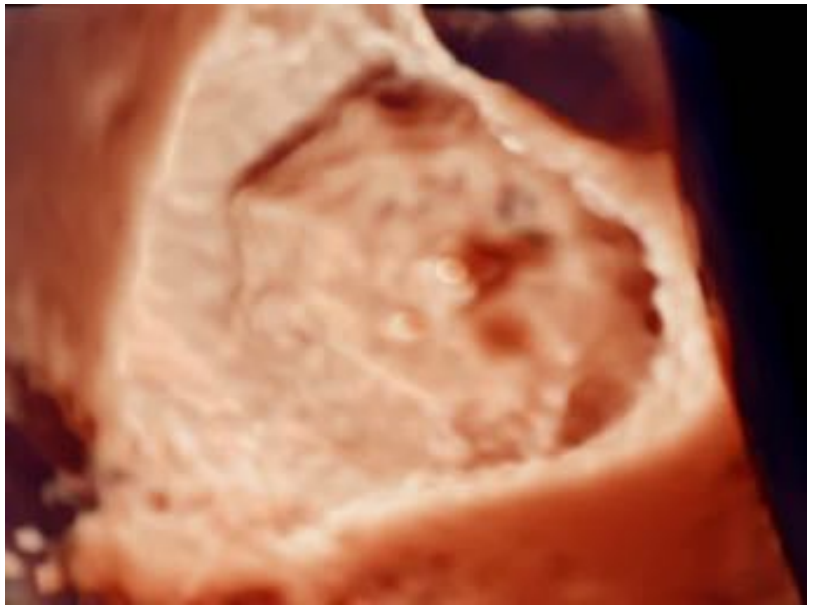


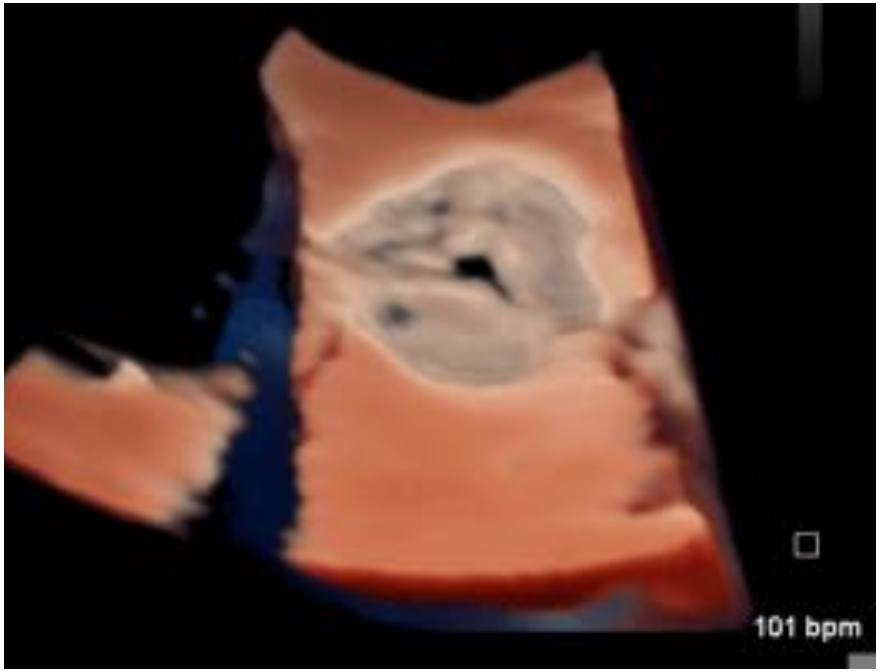
Fusion Echo-Scopy

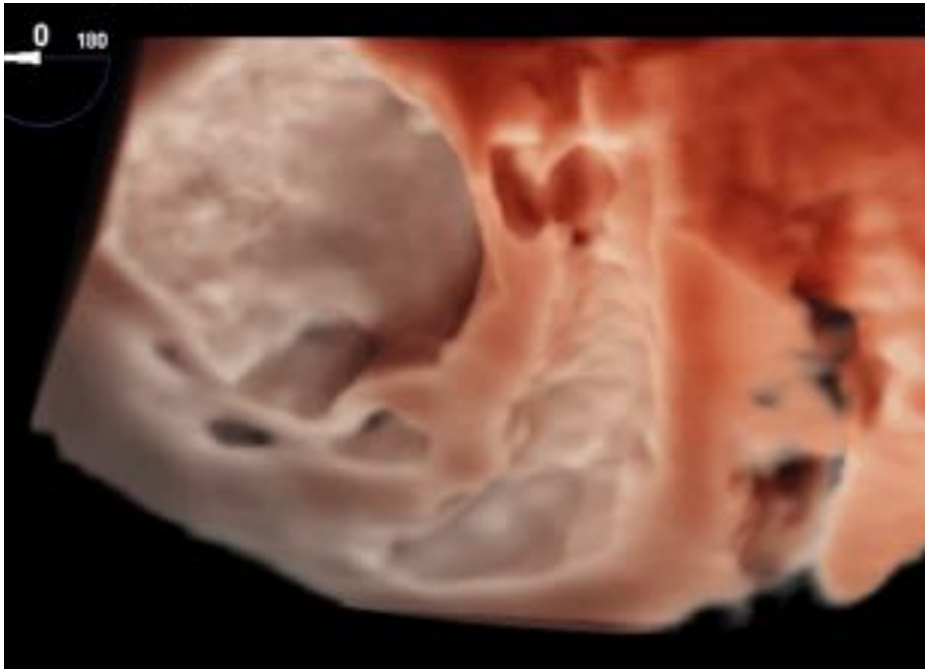
VSD Closure

3D TRUE VIEW

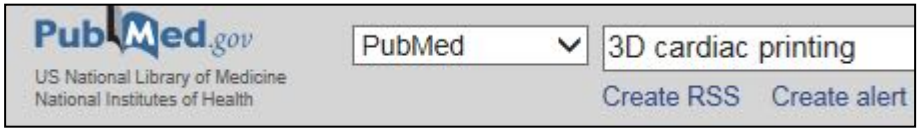


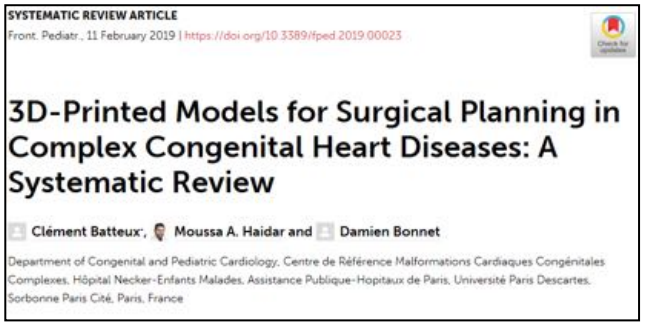






3D Cardiac Printing




SYSTEMATIC REVIEW ARTICLE

Front. Pediatr., 11 February 2019 | https://doi.org/10.3389/fped.2019.00023

3D-Printed Models for Surgical Planning in Complex Congenital Heart Diseases: A Systematic Review

Clément Batteux*, Moussa A. Haidar and Damien Bonnet

Department of Congenital and Pediatric Cardiology, Centre de Référence Malformations Cardiaques Congénitales Complexes, Hôpital Necker-Enfants Malades, Assistance Publique-Hopitaux de Paris, Université Paris Descartes, Sorbonne Paris Cité, Paris, France

Medical scanner

Dedicated Software

3D printing

Image acquisition → **Segmentation and 3D surface model** → **3D Printing**

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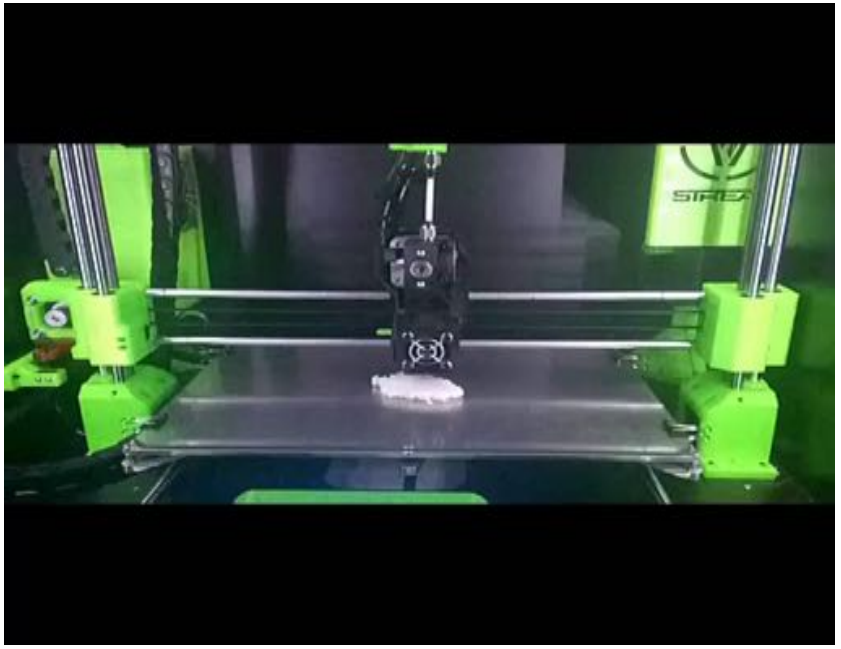
ELSEVIER

SCIENTIFIC EDITORIAL

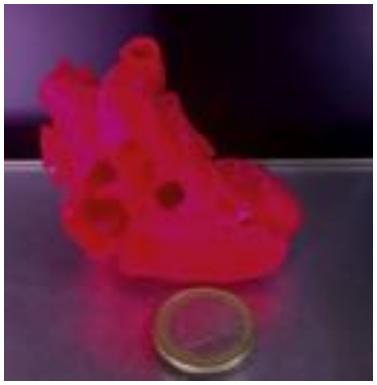
Cardiac 3D printing for better understanding of congenital heart disease

L'impression cardiaque 3D pour mieux comprendre les cardiopathies congénitales

Khaled Hadeed, Philippe Acar*, Yves Dulac, Fabio Cuttone, Xavier Alacoque, Clément Karsenty

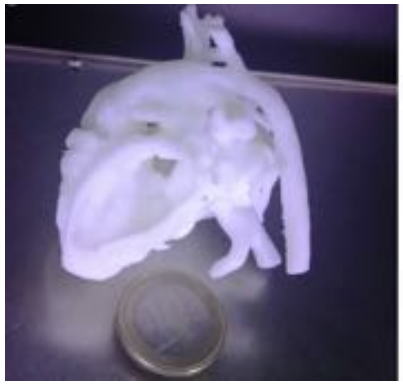


5 years old
TOF



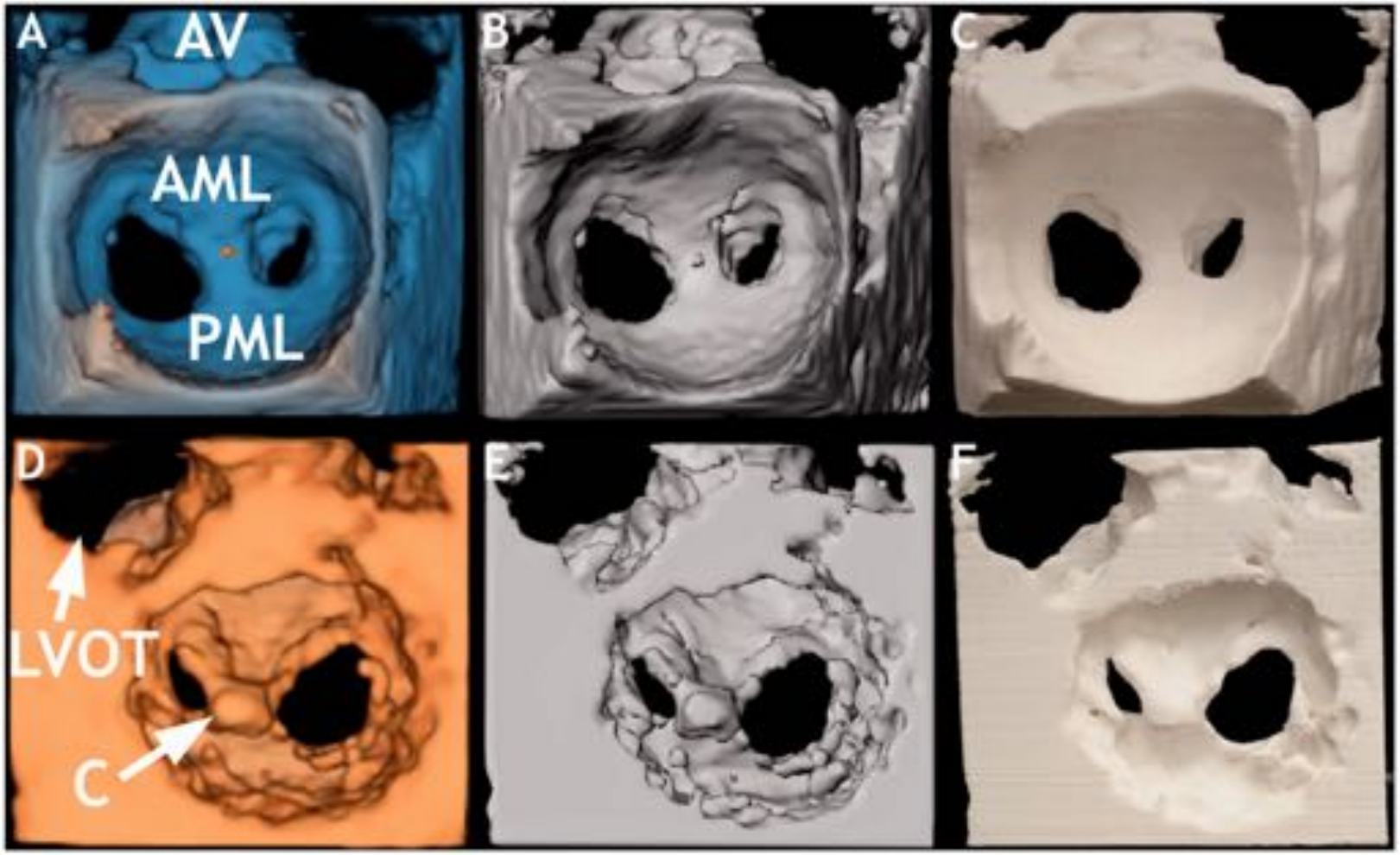
8 months old, 7 kg
DORV

1 month old, 4 kg
TAC



Premature, 2 kg
Syndrome of Coa

3D Echo Printing
MitraClip



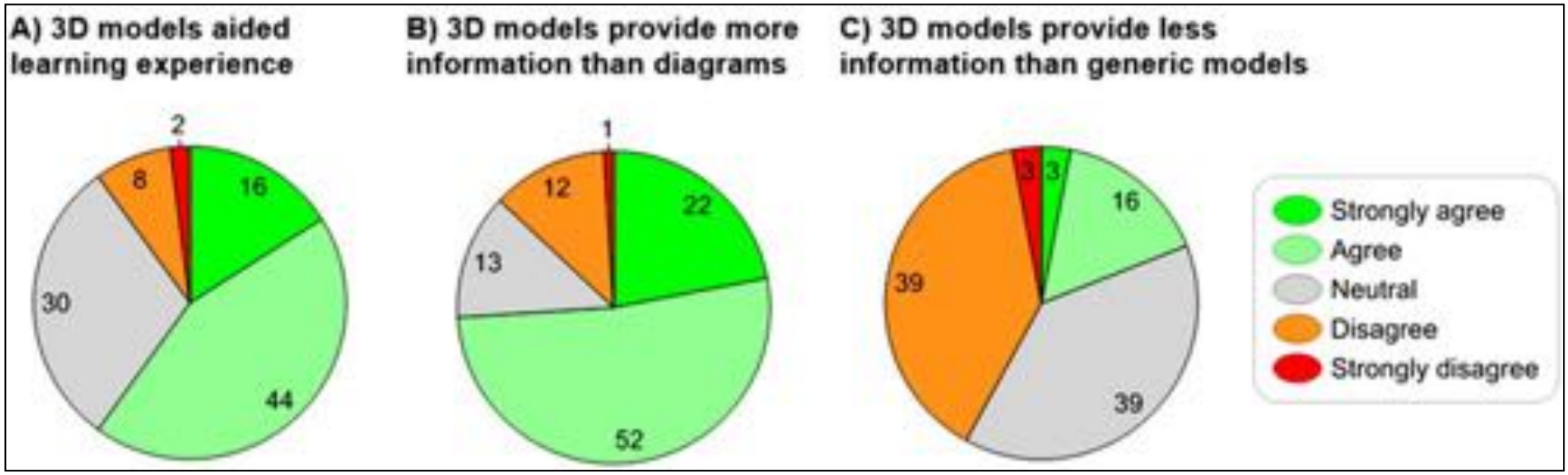
3D Printing
Communication

Pediatr Cardiol (2017) 38:813–818
DOI 10.1007/s00246-017-1586-9

ORIGINAL ARTICLE

Piloting the Use of Patient-Specific Cardiac Models as a Novel Tool to Facilitate Communication During Cinical Consultations

Giovanni Biglino[1,2] · Despina Koniordou[3] · Marisa Gasparini[4] · Claudio Capelli[2,5] · Lindsay-Kay Leaver[2] · Sachin Khambadkone[2] · Silvia Schievano[2,5] · Andrew M. Taylor[2,5] · Jo Wray[2]



BMC Medical Education

RESEARCH ARTICLE Open Access

Three-dimensional printing models in congenital heart disease education for medical students: a controlled comparative study

Wei Su[1], Yunbin Xiao[2], Siping He[3], Peng Huang[2] and Xicheng Deng[2*]

Guitarte et al. ACVD 2019

	Printing	Control	p
Lecture score	**17,34**	**16,60**	**0,04**
Diagnosis (/5)	4,42	4,15	**0,03**
Treatment (/5)	4.28	3.87	**<0.01**

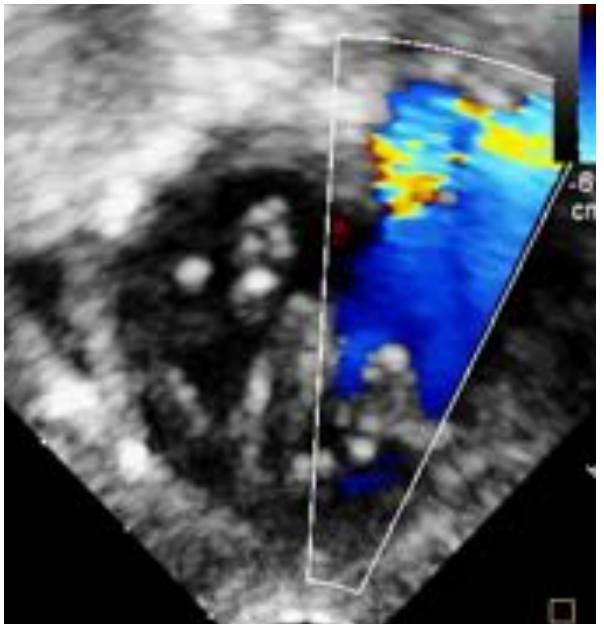
Three-dimensional printed models for surgical planning of complex congenital heart defects: an international multicentre study

Israel Valverde, Gorka Gomez-Ciriza, Tarique Hussain, Cristina Suarez-Mejias, Maria N Velasco-Forte, Nicholas Byrne, Antonio Ordoñez, Antonio Gonzalez-Calle, David Anderson, Mark G Hazekamp, ... Show more

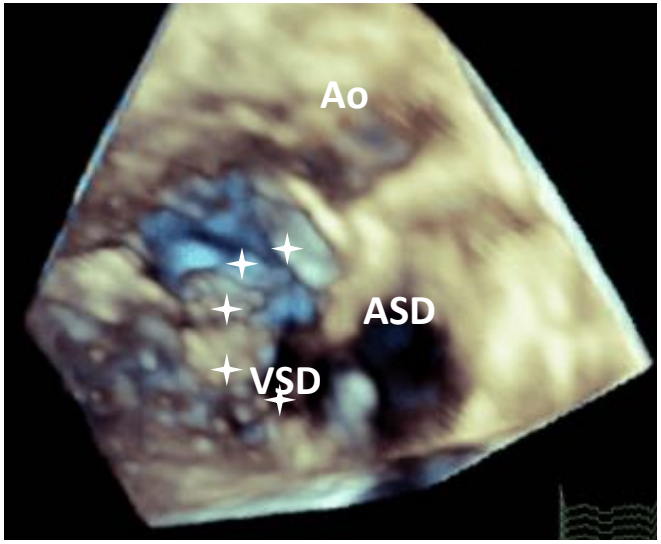
European Journal of Cardio-Thoracic Surgery, Volume 52, Issue 6, 1 December 2017, Pages 1139–1148, https://doi.org/10.1093/ejcts/ezx209

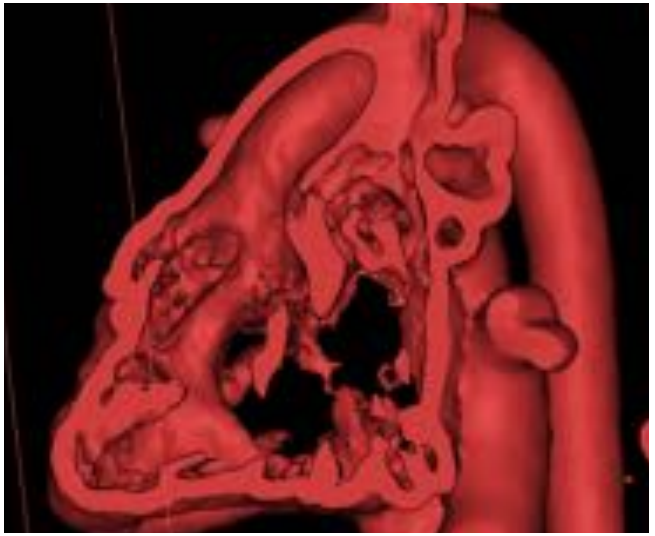
3D Printing
Surgery

3D Printing
Surgery

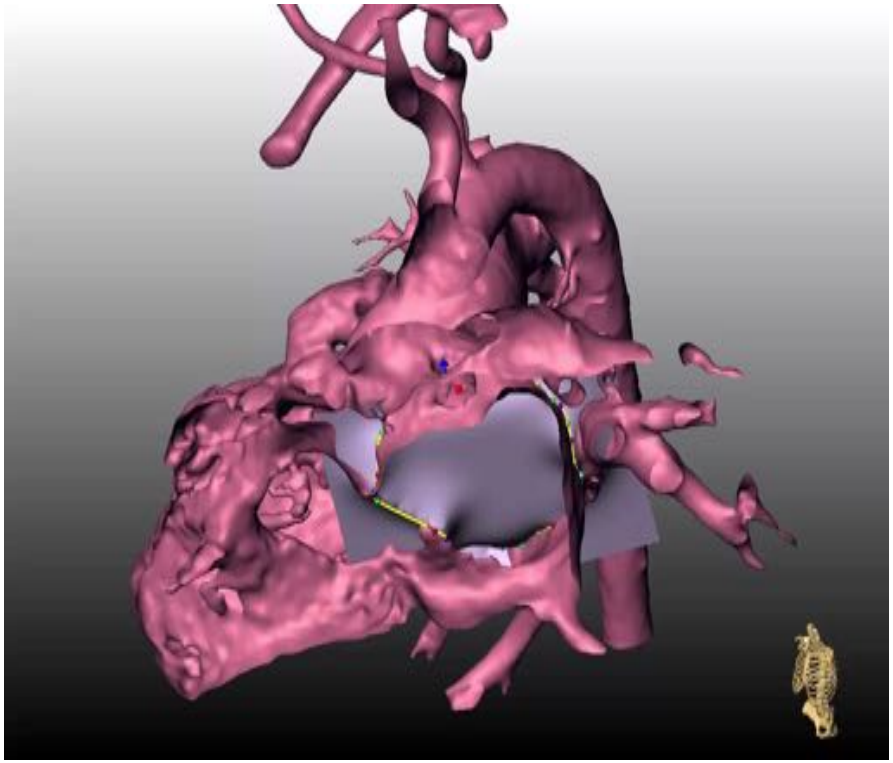


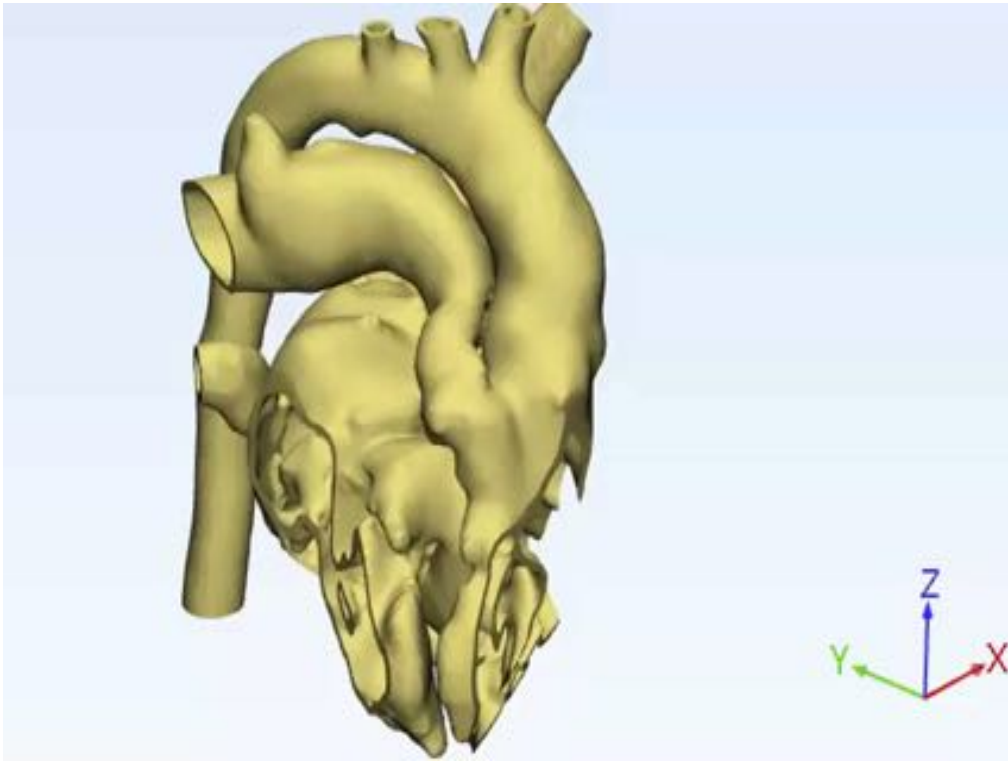
DORV
AVSD
PS

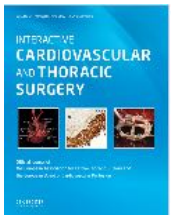




3D Printing
Surgery







Cuttone et Hadeed. 2017

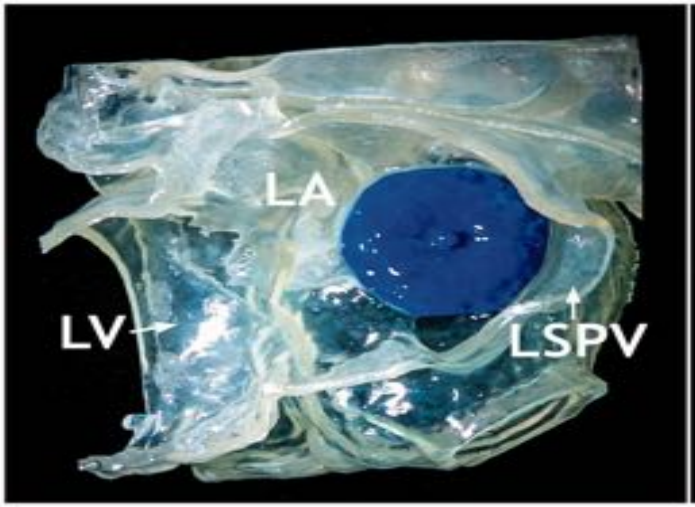
3DE Printing
ASD

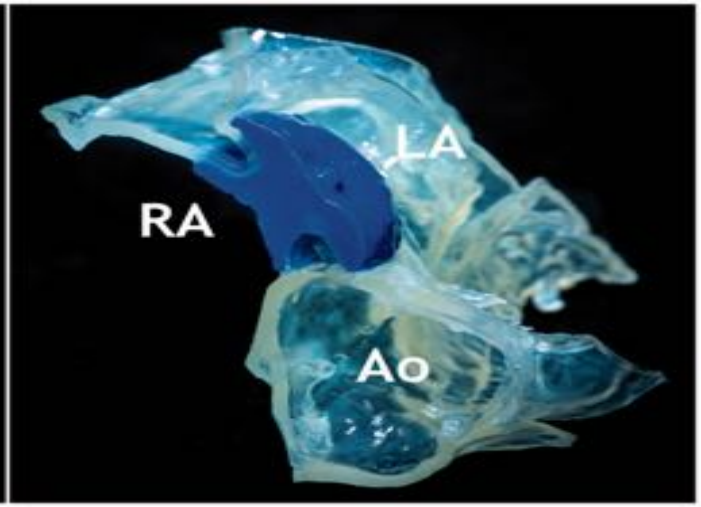
JACC: BASIC TO TRANSLATIONAL SCIENCE VOL. 3, NO. 2, 2018

STATE-OF-THE-ART REVIEW

3D Printing is a Transformative Technology in Congenital Heart Disease

Shafkat Anwar, MD,[a] Gautam K. Singh, MD,[a] Jacob Miller, MD,[b] Monica Sharma, MS,[a] Peter Manning, MD,[b] Joseph J. Billadello, MD,[c] Pirooz Eghtesady, MD, PhD,[b] Pamela K. Woodard, MD[d]



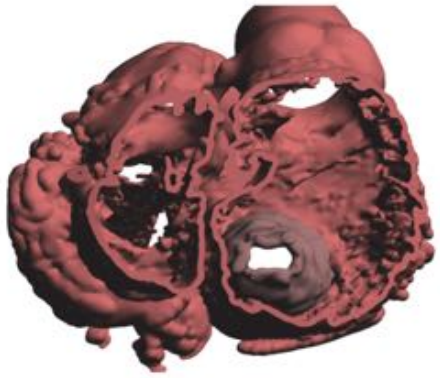


Hybrid 3D

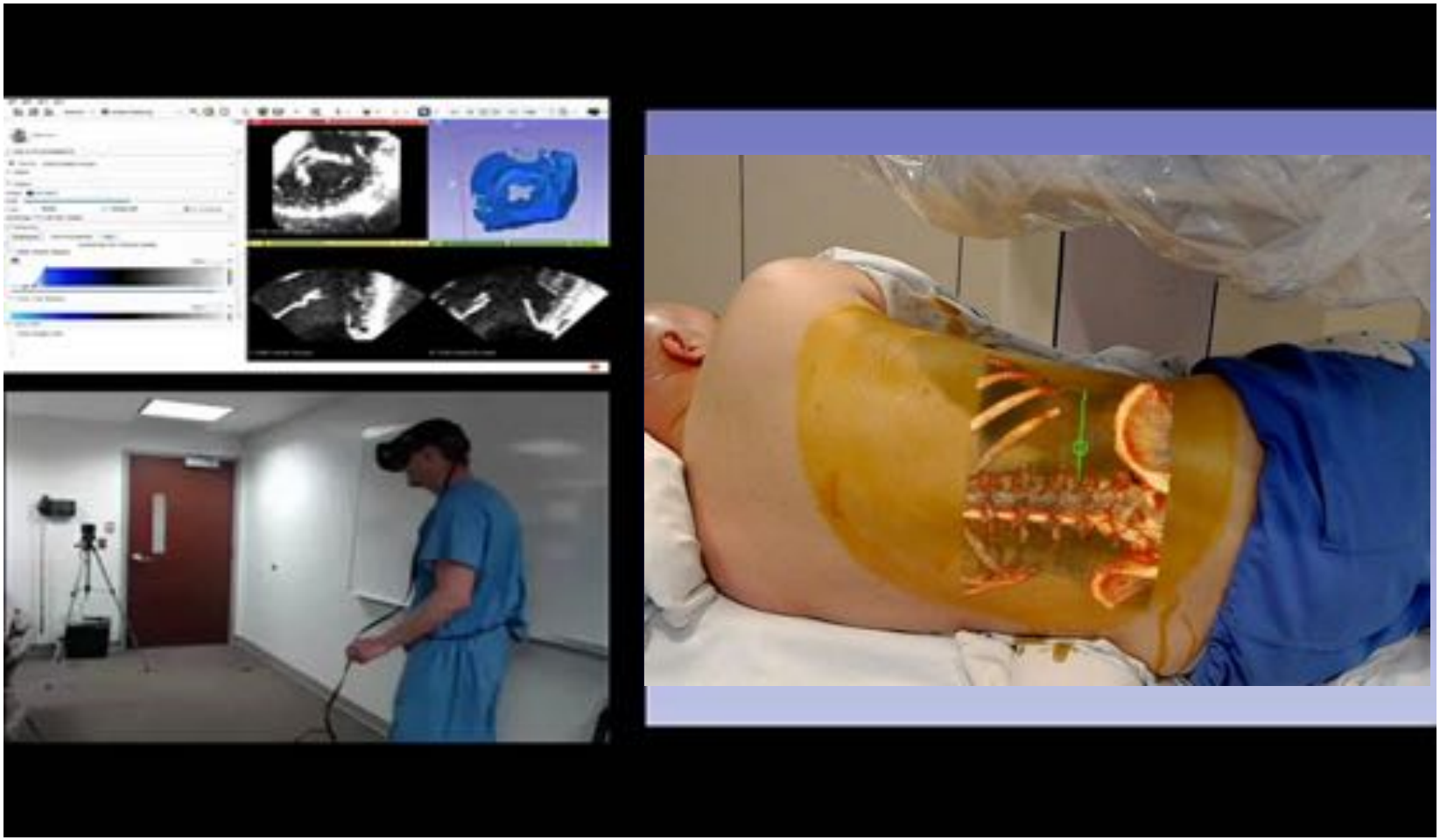
+ 2D-3D TTE

Gosnell et al, J Digit Imaging 2016

+ 3D TEE



Virtual Reality



Lasso et al, JASE 2018

Conclusion
Keep Contact