J Cardiovasc Imaging. 2021 Oct;29(4):375-378
https://doi.org/10.4250/jcvi.2020.0209
pISSN 2586-7210·eISSN 2586-7296

Journal of Cardiovascular Imaging JCVI

Images in Cardiovascular Disease

Check for updates

Ductal Stenting and Judicious Avoidance of Septostomy Rapidly Retrain a Regressed Left Ventricle in D Transposition: A Case Report

Avinash Anantharaj, MD[1], Bhagwati Prasad Pant, MD[1], Nagendra Singh Thalor, MD[1], Harapriya Balasubramanian, MD[2], and Robert Coelho, MS, MCh[2]

[1]Department of Cardiology, Jawaharlal Institute of Postgraduate Medical Education and Research (JIPMER), Puducherry, India
[2]MIOT Centre for Children's Cardiac Care, MIOT International, Chennai, India

OPEN ACCESS

Received: Nov 8, 2020
Revised: Dec 13, 2020
Accepted: Jan 26, 2021

Address for Correspondence:
Avinash Anantharaj, MD
Department of Cardiology, Jawaharlal Institute of Postgraduate Medical Education and Research (JIPMER), Jipmer Campus Rd, Gorimedu, Puducherry 605006, India.
E-mail: avinboxer@gmail.com

ORCID iDs
Avinash Anantharaj
https://orcid.org/0000-0003-2426-8813
Bhagwati Prasad Pant
https://orcid.org/0000-0002-7257-8659
Harapriya Balasubramanian
https://orcid.org/0000-0001-5572-6544

Conflict of Interest
The authors have no financial conflicts of interest.

Author Contributions
Conceptualization: Anantharaj A; Writing - original draft: Anantharaj A; Writing - review & editing: Anantharaj A, Pant BP, Thalor NS, Balasubramanian H, Coelho R.

A 39-day-old infant (weight, 3.2 kg; length, 52 mm) with dextro-transposition of the great arteries (d-TGA) (saturating 72%) and an intact inter-ventricular septum (IVS) and unobstructed left ventricular (LV) outflow presented to our clinic. The inter-atrial septal (IAS) length was 21 mm. An atrial septal defect (ASD) (3.6 mm) (**Figure 1A**) and a closing patent

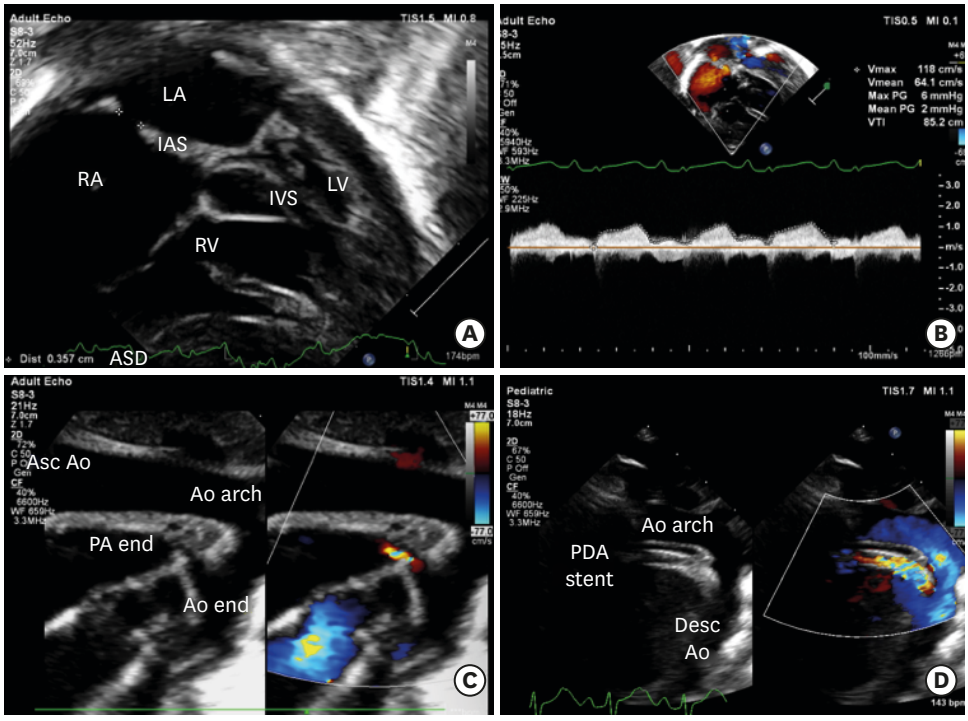

Figure 1. (A) Native atrial septal defect (ASD) measured in the sub-xiphoid coronal view. (B) Continuous wave Doppler across the inter-atrial septum (IAS) showing an inter-atrial mean gradient of 2 mm Hg. (C) Suprasternal long axis view of the aortic arch (Ao arch) at baseline in color compare mode zoomed in to focus on the PDA, showing the large aortic end (Ao end) and the extremely narrow pulmonary end (PA end) (<0.5 mm), suggestive of imminent closure. A measurement obtained during echocardiography and intra-procedural sizing (after balloon dilatation of the narrowed pulmonary end) using a coronary balloon with 2 marker bands agreed on a ductal length of 12 mm. (D) Four days after ductal stenting, a suprasternal long axis view of the aortic arch showed a well-flowing ductal stent. Asc Ao: ascending aorta, Desc Ao: descending aorta, IVS: inter ventricular septum, LA: left atrium, LV: left ventricle, RA: right atrium, RV: right ventricle.

Journal of Cardiovascular Imaging JCVI

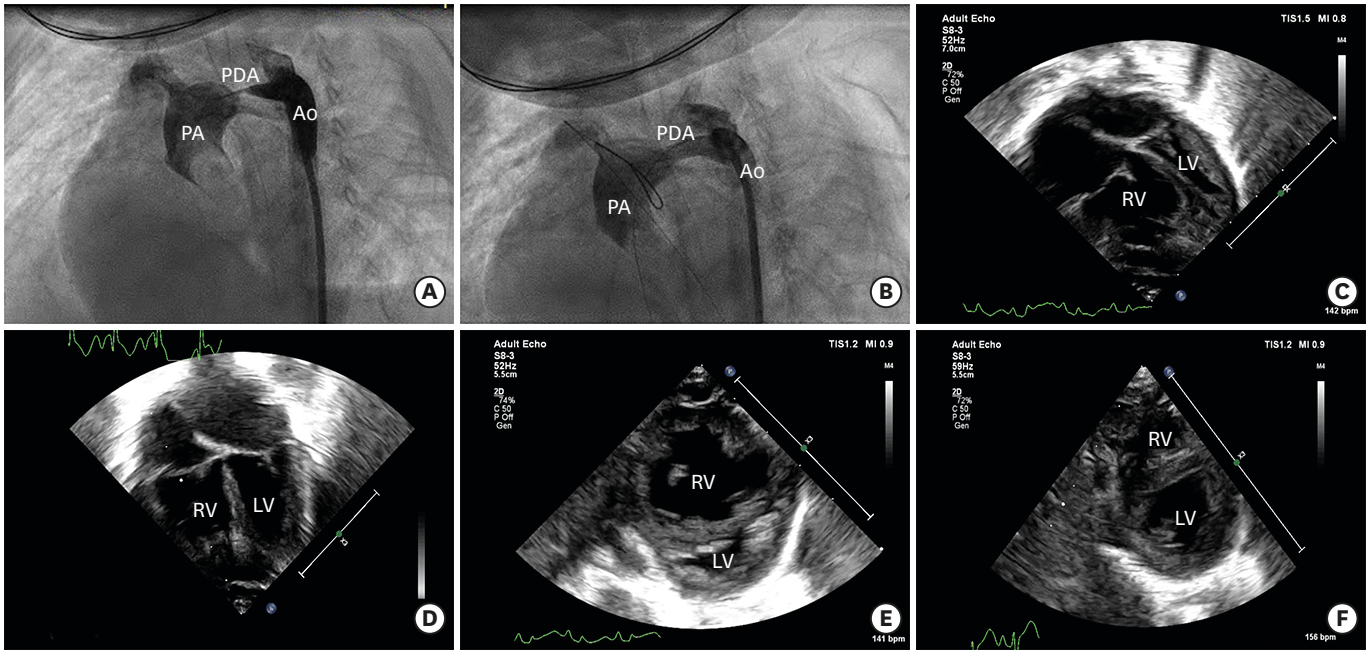

Figure 2. (A) Aortogram reveals an extremely narrowed and closing pulmonary end of the PDA. (B) Post-stenting aortogram shows a well-expanded stent. (C) End systolic frame from a baseline echocardiogram at presentation shows a squashed banana-shaped left ventricle on day 39 of life. (D) Apical 4 chamber view frozen in an end systolic frame showing IVS in midline. The LV was no longer banana-shaped. (E) At presentation, the baseline echocardiographic images in the parasternal short axis view at the papillary muscle level frozen in an end systolic frame shows an ellipsoid LV (classification from Leong et al.[2]) with the IVS pushed toward the LV. (F) Four days after stenting, the parasternal short axis view at the papillary muscle level frozen in an end systolic frame shows a well-expanded LV in a satisfactory configuration (classification from Leong et al.[2]) with the IVS pushed toward the RV.
Ao: aorta, IVS: inter-ventricular septum, LV: left ventricular, PA: pulmonary artery, PDA: patent ductus arteriosus, RV: right ventricle.

ductus arteriosus (PDA) (**Figures 1C** and **2A**) allowed inter-circulatory mixing. The LV was squashed by the right ventricle (RV) (**Figure 2C**), regressed, and banana-shaped (end-diastolic left ventricular posterior wall thickness [LVPWd], 3 mm; end-diastolic left ventricular internal dimension [LVIDd], 13.4 mm; left ventricular indexed mass [LVmi], 37 g/m^2). Since the interatrial mean gradient, which measured 1 mm Hg on catheterization and 2 mm Hg on echocardiography (**Figure 1B**),[1] revealed effective inter-atrial mixing, we avoided balloon atrial septostomy. Furthermore so since increasing the ASD/IAS ratio (0.18) might hinder successful LV retraining.[2][3]

The LV/RV pressure ratio of 0.65[4] mandated LV retraining. Since prolonged post-operative support was impractical during coronavirus disease 2019 (COVID-19) pandemic, we performed ductal stenting (4 × 16 mm, everolimus-eluting; Promus Element Plus; Boston Scientific, Natick, MA, USA)[5] instead of surgical retraining. There was no aortic arch/branch pulmonary artery (PA) encroachment (**Figures 1D** and **2B**, **Movie 1**). The patient's oxygen saturation improved to 90%. The shunt induced congestive failure, that was compounded by the restrictive ASD required intensive therapy with diuretics. Echocardiography on post-procedure day four revealed that the IVS had shifted toward the midline (**Figure 2D** and **Movie 2**) and the LV that was ellipsoid-shaped (**Figure 2E**), demonstrated transformation to a "satisfactory configuration" (LVPWd, 3.8 mm; LVIDD, 24.3 mm; LVmi, 90 g/m^2) (**Figure 2F** and **Movie 2**).[2] Successful arterial switch and stent explantation (**Figure 3**) were done 17 days later. The patient's postoperative course was uneventful, with normal RV function, normal PA pressures, and minimal neo-aortic regurgitation.

https://doi.org/10.4250/jcvi.2020.0209

Journal of Cardiovascular Imaging JCVI

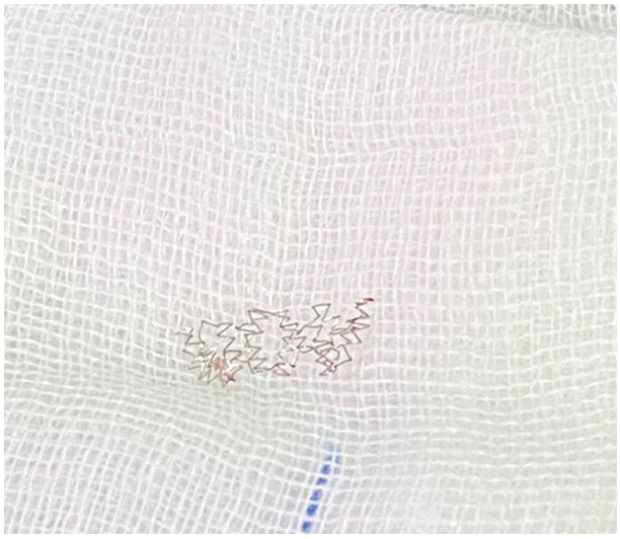

Figure 3. Explanted ductal stent.

ACKNOWLEDGMENTS

The authors are indebted to Professor Raja J Selvaraj, Department of Cardiology, Jawaharlal Institute of Postgraduate Medical Education and Research (JIPMER), for kindly reviewing the manuscript and patiently editing the pictures and video.

SUPPLEMENTARY MATERIALS

Movie 1

Suprasternal long axis view of the aortic arch in color compare mode 4 days after ductal stenting shows a well-flowing ductal stent.

Click here to view

Movie 2

Parasternal short axis view and apical 4 chamber view before and 4 days after stenting.

Click here to view

REFERENCES

1. Neches WH, Mullins CE, McNamara DG. The infant with transposition of the great arteries. II. Results of balloon atrial septostomy. *Am Heart J* 1972;84:603-9.
PUBMED | CROSSREF
2. Leong MC, Ahmed Alhassan AA, Sivalingam S, Alwi M. Ductal stenting to retrain the involuted left ventricle in d-transposition of the great arteries. *Ann Thorac Surg* 2019;108:813-9.
PUBMED | CROSSREF
3. Gopalakrishnan A, Sasidharan B, Krishnamoorthy KM, et al. Left ventricular regression after balloon atrial septostomy in d-transposition of the great arteries. *Eur J Cardiothorac Surg* 2016;50:1096-101.
PUBMED | CROSSREF

https://doi.org/10.4250/jcvi.2020.0209

4. Parker NM, Zuhdi M, Kouatli A, Baslaim G. Late presenters with dextro-transposition of great arteries and intact ventricular septum: to train or not to train the left ventricle for arterial switch operation? *Congenit Heart Dis* 2009;4:424-32.
PUBMED | CROSSREF
5. Sivakumar K, Francis E, Krishnan P, Shahani J. Ductal stenting retrains the left ventricle in transposition of great arteries with intact ventricular septum. *J Thorac Cardiovasc Surg* 2006;132:1081-6.
PUBMED | CROSSREF