

STS/EACTS Latin America Cardiovascular Surgery Conference

November 15-17, 2018

Hilton Cartagena | Cartagena, Colombia



Surgical options for TGA and LVOTO.

Christian Kreutzer MD
Head, Congenital Heart Surgery
Hospital Universitario Austral
Argentina

STS/EACTS Latin America Cardiovascular Surgery Conference

November 15-17, 2018

Hilton Cartagena | Cartagena, Colombia



The Society
of Thoracic
Surgeons



EACTS
European Association for Cardio-Thoracic Surgery

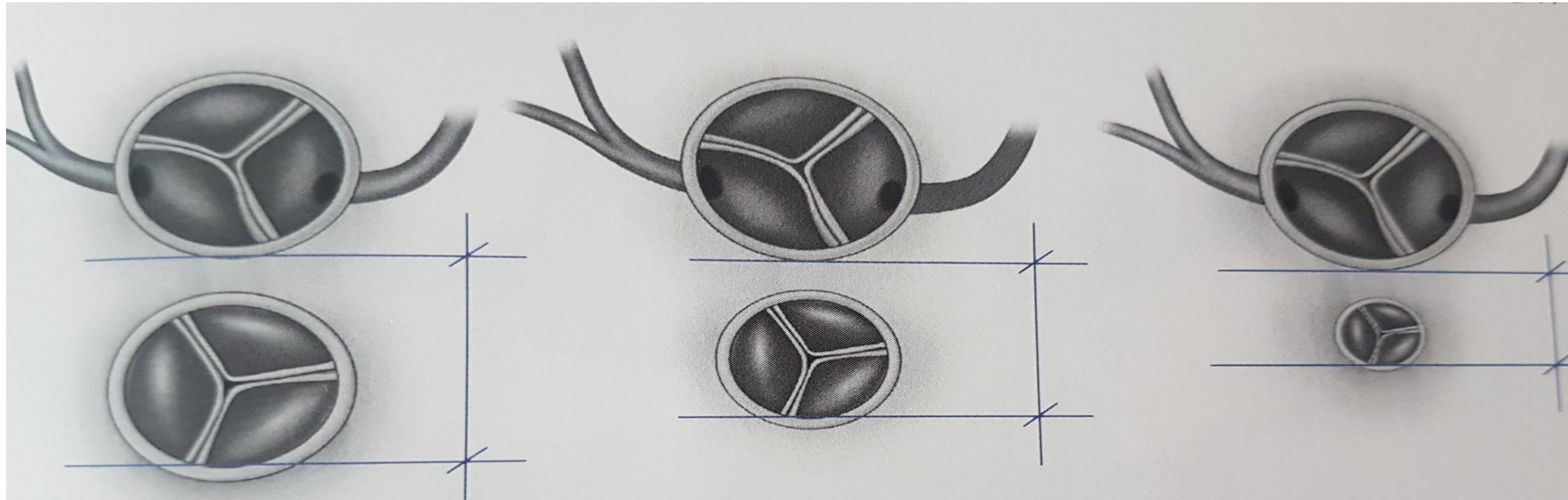
No disclosures

Therapeutic Goal in TGA, VSD and LVOTO.

- Biventricular repair..
- Systemic Left Ventricle.
- Low early M/M.
- Low late M/M
- Low reintervention rate.

Anatomy

- Multi Level LVOTO.
- Pulmonary Valve. (annulus and bicuspid)
- Sub pulmonary
 - Posterior deviation of Conal Septum
 - Abnormal Mitral valve attachments.
 - Cleft Mitral Valve.



What are we doing

- Palliation with BT shunt vs early correction.
 - Progression of LVOTO.
- Neonatal Rastelli, Switch or Nikaidoh.
- **Infant/toddler Rastelli with homografts.** (Eur J Cardiothorac Surg. 2010 Dec;38(6):699-706)
- Low early mortality.
- High late morbidity
 - RVOTO Reintervention.
 - LVOTO Reoperation.
 - Arrhythmias
 - LV failure.
- Late mortality even worse than atrial switch.

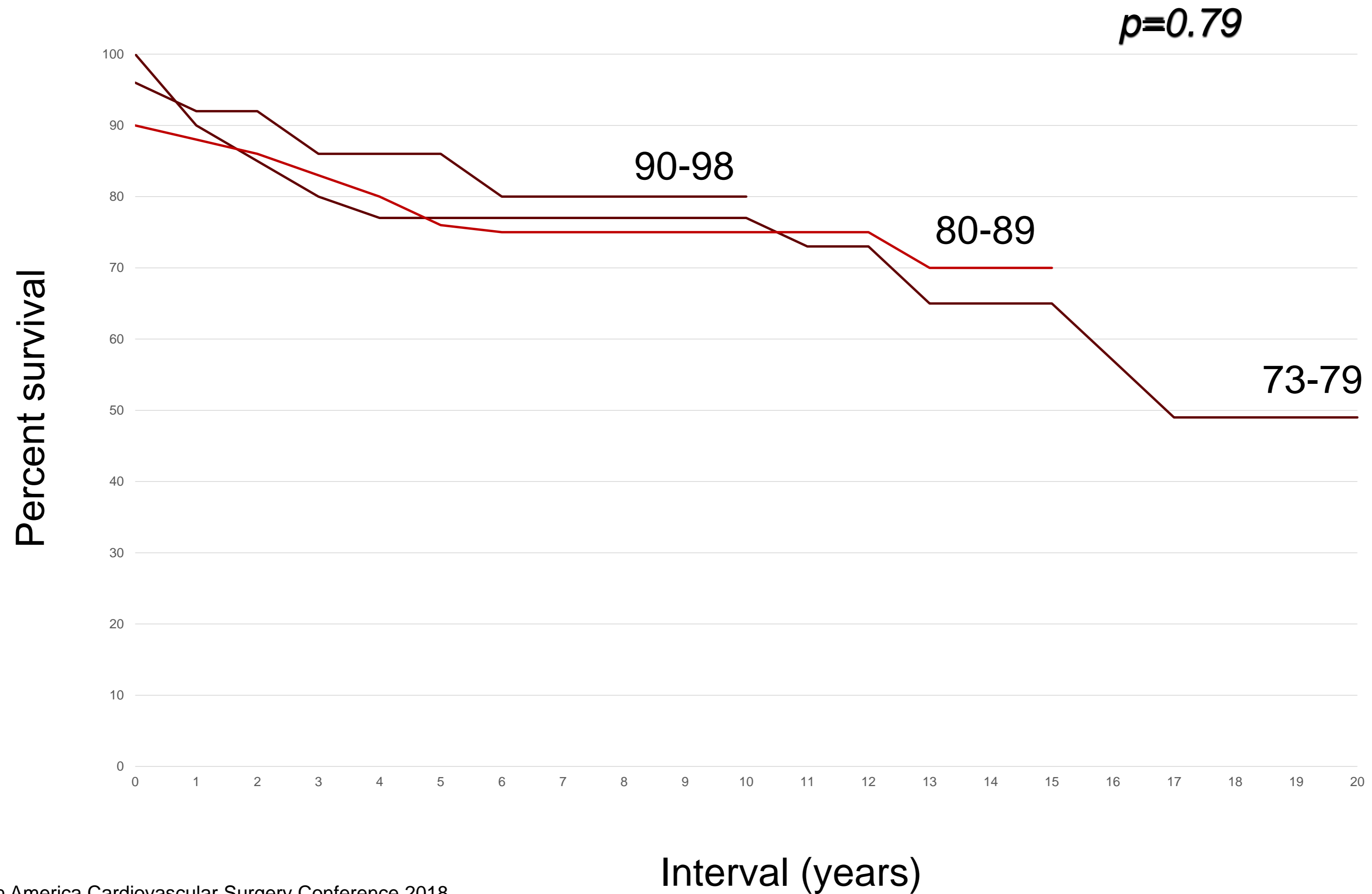
Mayo Clinic Study

- Rastelli for TGA: 231 pts. (7/68-1/00)
- Early mortality: 10 %.
- Late Survival: 48 % at 20 yrs.
- Freedom from reintervention: 18 % at 20 yrs.
- Causes of late death: Arrhythmia and LV fail.

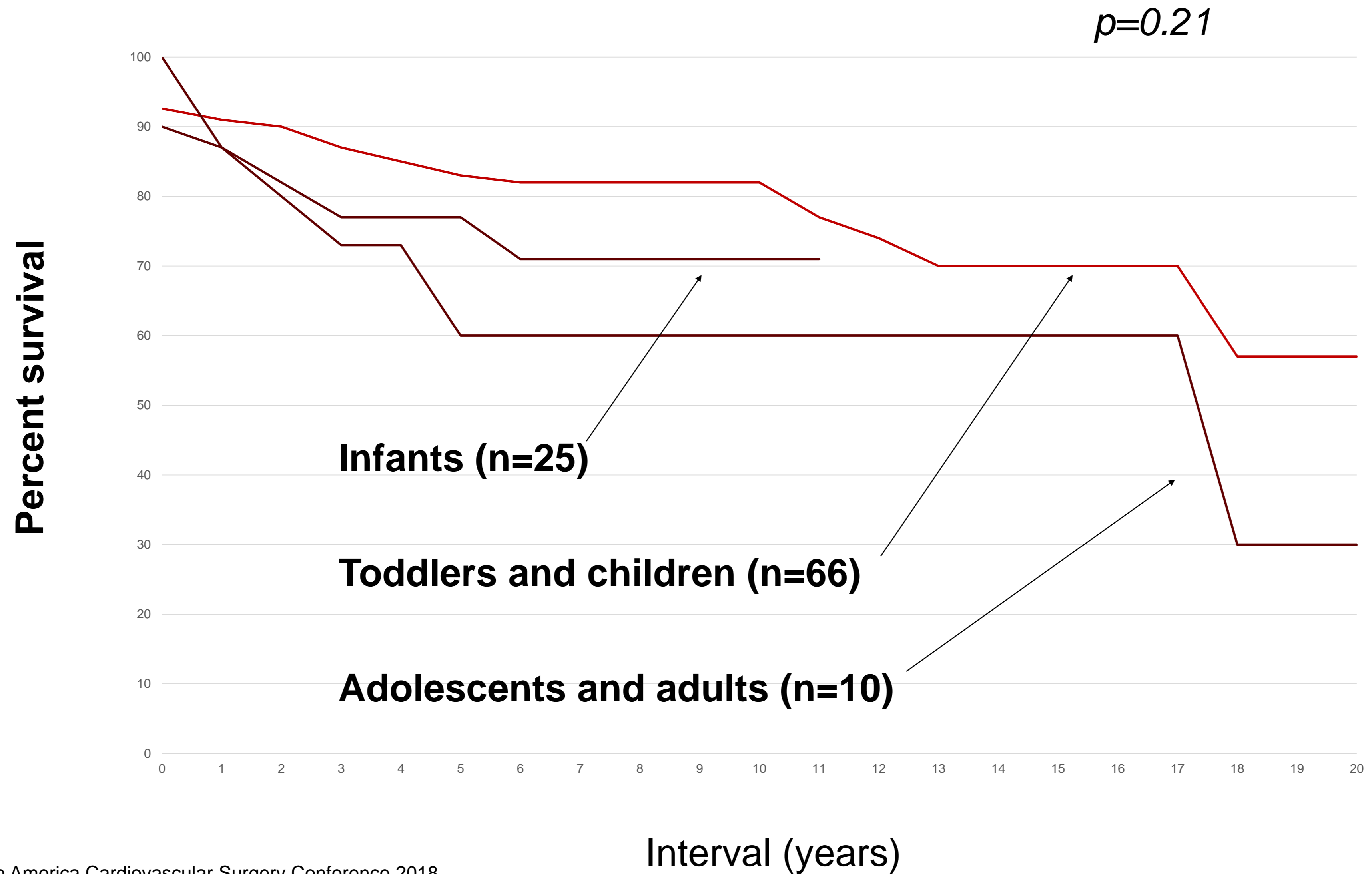
Boston Children's Study

- Rastelli for TGA: 101 pts. (7/73-4/98)
- Early mortality: 7 %.
- Late Survival: 49 % at 20 yrs.
- Freedom from reintervention: 18 % at 20 yrs.
- Causes of late death: Arrhythmia and LV fail.

Survival



Survival



Late failure

- 17 deaths and 1 HTX.
- LV failure= 7, sudden death=5
- Significant predictors

Straddling TV

p=0.0002

Dacron Cdt.

p=0.009

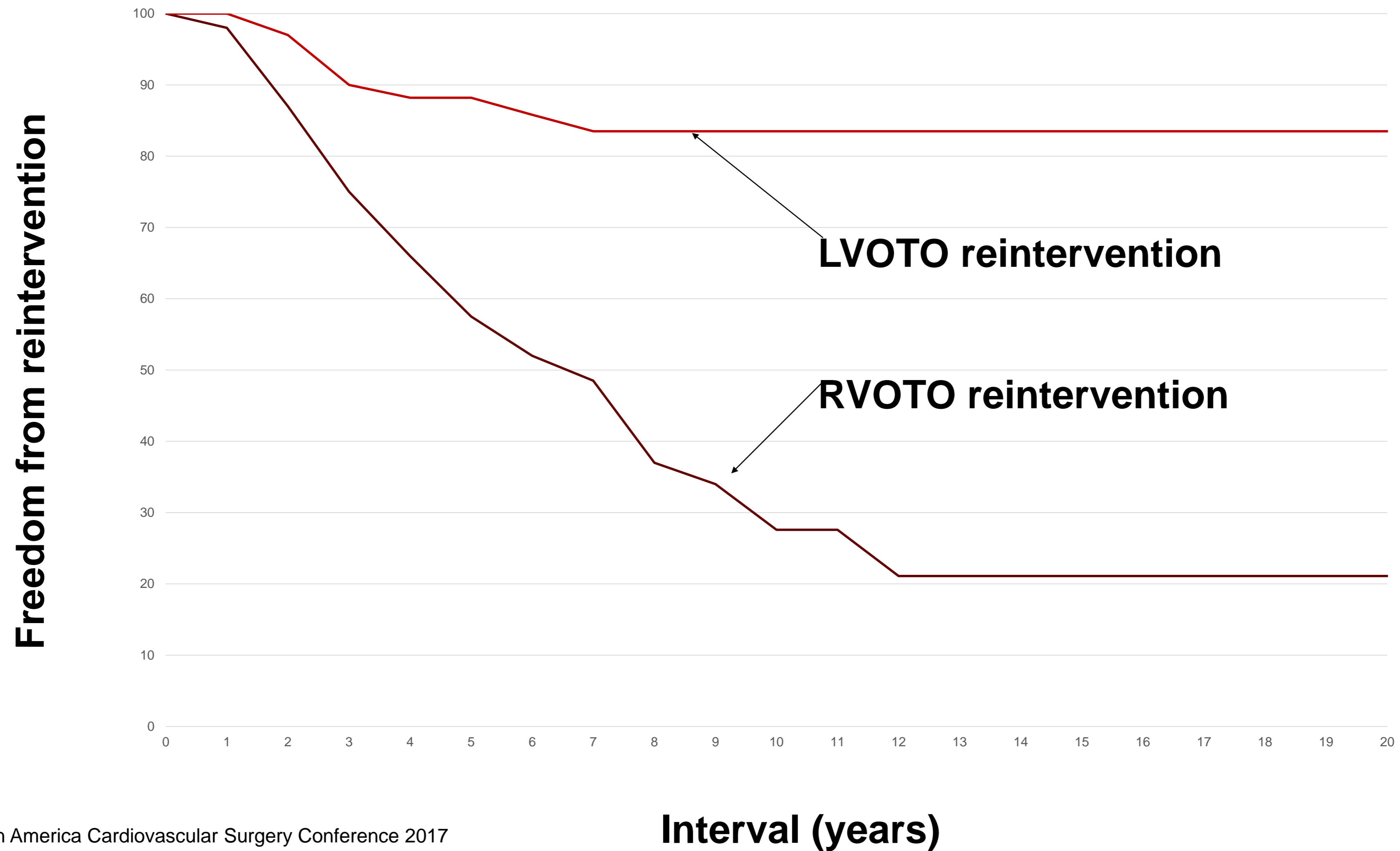
longer LOS

p=0.03

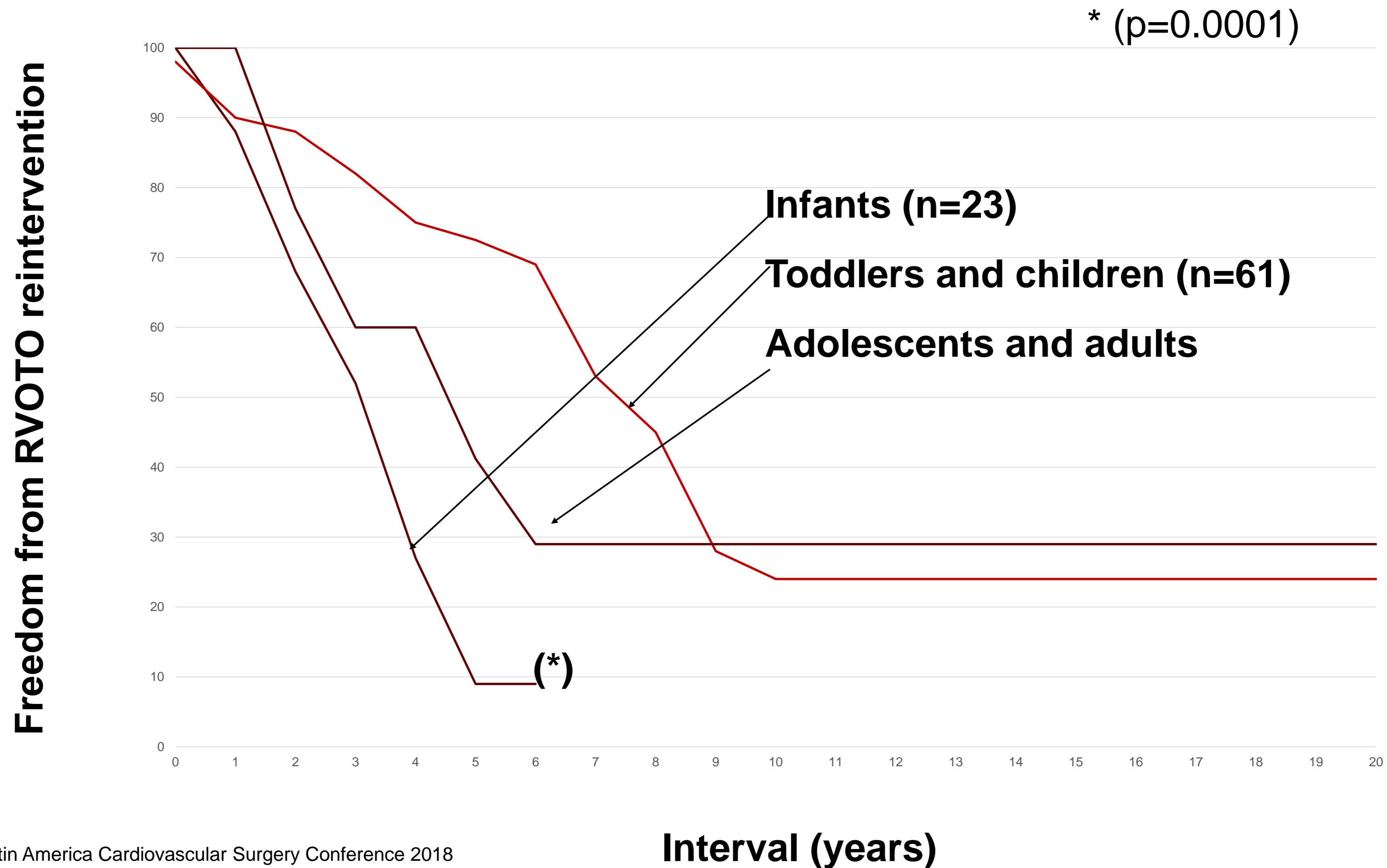
C-Ed. Conduits

p=0.05

Freedom from reintervention



Freedom from RVOTO reintervention



Risk factors for reinterventions

- LVOTO reintervention= 17 % /15 yrs.

No VSD enlargement $p=0.02$

Longer CPB time $p=0.02$

LOS ≥ 14 d $p=0.04$

- RVOTO reintervention= 79 % /15 yrs.

Surgeon X $p=0.001$

Rt sided cdt. $p=0.02$

Infants $p=0.0001$

Weight < 9 Kg $p=0.02$

Male gender $p=0.05$

“Kreutzer's article illustrates the results of the perfect observance of surgical orthodoxy. In view of the long-term results, I wonder whether this observance is still justified?”

Yves Lecompte, JTCVS, January 2002

TGA, VSD, LVOTO

¿Why Rastelli's fail in the long term?

- **LVOTO and LV. Failure** Graham T. et al. J.Thorac & CV. Surg 1987;93:775-84. Palik I. Et al. Am. Heart J. 1986; 112: 1271-8)
- Arrhythmia and sudden death.
- Reoperation. (Aorta or conduit behind the sternum)
 - ¿Lessons Learnt? (Univ Indiana, Brown J, WJPCHS, in press)
Ann Thorac Surg. 2009 Jul;88(1):137-42; Al Halees.
- Always enlarge the VSD and resect conal septum.
- Avoid Rastellis in non committed VSD.
- Avoid Rastellis in mild LVOTO. (Circulation. 2009 15;120(11 Suppl):S53-8) Emani R.
 - “The bigger the pulmonary annulus the more tortuous the LVOT will be after Rastelli”
- Achieve pulmonary competence with PVR.
 - Surgical.
 - Interventional.

So, what Now?

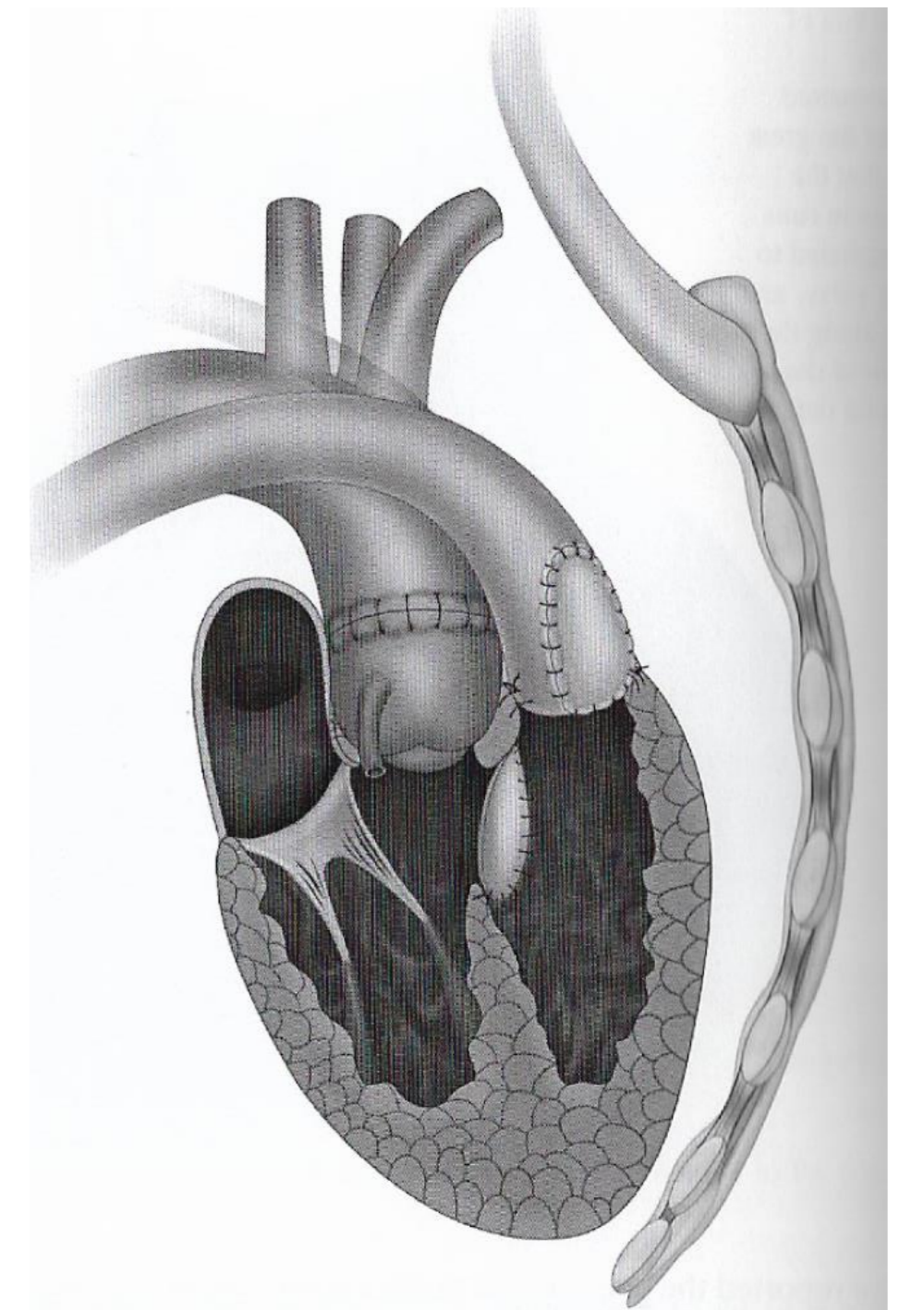
- Modification of the RVOT reconstruction in Rastelli:
 - Non Homograft Rastelli: APVC, Contegra, Cor Matrix.
- Explore other alternatives:
 - Arterial switch operation and resection.
 - Nikaidoh or “Ross Konno Arterial switch”.
 - REV.
 - One and a Half ventricle repair.
 - Univentricular repair.

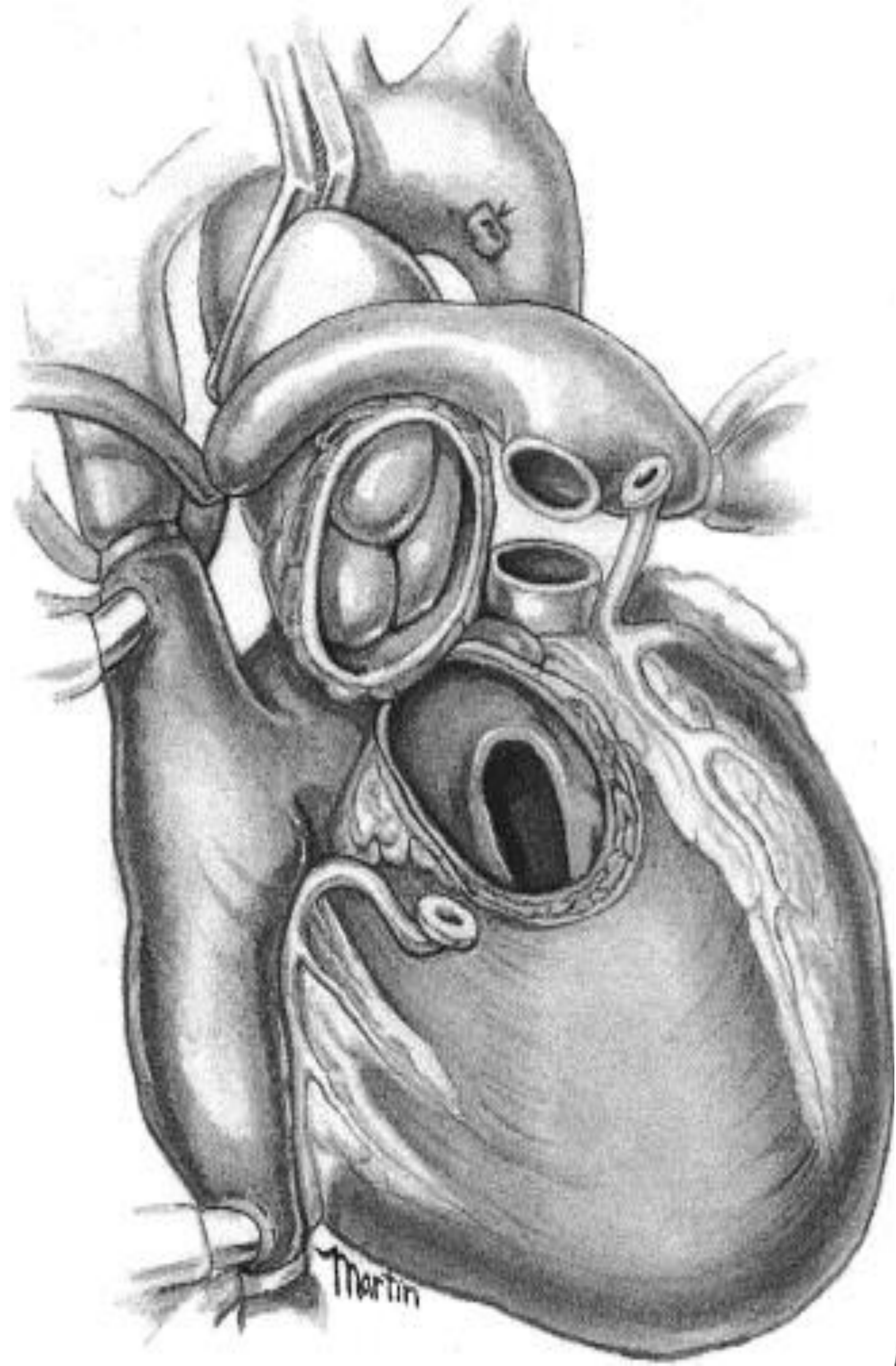
Arterial Switch

- The best option when possible.
 - Do not delay the repair!! (Circulation. 2009 15;120(11 Suppl):S53-8) Emani R
 - Mild Hypoplastic pulmonary annulus. (z -2)
 - Mild Dysplasia. At least bicuspid PV.
 - Complete resection of conal septum.
 - Traction stitches
 - VSD closure.
 - ASO without Ao P miss match.

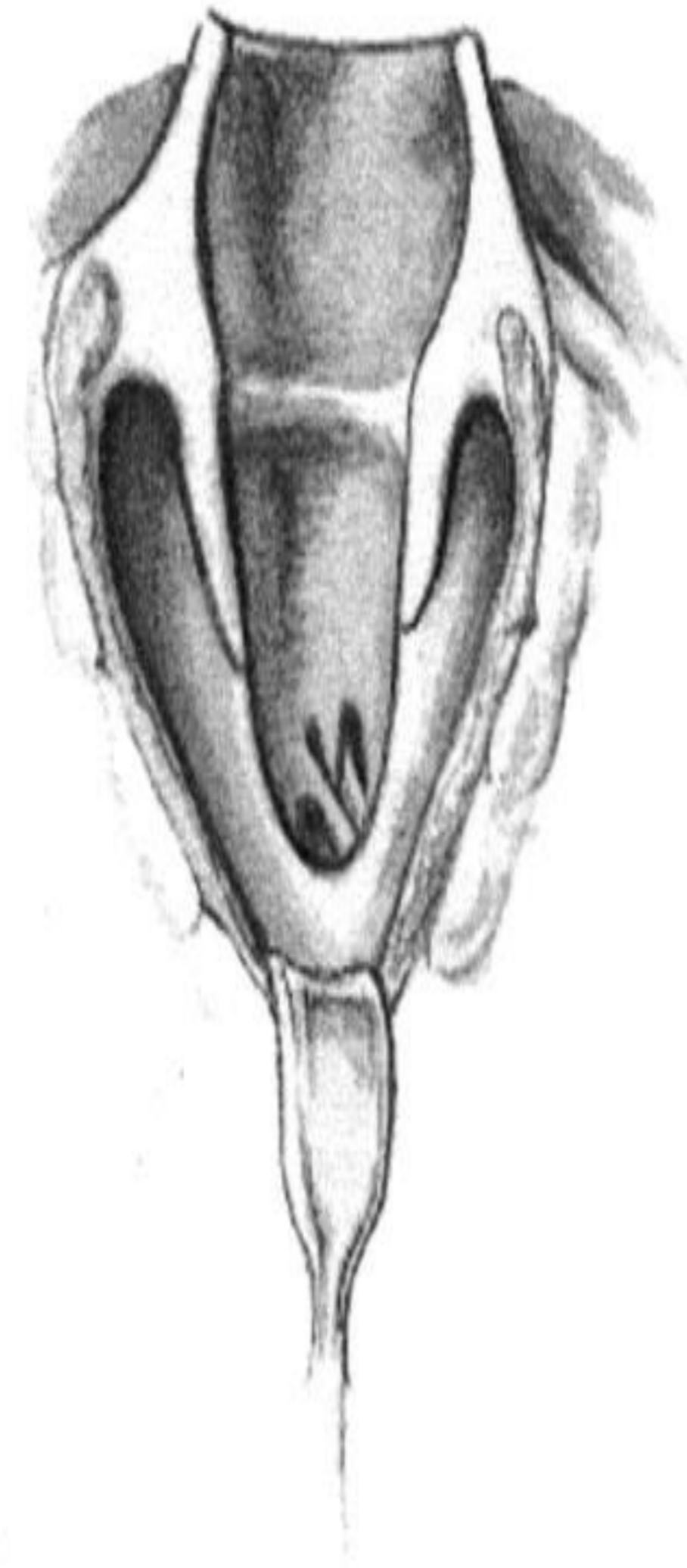
Nikaidoh or Ross Konno Switch

- Aortic translocation and Reimplantation in the LVOT.
- With coronary reimplantation.
- Ideally for mild mod PV Hypoplasia or dysplastic PV
- Appropriate when VSD is not committed.
 - No baffle, RV volume not affected.
- Use of Lecompte Manouver and RV PA conduit.
- Sternal compression is diminished.
- **Technical difficulty, late AI.** Morrel V, Surgery of Conotruncal Anomalies



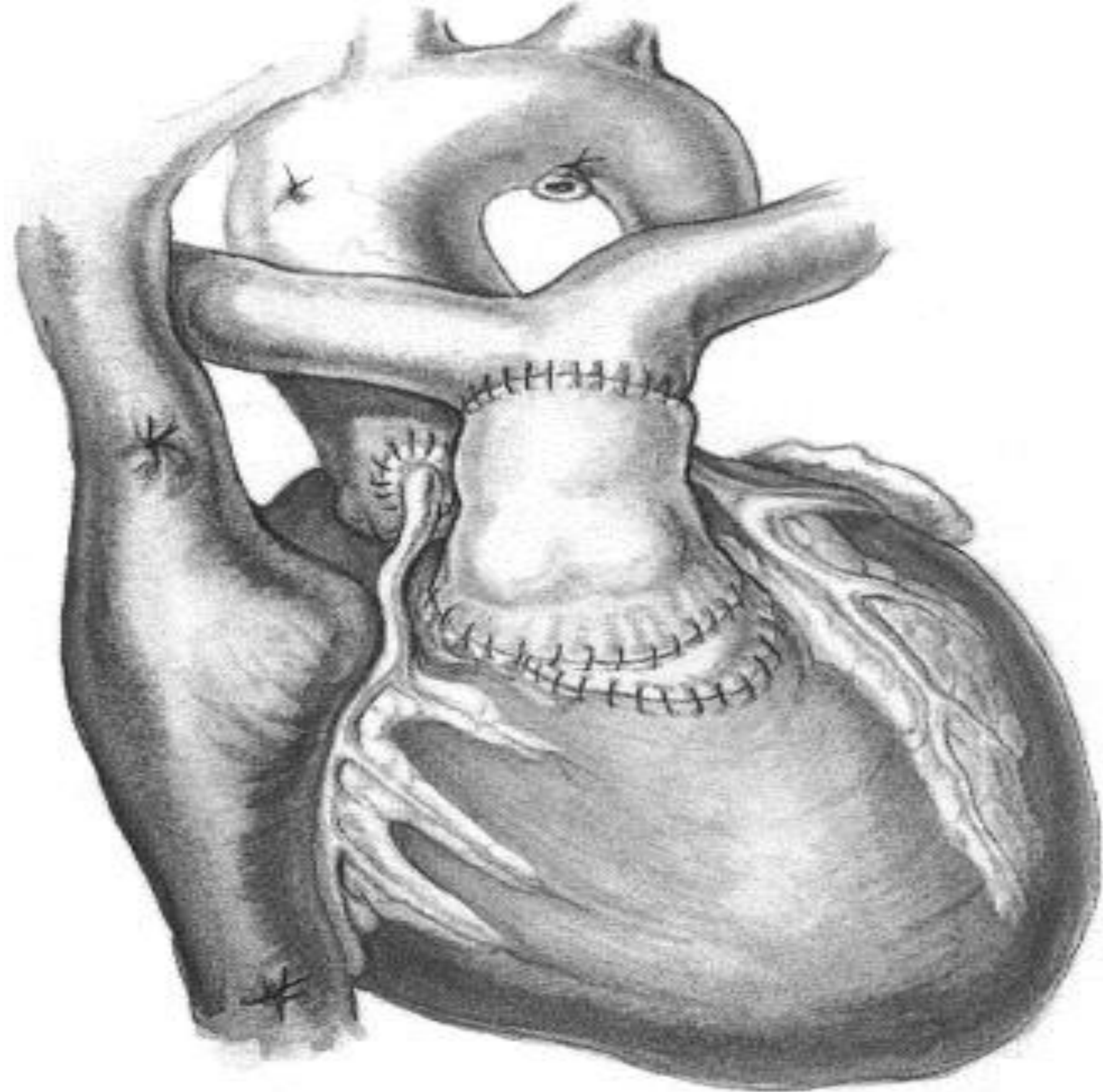


A



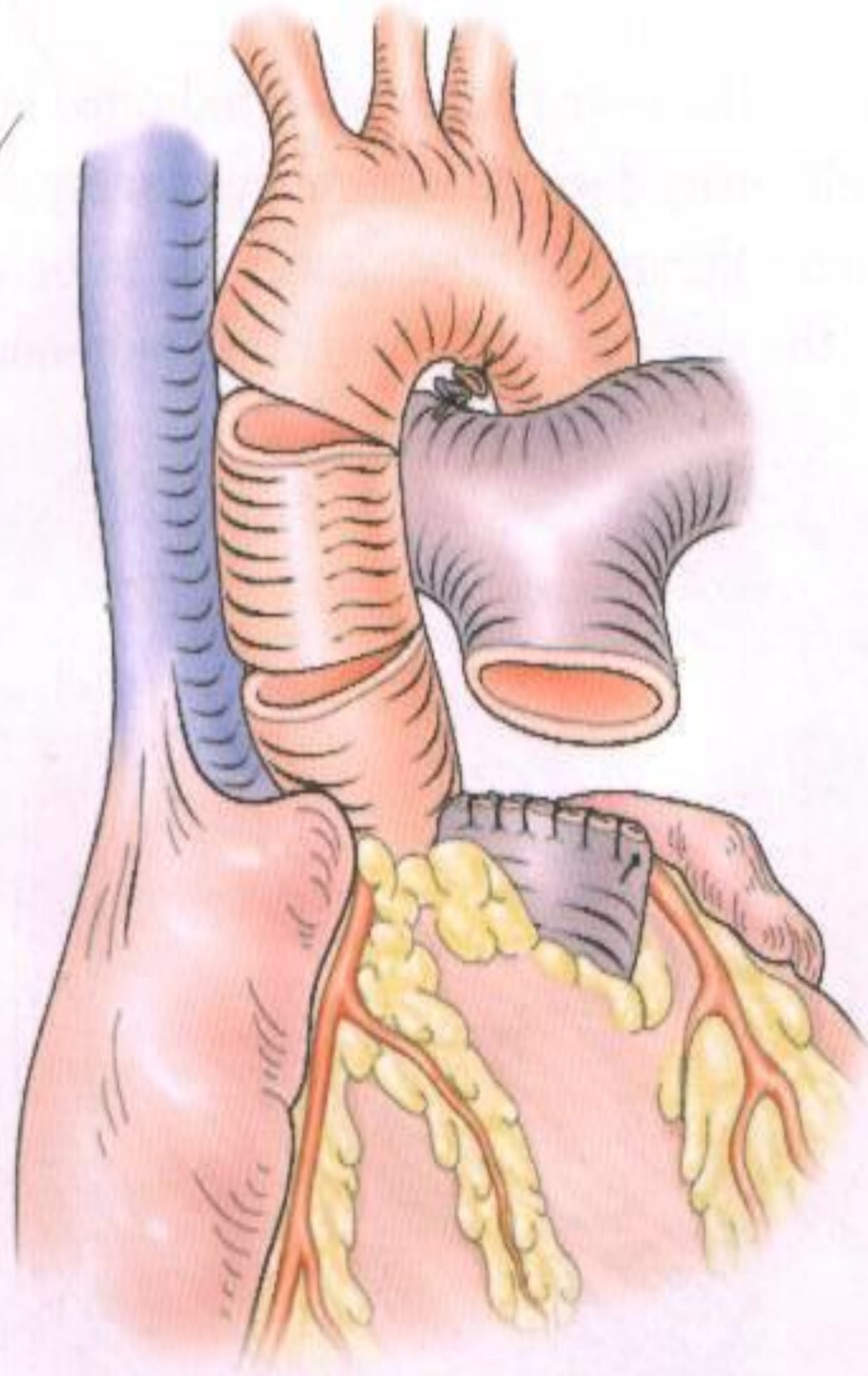
B



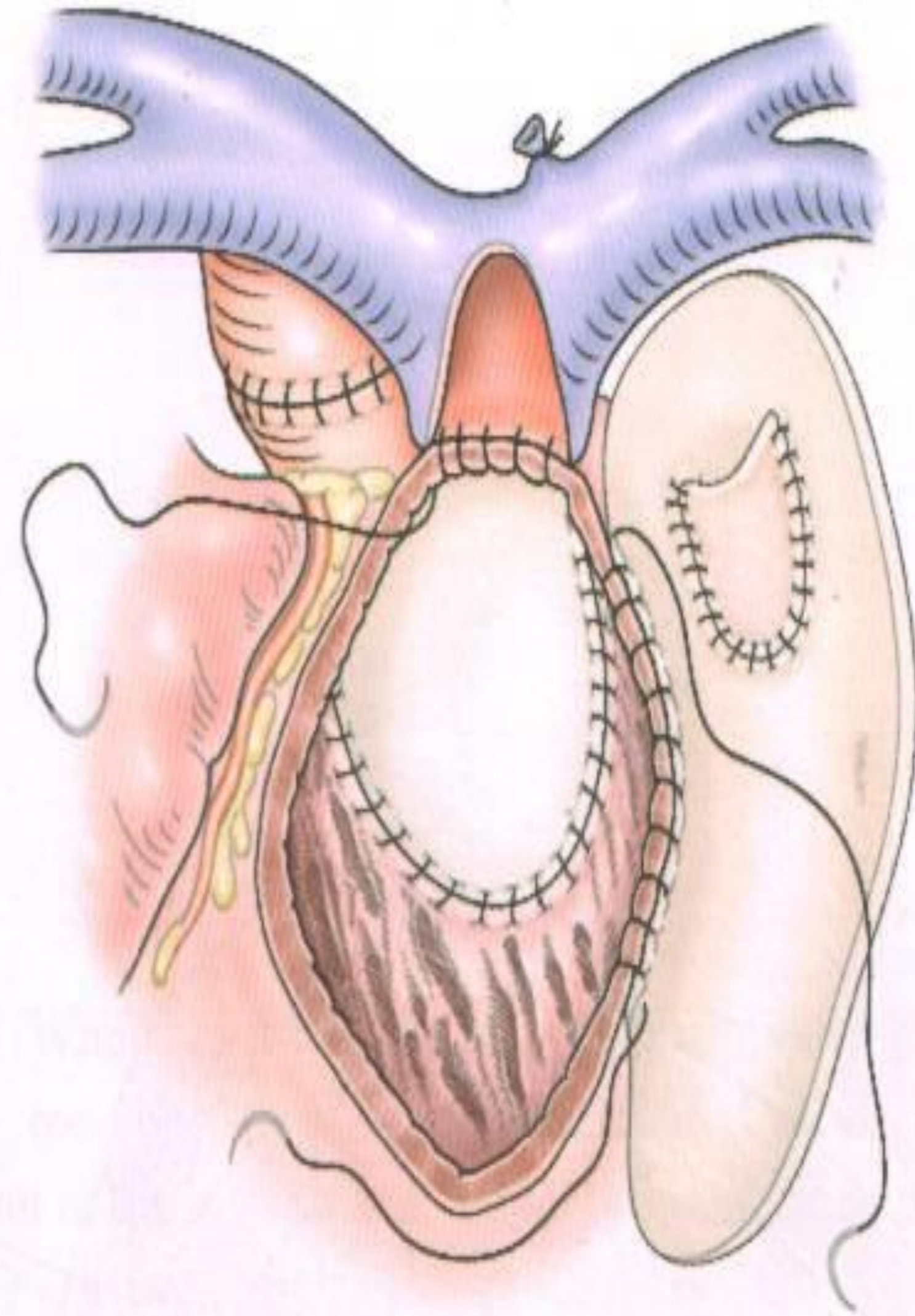


Reparación a le étage Ventriculaire

- Resection of conal septum.
 - (VSD baffling) Direct LV Ao connection.
 - Lecompte manouever for RV PA connection.
- Huge ascending aorta.
 - Posterior compression of pulmonary branches.
- Anterior compression by sternum.
- Pulmonary Regurgitation.



6a



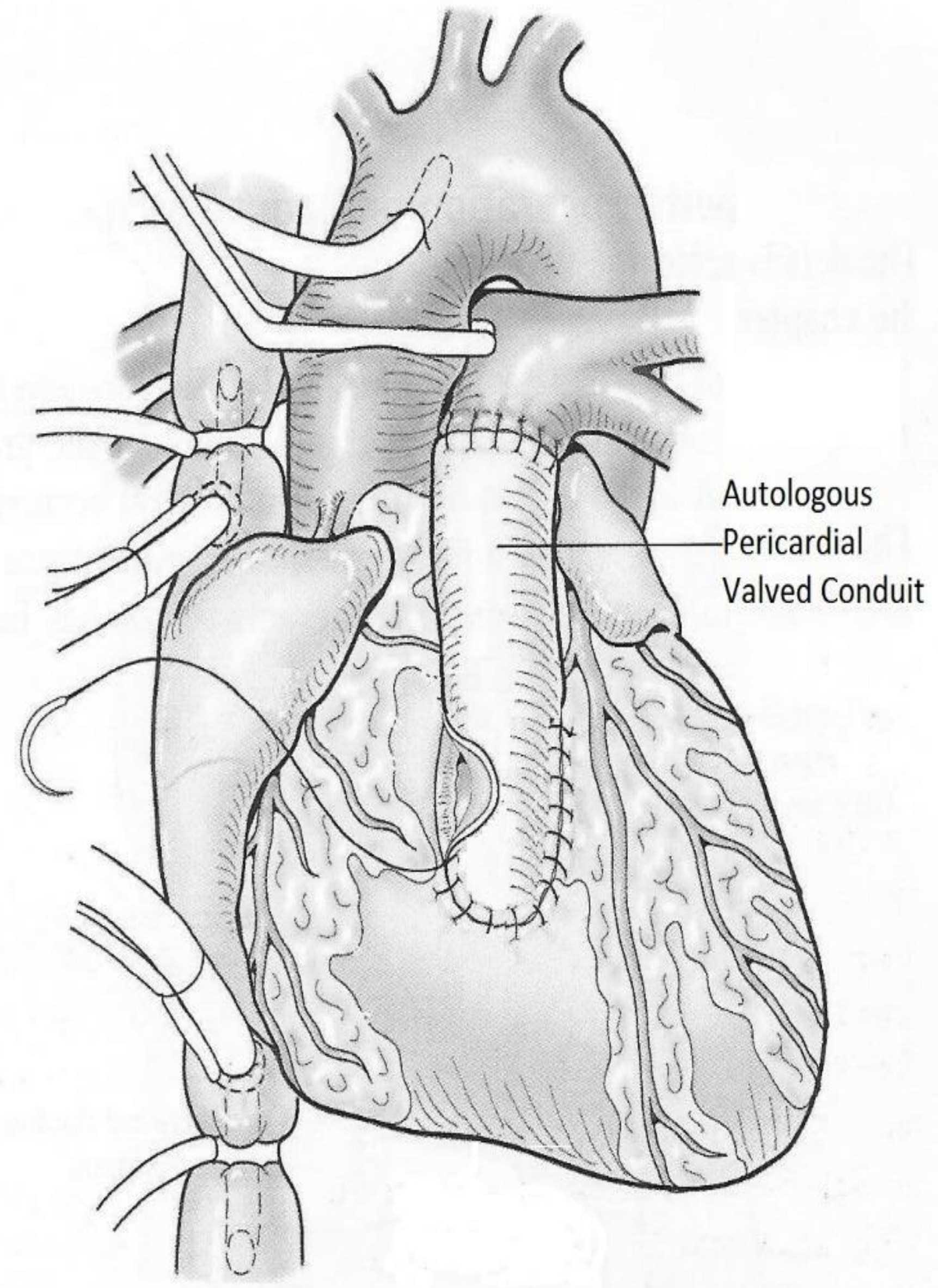
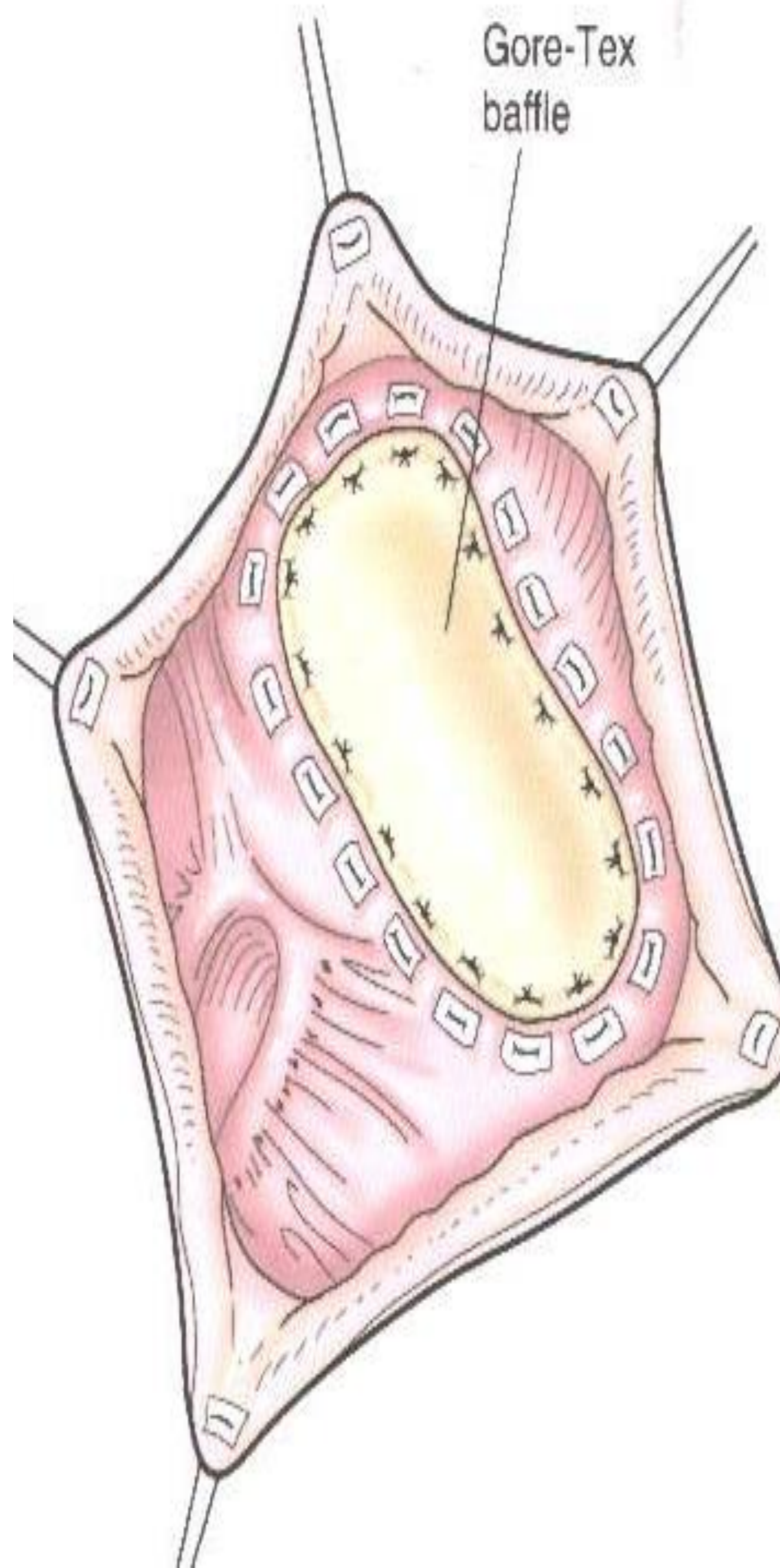
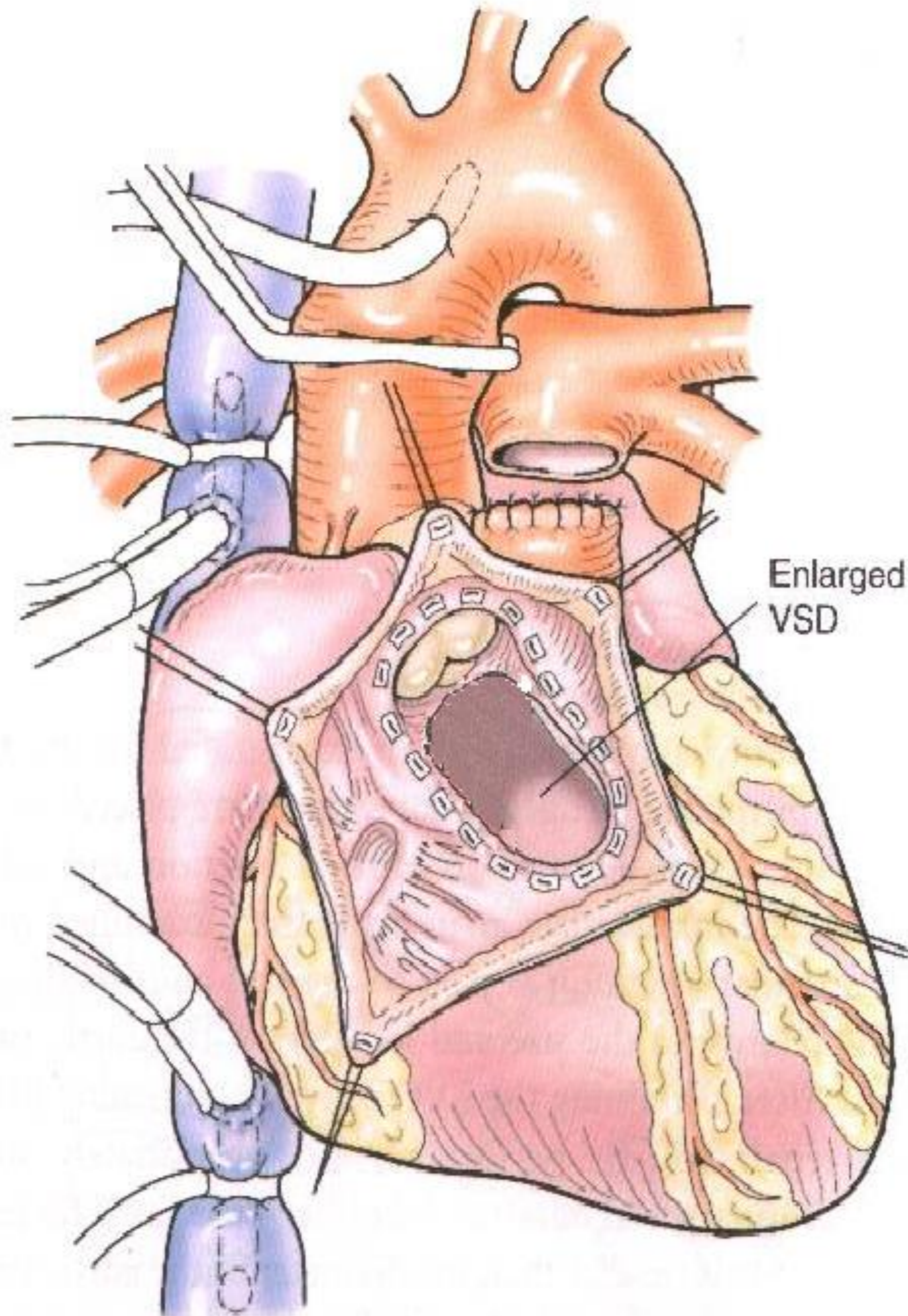
6b

Extracardiac patch

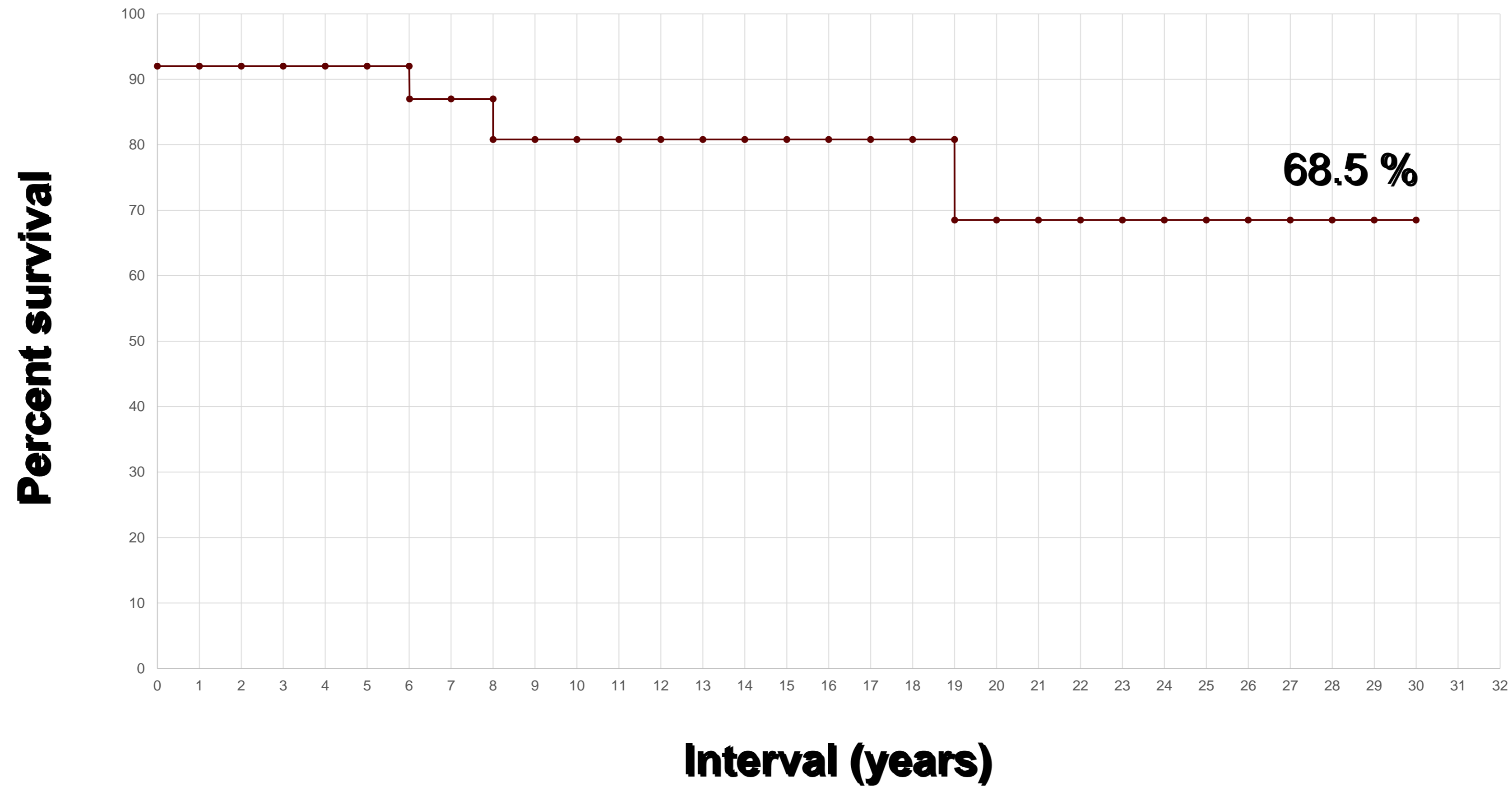
Rastelli with APVC

June 1983 – Nov 2018

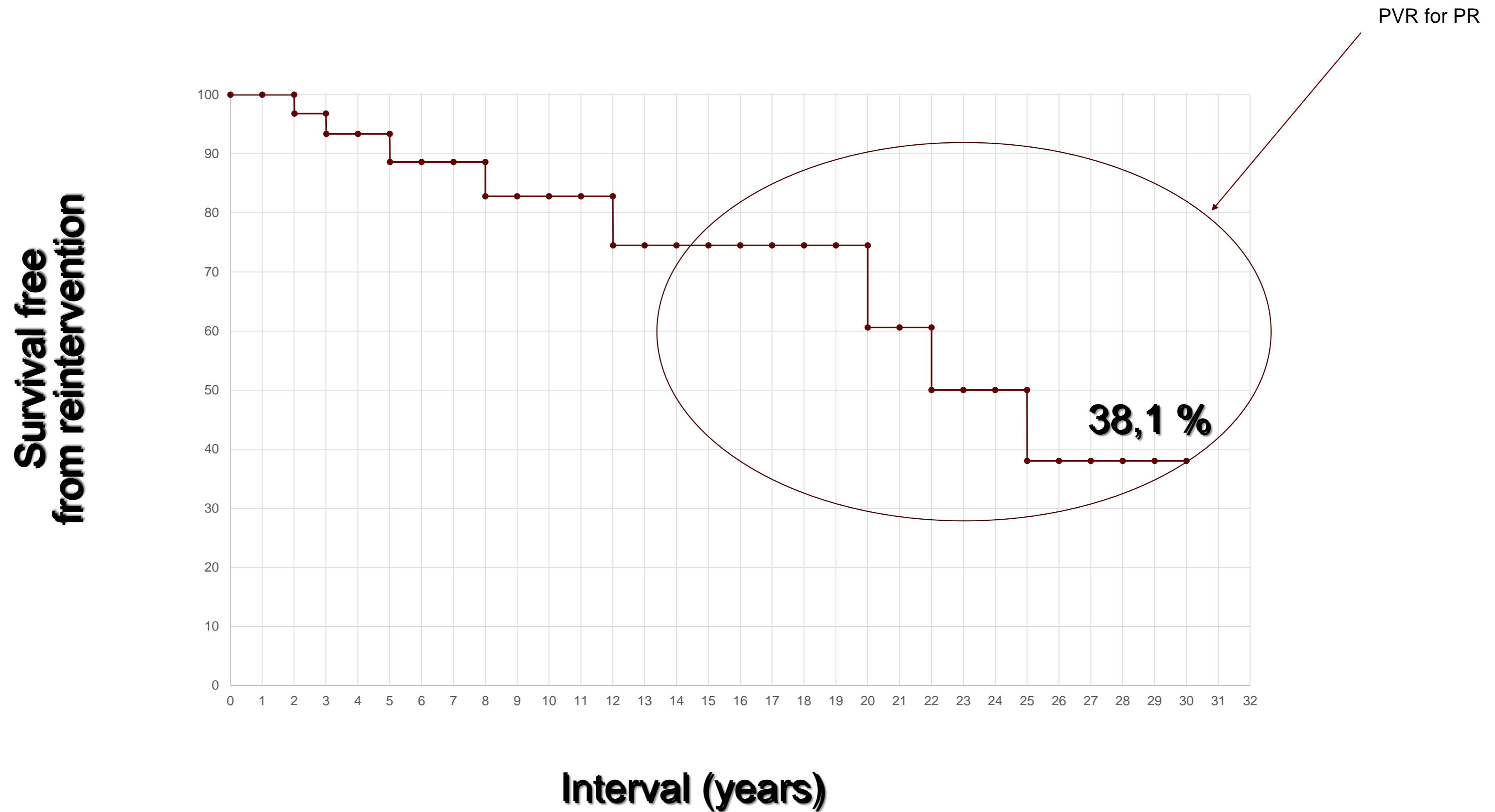
- Enlargement of VSD.
- Baffling with PTFE or pericardium.
- Pericardial valved conduit for RV PA connection.
- Mortality $4 / 54 = 7,4 \%$
- None in the last 18 years.
- Late mortality: 4/45.



Rastelli with APVC



Freedom from Reintervention



Summary

- Best option Rastelli:
 - PA or PS with severe PV ann hypoplasia. $Z < 5$.
 - Straight LVOT after VSD baffling.
 - Related conoventricular VSD.
 - Mitral Valve abnormal attachments & Cleft in TGA.
 - NO TV Straddling
 - NO RV hypoplasia.

Summary II

- Best option ASO when mild hypo PV annulus present. ($Z > 2$)
 - Decent PV. Mild grade of dysplasia
- Best option Nikaidoh when
 - PV annulus between $Z = -2$ to -5 and or Dysplastic PV.
 - Delayed Repair. (3 m to 1 yr)
 - VSD is non committed (inlet type), Straddling TV and/or restrictive.
- Best option 1 and 1/2 or Fontan:
 - Hypo RV.
 - Unfavorable coronary anatomy.

Summary III

- There is no optimal procedure for all TGA VSD and LVOTO.
- Many anatomical variants.
- Avoid forcing indications of a procedure when the anatomic setting is not appropriate.
- Apply the best procedure to a specific anatomy.
- Excellent results can be achieved. [Eur J Cardiothorac Surg. 2016 Oct;50\(4\):617-625 Hraska V](#)

STS/EACTS Latin America Cardiovascular Surgery Conference

November 15-17, 2018

Hilton Cartagena | Cartagena, Colombia



The Society
of Thoracic
Surgeons



EACTS
European Association for Cardio-Thoracic Surgery

THANK YOU

