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The Nikaidoh Procedure in DORV

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Disclosures

- None

Introduction

- The Nikaidoh procedure is a wonderful example of the spirit and history of congenital heart surgery.
  - Early complete correction of physiology and anatomy
  - Growable solutions
  - Supportive environment for innovation
- The Nikaidoh procedure has become an important option for complex DORV

History

> Ann Thorac Surg. 1980 Jan;29(1):86-8. doi: 10.1016/s0003-4975(10)61636-0.

Anatomical correction of transposition of the great arteries

J P Bex, Y Lecompte, F Baillot, E Hazan

Comment

Until now this procedure has been performed only on anatomical specimens of TGA. It constitutes a real anatomical repair of TGA since

The three distinct advantages of this procedure allowing its application in the newborn are as follows: its technical simplicity; the avoidance of any tubes of a foreign material, which permits a normal growth; and, above all, the absence of an anastomosis involving the coronary arteries.

Addendum

Since the submission of this paper, we used this technique on a 3-month-old girl with TGA and subpulmonary stenosis. Right ventricular pressure was

J Thorac Cardiovasc Surg 88:365-372, 1984

Aortic translocation and biventricular outflow tract reconstruction

A new surgical repair for transposition of the great arteries associated with ventricular septal defect and pulmonary stenosis

Transposition of the great arteries associated with ventricular septal defect and left ventricular outflow tract obstruction remains a serious surgical challenge. A new surgical technique that utilized aortic root mobilization and transfer combined with reconstruction of the right and left ventricular outflow tracts was applied successfully in two children. This technique provides an additional type of arterial switch operation for complex transposition and is an alternative to (1) the conventional combination of Mustard (Senning) procedure with closure of the ventricular septal defect and relief of left ventricular outflow tract obstruction and (2) the Rastelli operation.

Hisashi Nikaidoh, M.D., *Dallas, Texas*

ORIGINAL ARTICLE | CARDIOVASCULAR · Volume 79, Issue 6, P2089-2093, June 2005

Aortic Translocation in the Management of Transposition of the Great Arteries With Ventricular Septal Defect and Pulmonary Stenosis: Results and Follow-Up

Victor O. Morell, MD [a] · Jeffrey P. Jacobs, MD [b] · James A. Quintessenza, MD [b]

Utilization and Outcomes of the Nikaidoh, Rastelli, and REV Procedures: An Analysis of The Society of Thoracic Surgeons Congenital Heart Surgery Database

METHODS This retrospective study using The Society of Thoracic Surgeons Congenital Heart Surgery Database evaluates surgical procedure utilization and outcomes of patients undergoing repair of TGA-VSD-LVOTO and DORV-TGA with a Nikaidoh, Rastelli, or REV procedure.

RESULTS A total of 293 patients underwent repair at 82 centers (January 2010 to June 2019). Most patients underwent a Rastelli (n = 165, 56.3%) or a Nikaidoh (n = 119, 40.6%) operation; only 3.1% (n = 9) underwent a REV. High-volume

Drs. Seese, et al
Ann Thorac Surg 2022;114:800-8

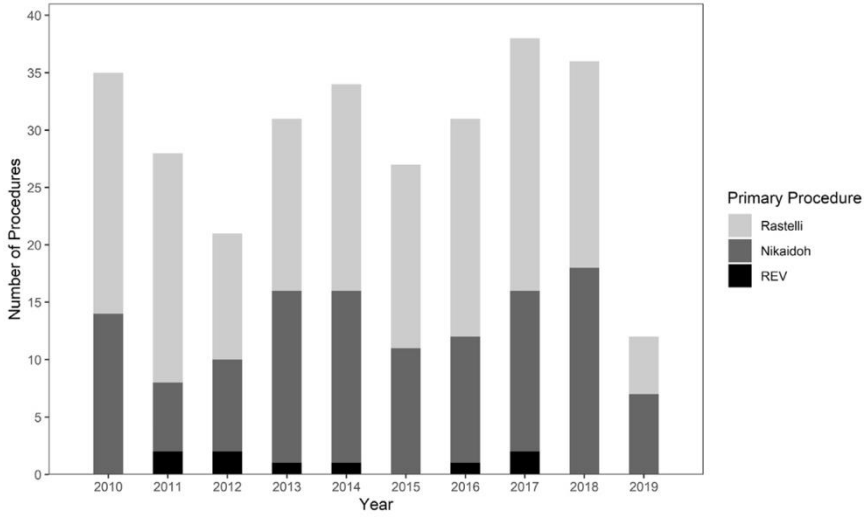


FIGURE 3 Bar graph demonstrating the volume of Nikaidoh, Rastelli, and réparation à l'etage ventriculaire (REV) operations by year.

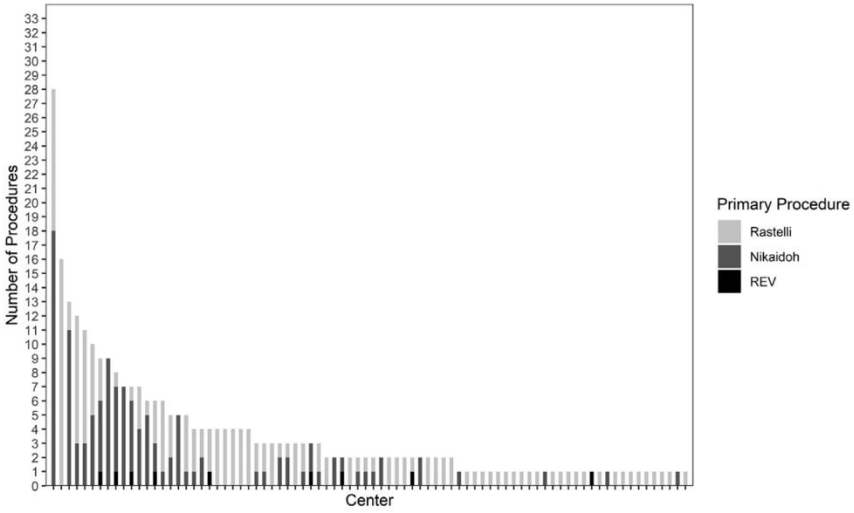


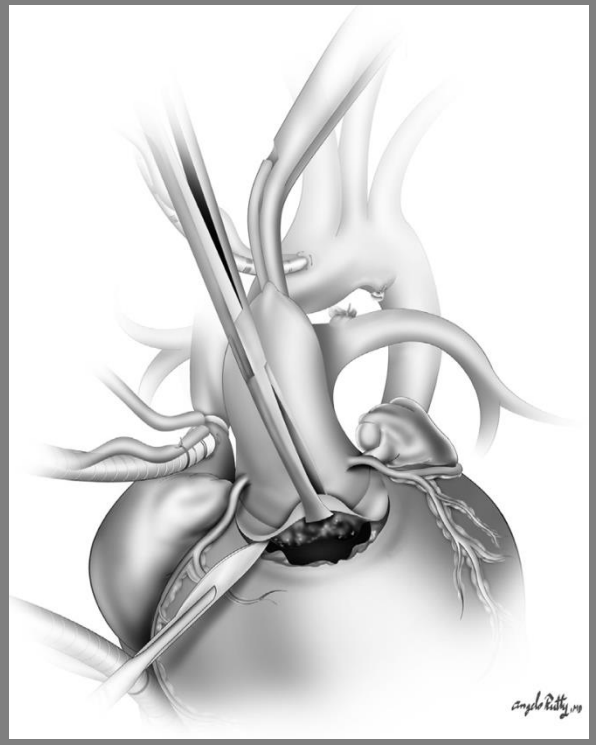
FIGURE 2 Bar graph demonstrating the utilization of Nikaidoh, Rastelli, and réparation à l'etage ventriculaire (REV) operations stratified by center.

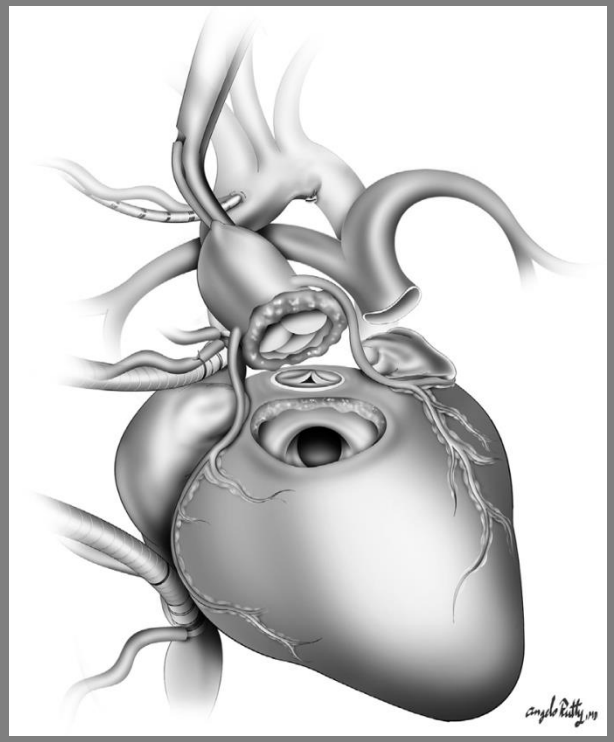
TABLE 4 Early Postoperative Outcomes

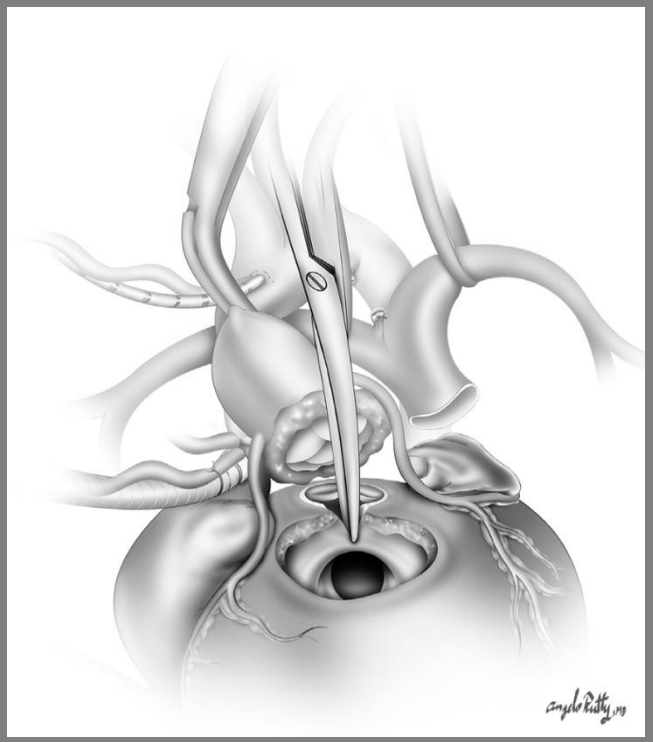
Variable	Overall (n = 293)	Rastelli (n = 165)	Aortic Root Translocation Over Left Ventricle (n = 119)	REV (n = 9)
Operative mortality	3.83 (11) [1.93-6.75]	3.07 (5) [1.00-7.01]	4.35 (5) [1.43-9.85]	11.11 (1) [0.28-48.25]
Composite mortality and/or major morbidity	21.23 (62) [16.68-26.38]	18.90 (31) [13.22-25.74]	24.37 (29) [16.97-33.09]	22.22 (2) [2.81-60.01]
Major morbidity	21.40 (61) [16.79-26.63]	18.75 (30) [13.02-25.67]	25.00 (29) [17.43-33.89]	22.22 (2) [2.81-60.01]
Acute renal failure requiring dialysis	1.75 (5) [0.57-4.05]	1.88 (3) [0.39-5.38]	1.72 (2) [0.21-6.09]	0.00 (0)
Neurological deficit	1.75 (5) [0.57-4.05]	1.88 (3) [0.39-5.38]	1.72 (2) [0.21-6.09]	0.00 (0)
Arrythmia requiring permanent pacemaker	6.23 (18) [3.79-9.80]	5.00 (8) [2.18-9.61]	8.62 (10) [4.21-15.28]	0.00 (0)

CONCLUSIONS Rastelli and Nikaidoh procedures are the prevalent repair strategies for patients with DORV-TGA and TGA-VSD-LVOTO. Most are performed at high-volume institutions, and early outcomes are similar.

Nikaidoh Procedure







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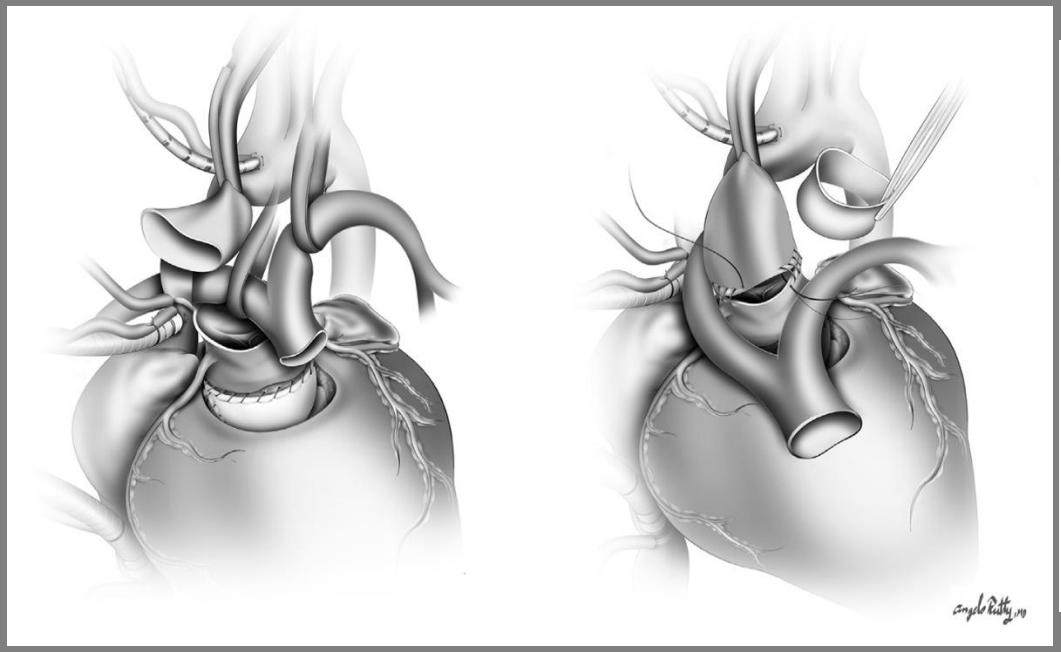
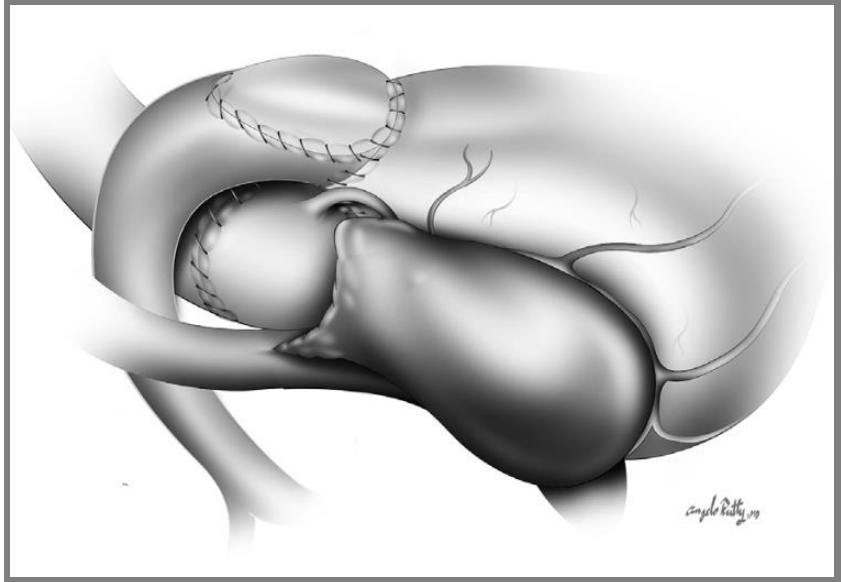
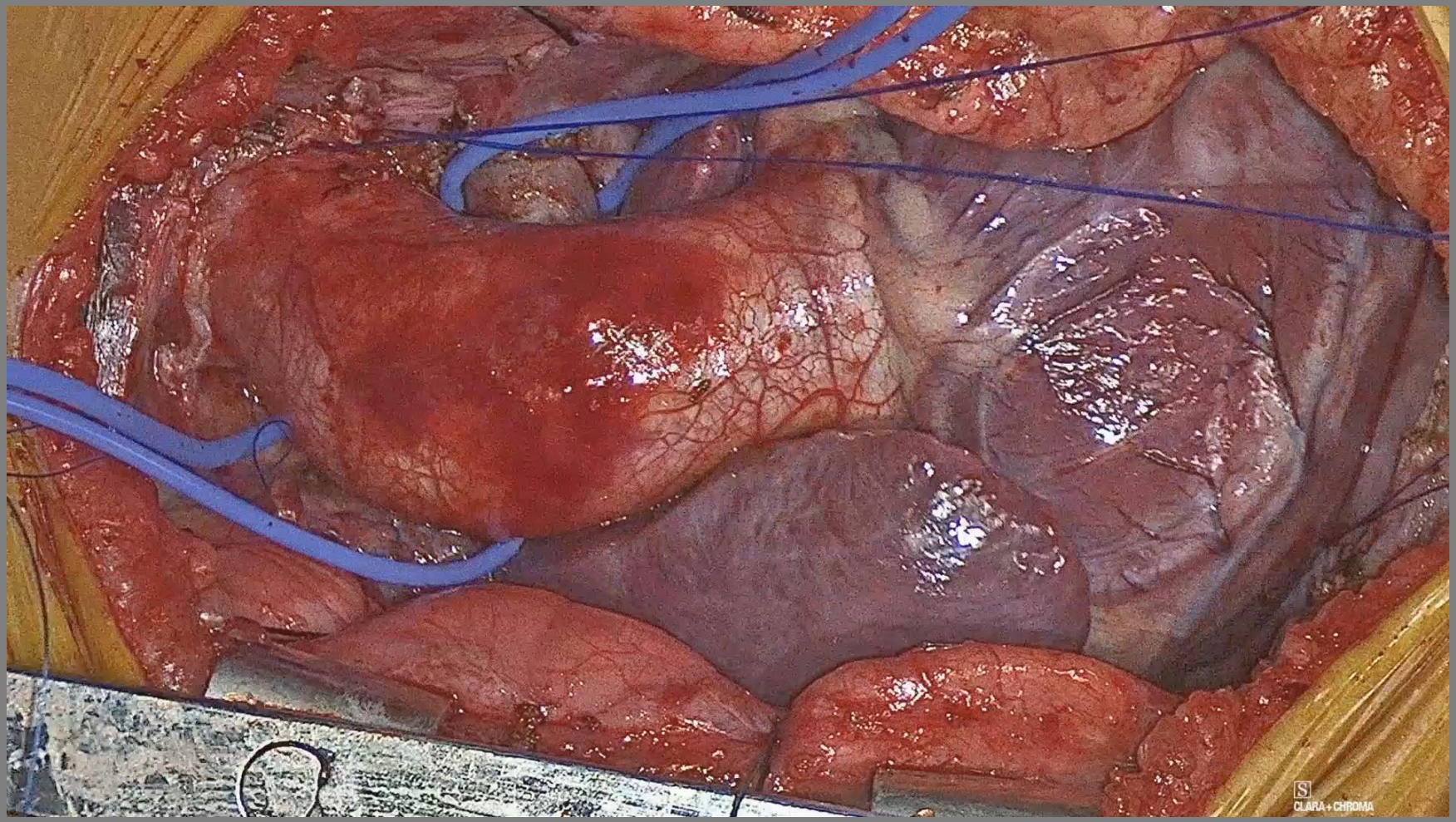
Ann Thorac Surg 2017;104:1446–9

Nikaidoh Procedure

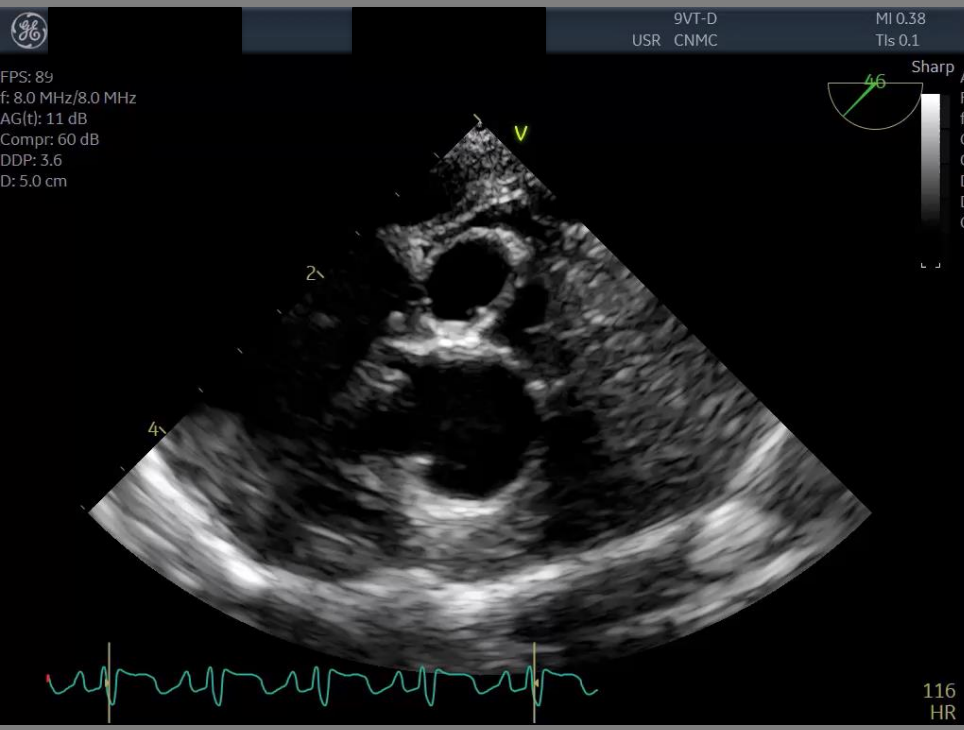




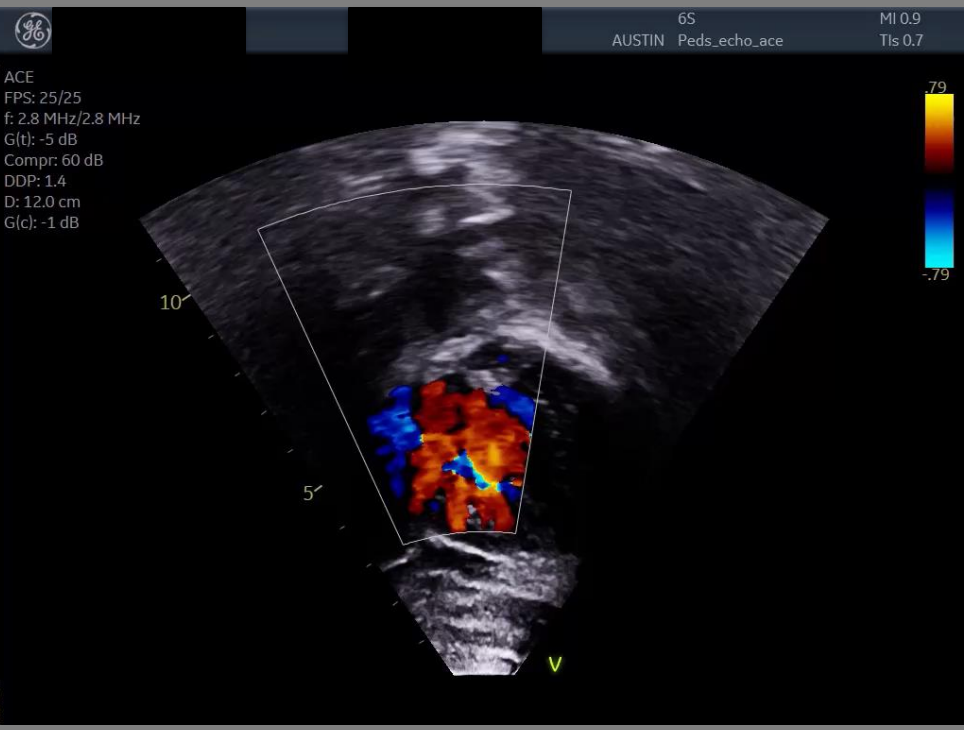
Nikaidoh Procedure



Nikaidoh Procedure



Pre-op



Post-op

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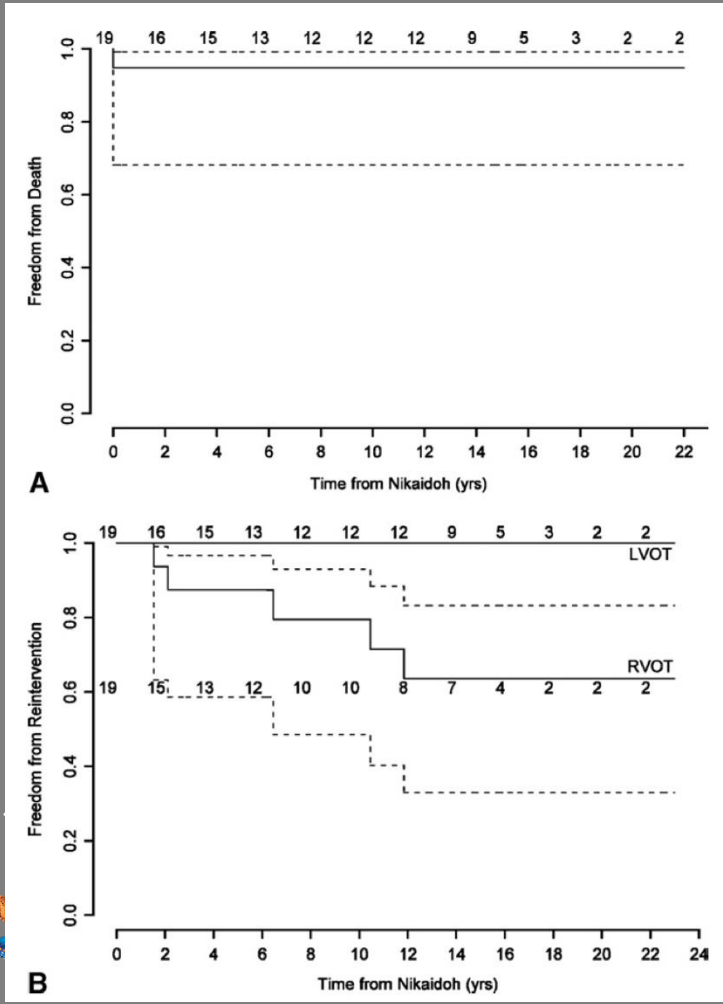
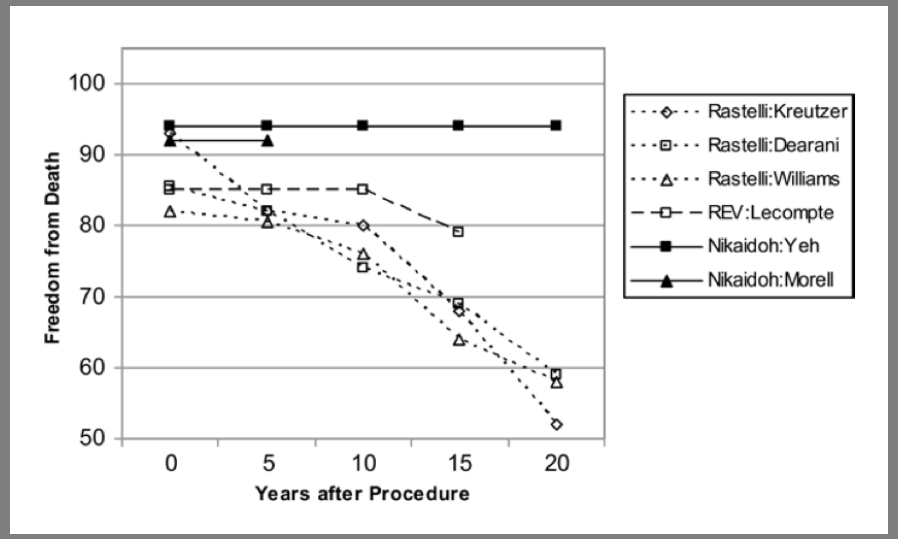
Outcomes

The aortic translocation (Nikaidoh) procedure: Midterm results superior to the Rastelli procedure

Thomas Yeh Jr, MD, PhD, Claudio Ramaciotti, MD, Steven R. Leonard, MD, Lonnie Roy, PhD, and Hisashi Nikaidoh, MD





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Extended Indications

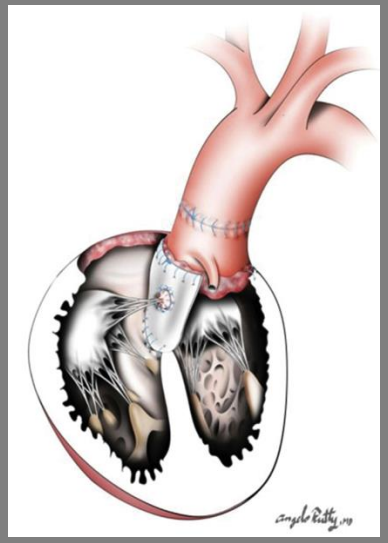
- Tradition indications for the Nikaidoh procedure include TGA/VSD/LVOTO or DORV/LVOTO with a conoventricular VSD and typical coronary artery anatomy
- However, with experience traditional contra-indications such as atypical coronary artery patterns, remote VSD, AVSD, straddling valves can be addressed with the Nikaidoh

Extended Indications

Aortic root translocation (Nikaidoh) procedure for complex transposition of the great arteries with left ventricular outflow tract obstruction

Emile A. Bacha, MD, Stephanie N. Nguyen, MD, Rachel Vanderlaan, MD, PhD, Andrew B. Goldstone, MD, PhD, and David M. Kalfa, MD, PhD

- 12 pts with TGA/DORV/LVOTO
  - 3 ccTGA
  - 1 situs inversus
  - 5 abnormal coronary pattern
  - 4 straddling AV valve
  - 1 AVSD



Extended Indications

- No early mortality, no PPM, LOS 9.5 days
- 2 late infection deaths in heterotaxy pts

CENTRAL MESSAGE

Even with the variable and challenging anatomy often seen in complex forms of TGA/VSD/LVOTO, the Nikaidoh operation may be performed with excellent results in this subset of patients.

Other Strategies with the Nikaidoh

- Lack of resources for neonatal repair
  - Developing countries with no, or poor neonatal cardiac surgery options
  - DORV/TGA/PS with adequate mixing and balanced circulation (survivor)
    - When cyanotic proceed to Glenn
    - When next cyanotic proceed to OR for repair – 1V (Fontan), 2V (Nikaidoh, Rastelli, REV, Switch)
- At birth clear goal for 1 ½ repair
  - Borderline RV, borderline TV, etc but otherwise good anatomy for LV to AO via Nikaidoh
  - Initial palliation to augment pulmonary flow (if necessary), Glenn, then later definitive repair
- Uncertainty
  - With experience and comfort with the Nikaidoh procedure the ultimate decision can be made inter-operatively between Nikaidoh, REV, Rastelli, Switch, or TOF type repair based on "explorative" findings that will not compromise any repair

Conclusions

- DORV presents a challenging spectrum of anatomic and physiologic issues for both management and repair
- There are variable interactions between the anatomic/spatial relationships of the VSD, the Great Arteries, the Outflow Tracts, the Coronary Arteries, and the Atrio-Ventricular Valves
- As such, no one surgical solution will fit all
- The Nikaidoh Procedure is an important option to have available
- However, the Nakaidoh Procedure presents another level of complexity requiring an elevated level of technical skill and experience potentially limiting its widespread usage