

Transplantation for Failed Fontan

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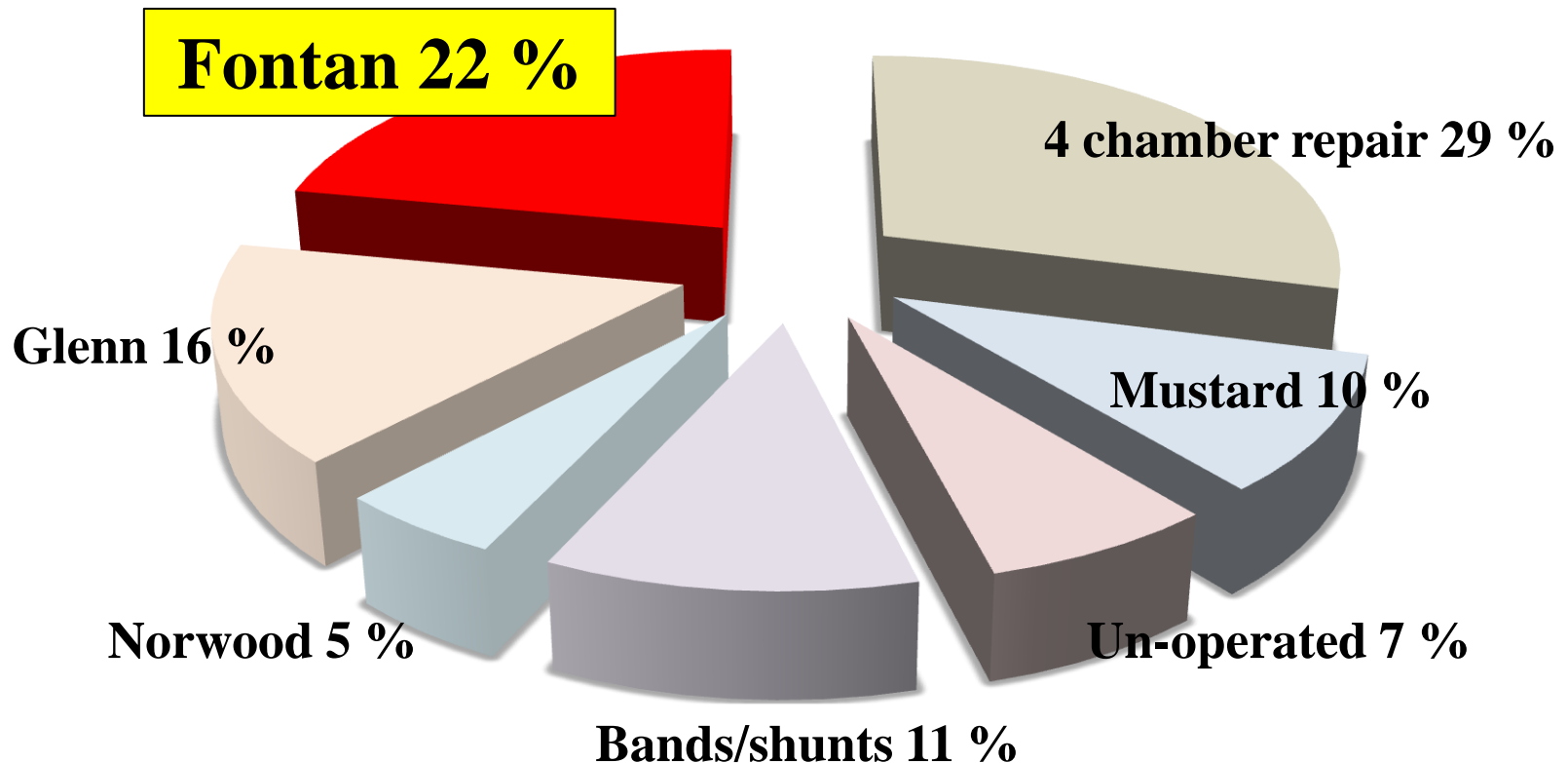
Seoul St. Mary's Hospital

The Catholic University of Korea, Catholic Medical Center

Last Major Surgical Operation before Heart Transplantation

J Am Coll Cardiol 2009; 54:160-5

- 488 patients transplanted for CHD (CTRD & PHTS)



Fontan Failure

- **Bi-modal**

- **Early**

- Unsuspected risk factors

- Intraoperative myocardial injury

- Late

Systemic-Ventricular Dysfunction

Elevated PVR

Lack of **pulsatility**

Pulmonary recurrent **microemboli**

Elevated pulmonary **lymphatic** pressure

Disordered **NO synthesis/endothelial** dysfunction

Valve Dysfunction and Subvalvar Stenosis

Lymphatic Derangement: PLE (3-15% incidence)

Plastic Bronchitis

50%
mortality

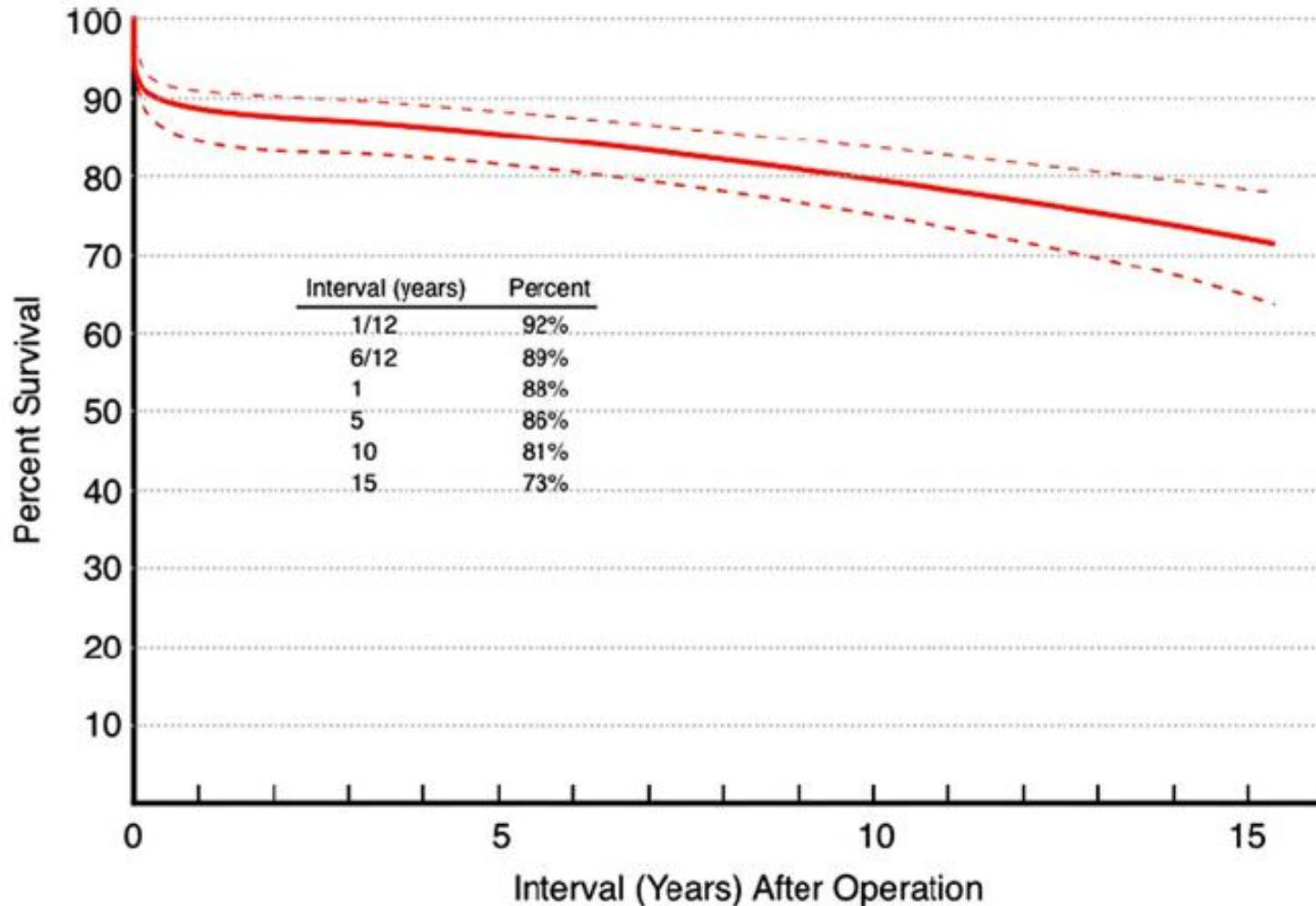
Pulmonary AV Malformation

Thrombotic Circuit Occlusion (20% incidence, 25% mortality)

Intractable Arrhythmias

Outcome following “*perfect*” Fontan

Circulation 1990; 81:1520-36



Indications for Heart Transplantation

- **Failing Fontan Physiology**
 - No obvious remediable lesions
 - Poor ventricular Function
- **Timing**
 - Early
 - Difficult due to disparate modes of failure
 - **Evidence of systemic mal-perfusion**
 - Lack of reliable mechanical assist methods

Transplant **Evaluation**

- **Analysis of anatomy**

- Cardiac Situs
- Great vessels
- Location of pulmonary and systemic venous returns

- **Fontan type**

- **Aortopulmonary collateral vessels**

- **Patent vessels** for both hemodynamic monitoring and peripheral cannulation site.

■ **Pulmonary Vascular Resistance in Failed Fontan**

: Difficult to assess and often “unreliable”

- Systemic - to - pulmonary collateral arteries
- Low cardiac output
- Non pulsatile flow
- Insidious Pulmonary Emboli
- (Presence of pulmonary AV malformation)

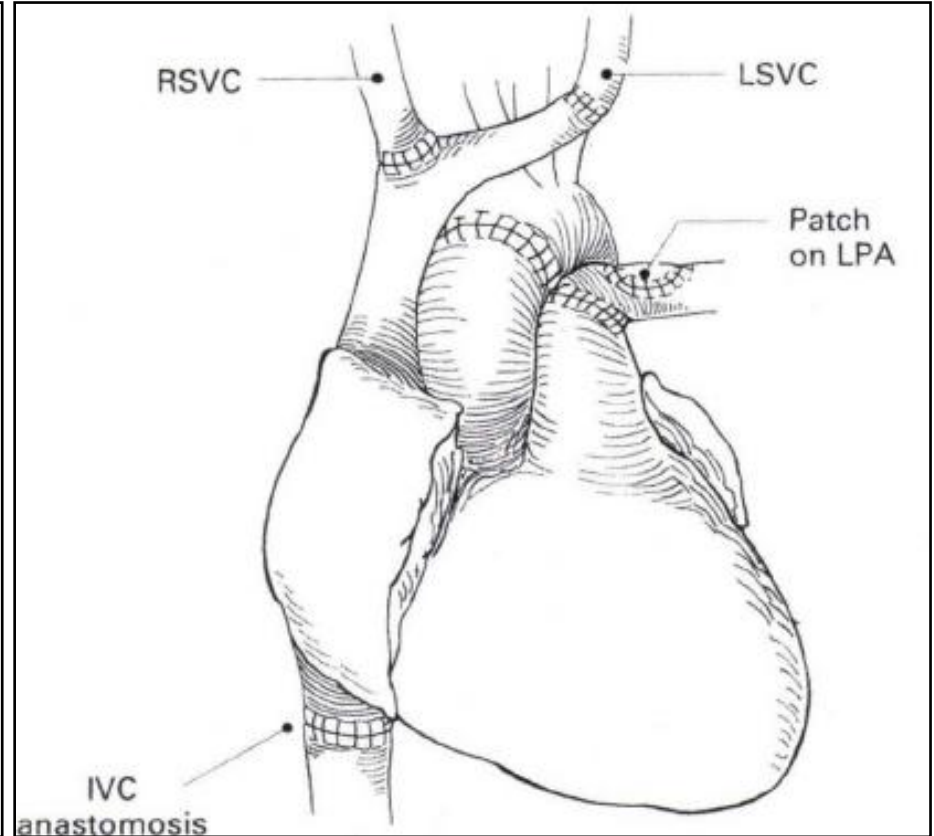
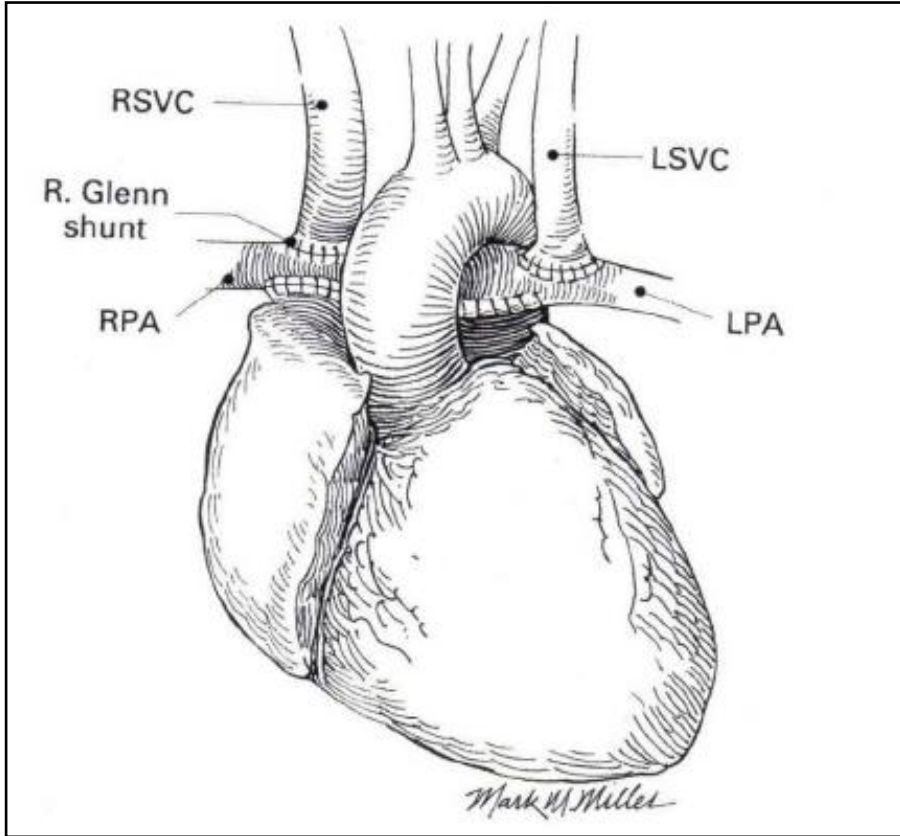
Donor Procedure

- Knowledge of **recipient anatomy** is critical
- Vast majority of recipients require **vascular reconstruction** (PA, systemic or pulmonary veins)
- **Retrieval of:**
 - Aortic arch and head vessels
 - Branch pulmonary arteries to the hilum
 - SVC & innominate vein (for bilateral SVC)
 - IVC

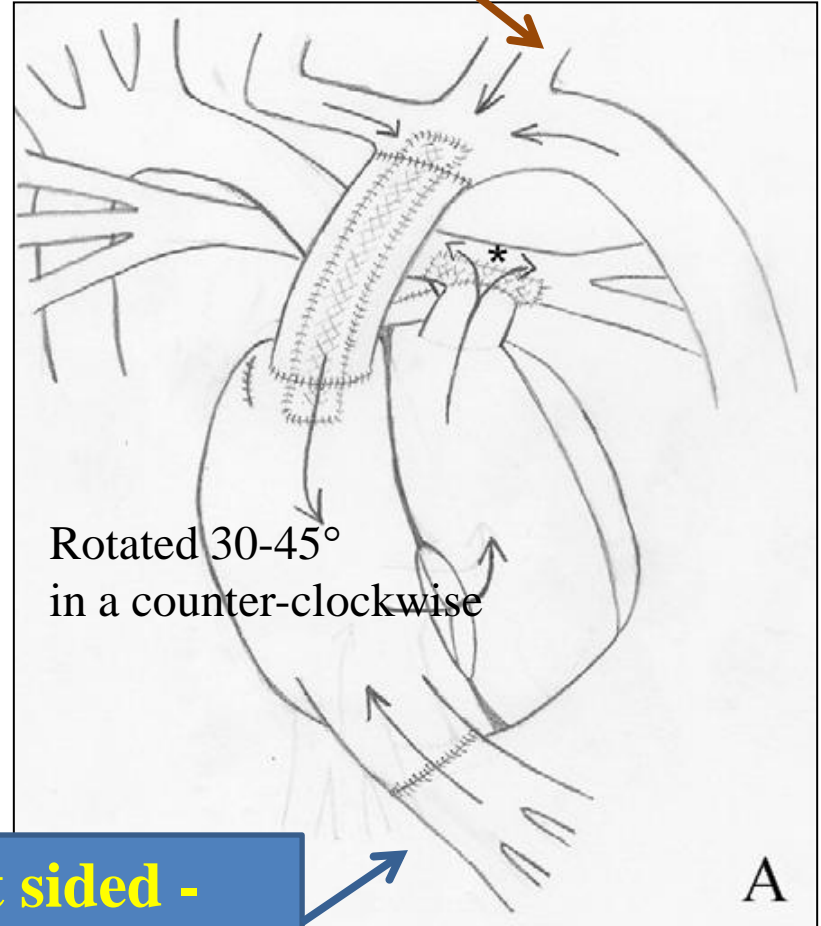
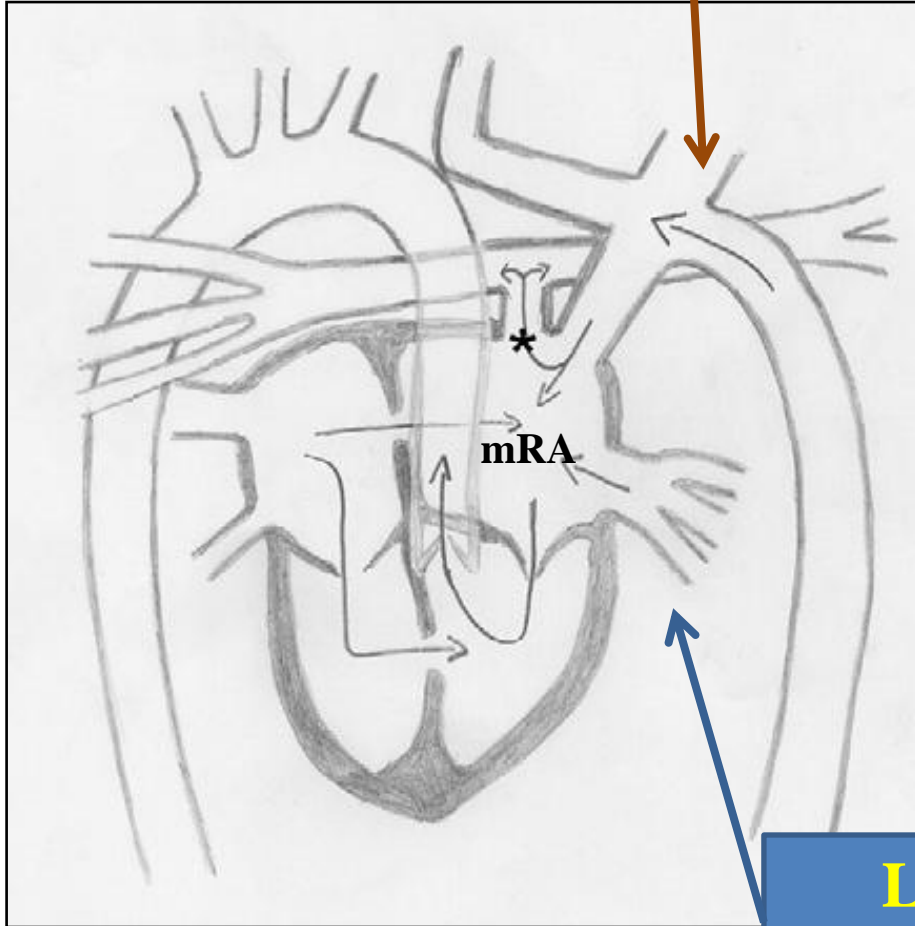
Recipient Procedures

- **Safe re-sternotomy**
 - Multiple reoperation
 - Anterior aorta
- **Peripheral CPB** may be necessary (> 40% of patients)
- **Bi-caval venous anastomosis** (less TR)

Bilateral SVC

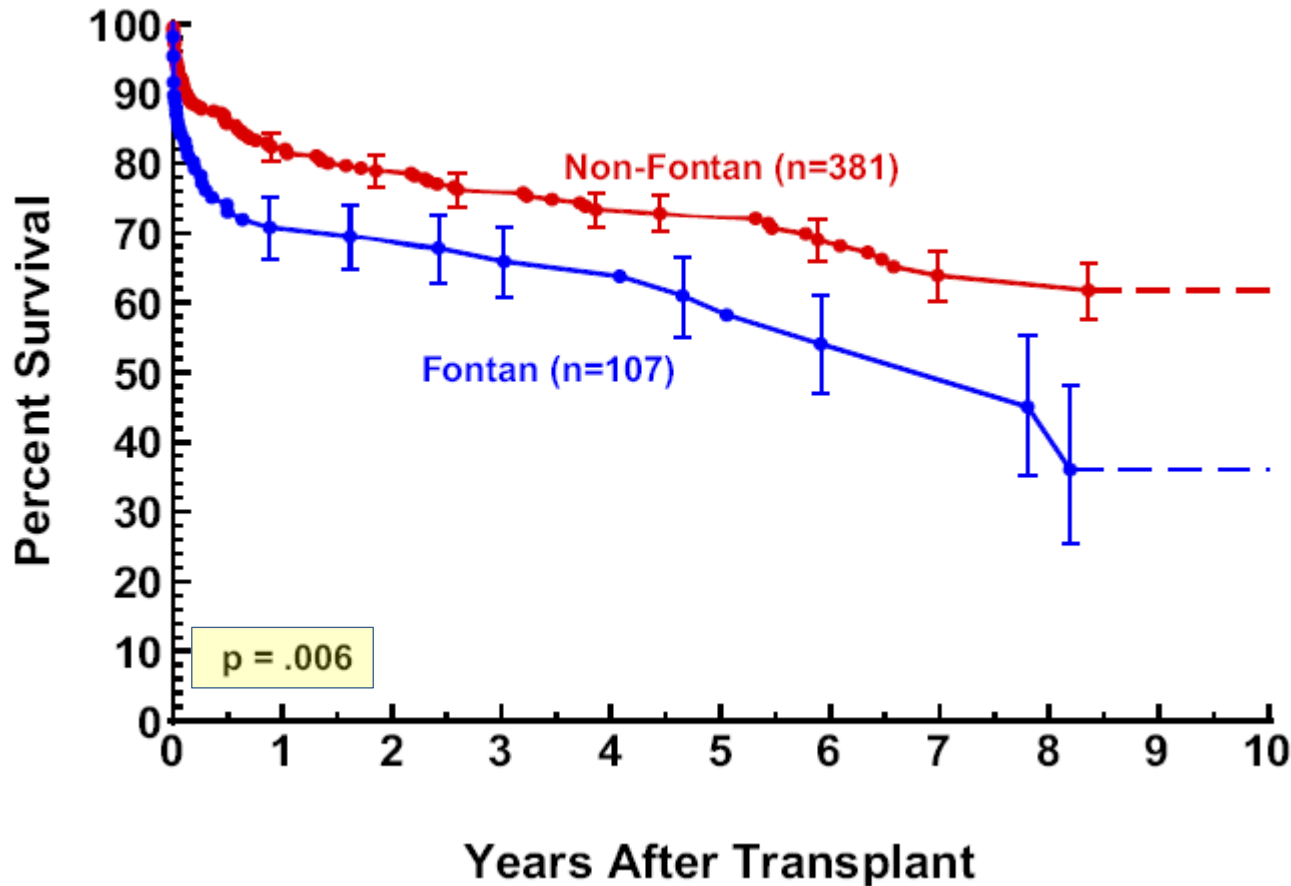


**IVC interruption with
azygous drainage**

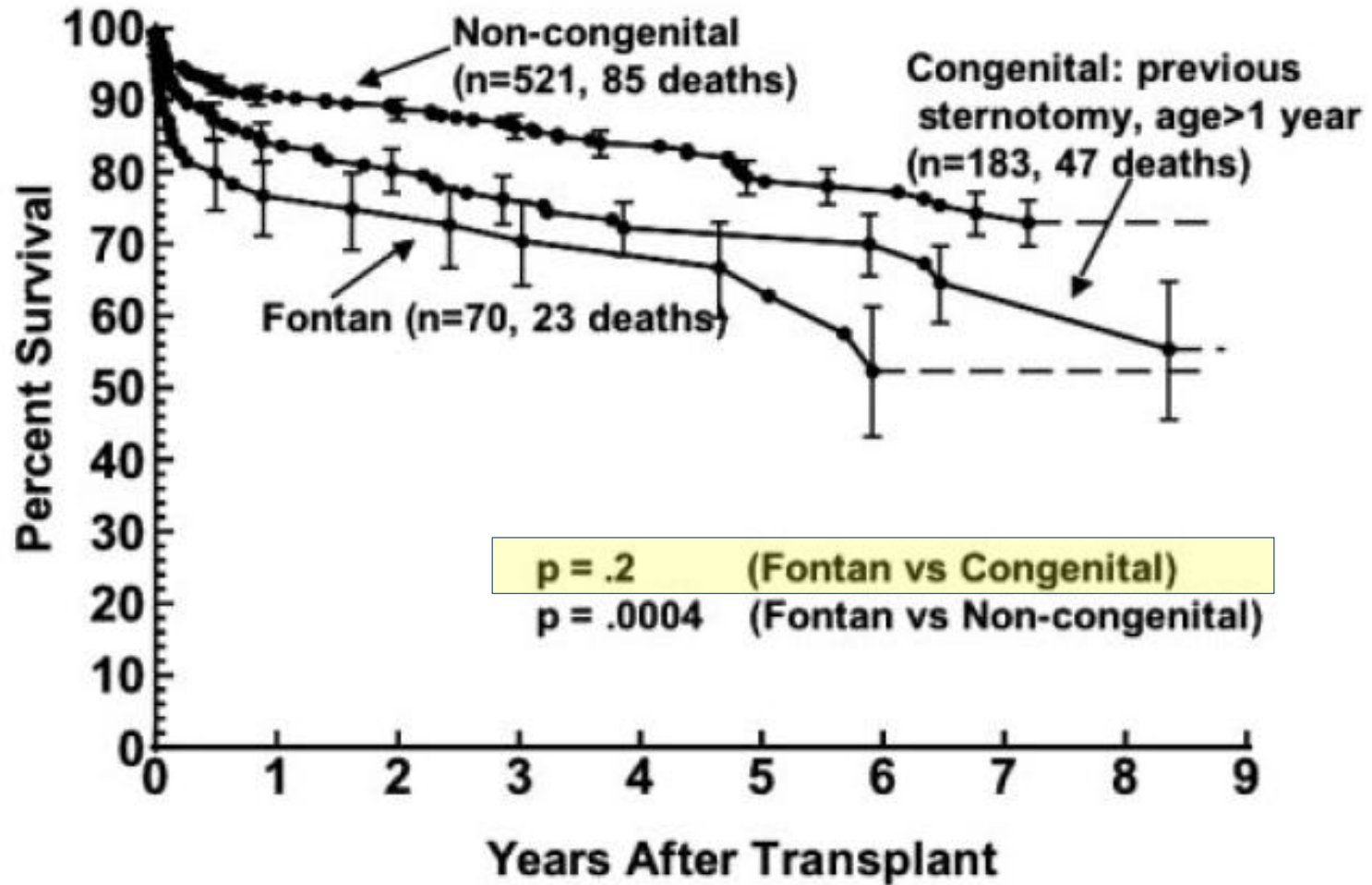


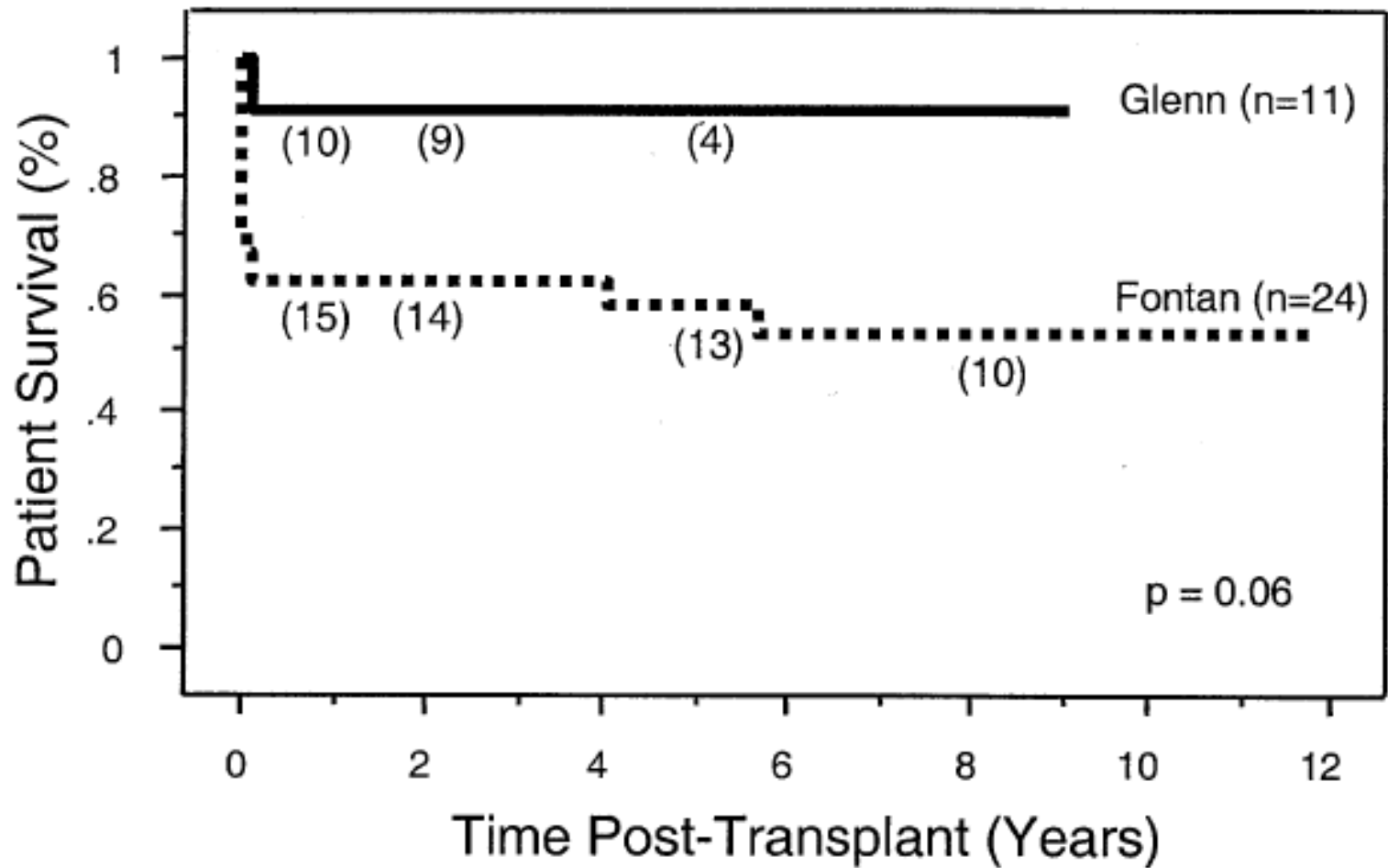
**Left sided -
Hepatic drainage**

Post - Transplant Survival



J Am Coll Cardiol 2009; 54:160-5 (data from CTRD & PHTS)



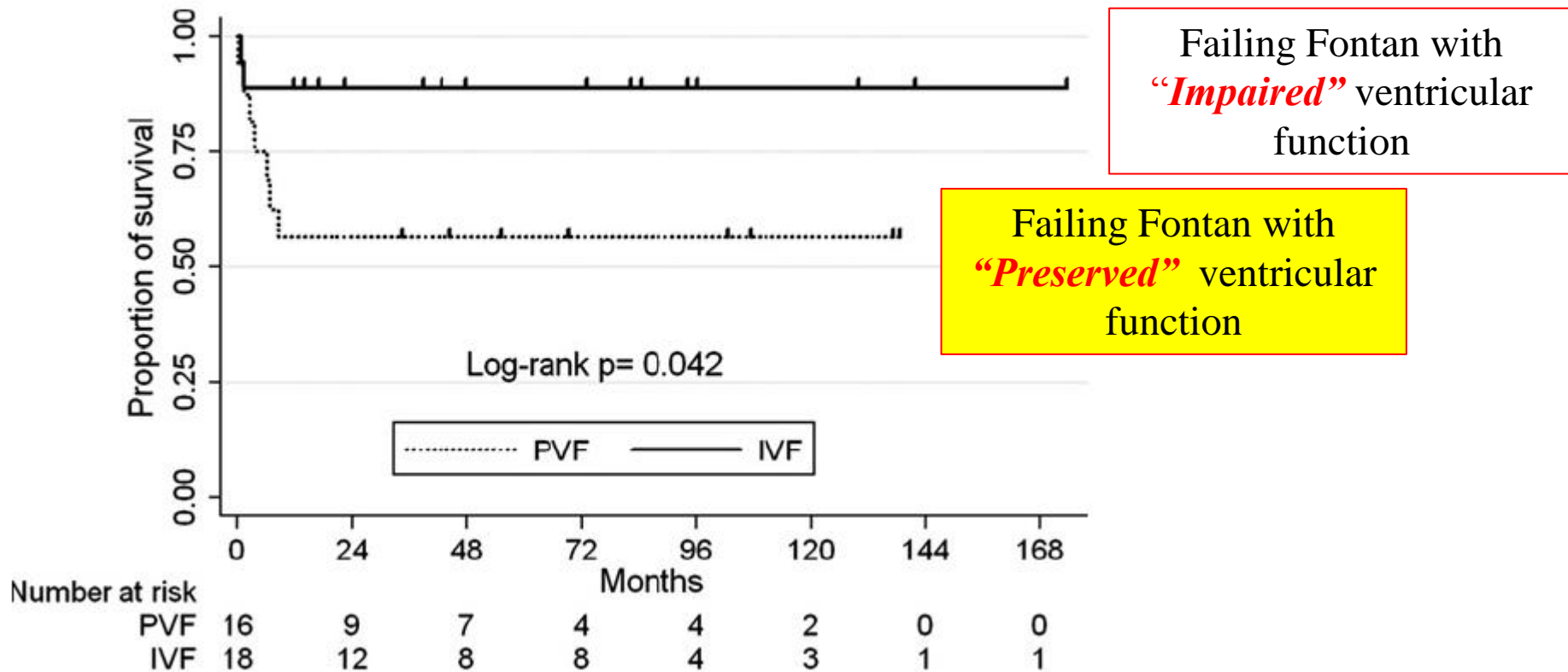


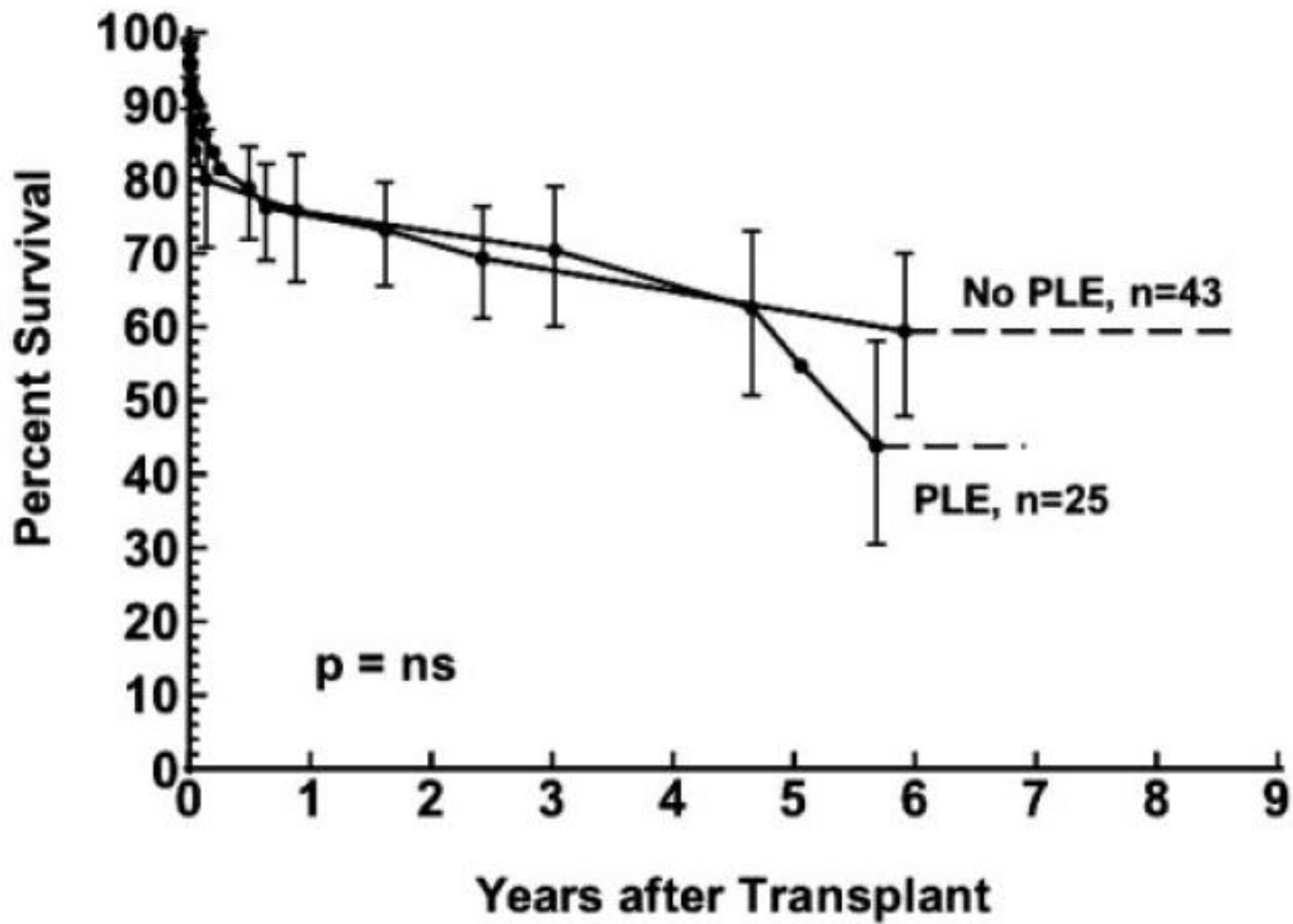
Causes of death after Transplantation

	Fontan Patients (n=23)	CHD (n= 47)	Non - CHD (n=85)
*Infection	7 (30)	10 (21)	11 (13)
*Early graft failure	4 (17)	5 (11)	7 (8)
Rejection	3 (13)	6 (13)	15 (18)
Sudden death	3 (13)	10 (21)	13 (15)
Graft CAD	2 (9)	0	10 (12)
*Hemorrhage/tech. /Op.	2 (9)	1 (2)	1 (1)

Circulation 2006; 114:273-280 (data from PHTS)

Risk factors of Death





Circulation 2006; 114:273-280 (data from PHTS)

Summary

- **Outcomes are acceptable.**
- **Transplantation for “failed Fontan” is technically challenging.**
- **Knowledge of recipient’s cardiac morphology is very important.**
- **Measurement of pulmonary vascular resistance is unreliable.**
- **Clear understanding of its risks and pitfalls is necessary to maximize survival and quality of life among Fontan patients.**