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SMC 삼성서울병원

The effects of fenestration on long-term outcomes of extracardiac fontan operation

Ilkun Park, MD, Ji-Hyuk Yang, MD, PhD, Tae-Gook Jun, MD, PhD

Samsung Medical Center, Sungkyunkwan University School of Medicine, Seoul, Korea

Disclosures

- None

Background

- **Creation of fenestration**
  - **Pros)** Cardiac output▲, congestion▼
  - **Cons)** Oxygen saturation▼, exercise capacity▼

- **Maintaining of fenestration : Debate !**
  - **Pros)** delay late hepatic & lymphatic dysfunction (possible)
  - **Cons)** Oxygen saturation▼, paradoxical embolism▲, exercise capacity▼

Objectives

- **Limitation of current studies related to fenestration**
  - Rare studies concerning long-term outcomes of fenestration
  - Rare studies analyzing the duration of fenestration maintenance
  - Rare studies within the homogenous cohort with same surgical principle

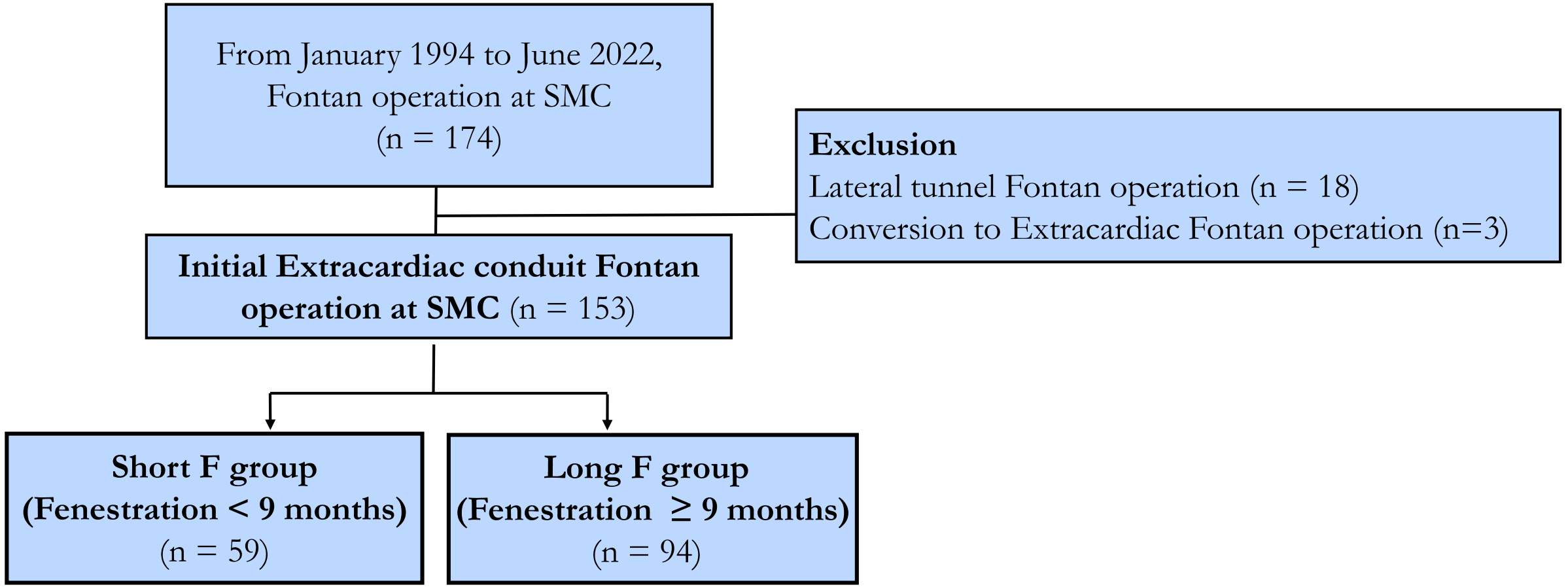
- **We aimed to analyze the impact of fenestration on the late outcomes of Fontan operation.**

Methods

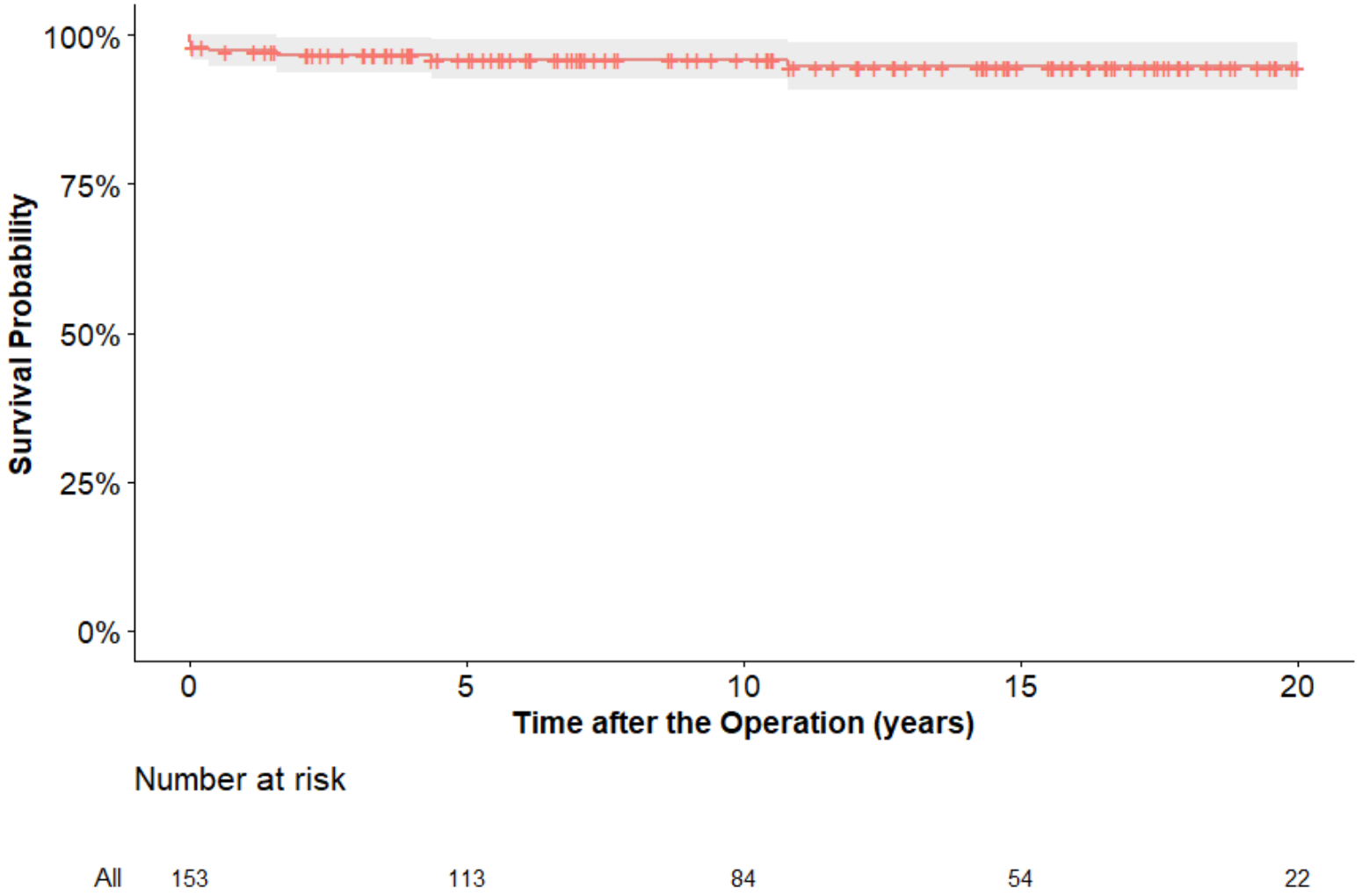
- **Patients**
  - Fontan operation at a single center (1994 to 2022)

- **Surgical principle**
  - Extracardiac conduit fontan operation
  - Routine fenestration
    - 1) Direct anastomosis between conduit and atrium
    - 2) PTFE graft (mainly 5mm)

Methods

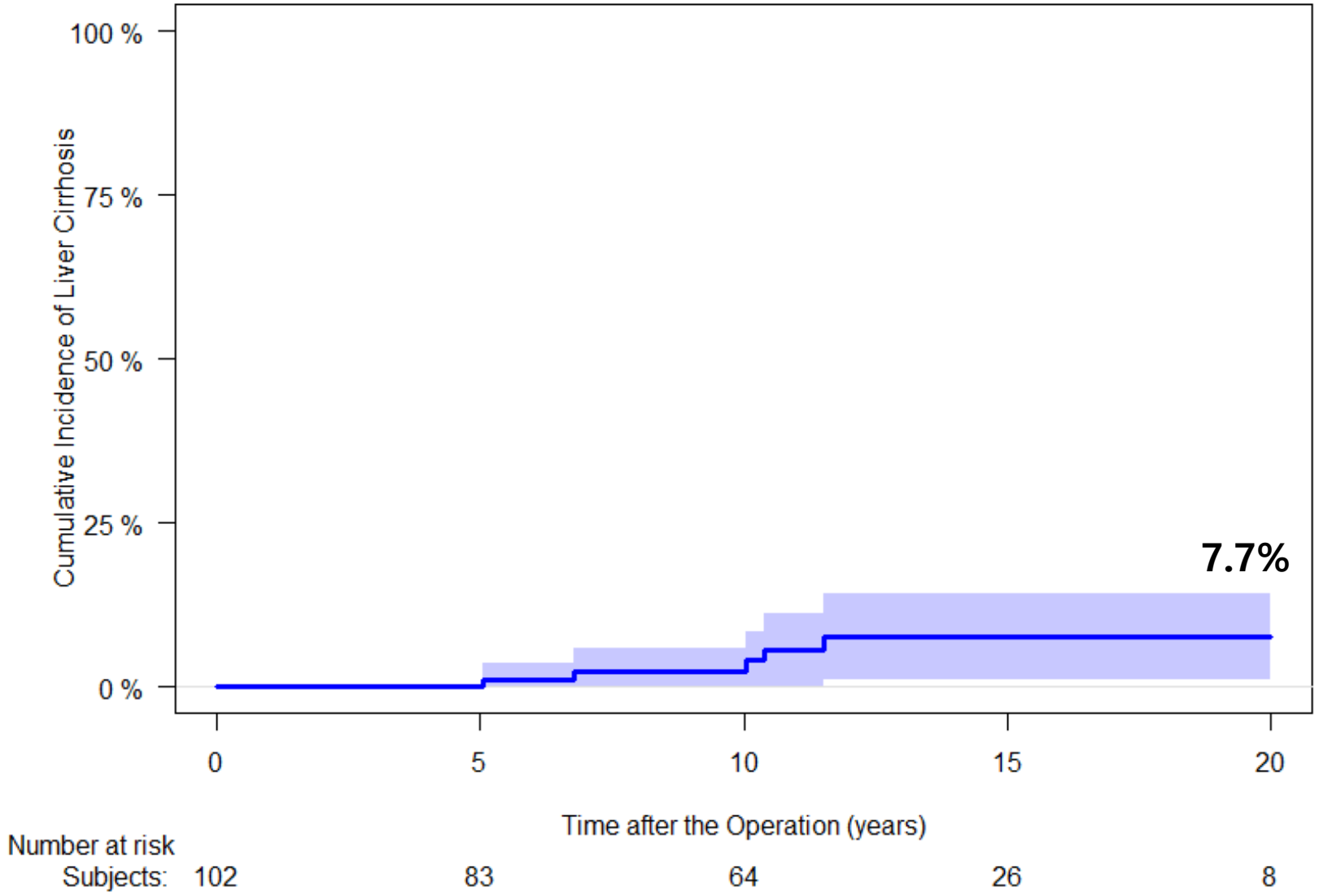

From January 1994 to June 2022,
Fontan operation at SMC
(n = 174)
Exclusion
Lateral tunnel Fontan operation (n = 18)
Conversion to Extracardiac Fontan operation (n=3)
Initial Extracardiac conduit Fontan operation at SMC (n = 153)
Short F group
(Fenestration < 9 months)
(n = 59)
Long F group
(Fenestration ≥ 9 months)
(n = 94)

Overall Survival

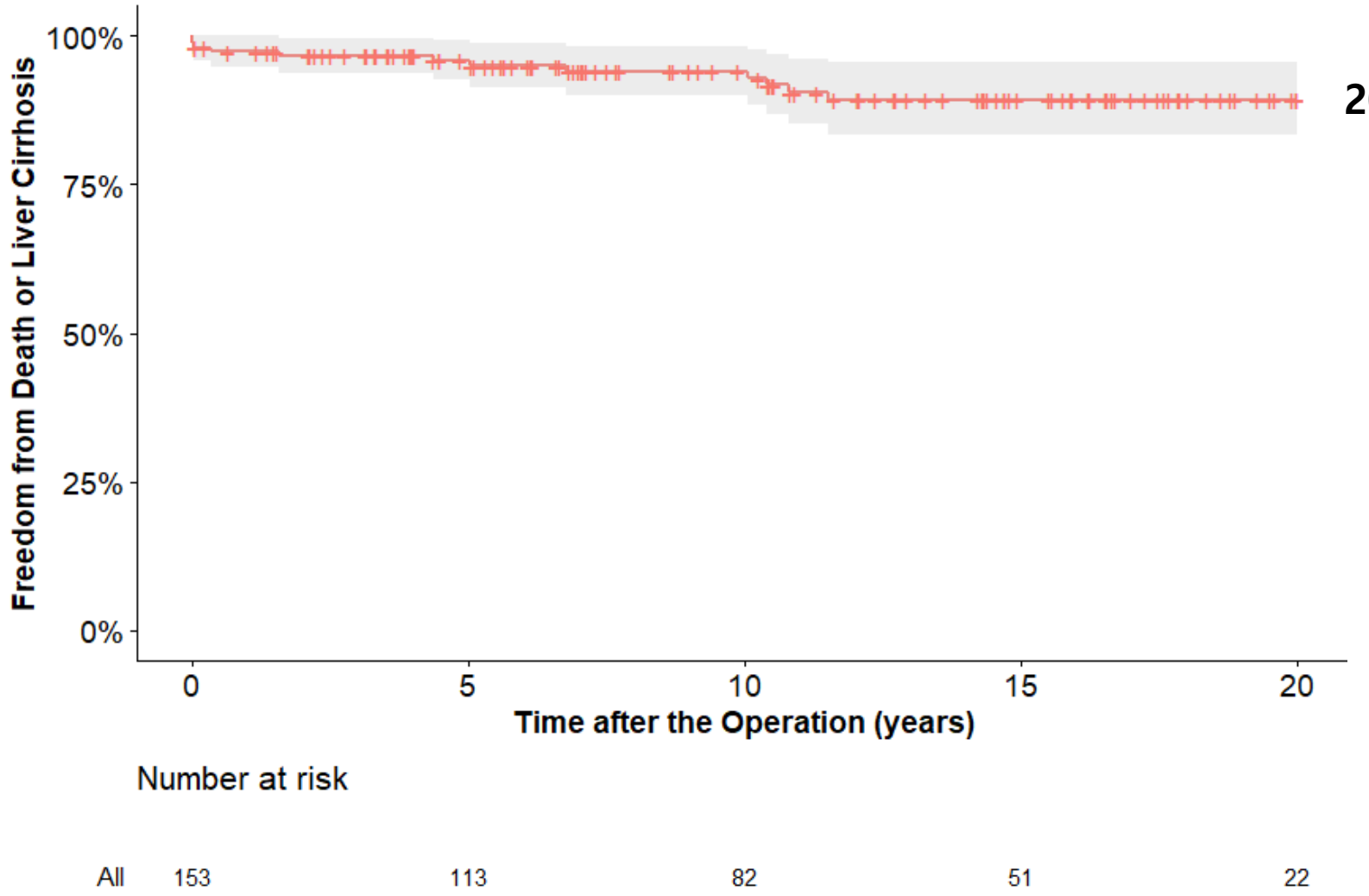


20YSR : 94.6%

Liver Cirrhosis



Primary endpoint : Death and Liver Cirrhosis



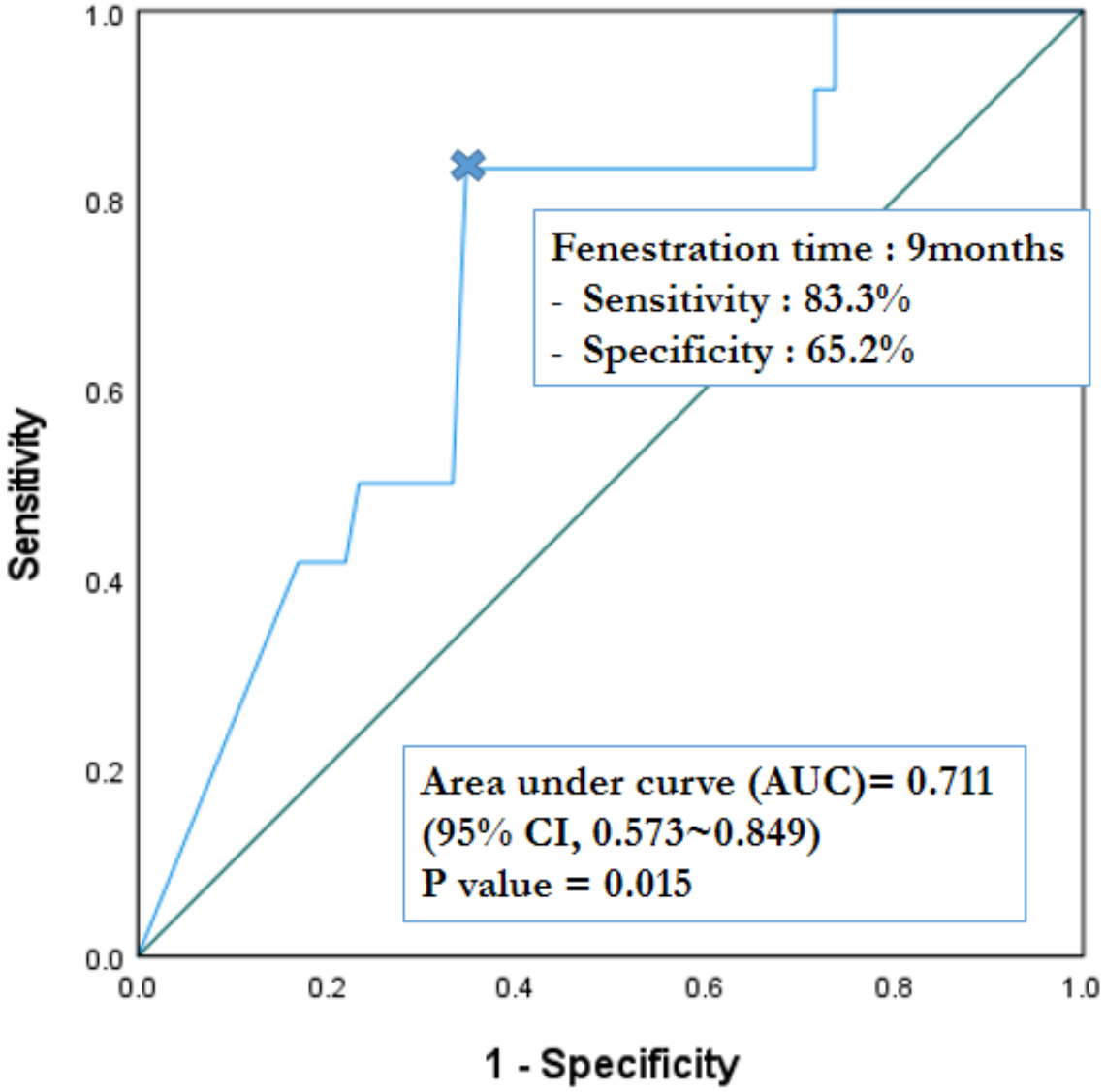
20YSR : 89.2%

Outcomes

- No Heart transplantation

- No Protein losing enteropathy
- One Plastic bronchitis (recovered)

ROC curve for the Primary Endpoint (Death+LC)



Baseline Characteristics according to Fenestration Duration

Variable	Short F group (n = 59)	Long F group (n = 94)	p-value
Age at fontan, years			0.168
< 2 years	1 (1.7%)	1 (1.1%)	
2-4 years	45 (76.3%)	84 (89.4%)	
4-16 years	10 (16.9%)	6 (6.4%)	
>16 years	3 (5.1%)	3 (3.2%)	
Male sex	33 (55.9%)	54 (57.5%)	>0.999
Preoperative anatomy			>0.999
Pulmonary atresia / intact septum	8 (14.6%)	15 (15.9%)	
Double inlet left ventricle	3 (5.1%)	6 (6.4%)	
Tricuspid atresia	7 (11.9%)	16 (17.0%)	
Heterotaxy	13 (22.0%)	18 (19.2%)	
Hypoplastic left heart syndrome	6 (10.2%)	6 (6.4%)	
Others	22 (37.3%)	33 (35.1%)	
Anomalous pulmonary venous return	5 (8.5%)	7 (7.5%)	>0.999
Interrupted inferior vena cava	2 (3.4%)	3 (3.2%)	>0.999
Preoperative bidirectional Glenn	48 (81.4%)	86 (91.5%)	0.111

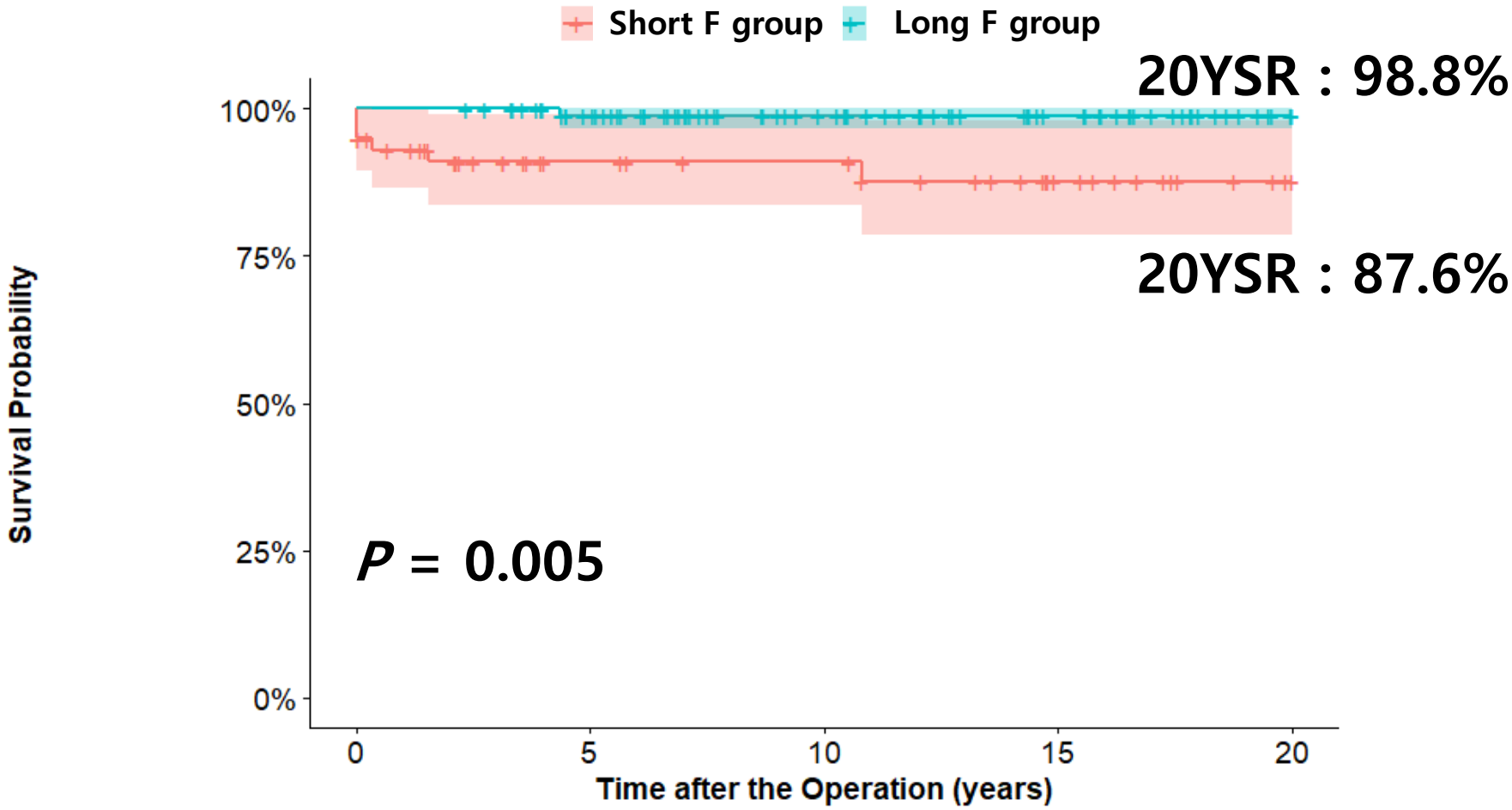
Baseline Characteristics according to Fenestration Duration

Variable	Short F group (n = 59)	Long F group (n = 94)	p-value
Preoperative catheter data			
Pulmonary vascular resistance, WU	1.75 ± 0.63	1.83 ± 0.75	0.586
SVEDP, mmHg	7.09 ± 3.22	7.83 ± 2.77	0.255
Nakata index, mm^2/m^2	257.9 ± 103.6	239.5 ± 112.7	0.411
Operative characteristics			
Type of Fenestration			<0.001
Absent	13 (22.0%)	0 (0%)	
Graft	35 (59.3%)	87 (92.5%)	
Direct	11 (18.6%)	7 (7.5%)	
Duration of Fenestration , months	**2.9 ± 3.2**	**60.5 ± 54.0**	**<0.001**

Postoperative Characteristics according to Fenestration Duration

Variable	Short F group (n = 59)	Long F group (n = 94)	p-value
Early outcomes (<30 days)			
Death	3 (5.1%)	0 (0%)	0.108
Mechanical circulatory support	1 (1.9%)	0 (0%)	0.813
Ventricular arrhythmia	1 (1.9%)	0 (0%)	0.813
Atrial arrhythmia	1 (1.9%)	0 (0%)	0.813
Reoperation	2 (3.9%)	2 (2.4%)	>0.999
Low cardiac output syndrome	3 (5.8%)	1 (1.2%)	0.317
Seizure	0 (0%)	5 (6.0%)	0.182
Stroke	0 (0%)	3 (3.6%)	0.432
Chylothorax	8 (15.4%)	10 (12.1%)	0.768
Duration of chest tube, days	9.5 ± 8.5	10.4 ± 7.9	0.694

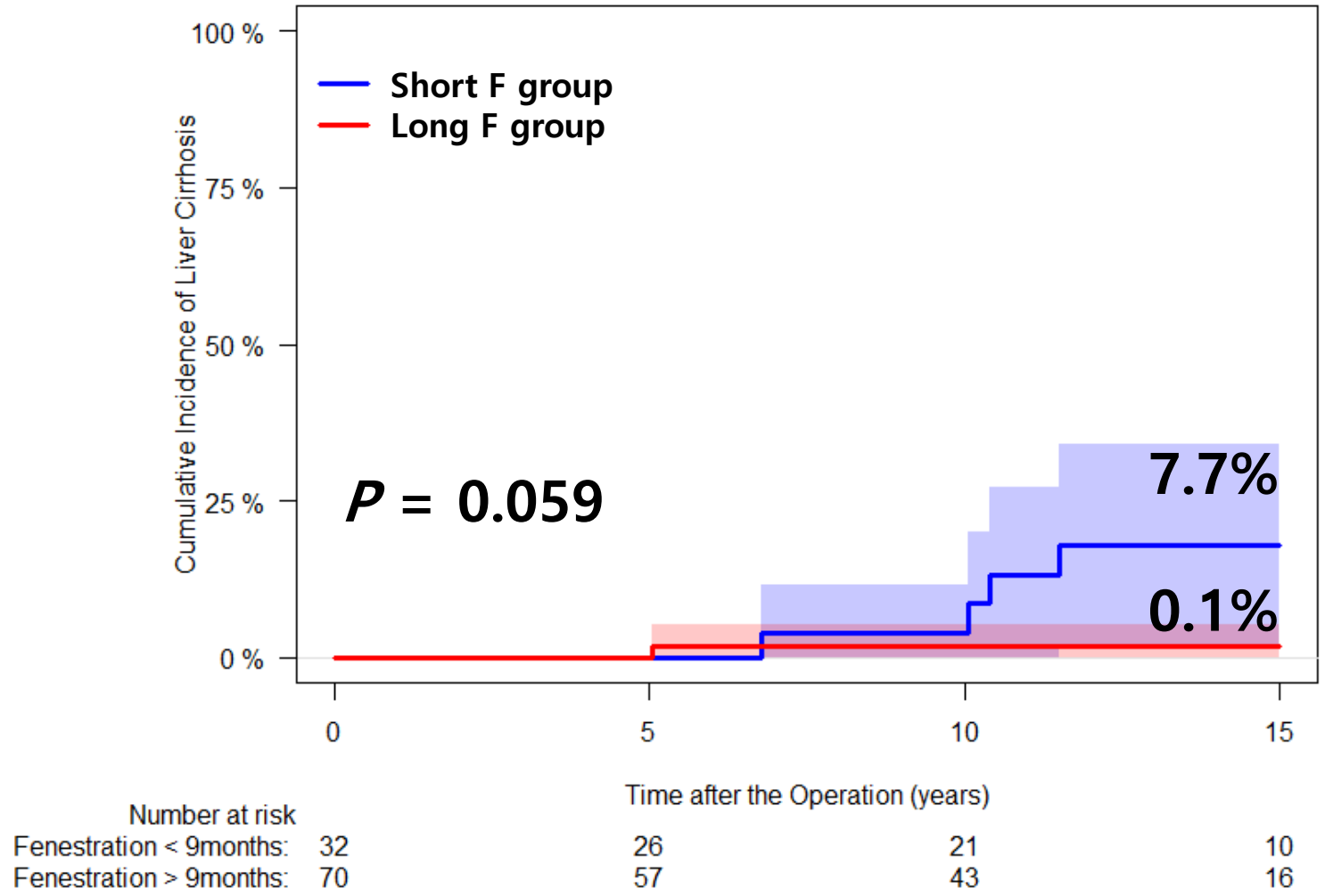
Outcomes according to Fenestration duration



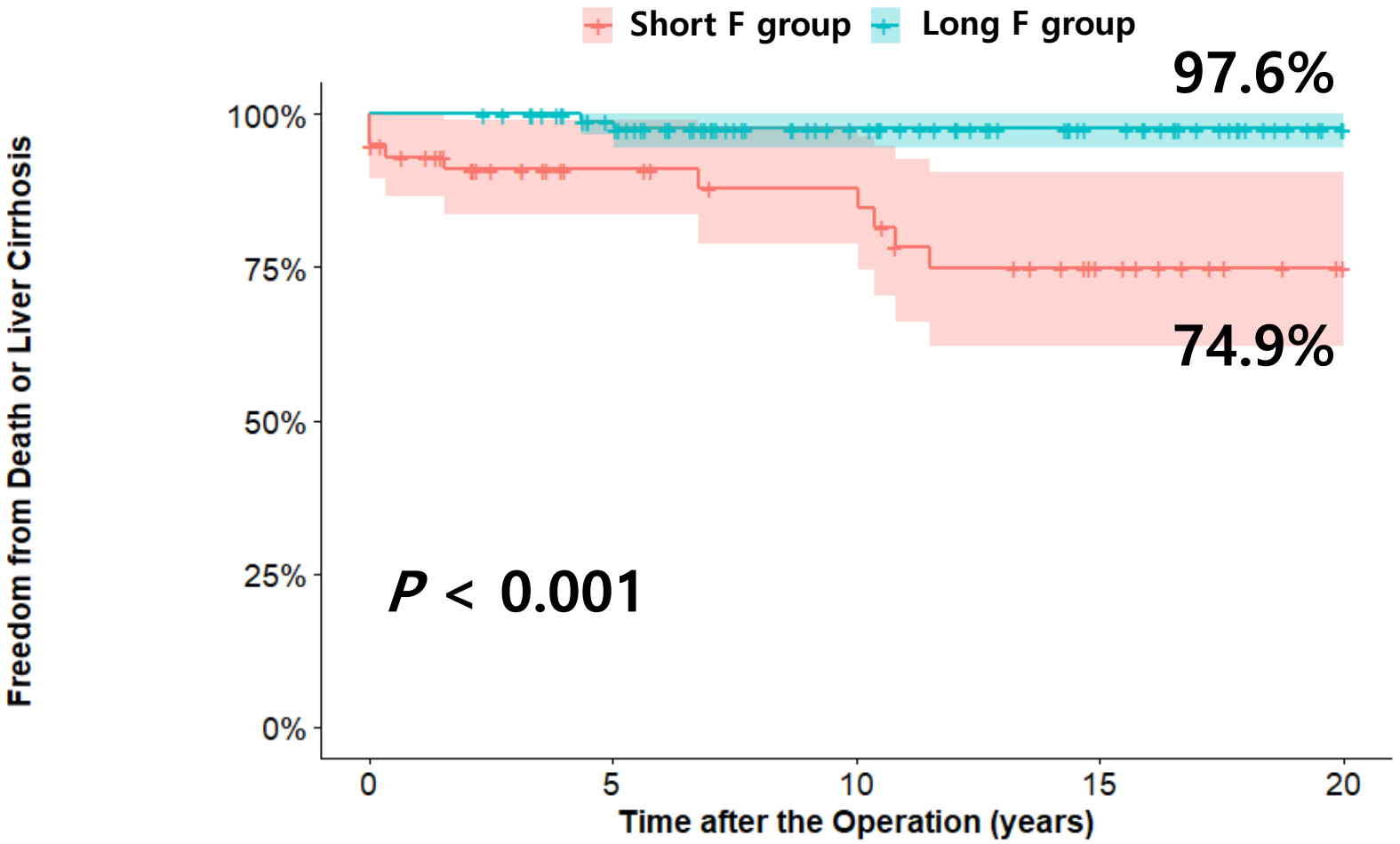
Number at risk

Fenestration < 9months	59	32	29	18	8
Fenestration ≥ 9months	94	81	55	36	14

Outcomes according to Fenestration duration



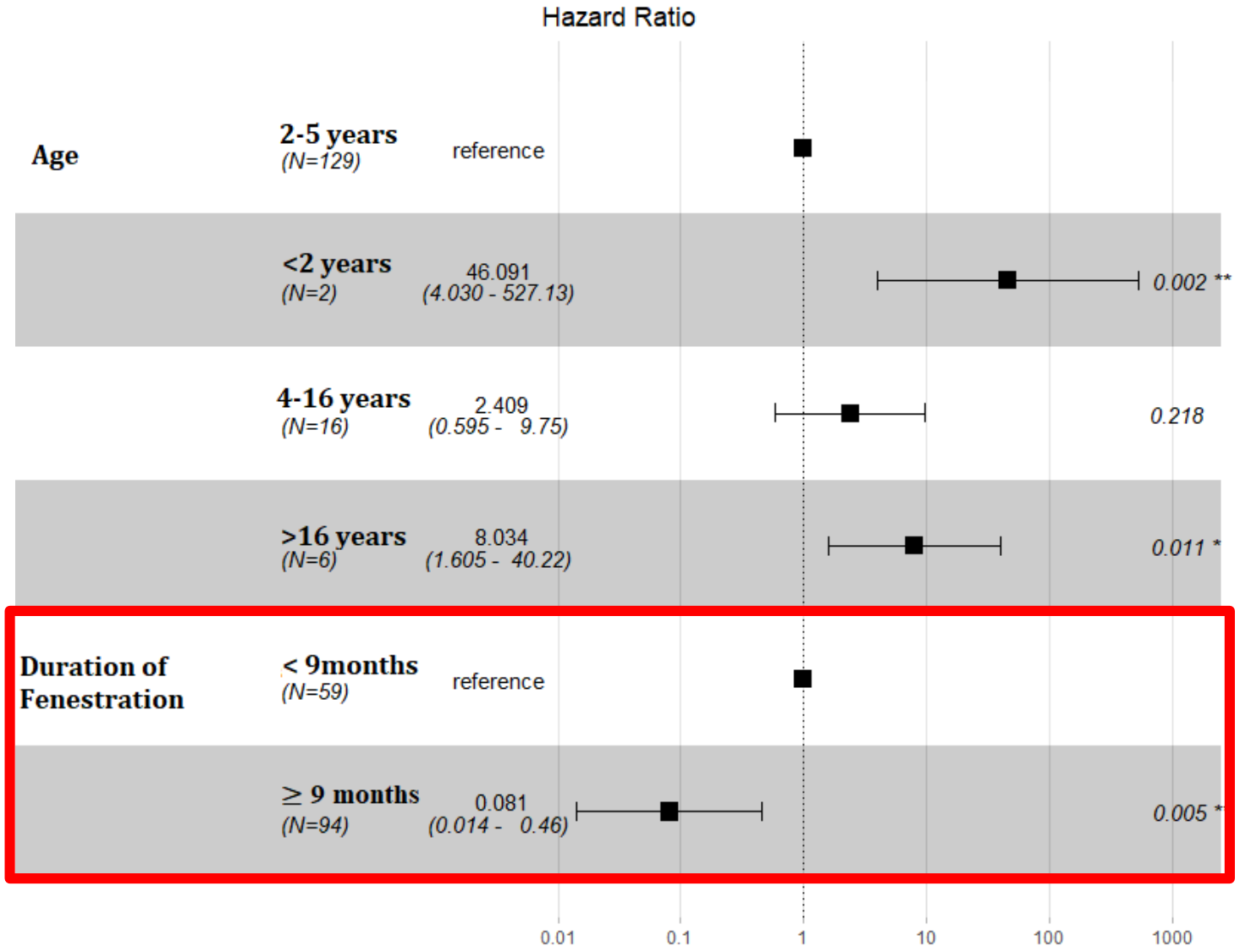
Outcomes according to Fenestration duration



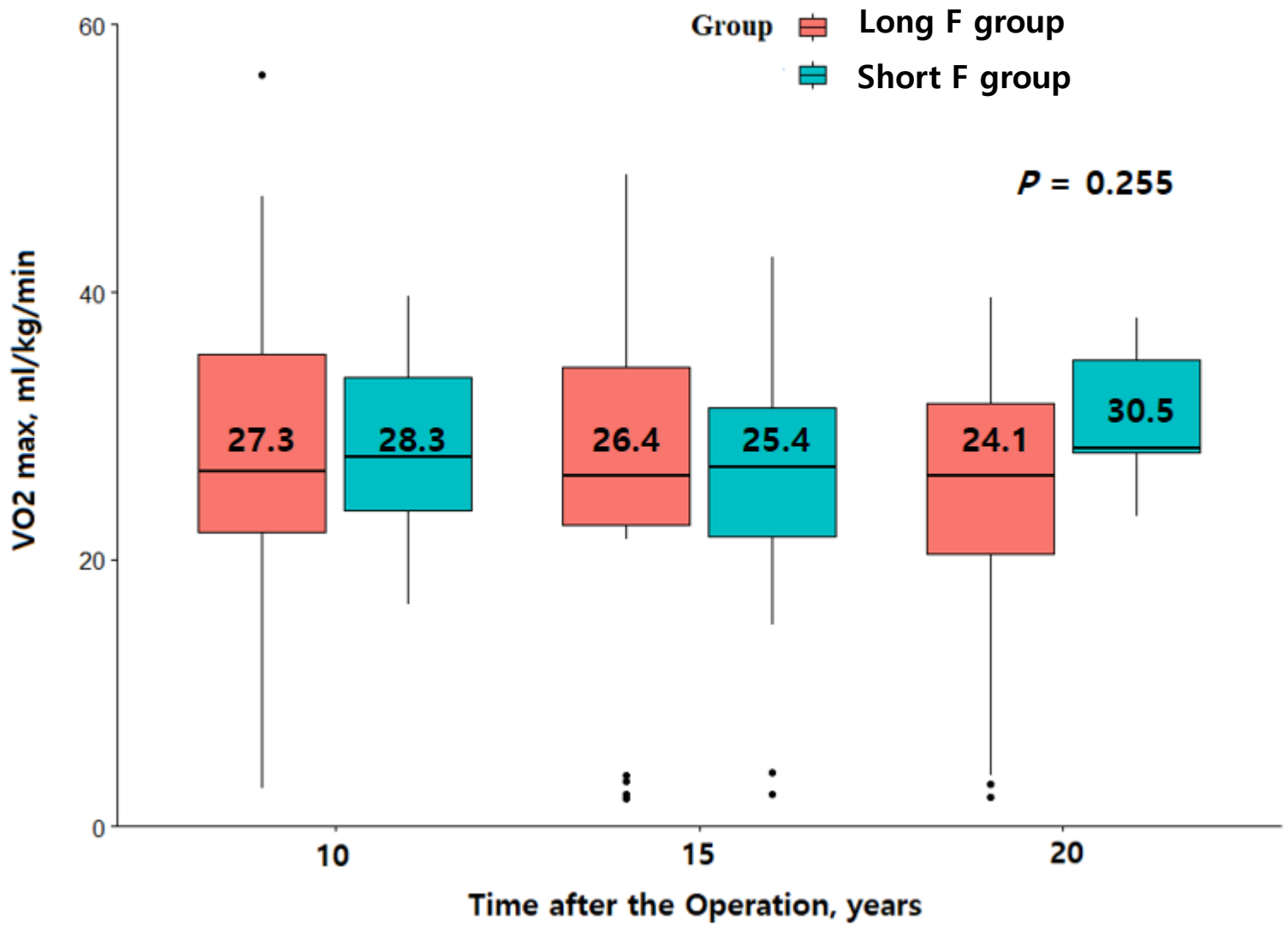
Number at risk

Fenestration < 9months	59	32	28	16	8
Fenestration ≥ 9months	94	81	54	35	14

Cox multivariable analysis for Primary Endpoint



Outcomes according to Fenestration duration



Conclusion

- **Maintaining fenestration for significant period**
  - No effect on exercise intolerance
  - May provide a protective effect against long-term death or liver cirrhosis

- **In conclusion, maintaining fenestration for a certain period might improve the long-term outcomes of contemporary Fontan operation.**

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Thank You

For your attention