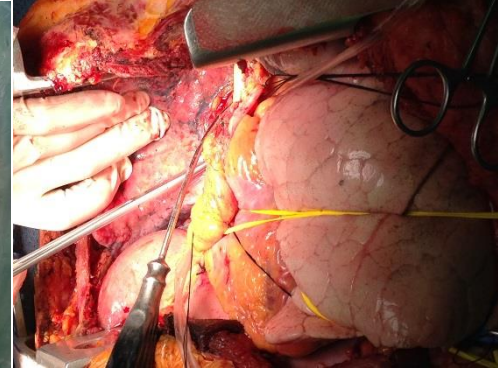


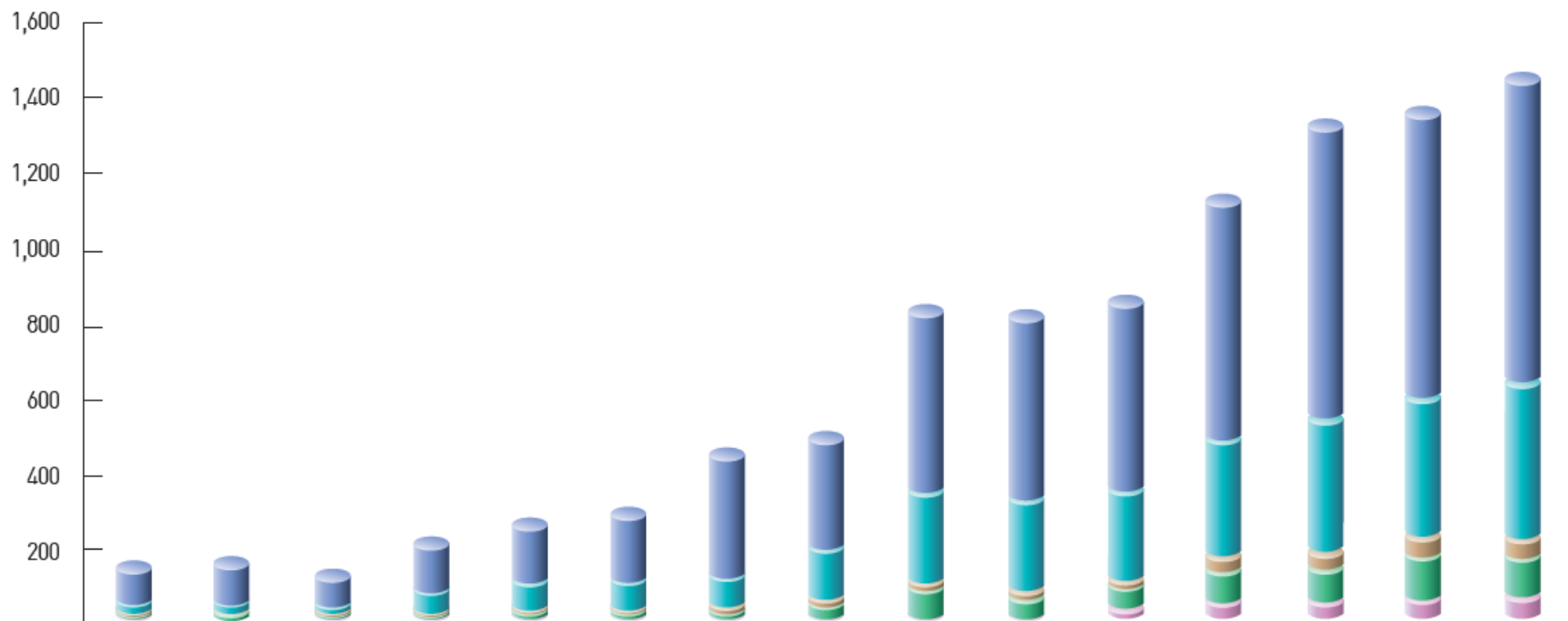


폐이식의 증례

양산부산대학교 병원
호흡기내과
조우현

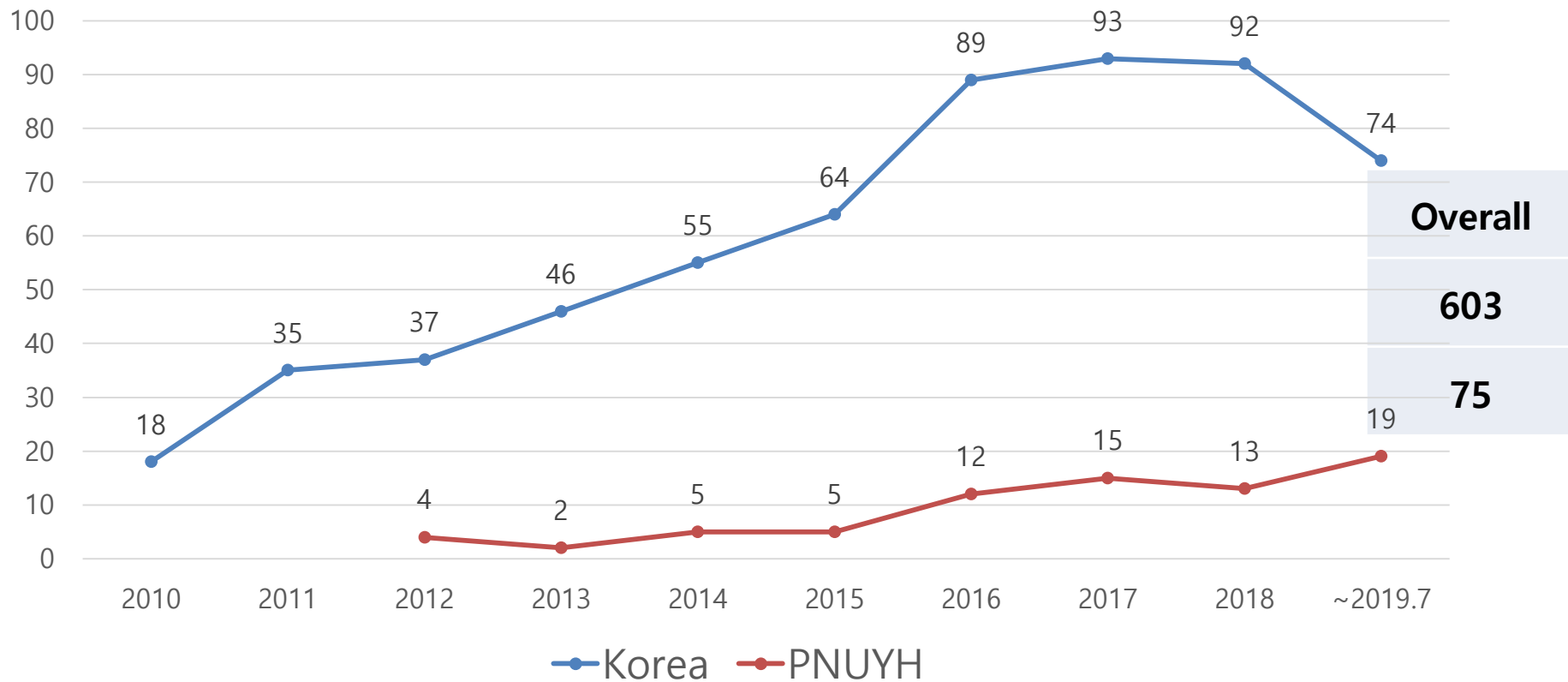
2-2-2. 뇌사 이식 추이(주요 장기별) : 2000 - 2014

(단위 : 건)



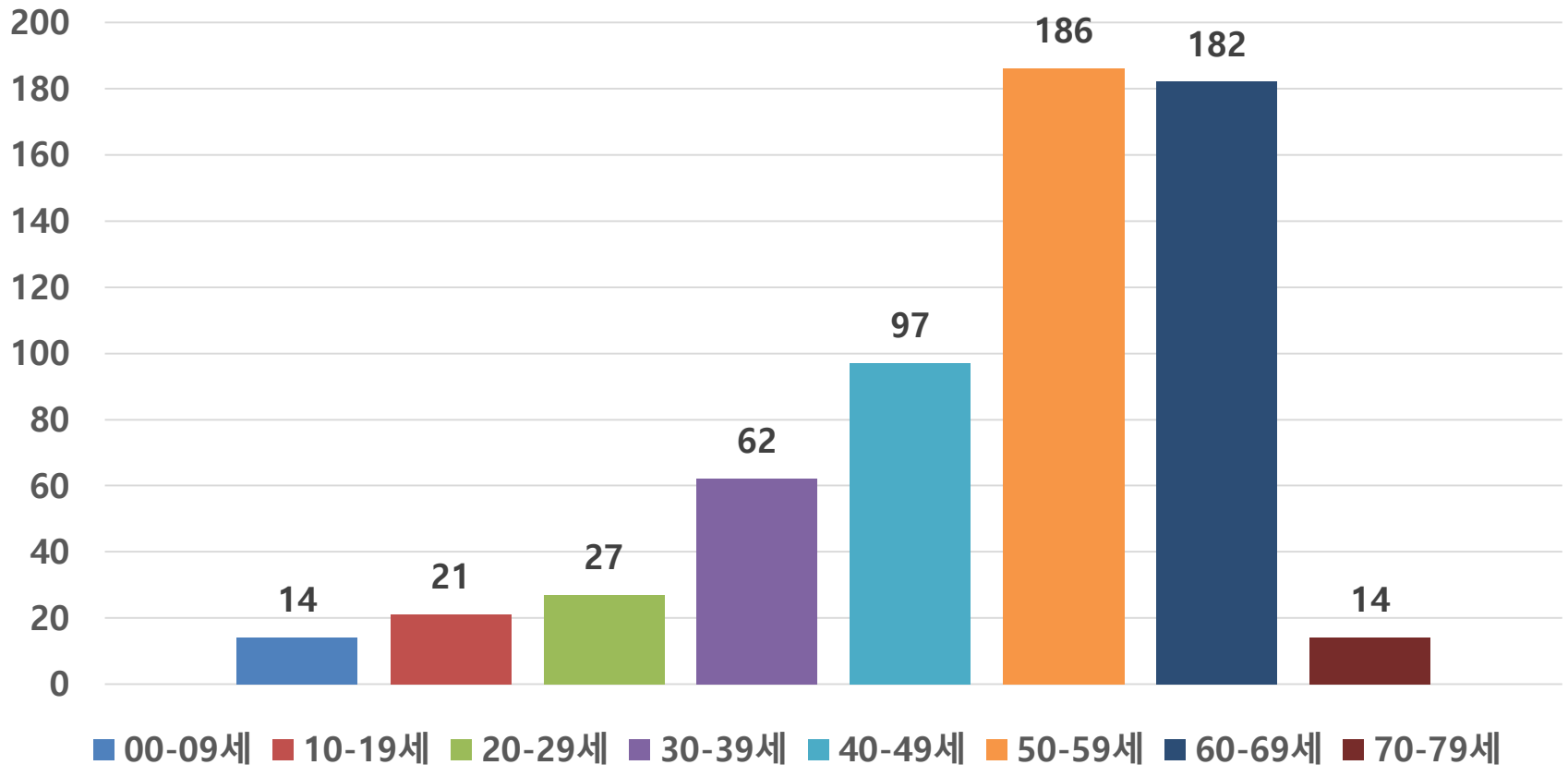
최근 10년간 국내 폐이식의 건수 변화

Annual case of lung transplantation

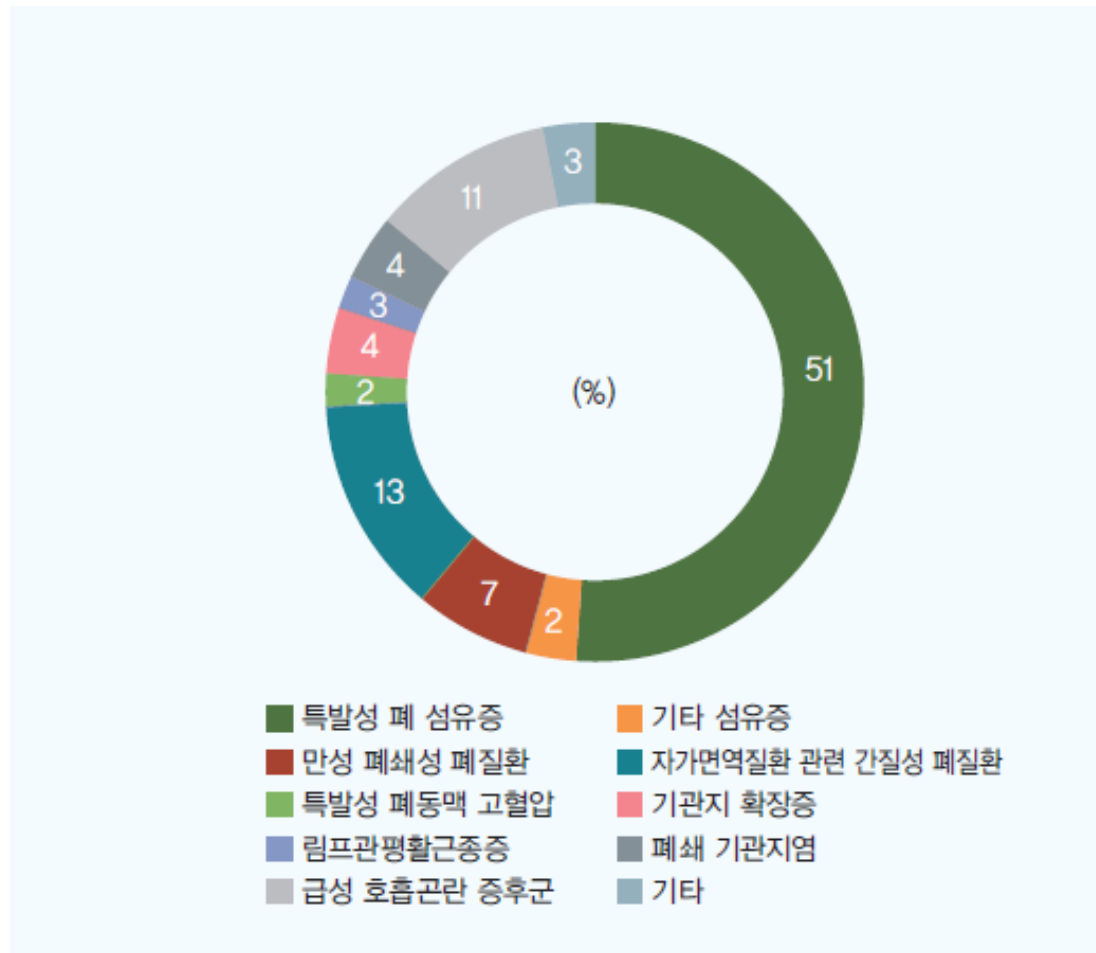


연령별 페이스 건수

From 2010 to Now (n=603)



폐이식의 원인 질환



IPF 증례 (M/51)

C.C.> DOE for 6 month

MRC 2

서서히 시작

마른 기침 동반

P/Ex>

양 폐하야 수포음

SHx>

산업용 로봇 설비 회사 운영..

석면 노출력(-)

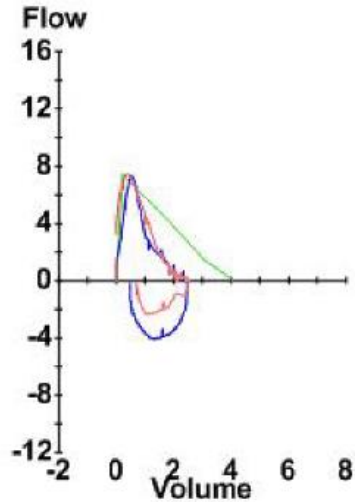
Initial lab findings

- RF 정량 <10

Anti-CCP Ab(-)

ANA 정량 (Blood) 1:160

PFT



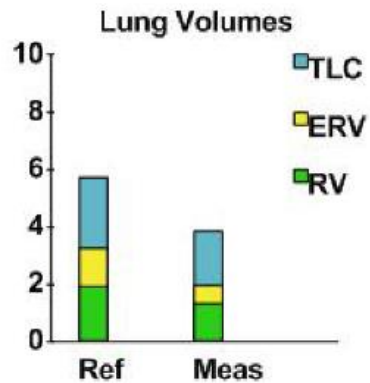
FVC 62(2.52)

FEV1 64(2.14)

FEV1/FVC 81

DLco 67

6MWT: 392m(88%)



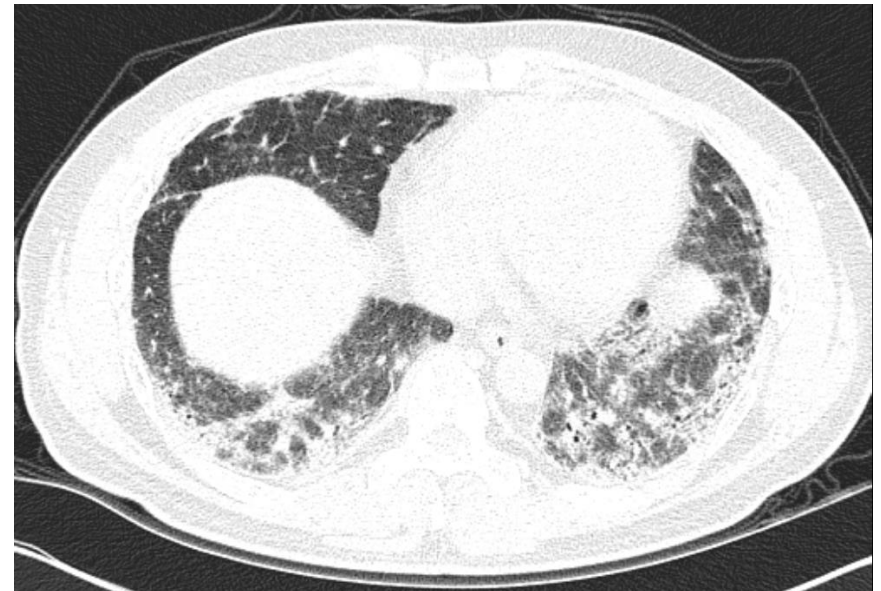
Initial radiologic findings



- Impression>
 - R/O fibrotic NSIP
 - R/O IPF
- Plan>
 - VATS Bx. or steroid try
 - Bx was refused by pt

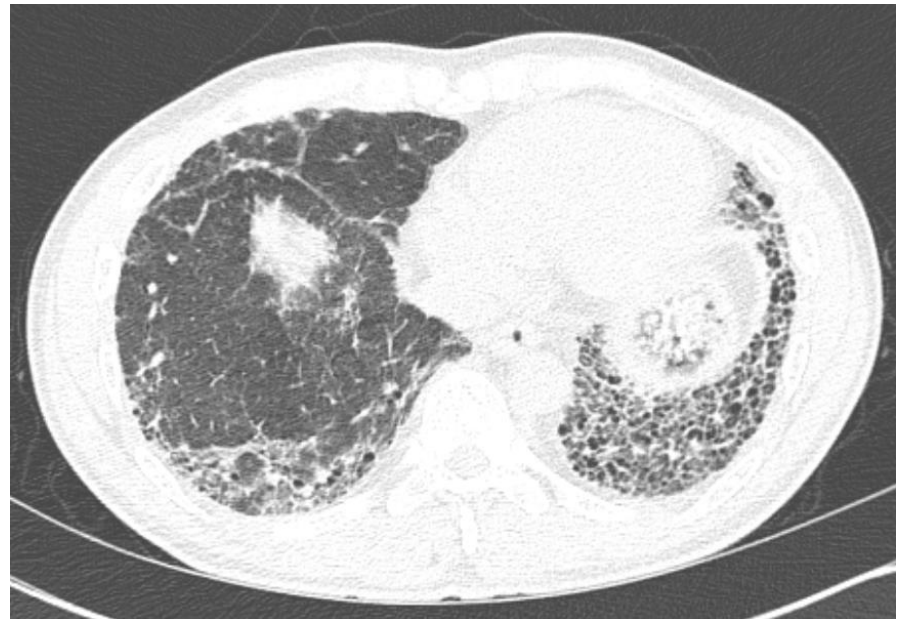
On 20 weeks of steroid+azathioprine

- No symptom improvement (MRC 2)
- FVC 63->61 -> 61
FEV1 67->69 -> 64
DLCO 33-> 37



1yr after F/U loss

- DOE aggravation
 - MRC 3
- FVC 63-->37
FEV1 67-> 38
DLCO 33-> 25
- Plan>
 - Lung transplant

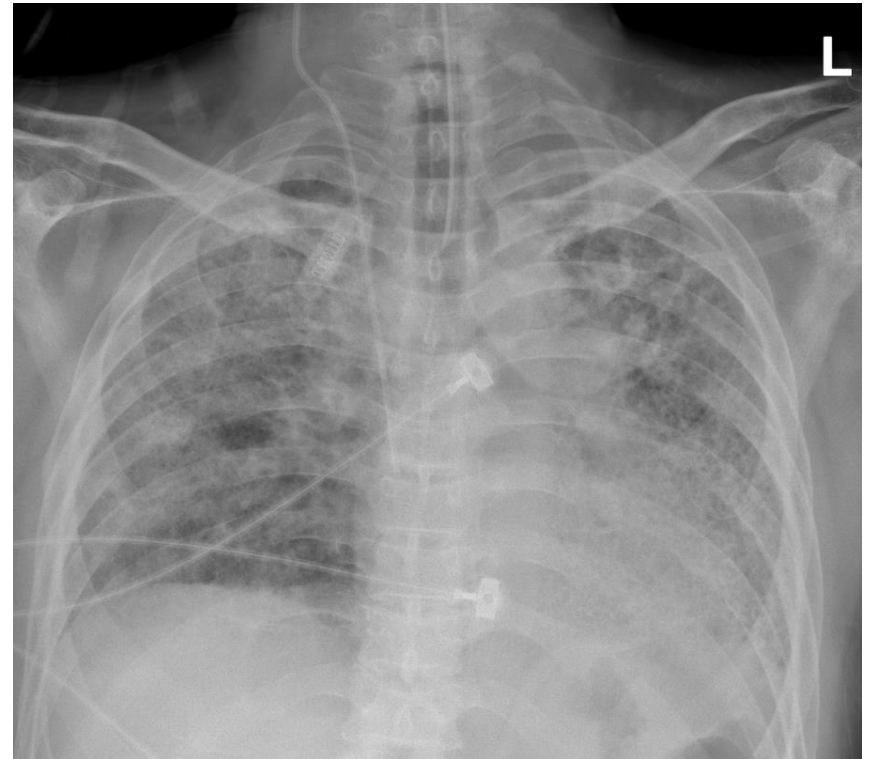


On lung transplant waiting list

D1



D130



Lung transplant was done with bridging by MV and ECMO

D1



D70



FVC 59->71->69->70

FEV1 68->79->77->81

IPF exacerbation (M/50)

- 2018.8 IPF Dx & Tx with pirfenidone
- Home O₂ Tx.
- DOE 악화로 F/U병원에서 기계환기 시작
- Hypoxia 심해 VV ECMO 시작
- 폐이식 상의 위해 외래 방문

The Feasibility of Inter-hospital Transport ECMO System for Lung Transplantation

Joo Hyung Son, Bong Soo Son, Do Hyung Kim

Department of Thoracic and Cardiovascular Surgery
Pusan National University Yangsan Hospital, Yangsan, Korea

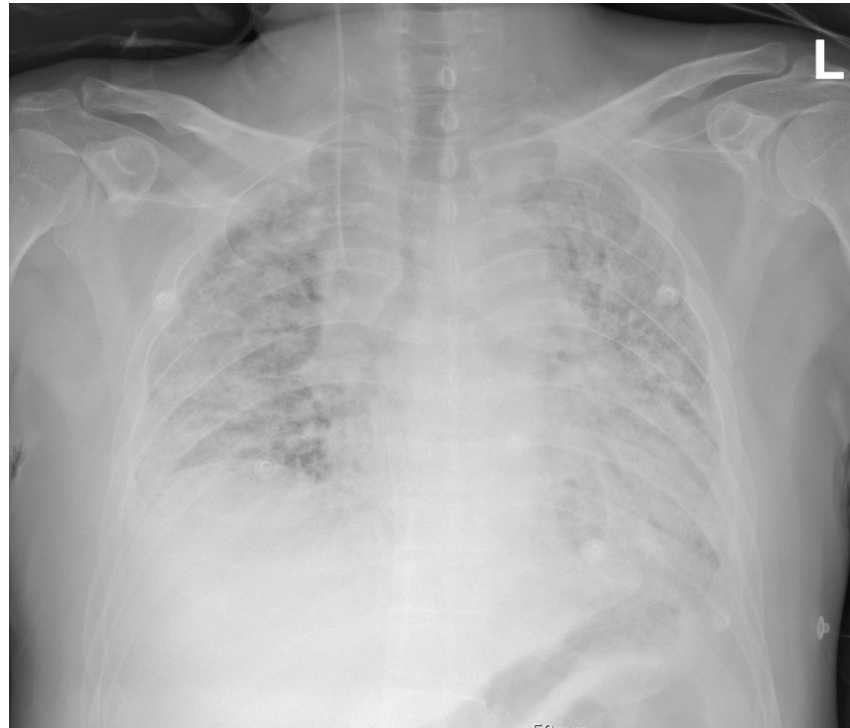


LTx waiting list

D1

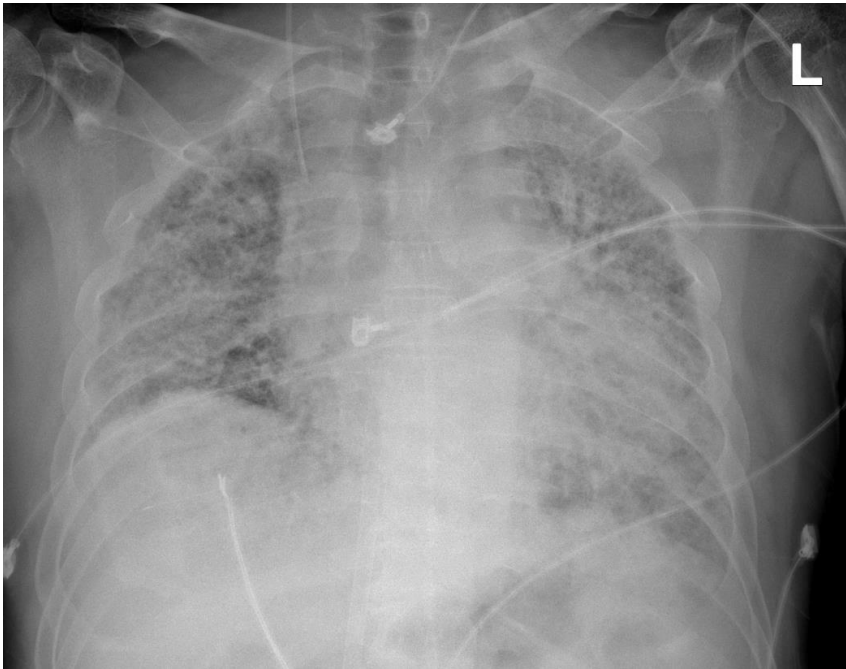


D4

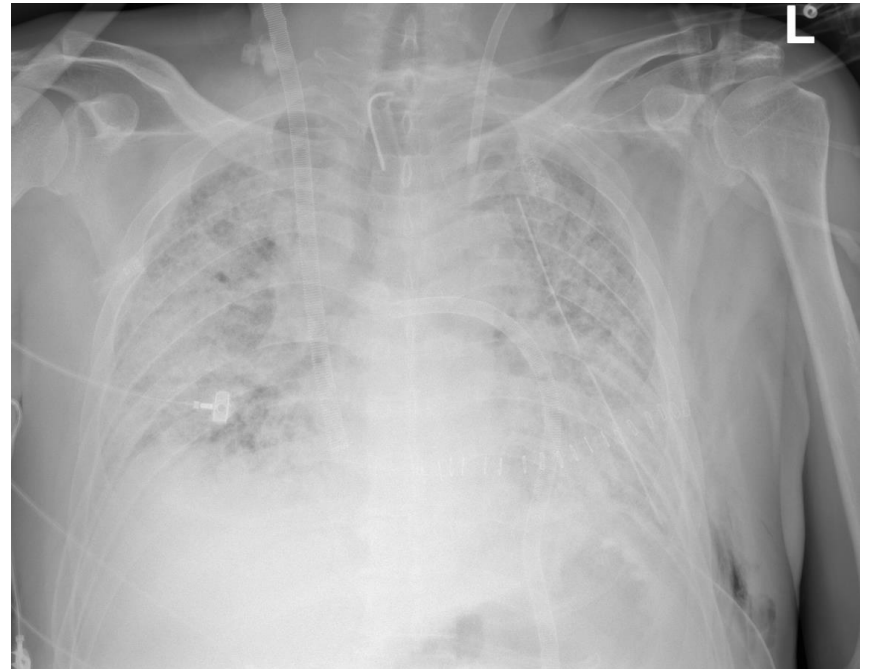


Oxy-RVAD was performed on 5th day of waiting list

D6



D9



LTx was performed on 10th day of waiting list

POD 1



At discharge on POD 18



9 month later

PFT

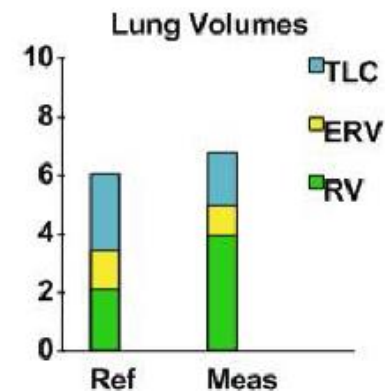
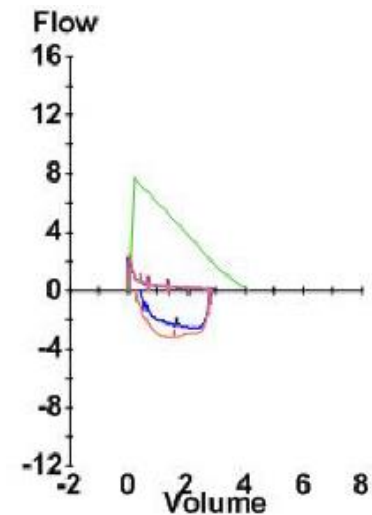
- FVC 75 ->85->86->82->84->86->78->80->81->**83**
- FEV1 81->93->90->92->97->87->92->89->**95**

CXR



COPD (M/56)

- DOE, 수년간
 - MRC 3-4
- SHx
 - Heavy smoker (40PY)
- PFT
 - FEV1/FVC 27
 - FVC 68%
 - FEV1 22%
 - DLco 26



CXR



Impression

- COPD, severe (IV)

Plan

- LABA+LAMA
- Home O₂ Tx
- Endo valve ?

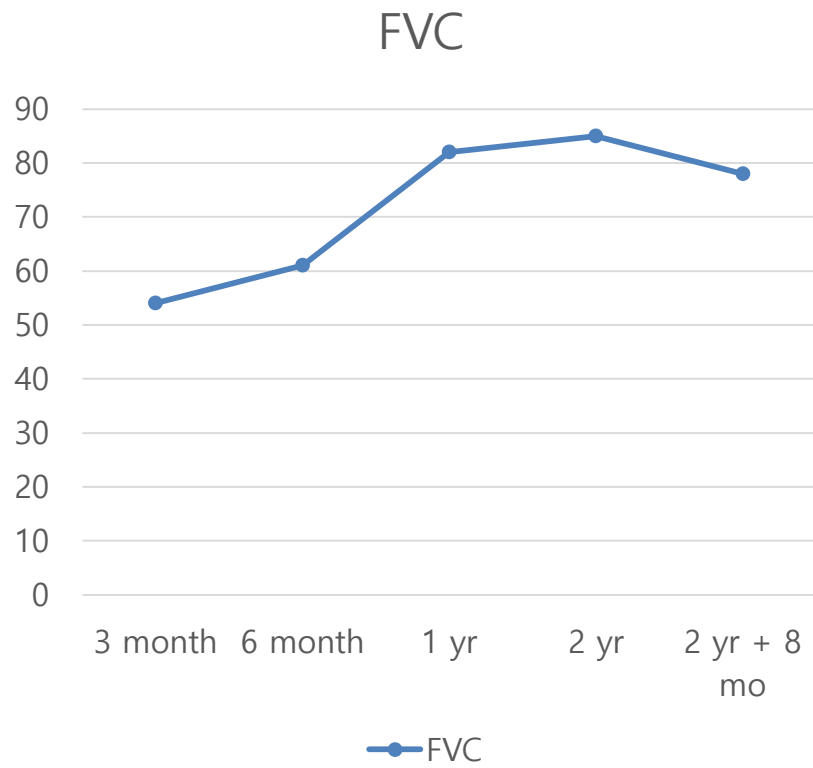
PFT (2016.3.3)

- post-FEV1 19%(0.63)
- DLco 33
- 6MWD:306m (SpO₂ 94%)
- MRC IV-V

Lung transplant (16.9.24)



F/U PFT

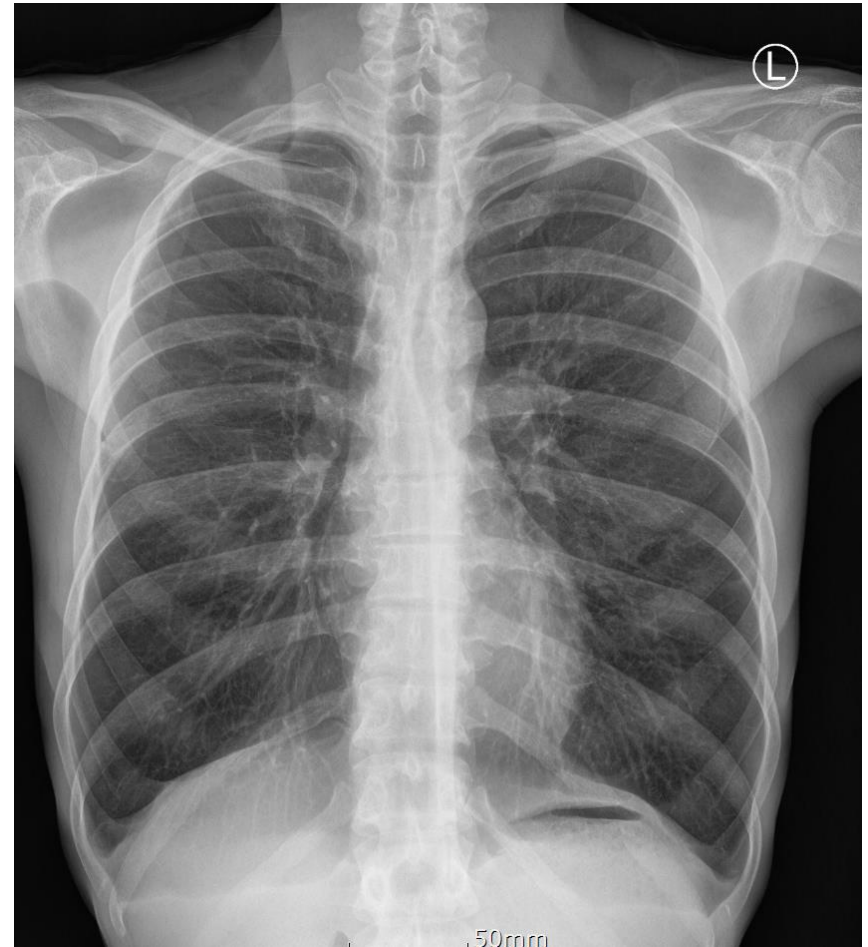


CXR (2019.5.14)



Chronic lung GVHD (M/42)

- AML로 2013년 Allo-SCT후 GVHD에 의해 bronchiolitis obliterans syndrome (BOS) 발생
- Home O₂ Tx
- PFT>
 - FVC 3.17 (66%)
 - FEV1 0.61 (15%)
 - FEV1/FVC 19



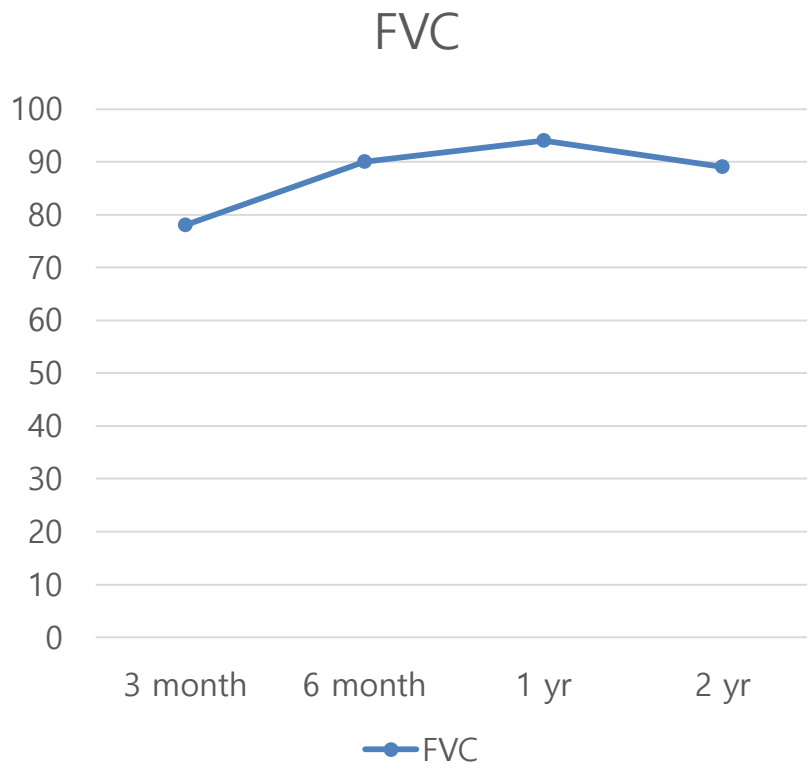
Waiting list for 6 month

- X-matching 양성으로 한차례 이식 취소됨
- PFT>
 - FEV1 0.47(11)
 - DLco 40

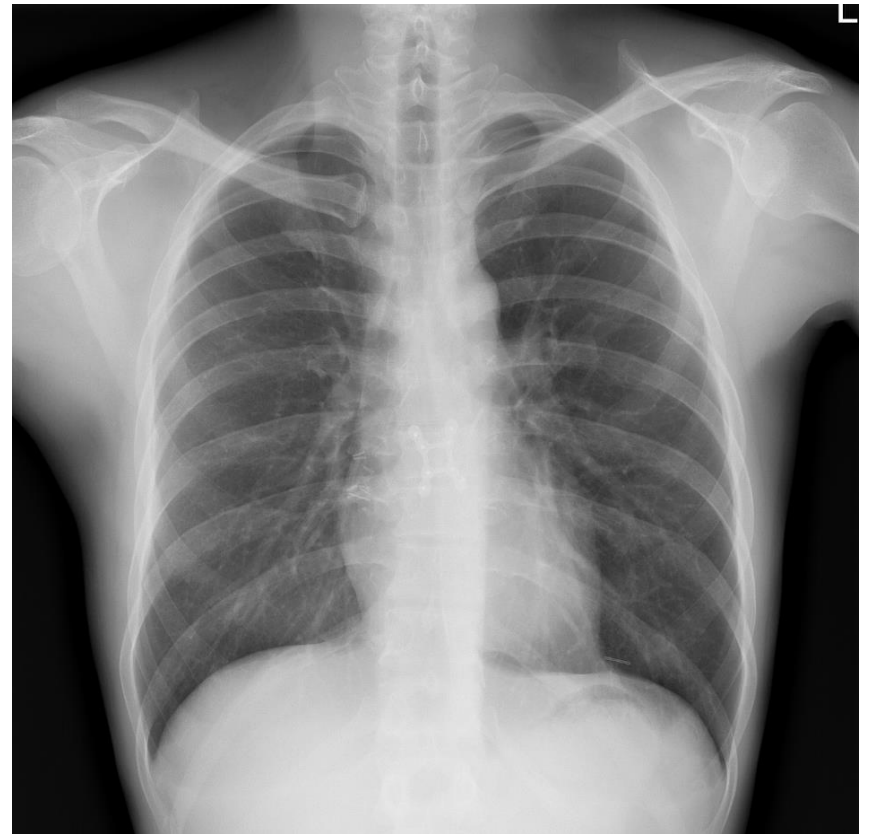
Lung transplant, POD1



F/U PFT

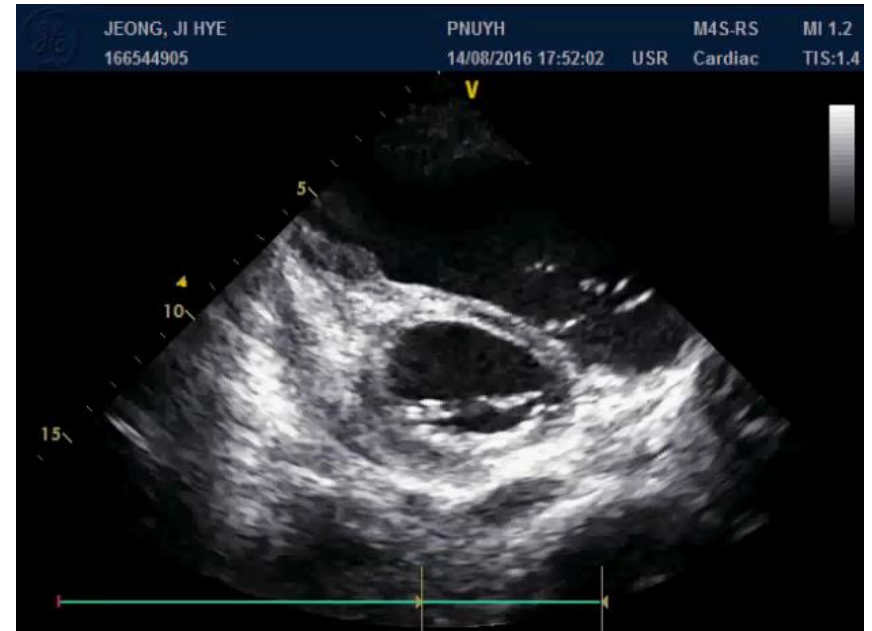


CXR at 2yr



IPAH (F/33)

CC. Hemoptysis and cardiac arrest

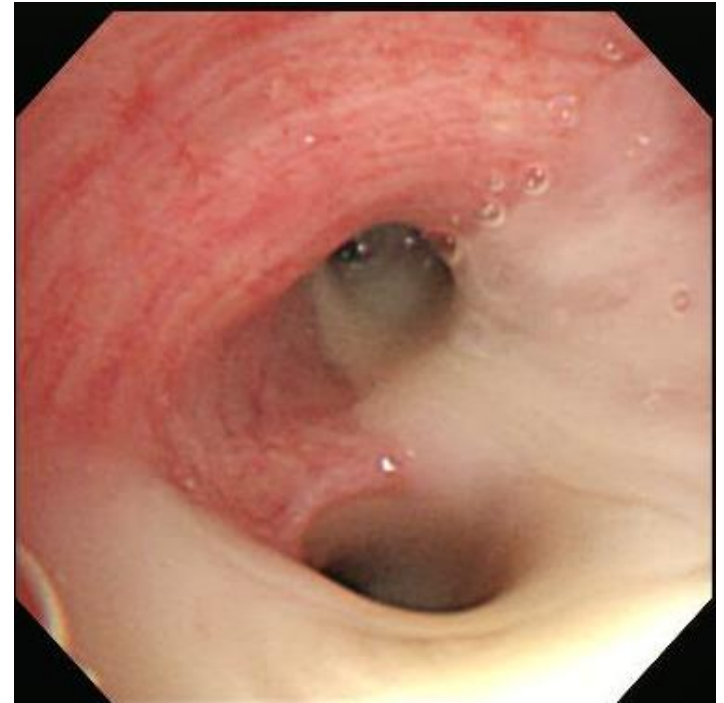
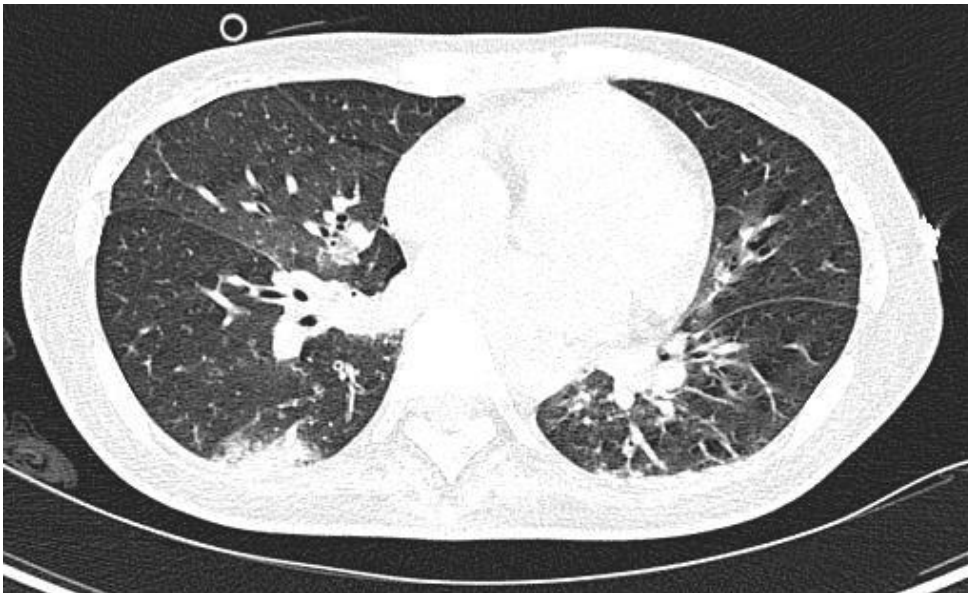


Donor management is important !

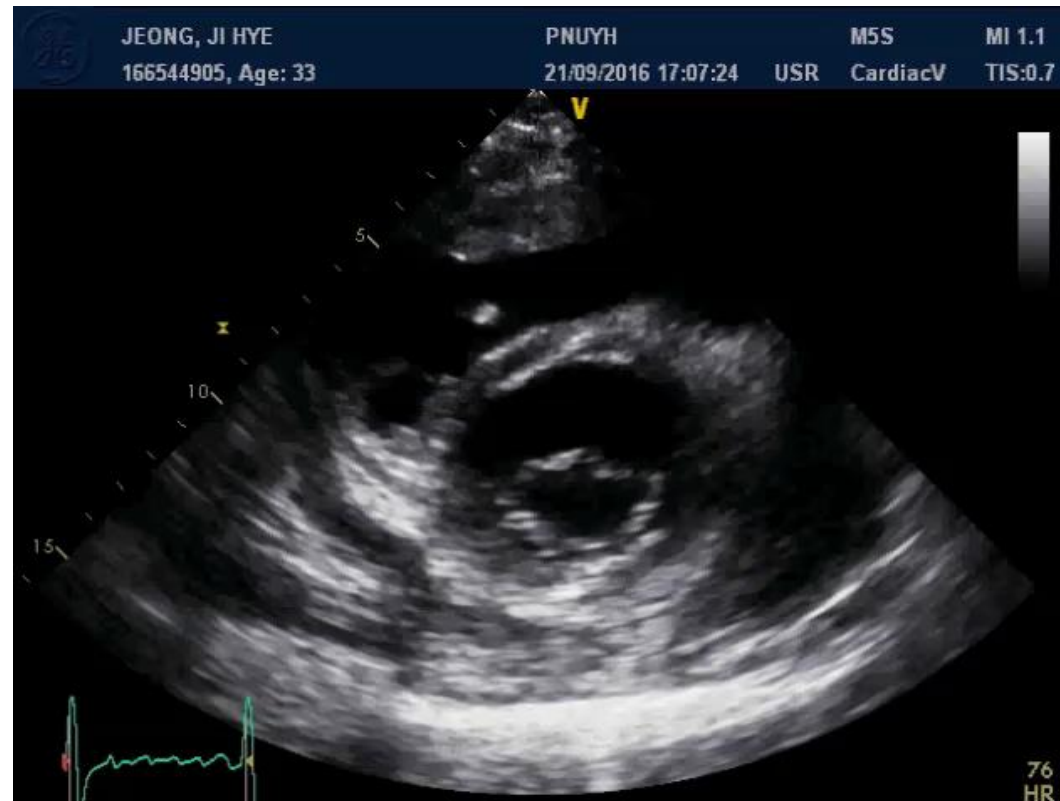
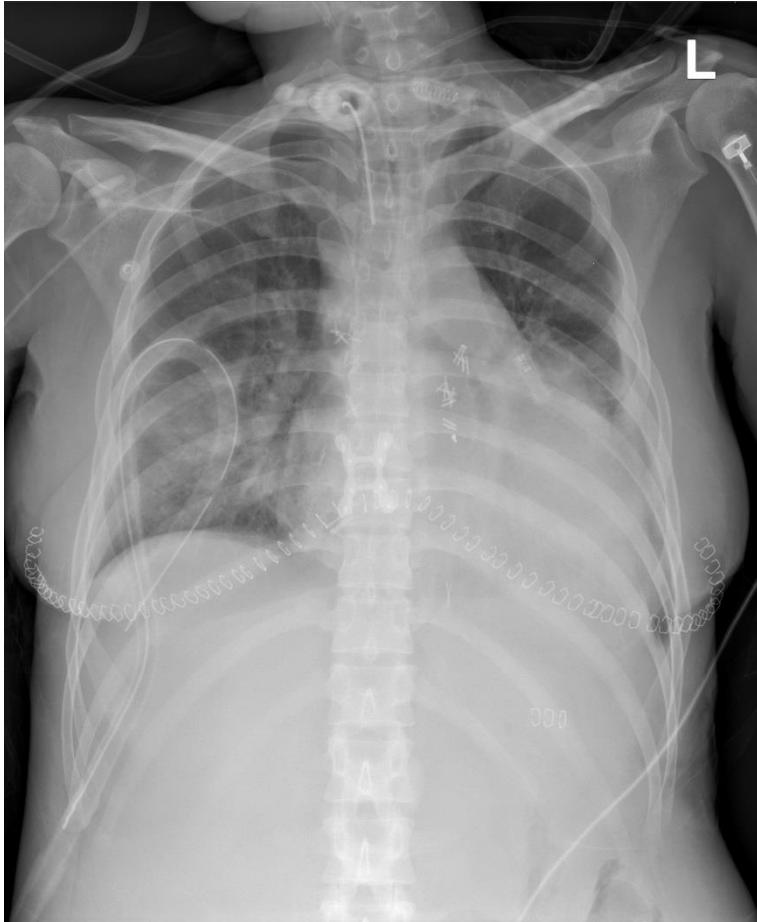
Donor, F/34

Hypoxic brain damage

Underlying C-cord injury



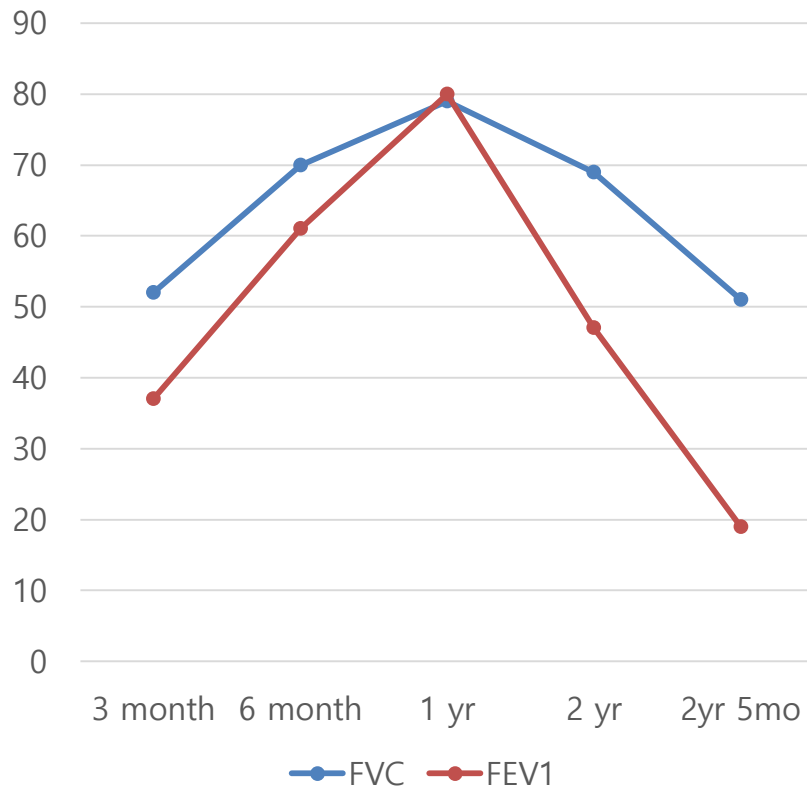
Postoperative CXR, 3wk



Chronic Allograft Dysfunction (CLAD)

- **Obstructive; BOS**
- Restrictive

F/U PFT

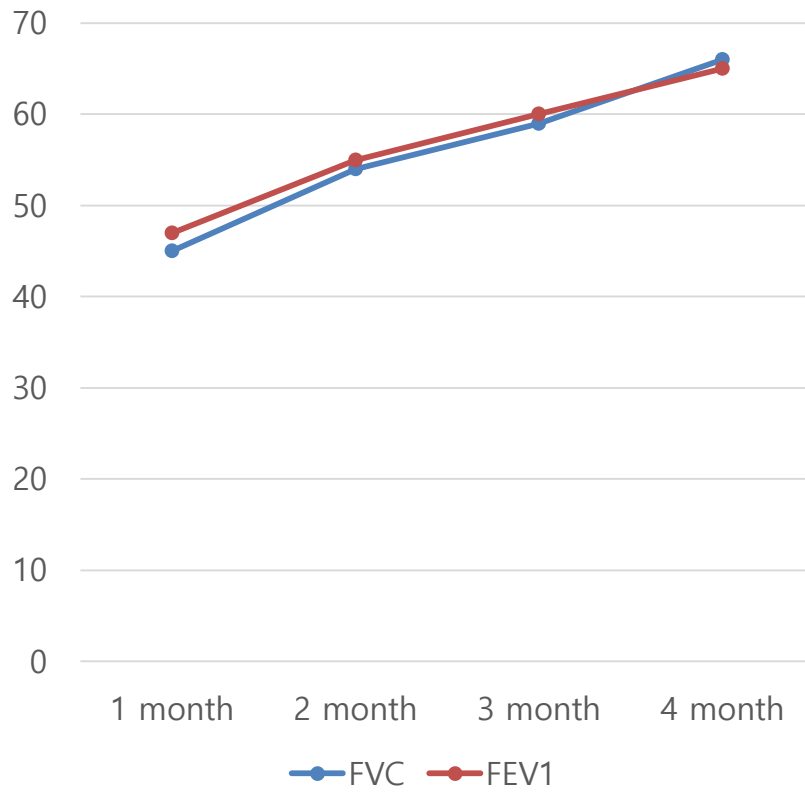


CXR at 2yr

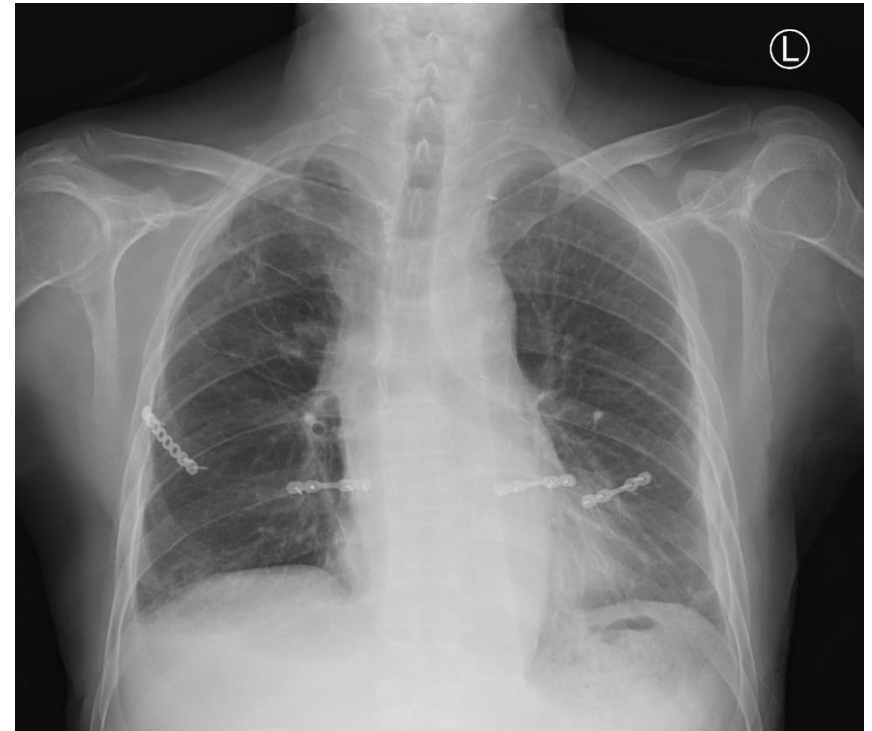


Retransplant

F/U PFT

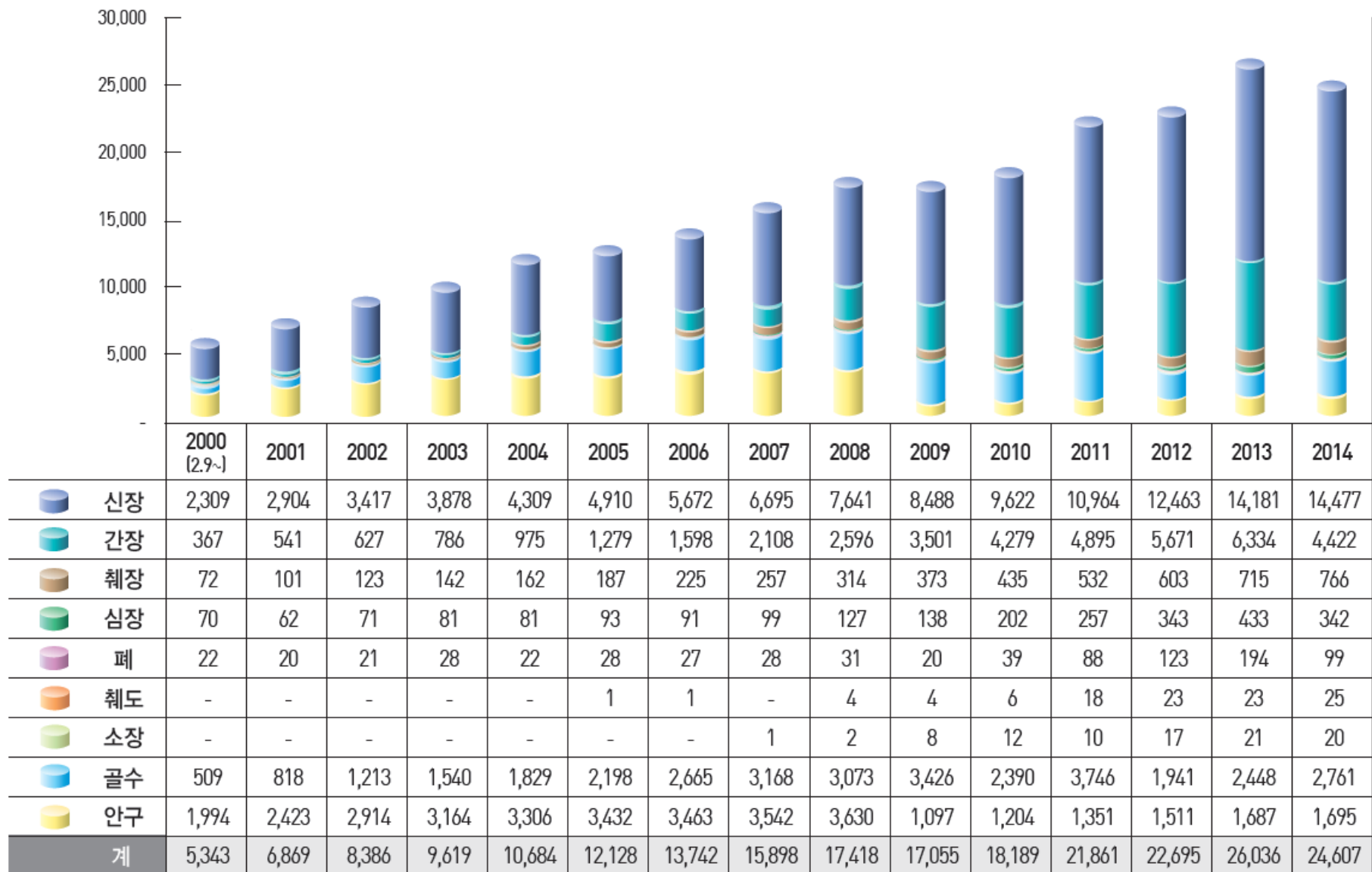


At discharge (POD 4wk)



2-3. 장기등이식대기자 추이(장기별) : 2000 - 2014

(단위 : 명)



4-1. 이식자의 평균 대기시간

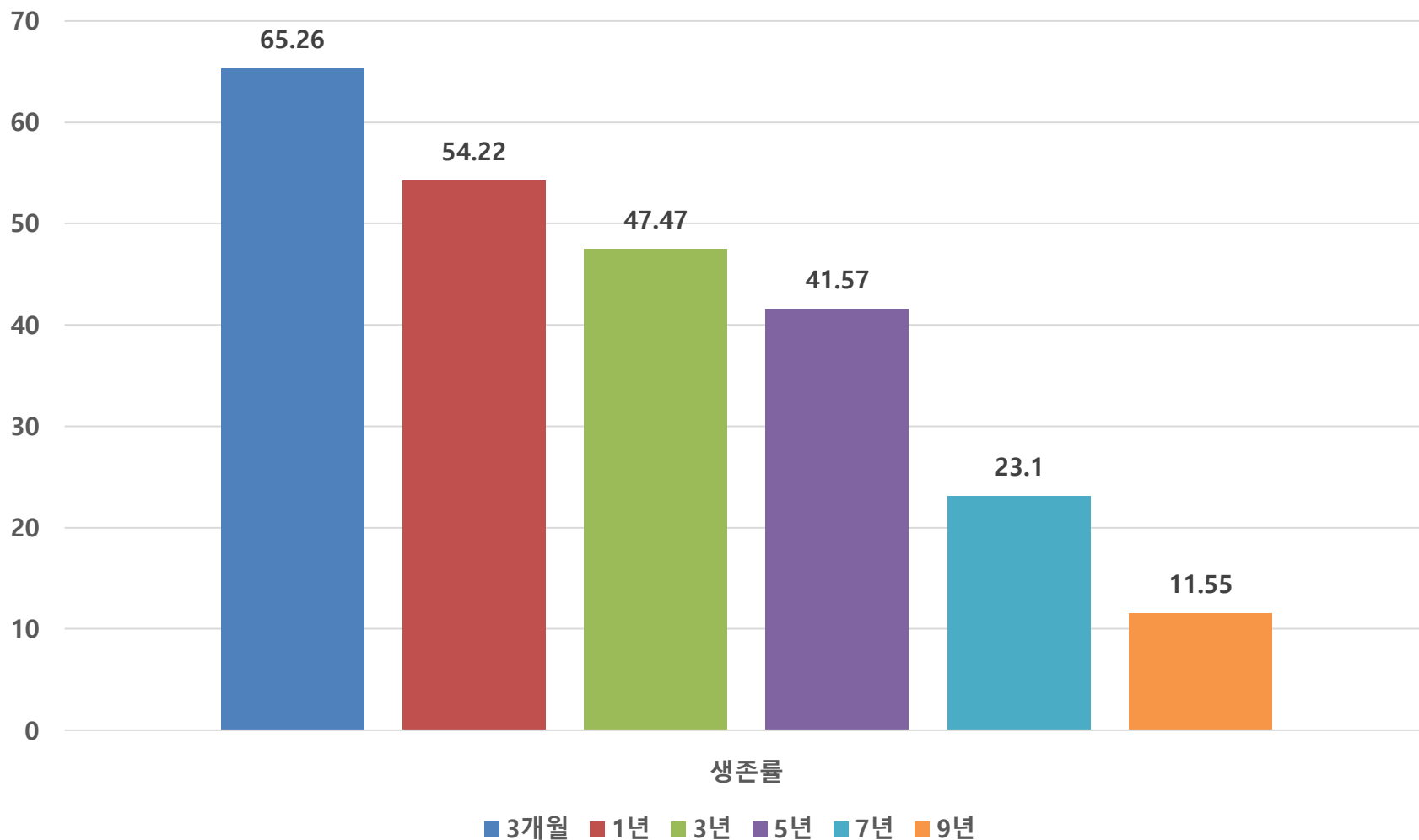
표 4-1-1. 이식자의 평균 대기시간 - 장기별

(단위: 일)

구분	평균	신장	간장	췌장	심장	폐	췌도	소장
2010	1,122	1,723	299	998	124	83		25
2011	1,165	1,799	262	1,044	142	53	39	792
2012	1,146	1,732	322	1,018	166	102	269	247
2013	1,155	1,861	252	872	151	91	249	305
2014	1,137	1,822	244	822	177	96		162

국내 폐이식의 문제점

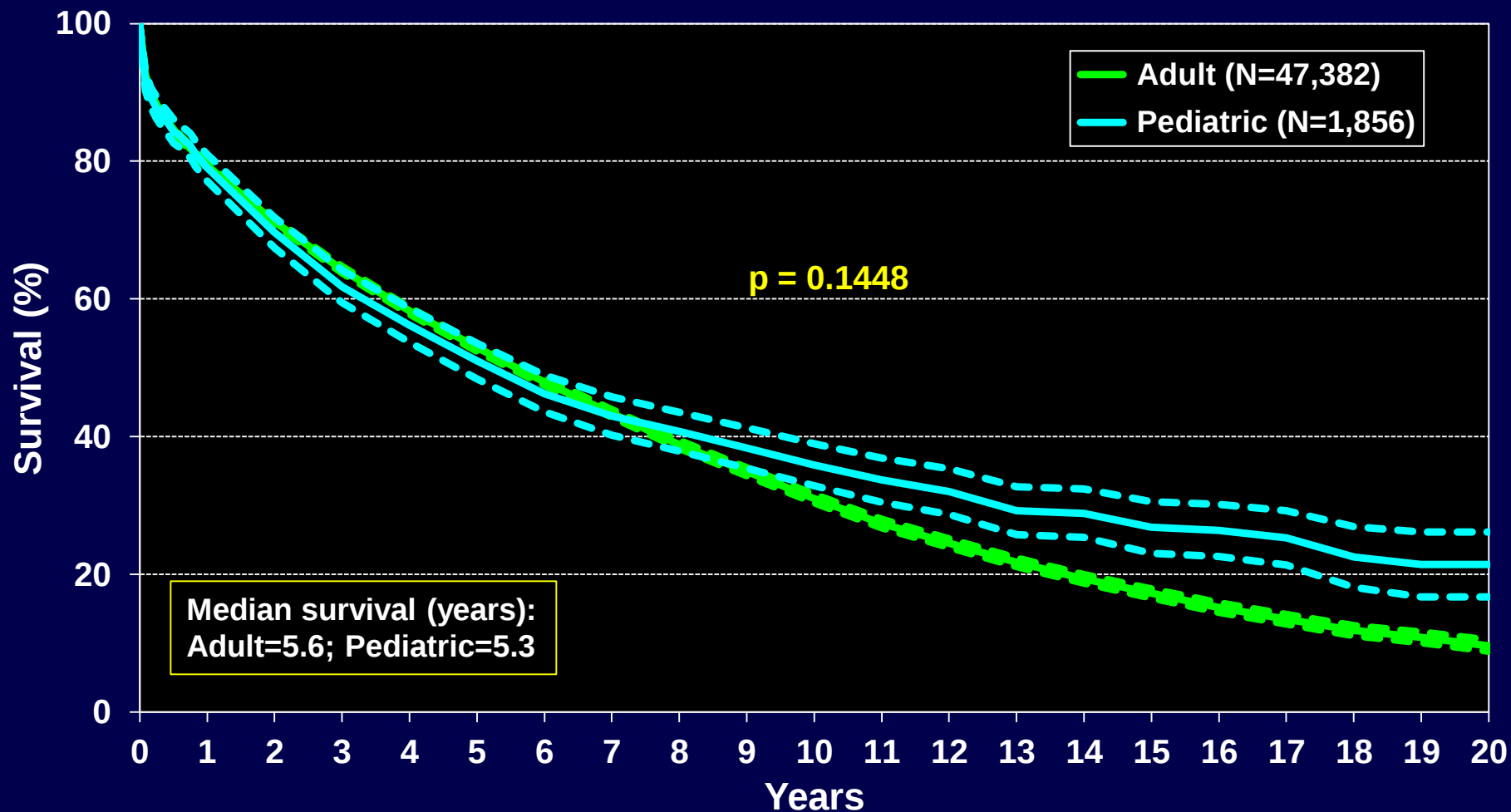
국내 폐이식 생존률 (2010 ~ 2014)



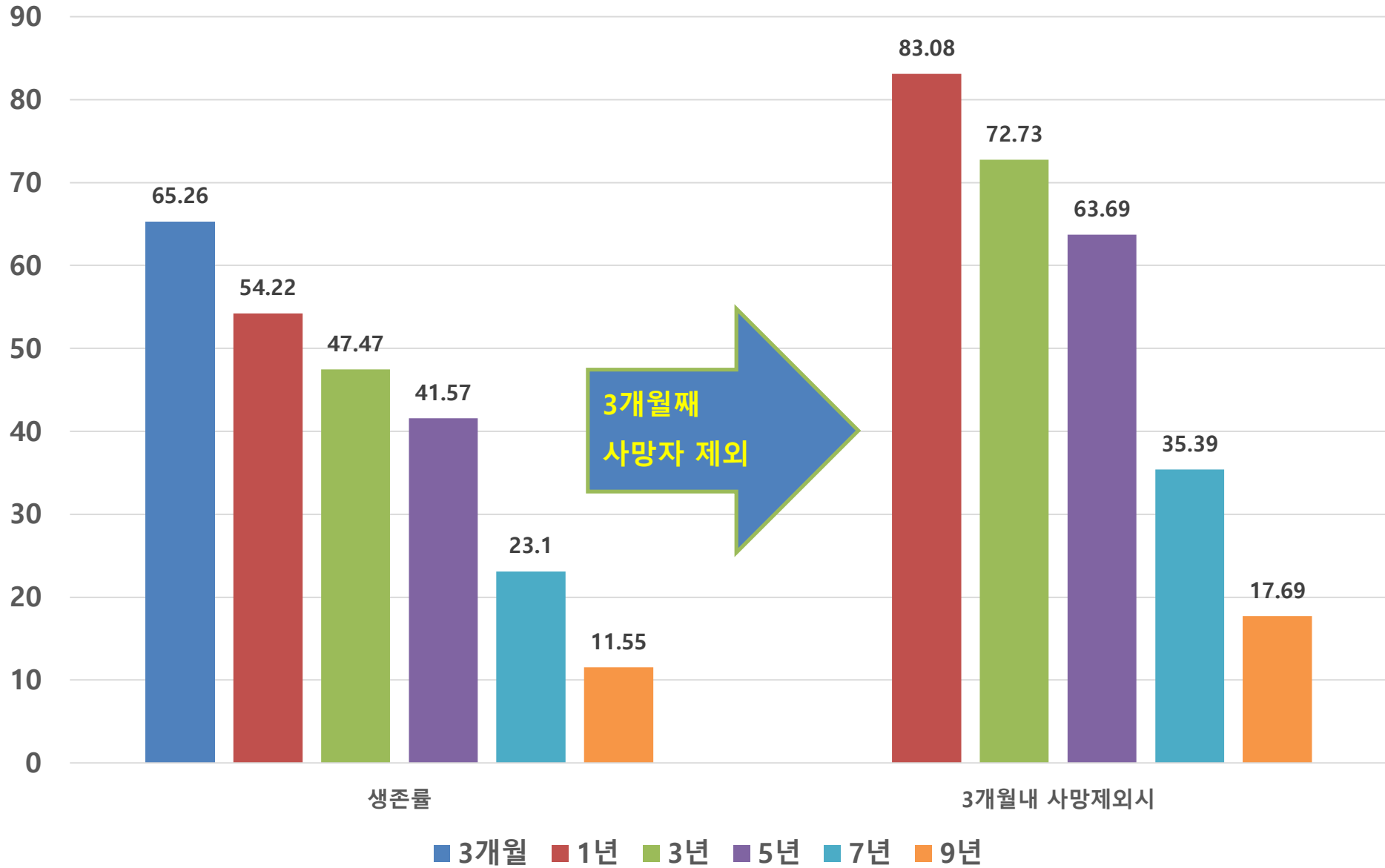
Adult and Pediatric Lung Transplants

Kaplan-Meier Survival by Age Group

(Transplants: January 1990 – June 2013)



국내 폐이식 생존률 (2010 ~ 2014)



Potential reasons for early mortality

- Recipient Factors (From domestic environments)
 - Preop severity
 - Age
 - Underlying disease (IPF or DILD >> COPD) -> Double >> Single
- Donor Factor (probably uncorrectable)
 - Donor shortage & Increased duration on waiting lists
 - Low donor utilization
- Postoperative period (From evidences)
 - PGD
 - Acute rejection
 - Infection

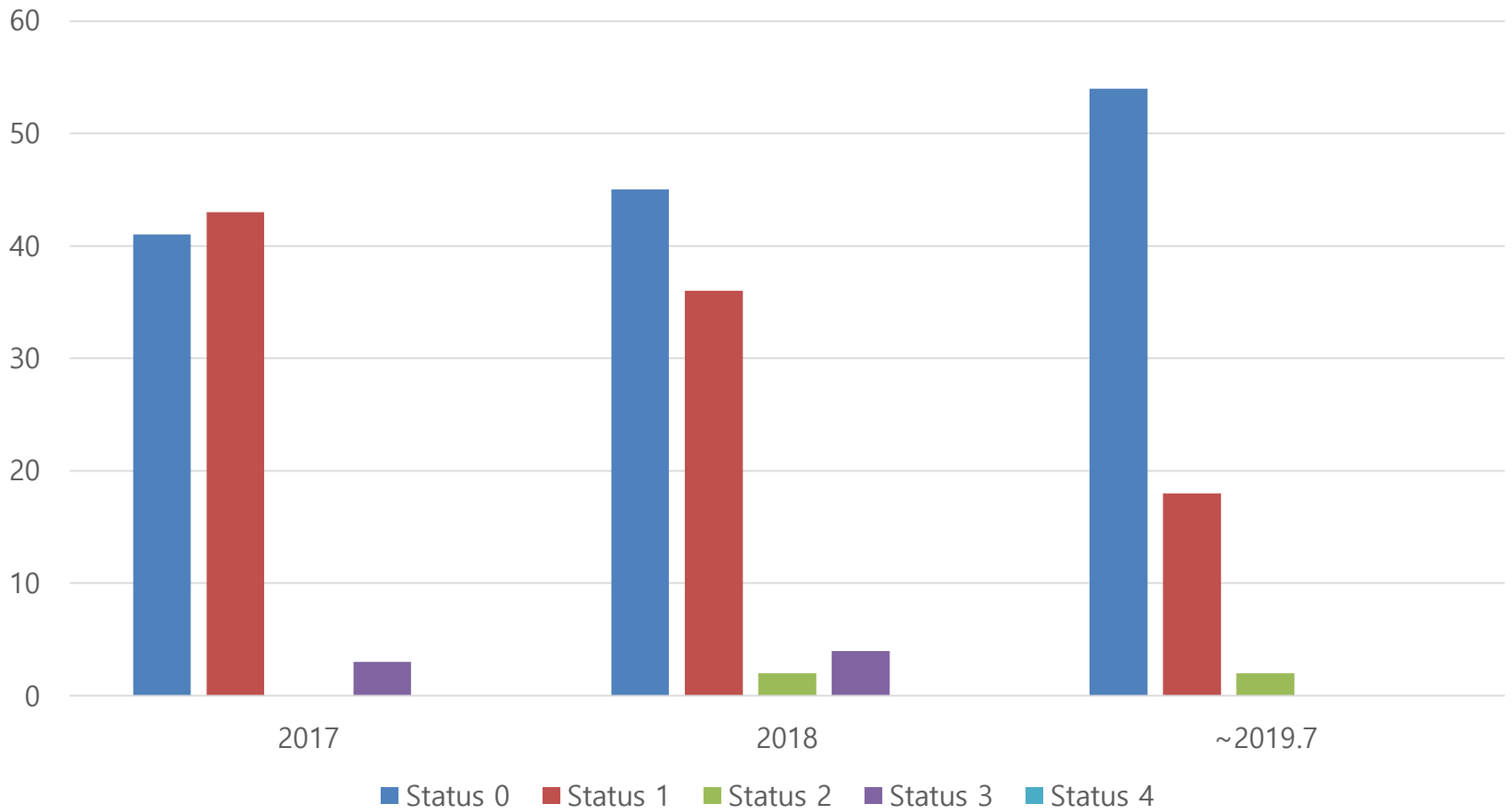
- 장기등 이식에 관한 법률 시행령 [별표5] 이식대상자 선정기준 2. 장기별 기준
다. 심장 및 폐 1)의 응급도의 기준은 아래와 같다.

구분	심장	폐
응급도 0	- 중환자실에 입원한 환자로 등록일 기준으로 다음 한가지 이상 해당하여야 한다. 1) 인공호흡기를 부착중이면서 좌심실이나 우심실 조력 장치(LVAD or RVAD)를 하고 있는 환자 2) 인공호흡기를 부착중이면서 체외막형 심폐기 가동중인 환자	- <u>입원한 환자로</u> 다음 한가지 이상 해당하여야 한다. 1) 호흡부전증으로 인공호흡기(Intubation ventilator)를 부착중인 환자 2) 체외막형 심폐기를 가동중인 환자
응급도 1	- 입원한 환자로 등록일 기준으로 다음 한 가지 이상 해당하여야 한다. 1) 인공심장(Artificial heart) 2) 인공호흡기를 부착하지 않은 좌심실이나 우심실 조력 장치(LVAD or RVAD) 3) 인공호흡기를 부착하지 않은 체외막형 심폐기 가동중인 환자 4) 대동맥내 풍선 펌프(Intraaortic balloon) 5) 심부전으로 인한 인공호흡기를 부착중인 환자 6) 연속적으로 4주 이상 정맥내 강심제 투여중인 환자	- 다음 한가지 이상 해당하여야 한다. 1) NYHA IV 이면서 산소 투여 측정된 동맥혈 가스 검사상 $PaO_2 < 55\text{mmHg}$ 2) NYHA IV 이면서 평균 폐동맥혈압 $> 65\text{mmHg}$ 또는 평균 우심방 혈압 $> 15\text{mmHg}$ 3) Cardiac index $< 2\text{L/min/m}^2$ 인 경우
응급도 2	- 등록일 기준으로 다음에 해당하여야 한다. · 4주 미만 정맥내 강심제 투여중인 자	- 다음 한가지 이상 해당하여야 한다. 1) 폐기능 검사에서 1초 강제호기량(FEV1) $< 25\%$ 2) 산소 없이 측정된 동맥혈 가스 검사상 $PaO_2 < 60\text{mmHg}$ 3) 평균 우심방 혈압이 10-15mmHg인 경우 4) 평균 폐동맥압력이 55-65mmHg인 경우 5) Cardiac index $< 2.25\text{L/min/m}^2$ 인 경우

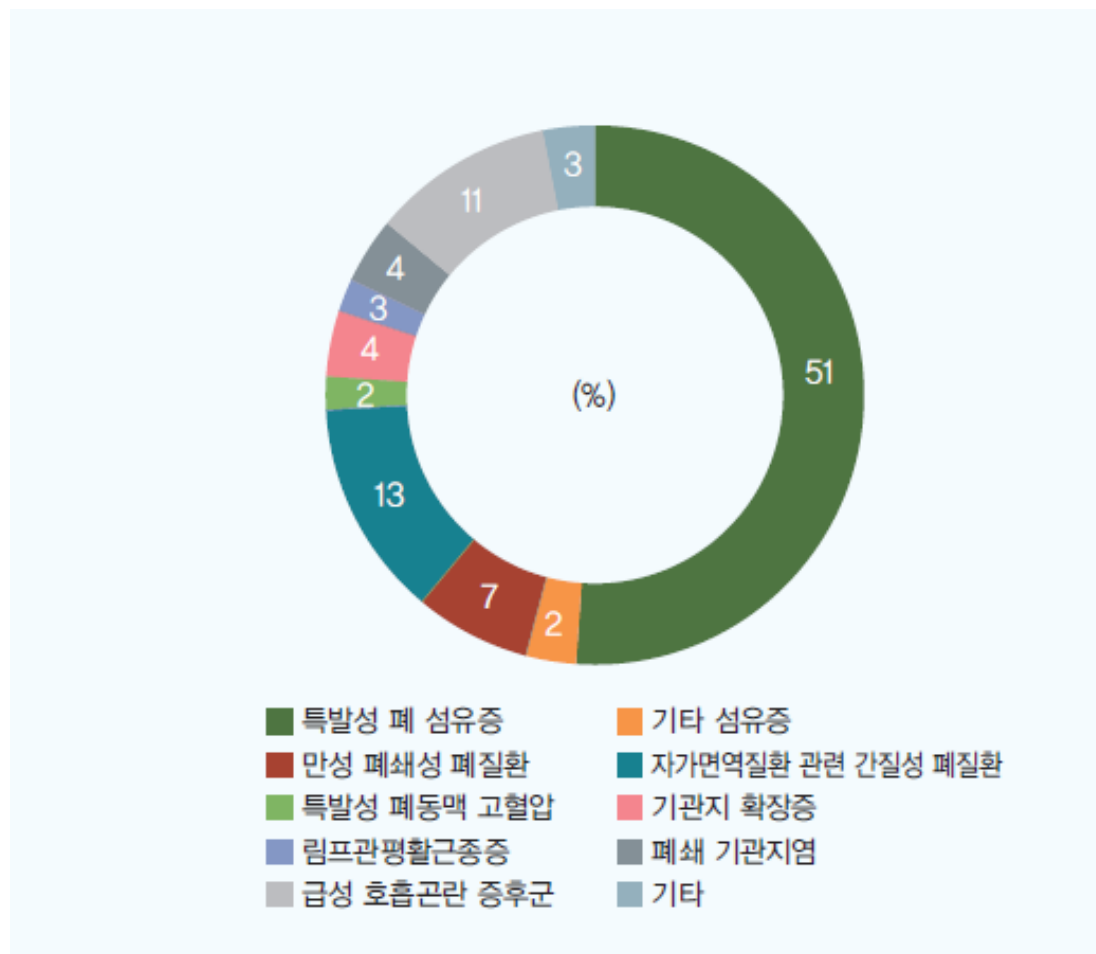
자 선정기준 2. 장기별 기준

폐
환자로 다음 한가지 이상 해당한다. 전증으로 인공호흡기(Intubation or)를 부착중인 환자 형 심폐기를 가동중인 환자
1) 이상 해당하여야 한다. IV 이면서 산소 투여 측정된 가스 검사상 $PaO_2 < 55\text{mmHg}$ IV 이면서 평균 폐동맥혈압 nHg 또는 평균 우심방 혈압 nHg index $< 2\text{L/min/m}^2$ 인 경우
1) 이상 해당하여야 한다. 검사에서 1초 강제호기량(FEV1) 1) 측정된 동맥혈 가스 검사상 60mmHg 심방 혈압이 10-15mmHg인 경우 동맥압력이 55-65mmHg인 경우 index $< 2.25\text{L/min/m}^2$ 인 경우 가 1) 이상 해당하여야 한다. 1)이식이 필요한 경우 폐고혈압, DILD 검사에서 노력호기량 $< 30\%$ -전증으로 3번이상 입원한 경우 1,2,3에 해당 되지 않는 모든

최근 3년간 수혜자 응급도



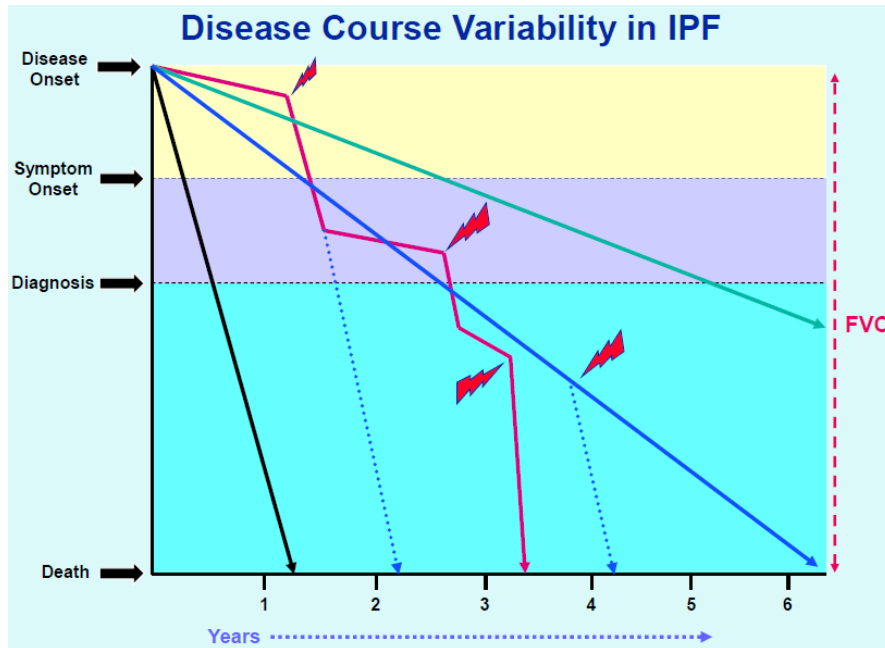
폐이식의 원인 질환



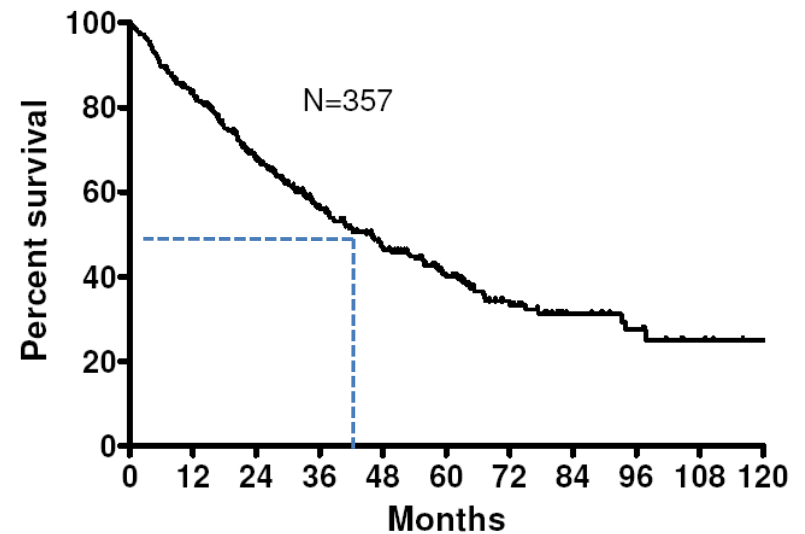
Timing of Referral

- **General principle**
 - Predicted 2-3yr survival $\leq 50\%$
 - Functional class: NYHA III or IV ; MRC 2-3
- **Consider waiting time**
 - Variable
 - Height, blood group

For example,

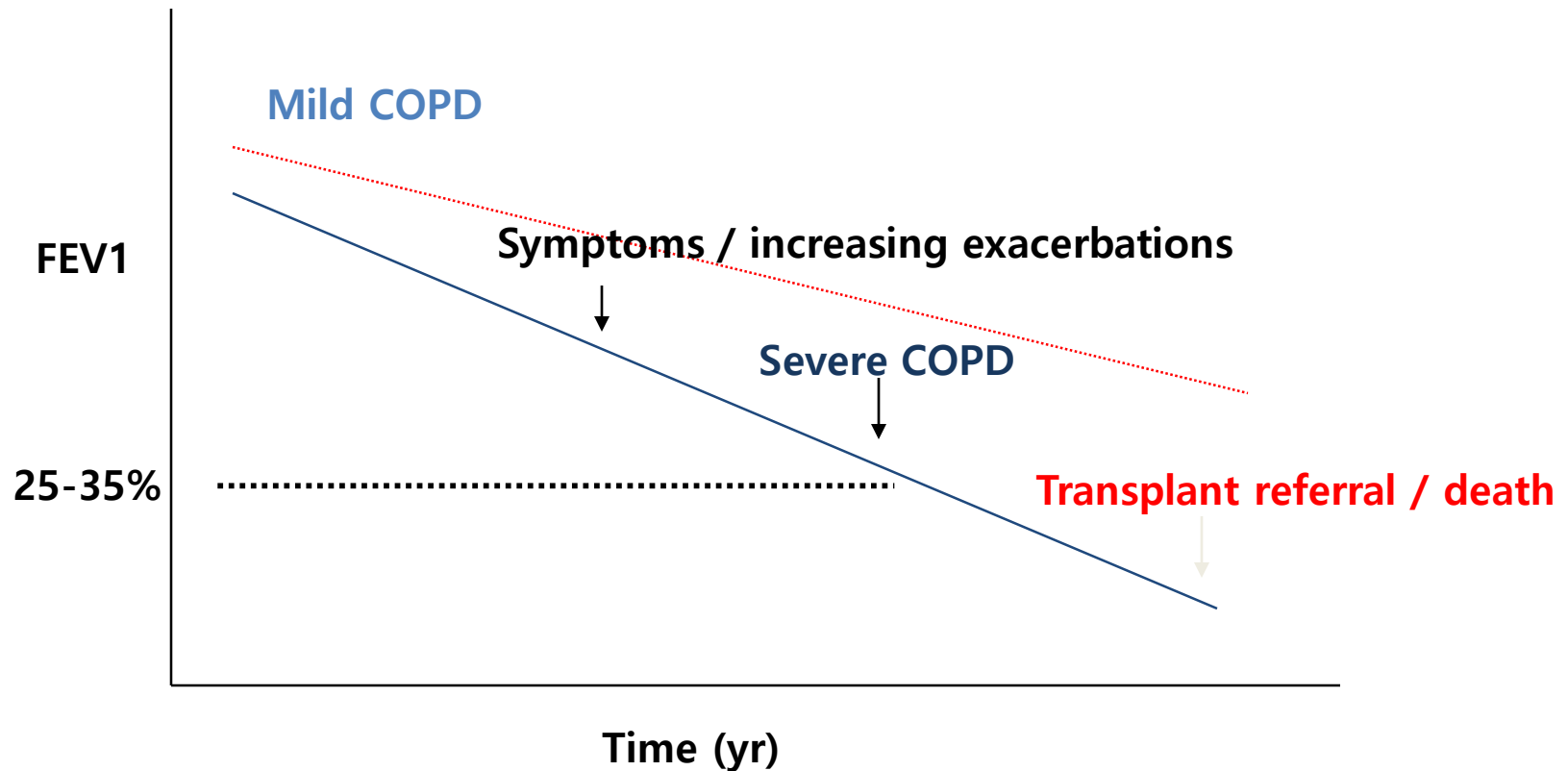


Long term course of IPF



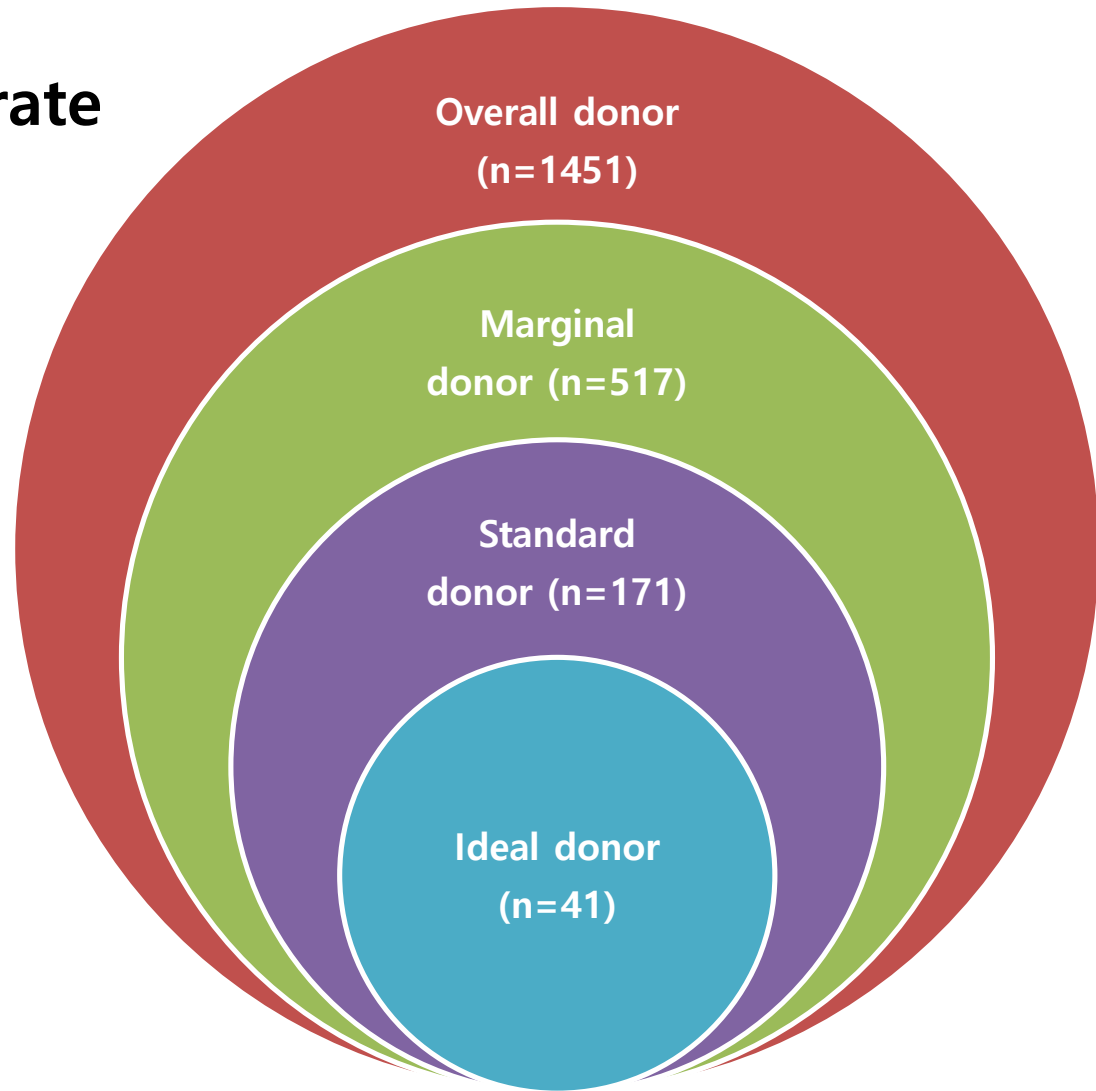
Nathan et al. Chest. 2011

For example,

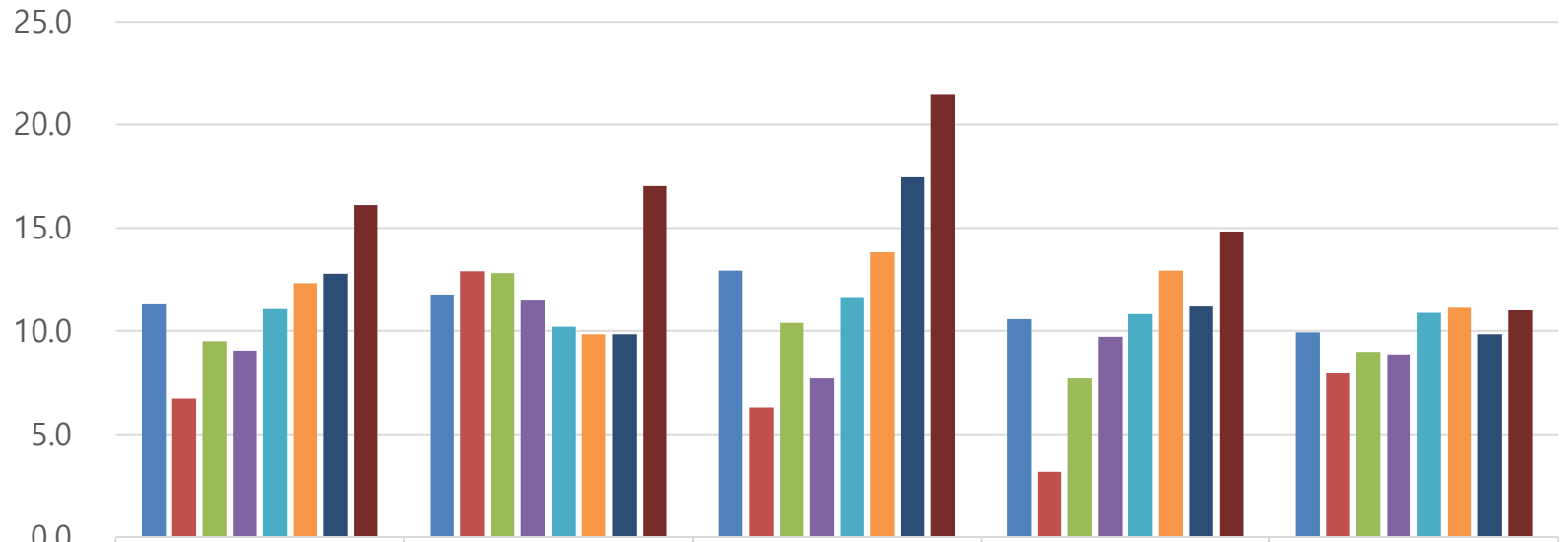


Decline in lung function to point of very severe disease, death, or transplant

Donor shortage d/t low utilized rate



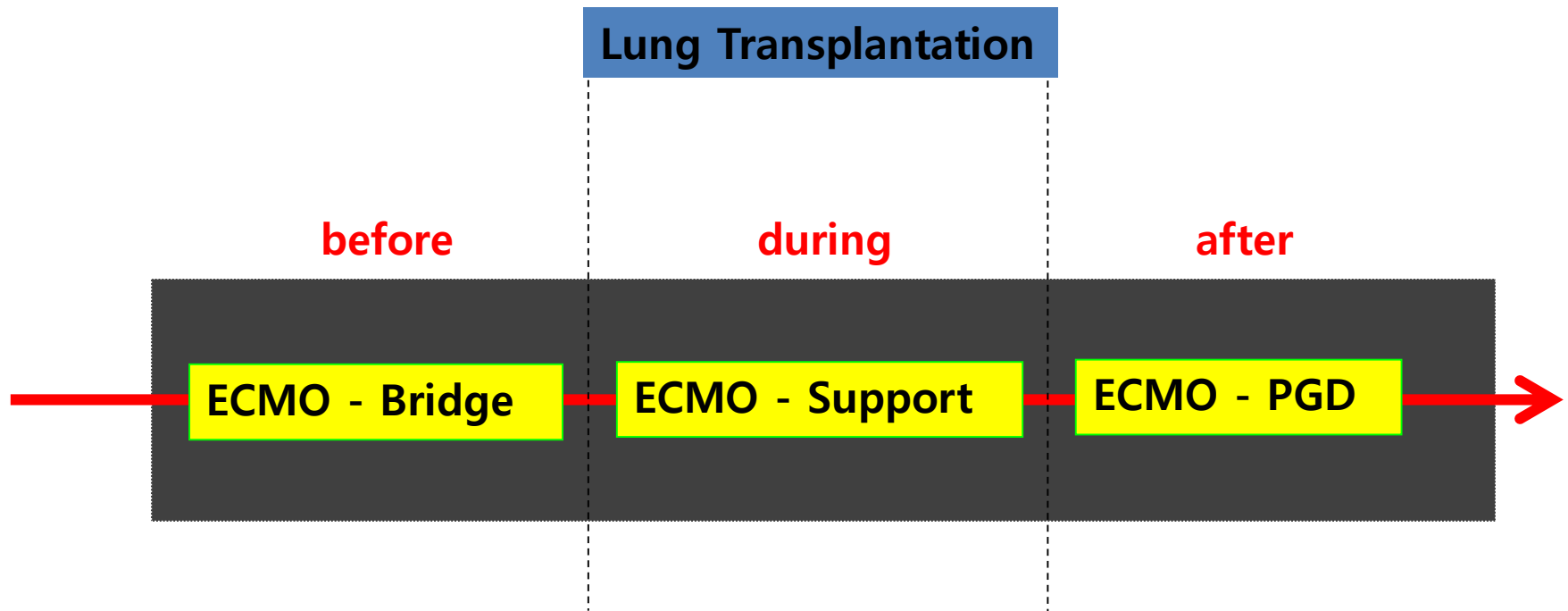
혈액형별 뇌사자 대비 폐장 공여 비율



	합계	AB	A	B	O
총공여비율	11.3	11.8	12.9	10.6	9.9
2010	6.7	12.9	6.3	3.2	7.9
2011	9.5	12.8	10.4	7.7	9.0
2012	9.0	11.5	7.7	9.7	8.9
2013	11.1	10.2	11.6	10.8	10.9
2014	12.3	9.8	13.8	12.9	11.1
2015	12.8	9.8	17.5	11.2	9.8
2016	16.1	17.0	21.5	14.8	11.0

■ 총공여비율
 ■ 2010
 ■ 2011
 ■ 2012
 ■ 2013
 ■ 2014
 ■ 2015
 ■ 2016

Role of ECMO in Lung Transplantation



Awakening ECMO + ICU rehabilitation



Postoperative Rehabilitation

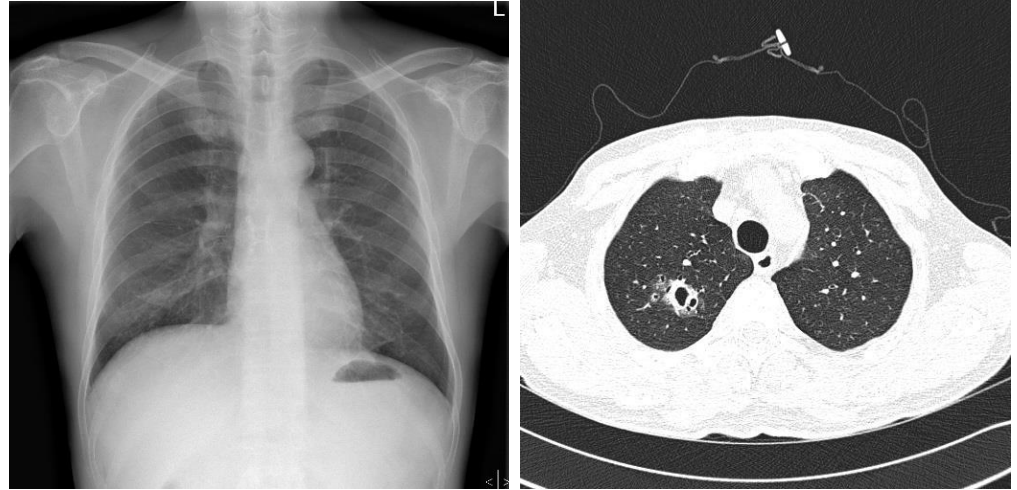
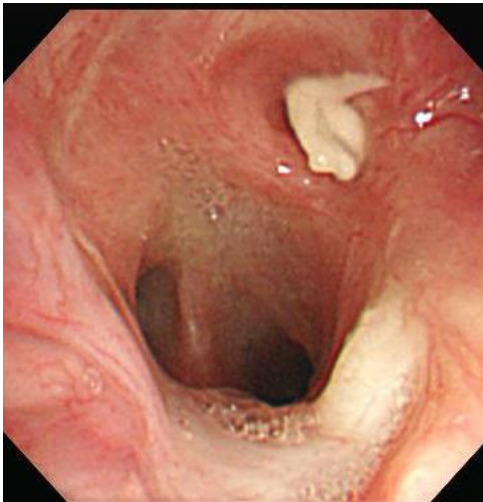


Delicated F/U is crucial!

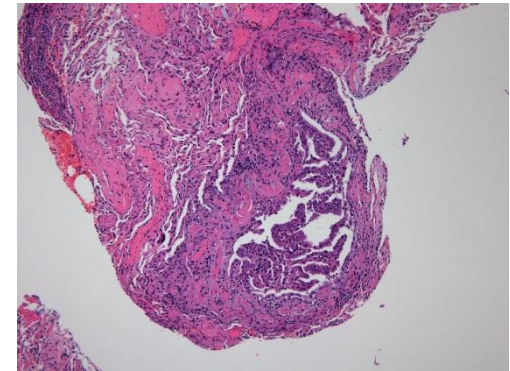
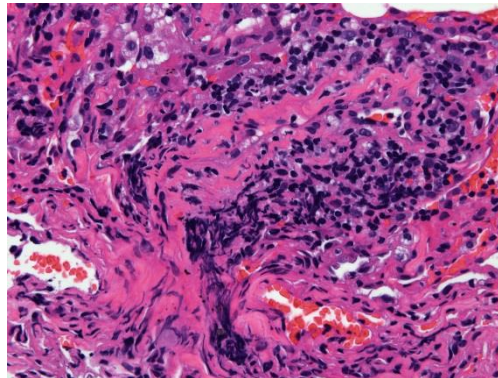
- Too many early Cx...

NTM

Invasive Aspergillosis



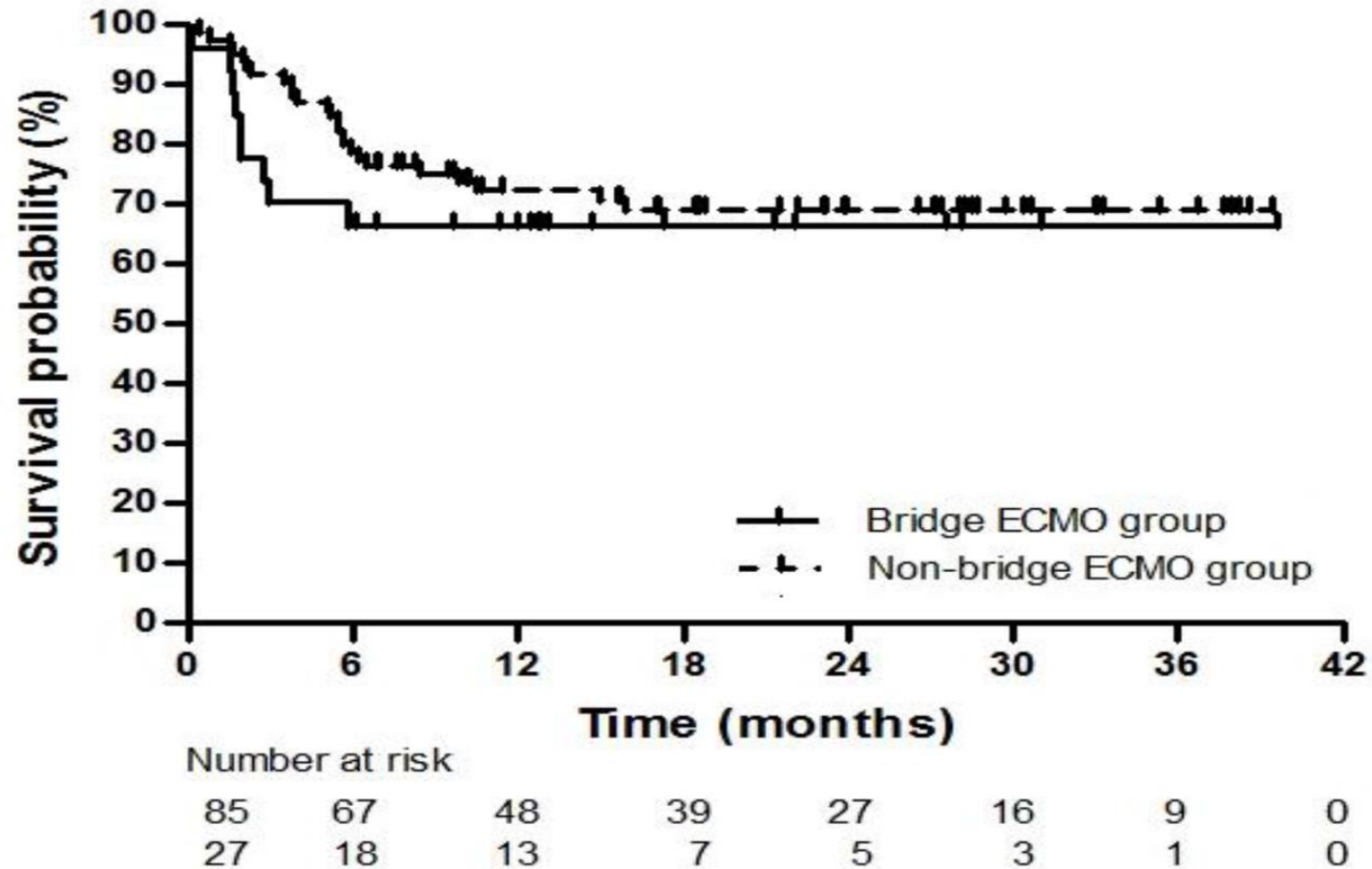
Acute & Chronic rejection



How to improve early outcome !

- **Patient selection !!!**
- **Donor shortage**
 - Early registration of waiting list (actually timely)
 - Donor Lung Care & utilized rate 
 - Legislation for increased donor pool
- **Learning Curve -> Center volume**

Lung Transplantation after Bridge with Extracorporeal Membrane Oxygenation: Analysis of Korean Organ Transplantation Registry (KOTRY) data



PNUYH

