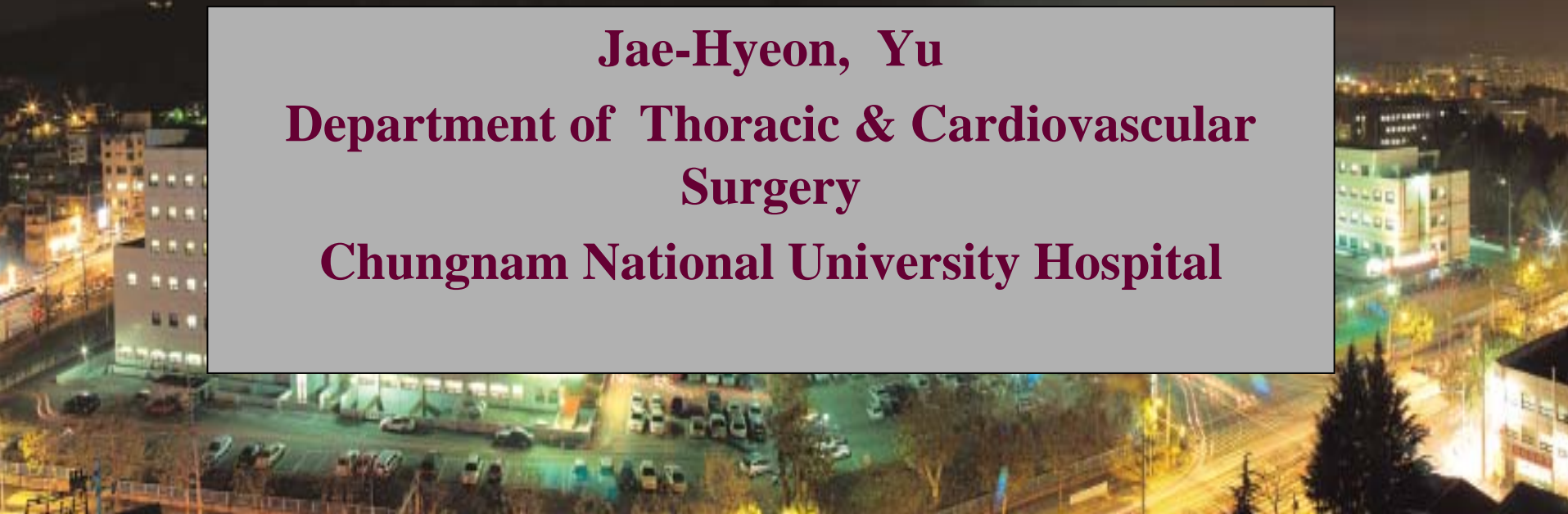


# **SURGICAL REPAIR VS DEVICE CLOSURE of 2 ASD**

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# Surgical Closure of ASD

- Surgical repair with CPB since 1953
- Essentially routine with expectation of zero mortality & minimally surgically related morbidity
- Secondary Outcomes – Cosmetics (Size & location of operation ), convalescence time, cost etc

	<b>Surgery</b>	<b>Device</b>
Indications	any ASD regardless of anatomy	Selected case of 2 ASD
Use of CPB	Yes	No
Closure rate	Complete closure	Immediately residual shunt
Complications	Minimal morbidity ( minor transient Cx)	A few Cx if occurs, severe , requiring surgical intervention
Convalescence Time	Longer than device ( shorter in minimal invasive surgery )	shorter
Cosmetics	Good in minimal invasive surgery	excellent
Cost		Higher cost
Long-term follow up data	Yes, excellent long term result	Only immediate-, short, and intermediated results

# Indications

## Surgery

- Any kinds ASD regardless of anatomy
- Associated cardiac anomaly can be treated

## Device Closure

- Isolated Type II ASD
- Sufficient rim of ASD more than 5 mm
- Size limitation

# Closure rate

Surgery	Device
<p data-bbox="154 451 847 586">Nearly complete closure at immediate postop.</p> <p data-bbox="154 618 847 753">No residual shunt in recent follow up data</p>	<p data-bbox="967 451 1494 586">Masura et al ( JACC 2005:45:505-7)</p> <ul data-bbox="967 618 1494 768" style="list-style-type: none"><li>-- 79.4% immediate</li><li>-- 99.4% in 2yrs</li></ul> <p data-bbox="967 799 1467 935">Fisher et al. ( Heart 2003 ;89:199-204)</p> <ul data-bbox="967 966 1494 1116" style="list-style-type: none"><li>--84,7% immediate ,</li><li>--94% at 2.3 yr f/u</li></ul>

# Cosmetics

- Minimal invasive procedure ( limited exposure) rather than full sternotomy

: Partial sternotomy,

Thoracotomy for adult (submammary skin incision )

Transxiphoid approach without sternotomy

--- satisfactory cosmetic result without compromising the safety or accuracy of the repair

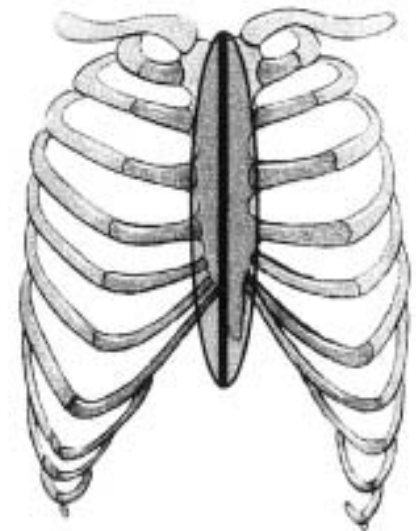
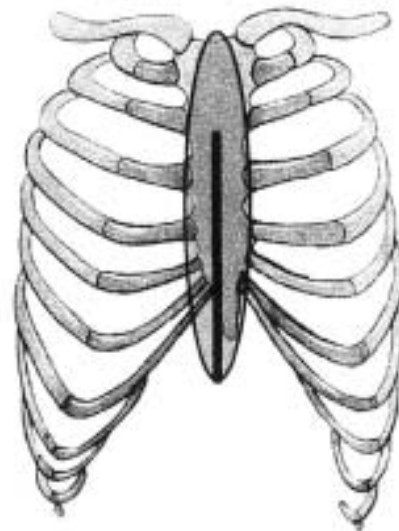
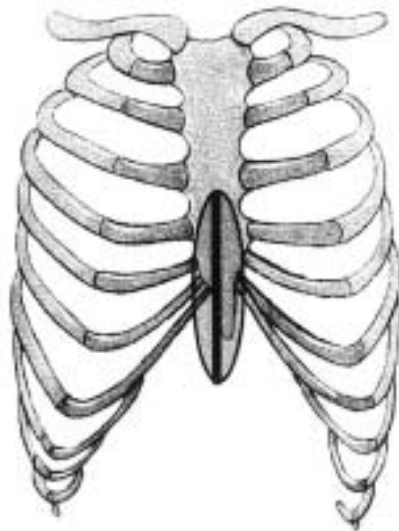
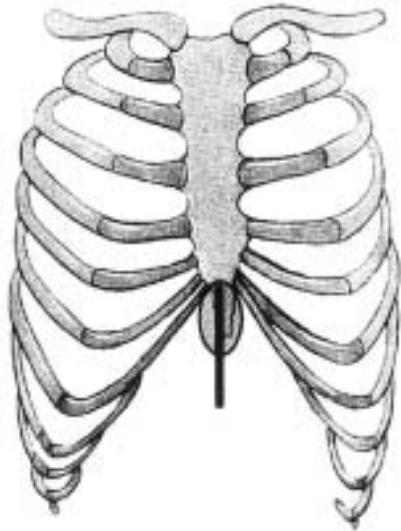
# Less Invasive Surgery

Group A

Group B

Group C

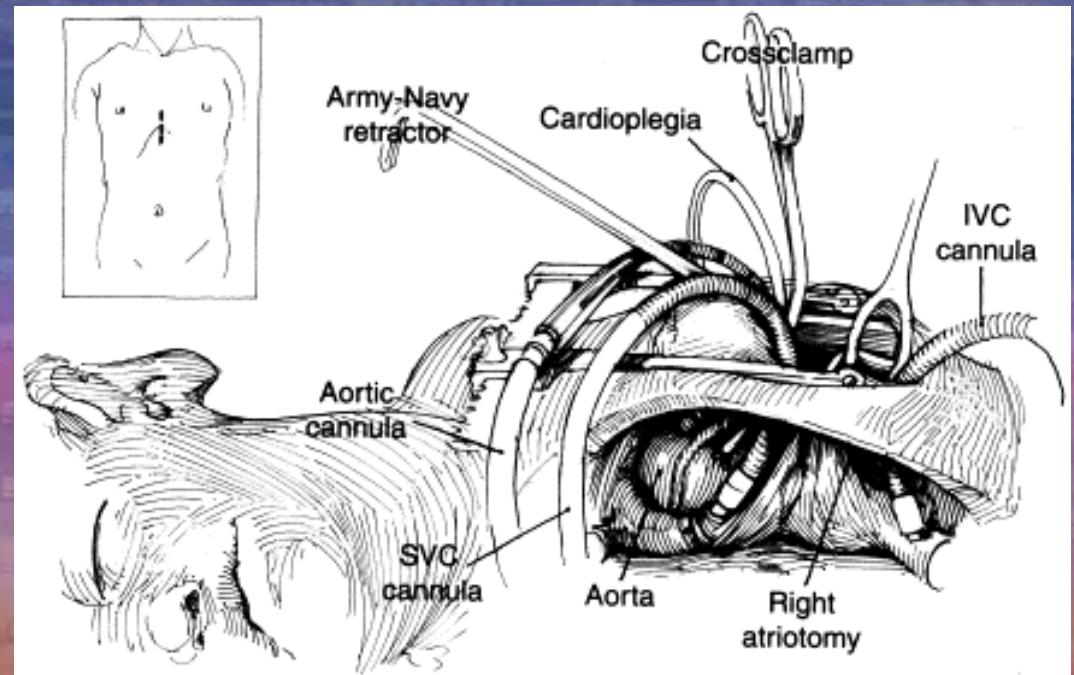
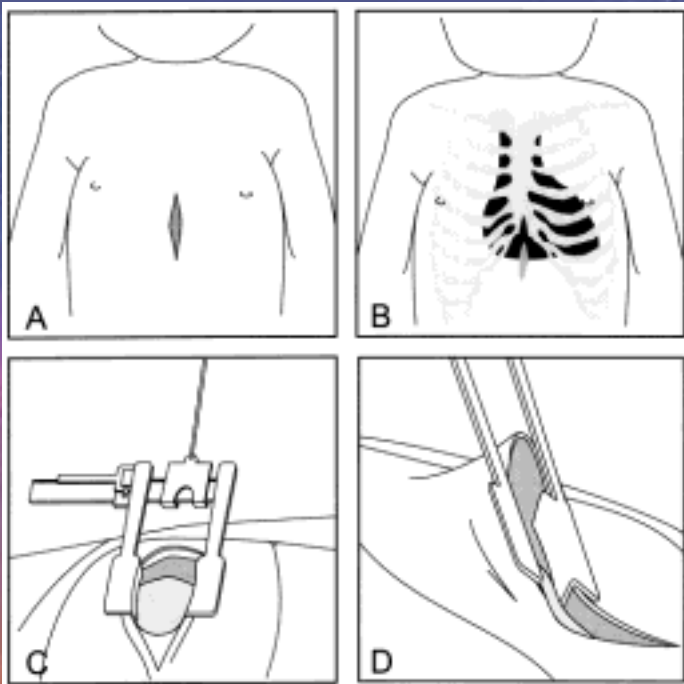
Group D



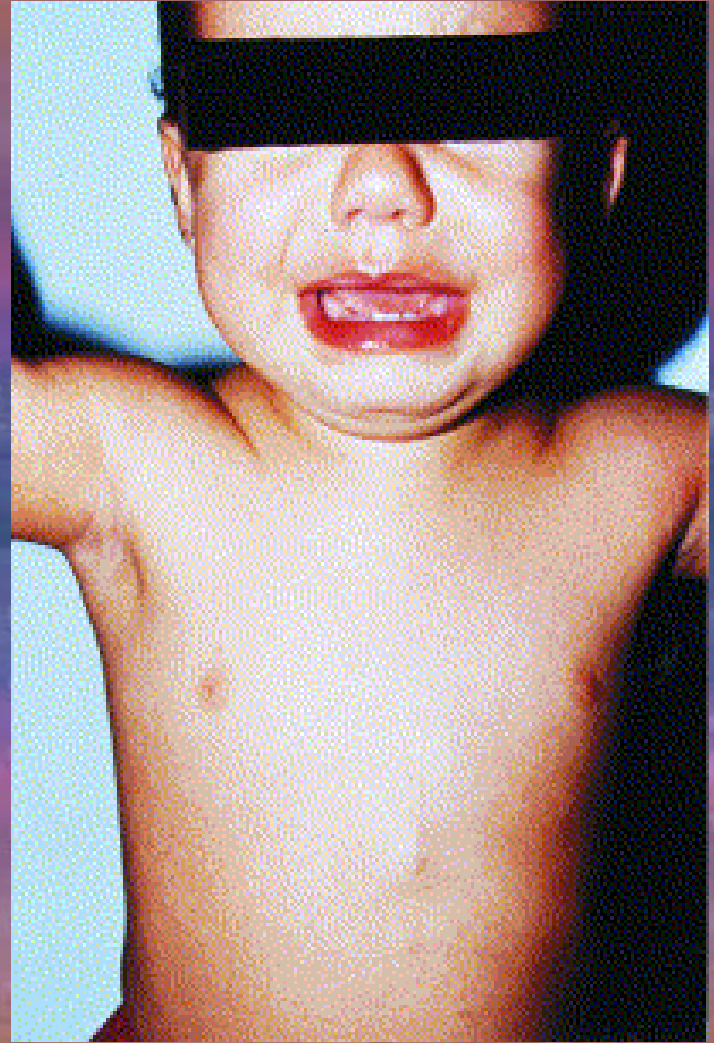
Length of skin incision



Extent of sternotomy







CNUH

# Surgical results for limited exposure

- 1992-1997, 115 isolated ASD (M:F = 40:60)
- Median age 4yr ( 3 months – 32yrs) ; 12 < 1yr, 13 > 10 yr
- Limited midline horizontal incision ( 3 – 8 cm ) exposure
- Cardiopulmonary bypass with fibrillating heart
- Median CPB time 23min( 10-30 min) , arrest time 20min(10-27) Extubation median 3hr, median stay in ICU ; 7hr, median hospital stay 4day
- No deaths, no conversion to full sternotomy, 6 minor cx : transient junctional tachycardia, 2 increased chest drain,

# Surgical results for limited exposure

*David P. Bichell et al, Children's Hospital of Boston, Ann Thorac Surg 2000*

- 1996-1998 200 isolated ASD, 1mo-34yr
- Full sternotomy (65cases, median 3year )
- Limited sternotomy ( 135 case median age 5 yr )

# Surgical results for limited exposure

Variables	Ministernotomy	Sternotomy
<b>Concomitant procedures</b>		
PDA ligation	2	8
Pulmonary valvotomy	2	4
Mitral valve repair	6	4
Tricuspid valve repair	1	0
Warden procedure	1	6
LSVC ligation	1	0
Cor membrane resection	0	2
Epicardial pacer	0	1
LPA plasty	1	0
<b>Hospital course (mean <math>\pm</math> SD)</b>		
Bypass time (min)	43 $\pm$ 14	56 $\pm$ 22
Aortic crossclamp (min)	22 $\pm$ 9	31 $\pm$ 17
Length of stay (days)	2.7 $\pm$ 1	4.5 $\pm$ 6
<b>Complications</b>		
Total readmissions	5 (3.7%)	5 (7.7%)
Cardiac readmissions	4 (2.9%)	3 (4.6%)
Pericardial effusion	4 (2.9%)	2 (3.1%)
Pericardiocentesis	2 (1.5%)	1 (1.5%)

# Surgical Outcome : Effect of CPB

- Cognitive function not affected by CPB in Children:

*Peter L. Stavinoha etc, Circulation.2003:107:2722-2725*

- No marked adverse neurologic effects of CPB in school-age children and young adults undergoing CPB:

*European Journal of Cardio-Thoracic surgery  
26(2004)920-925*

# Long-term after surgical ASD closure at young age

## Excellent survival and low incidence of arrhythmias, stroke and heart failure long-term after surgical ASD closure at young age

- A prospective follow-up study of 21–33 years
- 135 ASD-patients, operated in childhood,
- studied longitudinally with ECG, echocardiography, exercise testing and Holter-recording 15 (10–22) and 26 (21–33) years after surgery.
- Results : no cardiovascular mortality, stroke, heart failure and no pulmonary hypertension
- The incidence supraventricular tachyarrhythmias is lower than in natural history studies of ASD patients and also lower than after surgical correction at adult age
- Left and right ventricular function and dimension remained unchanged. Slightly more patients had right atrial dilatation at last follow-up.
- Exercise capacity was comparable with the normal Dutch population.

*J.W Roos-Hesselink<sup>a,\*</sup>, European Heart Journal 2003 : 24,190*

# Complications

## Surgery

- Minor Cx
- Transient arrhythmia
- Pericardial effusion
- Minor Wound problems

## Device

- Device malposition
- Residual shunts
- Hemolysis, thromboembolism
- Embolization into RV, pulmonary artery tree, peripheral embolization into leg,
- Partial occlusion of SVC, damage to mitral or tricuspid valves,
- Sudden cardiac death after implantation of an Amplatz device
- Erosion of device Late cardiac perforation

# Complications in device closure

- Complication rate is low in recent data
- Late complications are rare but serious
- Delayed ASO embolization
- Cardiac perforation 6 months after ASO implantation ( J Am coll Card 2002;39:1061-5)
- Aorta- to -right atrial fistula caused by erosion into aorta by right atrial disc of ASO
- Infective endocarditis



# Complications of Device

- 16 reported cases of hemopericardium following Amplatz device implant ( 2003 )
  - Reported late erosions or perforations – 4weeks, 5 weeks, 3 months, 8 months
- 28 case erosion ( 14 USA) ( Catherter Cardiovasc interv 2004:63:496-502)

# Comparison of results( 1)

- Multicenter Nonrandomized Trial ( 29 cardiology centers )

J Am Coll Cardiol 2002;39:1836-44

	Surgery (154 )	Device (442)
Age	5.9+/- 6.2	18.1+/-19.3
Procedure attempt success	100%	95.7%(423/442)
Immediate procedure success	100%	97.6%
Procedure success at 6 months	100%	97.2 %
Early efficacy success	96.1 %	94.8%
Secondary efficacy success	89%	91.6%
Major Cx	5.2%	0.2%
Cardiac arrhythmia treated	5.8%	2.7%
Surgical reintervention	0	1.1%(5/442)
Procedure Time(min)	159+/-54.1	105.7+/_43.2
Length of hospital stay(day)	3.4+/-1.2	1/.0+/-0.3

# Comparison of results of Cx

- Multicenter Nonrandomized Trial ( 29 cardiology centers )

J Am Coll Cardiol 2002;39:1836-44

	Surgery(154)	Device(442)
Major Cxs	8(5.4%)	7(1.6%)
Cardiac arrhythmia requiring Tx		2(0.5%)
Device embolization with surgical removal		3(0.7%)
Maker band embolism with surgical removal		1(0.2%)
Cerebral embolism		1(0.2%)
Pericardial effusion	3(1.9%)	
Pulmonary edema	1(0.6%)	
Repeat surgery ( pericardial effusion)	2(1.3%)	
Surgical wound Cx	2(1.3%)	
Minor Cxs	29(18.8%)	27(6.1%)

# Cost

- About 350-500 (CNUH)
- Covered by health insurance
- High cost in Korea
- About 1000
- Not covered by health insurance

# Technical problems

- 1cm ASD : no problem
- 3mm posterior rim is not effective for device closure
  - : Recommended criteria  $> 5\text{mm}$  rim
    - Potential risk of obstruction of near structures & erosion of heart due to bulky device

# Conclusion

- Surgery is better choice in this case than device closure
  - 1) no long- term follow-up data in device closure & lack of randomization study
  - 2) In device closure, Cx is few but if occurs , severe and need surgical procedures( device erosion & perforation of heart , device malposition, embolization etc )
  - 3) Deficient posterior rim ( < 5 mm) may occur serious Cx
  - 4) Less invasive surgical procedures ( limited sternotomy, transxiphoid approach ) may have comparable results with device closure in cosmetics & convalescence times
  - 5) surgeon's ability to close any ASD regardless of anatomy is important advantage of surgery



Thank You !