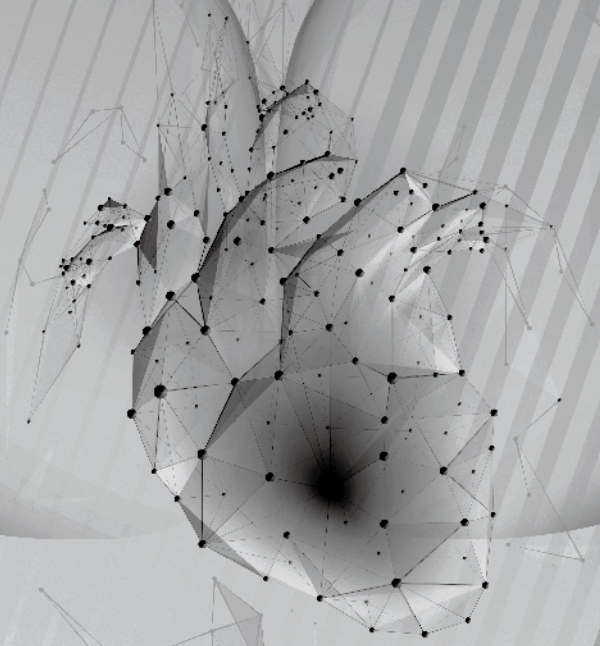
HONAM
CIRCULATION
SOCIETY



2019 제126차
호남순환기학회
학술대회 및 연수강좌

2019. 9. 20. FRI - 21. SAT

첫째날. 익산 웨스턴라이프 호텔 B2 그랜드볼룸홀

둘째날. 원광대학교 의과대학 제2의학관
(권역외상센터 7층 제생의세홀)

호남순환기학회
HONAM CIRCULATION SOCIETY

프로그램

9월 20일(금) Satellite Symposium with Dinner			
18:00–21:40	익산 웨스턴라이프 호텔	**진행** 윤남식, 이선화	
18:00-19:00	식사		
19:00-19:50	**Session I. 인문학 강좌**	**좌장** 홍순표(조선의대), 주찬웅(전북의대)	005
19:00-19:30	서동과 선화공주, 그리고 세계유산	이다운(원광대역사교육과)	006
19:30-19:50	**토의** 김용욱(광주기독병원), 김원호(전북의대), 박영봉(조선의대), 장경식(조선의대)		
19:50-20:40	**Session II. 잊혀지지 않는 환자들**	**좌장** 배종화(경희의대), 정진원(원광의대)	017
19:50-20:05	Unforgettable cases 1	주찬웅(전북의대)	018
20:05-20:20	Unforgettable cases 2 – Memory Yoga	최경훈(원주의대/최경훈내과)	022
20:20-20:40	**토의** 박혁진(전남의대), 오성식(전주예수병원), 윤현주(전남의대), 황선호(광주보훈병원)		
20:40-21:40	호남순환기학회의 밤		
9월 21일(토)			
08:20-12:40	원광대학교병원 신강당	**진행** 윤남식, 이선화	
08:20-08:30	개회사	정명호(호남순환기학회 이사장)	
08:30-09:30	**Session I. 심혈관질환의 최신 지견 1**	**좌장** 김원호(전북의대), 정명호(전남의대)	025
08:30-08:45	Renal denervation update for management of hypertension	김주한(전남의대)	026
08:45-09:00	Antiplatelet therapy in patients with coronary artery disease	윤경호(원광의대)	028
09:00-09:15	Debates in secondary prevention of IHD	이상록(전북의대)	036
09:15-09:30	**토의** 강동구(목포중앙병원), 김현욱(광주기독병원), 임지현(전주예수병원), 조장현(순천성가롤로병원)		
09:30–09:50	**기념사진촬영 / Coffee Break & Oral Poster Session**		039
	Oral poster presentation	**Moderator** 박영봉(조선의대), 김송이(제주의대)	040
	토의 공영화(전북의대), 기영재(조선의대), 김이슬(전남의대), 송지은(전주예수병원), 이자연(전북의대)		
09:50–10:50	**Session II. 심혈관질환의 최신 지견 2**	**좌장** 조정관(전남의대), 장경식(조선의대)	049
09:50–10:05	Cryoablation of AF	이우석(여수제일병원)	050
10:05–10:20	Arrhythmias in infiltrative heart disease	고점석(원광의대)	068
10:20–10:35	Update in clinical indications of TAVAR	박종필(전주예수병원)	078
10:35–10:50	**토의** 김남호(원광의대), 김동한(광주건강관리협회), 김우진(광주기독병원), 정래영(전북의대)		
10:50–12:10	**Session III. Session for Rising Stars**	**좌장** 길광채 (가슴뛰는내과), 오석규 (원광의대)	093
10:50–11:05	Current status of PCI in STEMI and multivessel disease	김민철(전남의대)	094
11:05–11:20	Differential clinical outcomes of antiplatelet regimens according to lesion locations in patients with PAD	조재영(원광의대)	096
11:20–11:35	LV dyssynchrony between RV septal pacing and RV apical pacing	김성수(조선의대)	098
11:35–11:50	How to optimize CRT performance in HF patients	정래영(전북의대)	106
11:50–12:10	**토의** 김송이(제주의대), 김이식(전북의대), 박형욱(전남의대), 이상재(원광의대)		
12:10–12:50	**Special Lecture**	**좌장** 고영엽(조선의대), 안영근(전남의대)	109
12:10–12:30	Clinical use of PCSK9 inhibitor	홍영준(전남의대)	110
12:30–12:40	**토의** 강승호(제주한라병원), 윤경호(원광의대), 이승욱(광주기독병원), 전승진(군산의료원)		
12:40–12:50	우수구연포스터상 시상 및 폐회사	길광채(호남순환기학회 회장)	

Session I. 인문학 강좌

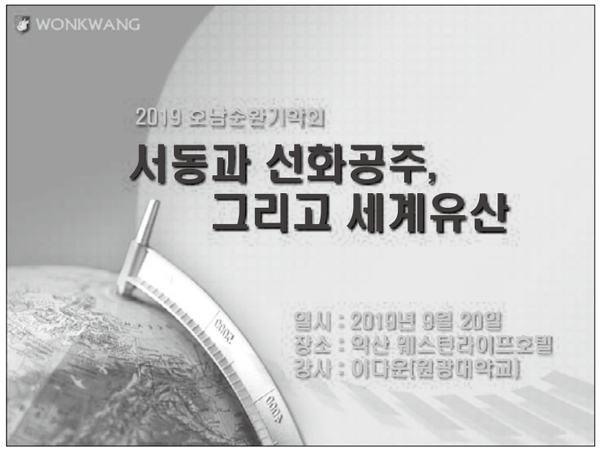
좌장 **홍순표**(조선의대), **주찬웅**(전북의대)

서동과 선화공주, 그리고 세계유산 **이다운** (원광대역사교육과)

MEMO

서동과 선화공주, 그리고 세계유산

이다운(원광대역사교육과)



서동의 고향은?

"백제 30대 무왕(武王)의 이름은 장(璋)이고 그의 어머니는 과부로 서울 남쪽 못가에 집을 짓고 살고 있었는데, 그녀는 그 못의 용과 관계하여 장을 낳았다. 아이 때 이름은 서동(薯童)이다. 재기(才器)와 도량(度量)이 커서 헤아리기가 어려웠다. 늘 마를 캐어 팔아서 생업을 삼았으므로 나랏사람들이 그 때문에 서동이라 이름했다"

『삼국유사』

호남순환기학회

서동요(薯童謠)

"선화공주님은(善花公主主隱) 남몰래 사귀어 두고(他密只嫁良置古)
서동방을(薯童房乙) 밤에 뭘 안고 가다(夜矣 夘[卵]乙抱遣去如)."

『삼국유사』

- 최초의 4구체 향가
- 서동 : 백제 제30대 무왕
- 서동의 직업 : 마(薯)
- 선화공주 : 진평왕 셋째딸
- 백제 ⇔ 신라

호남순환기학회

서동 설화(미륵사 창건 설화)

- 어느 날 왕이 부인과 함께 사자사(師子寺)에 가다가 용화산(龍華山) 아래 있는 큰 못가에 이르렀는데 못 가운데서 미륵삼존(彌勒三尊)이 출현하여 수레를 멈추고 경배하였다.
- 부인이 왕에게 "바라건대 이곳에 대가람을 참으로 이룩하길 원하옵니다" 고 간청하였다.
- 왕이 허락하며 지명(知命)에게 가서 못을 메울 일을 물었더니, 신력(神力)으로 하룻밤 사이에 산을 허물어서 못을 메워 평지로 만들었다.
- 이에 미륵삼존불과 전(殿)·탑(塔)·회랑(回廊)을 각각 세 곳에 세우고 액호(額號)를 미륵사라 하였다(국사(國史)에는 왕흥사(王興寺)라 하였다).
- 진평왕(眞平王)이 백공(百工)을 보내서 도와주었는데 그 절이 오늘에까지 남아 있다.(삼국사기에는 법왕의 아들이라 했는데 여기서는 독년(獨女)의 아들이라고 전하니 자세히 알 수 없다.)

『삼국유사』

호남순환기학회

사자암(獅子庵)

師子寺

MEMO

MEMO


미륵사 창건과정 추정도


국보 제11호 미륵사지 서석탑
1910년
호남순환기학회


동석탑 복원?
1973년
2년 3개월


해체(1999/2001) ⇒ 보수 ⇒ 복원(약 20년간 230억)
호남순환기학회


2019년 4월 30일 준공
1915년
2019년
185톤
1627개
1830톤
14.5m
12.5m
81%
65%
35%
호남순환기학회


동탑 : 기존 부재 33개
호남순환기학회

MEMO

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사리장엄구 1만여 점 발견(2009)

<사리공>
폭 25㎝, 깊이 27㎝

호남순환기학회

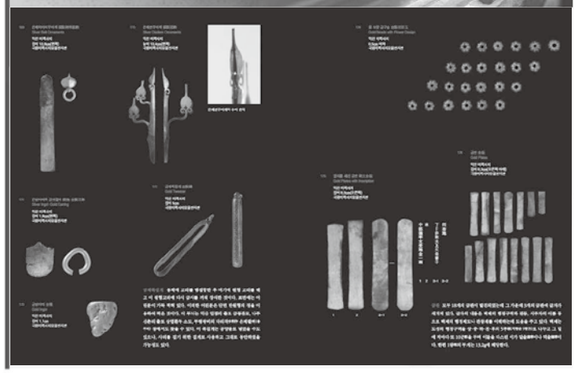
호남순환기학회

사리봉안 추정도

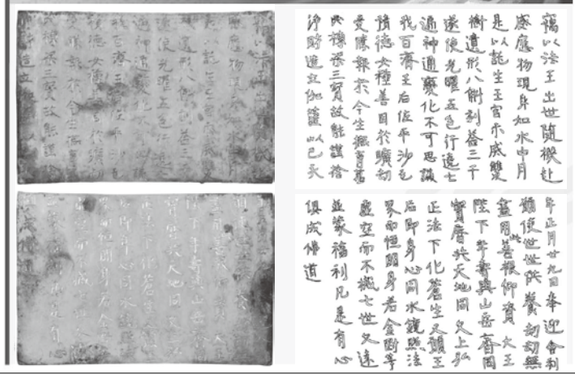
호남순환기학회

부여왕흥사지 사리장엄구

儉而不陋 華而不侈



금제사리봉영기



선화공주는 실존 인물이 아니다?

ⓐ가만히 생각하건데, 법왕(法王)께서 세상에 출현하시어 근기(根機)에 따라 부감(赴感)하시고, 중생에 응하여 몸을 드러내신 것은 마치 물속에 달이 비치는 것과 같으셨다.
그래서 왕궁(王宮)에 태어나시고 사라쌍수(紗羅雙樹) 아래에서 열반을 보이셨으며, 8곡(斛)의 사리(舍利)를 남기시어 삼천대천세계(三千大天世界)를 이익 되게 하셨다.
마침내 오색(五色)으로 빛나는 (사리로)하여금 일곱 번 돌게 하였으니 그 신통변화는 불가사의하였다.

ⓑ우리 백제왕후께서는 좌평(佐平) 사택적덕(沙宅積德)의 딸로 오랜 세월(曠劫)에 선인(善因)을 심으셨기에 금생에 뛰어난 과보(勝報)를 받아 태어나셨다.
(왕후께서는) 만민(萬民)을 어루만져 길러주시고 삼보(三寶)의 동량(棟梁)이 되셨으니, 이에 공손히 정재(淨財)를 희사하여 가람을 세우시고, 기해(己亥)년 정월 29일에 사리를 받들어 맞이하셨다.(후략)

호남순환기학회

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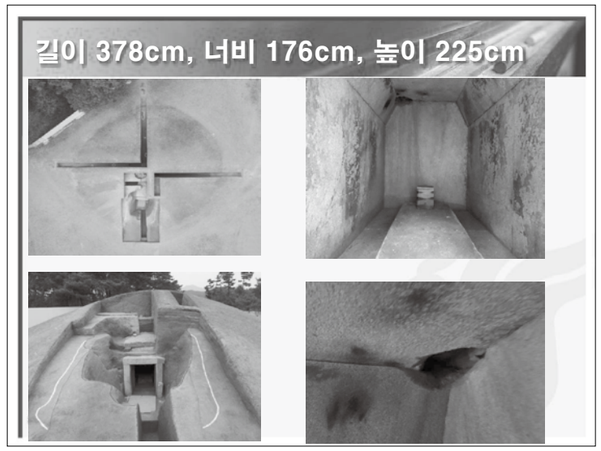
익산에서 왕궁터가 발견되다
호남순환기학회

준왕의 수부? 무왕의 수부? 안승의 수부?
수부(首府)
왕궁사(王宮寺)
정원
도가니


왕궁 화장실


익산에서 왕릉(쌍릉)이 발견되다
호남순환기학회


길이 378cm, 너비 176cm, 높이 225cm


연령 : 60대 전후
키 : 160~170㎝
성별 : 남성,
사망 시점 : 620~659년
호남순환기학회

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익산(금마)는 백제시대 수도?

- 지명 : 왕궁리, 고도리
- 유적 : 미륵사지(백제 최대의 종교시설), 왕궁리유적(백제 유일의 왕궁), 쌍릉(백제 최대의 고분), 서동 생가터, 사찰, 산성 등
- 유물 : 수부명 기와, 최상급 유물
- 백제 무왕도읍설, 별도설, 북도설, 천도계획설, 후백제 견훤도읍설…
- 유일한 단점 : 문헌 부재

호남순환기학회

『관세음응험기』

교토 쇼렌인(青蓮院)에 필사본으로 소장(중요문화재)

<주요 내용>
•백제 무광왕
• '지모밀지' 로 천도
•제석사 창건
•정관(貞觀) 13년(639)에 제석사에 화재
•금당、칠층탑、회랑이 전소
•탑심초석에서 채색 수정병(사리병), 금강반야경이 무사히 잔존
•제석사 재건

호남순환기학회

제석사지

호남순환기학회

제석사 폐기장

호남순환기학회

국보 제289호 왕궁리오층석탑

1917년

1940년

호남순환기학회

해체 과정(1965)

호남순환기학회

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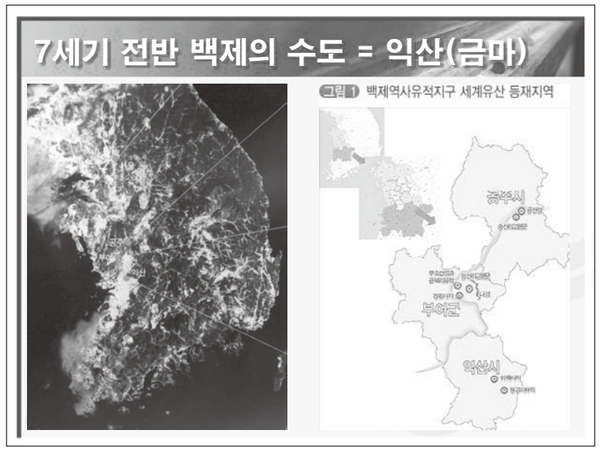

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제126차 호남순환기학회
학술대회 및 연수강좌

Session II. 잊혀지지 않는 환자들

좌장 **배종화**(경희의대), **정진원**(원광의대)

Unforgettable cases 1	**주찬웅** (전북의대)
Unforgettable cases 2 – Memory Yoga	**최경훈** (원주의대/최경훈내과)

Unforgettable cases 1

주찬웅(전북의대)

Unforgettable Cases

Chan Uhng Joo

Department of Pediatrics
Chonbuk National University Hospital

- **A case of CoA treated with Balloon Angioplasty**
- **A case of LQTS(?) or 'School Violence'**
- **A case of Commotio Cordis**
- **A *forgotten* case of VSD**

A Case of Coarctation of the Aorta Treated with Balloon Angioplasty

Chan Uhng Joo, M.D.
Department of Pediatrics, School of Medicine, Chonbuk National University

Balloon dilatation angioplasty was performed in a 15 months old child with isolated discrete unoperated coarctation of the aorta. The peak systolic pressure gradient across the coarctation before balloon angioplasty was 80 mmHg, and immediately after balloon angioplasty it decreased to 19 mmHg. No significant complications were encountered during the procedure.

No evidence of aneurysm formation and restenosis was seen on 6 months follow-up examination.

Balloon dilatation angioplasty seems to be a safe and effective nonsurgical alternative for relieving the obstruction associated with discrete coarctation of the aorta.

KEY WORDS : Balloon dilatation angioplasty · Coarctation of the aorta.

순환기 20:135, 1990

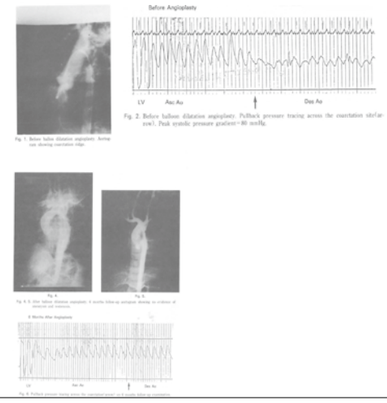
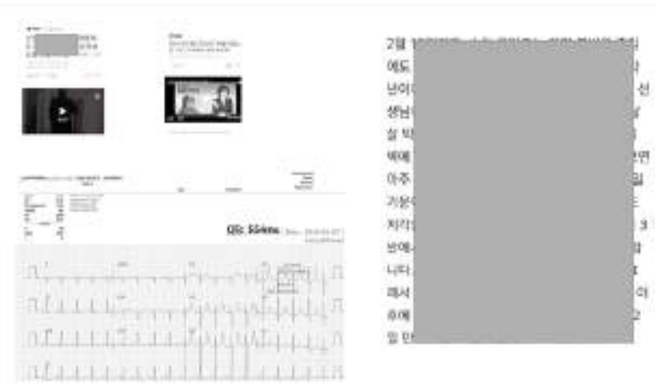


Fig. 1. Before balloon dilatation angioplasty. Aortogram showing coarctation ridge.

Fig. 2. Before balloon dilatation angioplasty. Pullback pressure tracing across the coarctation site(arrow). Peak systolic pressure gradient=80 mmHg.

Fig. 3. One month after balloon angioplasty. Aortogram showing no evidence of aneurysm and restenosis.

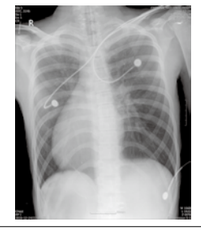
Fig. 4. Pullback pressure tracing across the coarctation site 6 months after angioplasty. No pressure gradient.



A Case of Cardiac Arrest after Blunt Chest Trauma in Patient with Dextrocardia

Commotio cordis is defined as sudden cardiac death secondary to relatively innocent chest wall impact.

- 14-year-old boy with cardiac arrest
- After his friend hit his chest, pulseless and unconsciousness
- CPR start, 1 min, 9 min. 119 rescue
- 3 times electric shock for ventricular fibrillation
- It took 23min to recover sinus rhythm



SCI(science citation index)reports with WKUH

Cardiol Young 1997;7:462

Mycoplasma pneumoniae induced popliteal artery thrombosis treated with urokinase

Postgraduate Medical J 2001;77:723

Another My SCIs

SCI : service contact index

MEMO

Unforgettable cases 2 – Memory Yoga

최경훈(원주의대/최경훈내과)

MEMO

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HONAM
CIRCULATION
SOCIETY

Session I. 심혈관질환의 최신 지견 1

좌장 **김원호**(전북의대), **정명호**(전남의대)

Renal denervation update for management of hypertension	**김주한** (전남의대)
Antiplatelet therapy in patients with coronary artery disease	**윤경호** (원광의대)
Debates in secondary prevention of IHD	**이상록** (전북의대)

Renal denervation update for management of hypertension

김주한(원주의대/최경훈내과)

MEMO

MEMO

Antiplatelet therapy in patients with coronary artery disease

윤경호(원광의대)

Antiplatelet therapy in patients with coronary artery disease

Kyeong Ho Yun, MD.PhD

Cardiovascular medicine,
Regional cardiovascular center,
Wonkwang University Hospital, Iksan, Korea

Regional Cardiovascular center Wonkwang University Hospital

Antiplatelet agent

- For primary prevention
  - Aspirin ???
  - Statin > aspirin
- For secondary prevention
  - Dual antiplatelet therapy
    - Aspirin 75~100mg for life long
    - P2Y12 receptor antagonist for at least 12 months
      - clopidogrel 75mg daily
      - prasugrel 10mg daily
      - ticagrelor 90mg bid daily

AHA Secondary prevention guidelines. JACC 2011
NSTEMI guidelines 2015. EHJ 2016;37:267-315

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Antithrombotic therapy recommendation

2017 STEMI ESC guideline update

I	A

- Ticagrelor (brillinta)는 금기가 없는 한 시술 전 loading하고, 시술 후 12개월 이상 유지한다.
- Prasugrel은 관상동맥 병변을 알기 전에는 투여하지 않는다.
- Clopidogrel (plavix)은 prasugrel, ticagrelor가 금기인 경우 사용한다.
- 아스피린을 모든 환자에서 즉시 사용한다.
- 항혈소판제와 함께 항응고제 (anticoagulant)를 primary PCI 동안에 사용해야 하며 routine으로 heparin을 사용한다.

Ibanez B, et al. Eur Heart J 2018;39:119

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Contents

- **Duration of DAPT**
- Best option after discontinuation of DAPT

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Studies for DAPT duration

Study	N (% ACS)	DAPT (months)	MACE	Bleeding
RESET (2012)	2117 (55%)	3 vs. 12	4.3% vs. 4.7%	0.2% vs. 0.6%
OPTIMIZE (2013)	3119 (32%)	3 vs. 12	6.0% vs. 5.8%	0.6% vs. 0.9%
EXCELLENT (2012)	1443 (52%)	6 vs. 12	4.8% vs. 4.3%	0.3% vs. 0.6%
PRIDIGY (2012)	1970 (75%)	6 vs. 24	10.0% vs. 10.1%	3.5% vs. 7.4%
SECURITY (2014)	1399 (38%)	6 vs. 12	4.5% vs. 3.7%	0.6% vs. 1.1%
ISAR-SAFE (2015)	4000 (40%)	6 vs. 12	1.5% vs. 1.6%	0.2% vs. 0.3%
ITALIC (015)	1850 (23%)	6 vs. 24	1.6% vs. 1.5%	0.5% vs. 0.4%
DES LATE (2014)	5045 (61%)	12 vs. 24	2.4% vs. 2.6%	1.1% vs. 1.4%
ARTIC-INTERRUPTION (2014)	1259 (30%)	12 vs. 24	4.0% vs. 4.0%	0.5% vs. 1.0%
DAPT (2014)	9961 (43%)	12 vs. 30	5.9% vs. 4.3%	1.6% vs. 2.5%

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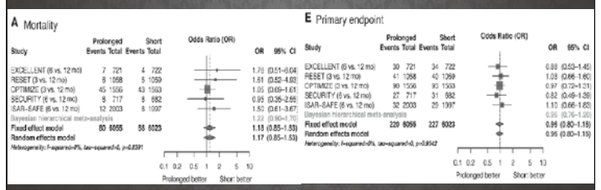
What is the minimum duration of DAPT?

DAPT (dual antiplatelet therapy) duration

3-6 months vs. 12 months



No significant differences in incidence of death, major hemorrhage, MI, or stent thrombosis

Circulation 2016;134:e156–78

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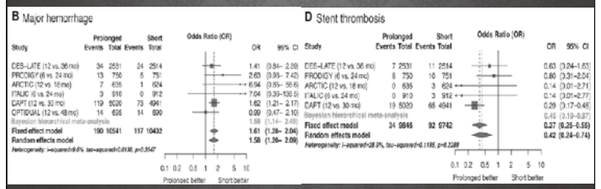
What is the clinical benefit of prolonged DAPT?

DAPT (dual antiplatelet therapy) duration

6-12 months vs. 18-48 months



No significant differences in incidence of death, but increased major hemorrhage, decreased MI, and decreased stent thrombosis

Circulation 2016;134:e156–78

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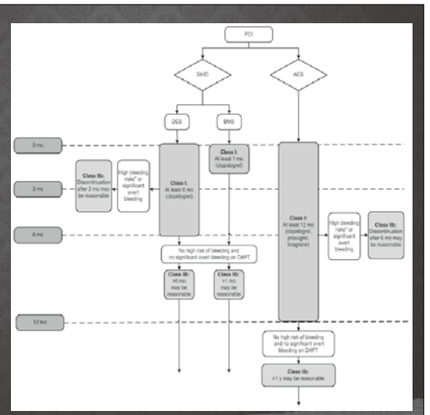
2016 ACC/AHA guideline for DAPT

SIHD: 3~6mo

ACS: 6~12mo



Circulation 2016;134:e123–55

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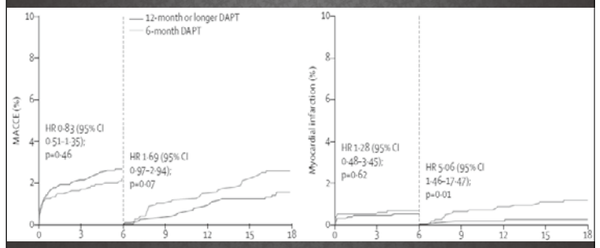
DAPT duration after ACS (1)

SMART-DATE: 1357 6mo vs. 1355 12mo after ACS PCI (80% clopidogrel)



12-month or longer DAPT should remain the standard of care for patients with acute coronary syndrome undergoing percutaneous coronary intervention, despite the improved safety of current-generation DES

Hahn JY, et al. Lancet 2018;391:1274-84

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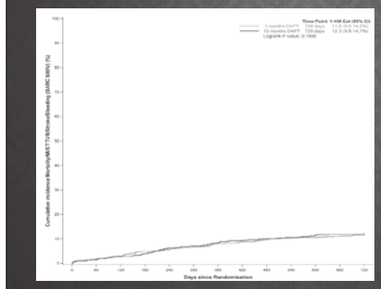
DAPT duration after ACS (2)

REDUCE: 751 3mo vs. 745 12mo after ACS PCI (50% STEMI, 40% clopidogrel)



- ST
  1.6% vs. 0.8%
- All cause mortality
  3.1% vs. 2.2%

ACS patients treated with COMBO, 3 months is non-inferior to 12 months DAPT.

De Luca G, et al. EuroIntervention 2019 Aug 20 [Epub ahead of print]

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Contents

- Duration of DAPT
- **Best option after discontinuation of DAPT**

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Options of long-term therapy (after DAPT)

- Aspirin alone (standard of care)
- Aspirin + P2Y12 inhibitor life-long
  Standard dose of P2Y12 inhibitor or modified dose of P2Y12 inhibitor
- Aspirin + very-low dose NOAC
- P2Y12 inhibitor alone

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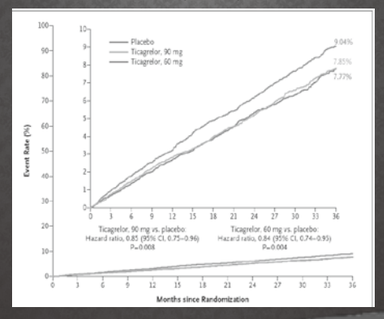
Long-term use of Ticagrelor

PEGASUS-TIMI 54: 21,162 pts with prior MI, 83% PCI rate



Bonaca MP, et al. N Engl J Med 2015;372:1791-800

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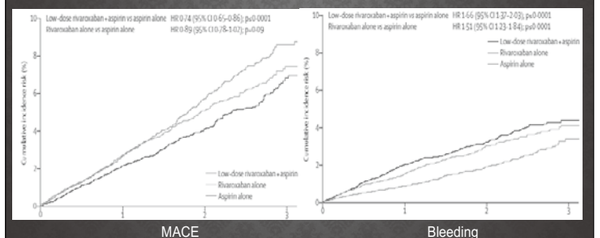
CAD w/o AF: COMPASS

24,824 pts with stable CAD, ASA vs ASA + rivaroxaban 2.5mg bid



In patients with stable CAD, addition of rivaroxaban to aspirin lowered major vascular events, but increased major bleeding. There was also a significant net benefit in favour of rivaroxaban plus aspirin and deaths were reduced by 23%.

Connolly SJ, et al. Lancet 2018;391:205

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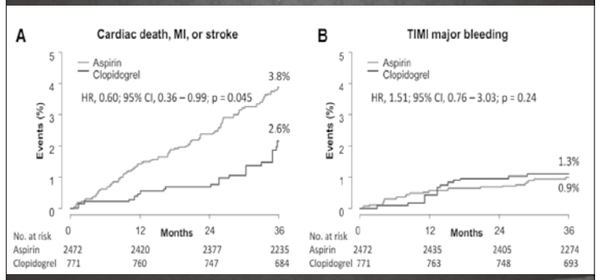
P2Y12 inhibitor alone

Post-DAPT (dual antiplatelet therapy) therapy
3243 pts receiving 12mo DAPT after DES



Park TK, et al. Circ Cardiovasc Interv 2016;9:e002816

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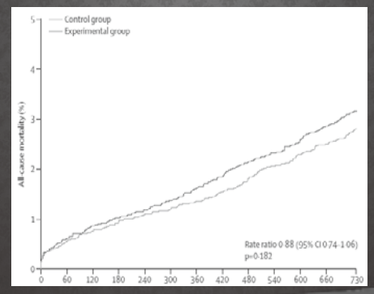
Long-term use of Ticagrelor

GLOBAL LEADERS:

7980 pts - 1mo ASA+Tica, 23mo Tica alone vs. 7988 pts - 12mo ASA+Tica or clopi, 12mo ASA alone



Vranckx P, et al. Lancet 2018;392:940

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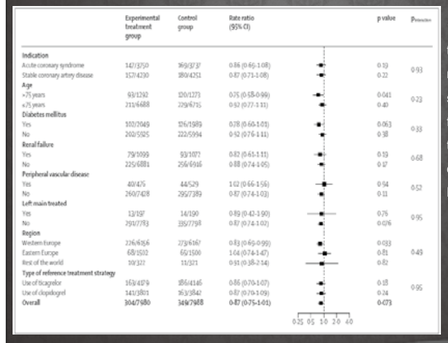
GLOBAL LEADERS



1mo DAPT followed by ticagrelor alone for 23 months was not superior to 12mo DAPT followed by ASA alone in the prevention of all-cause mortality or MI 2 years after PCI.

Vranckx P, et al. Lancet 2018;392:940

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P2Y12 inhibitor monotherapy

SMART-CHOICE:

- ✓ 1495 (3mo DAPT + P2Y12 inhibitor alone) vs 1498 (12mo DAPT)
- ✓ Non-inferior trial (non-inferiority margin 1.8%)
- ✓ About 40% SAP and 60% ACS (including STEMI)
- ✓ Xience, Promus, Orsiro stent
- ✓ 77% clopidogrel, 19% ticagrelor, 4% prasugrel

Hahn JY, et al. JAMA 2019;312:2428

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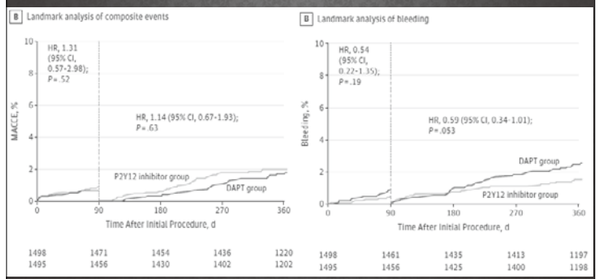
P2Y12 inhibitor monotherapy

SMART-CHOICE



P2Y12 inhibitor monotherapy after 3 months of DAPT compared with prolonged DAPT resulted in non-inferior rates of major adverse cardiac and cerebrovascular events.

Hahn JY, et al. JAMA 2019;312:2428

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Take Home Message

- 스텐트 시술 후 DAPT는 출혈 위험도가 우려될 경우 선택된 환자에서 3~6개월간 사용할 수 있다.
- 그럼에도 불구하고 ACS 환자는 길게 사용하는 것이 좋다. 특히 thrombotic complication이 우려되는 경우에는 12개월 이상 사용할 수 있다.
- DAPT duration과 무관하게 아스피린 보다는 P2Y12 inhibitor 단독사용법에 대한 관심이 증가되고 있다. 특히 짧은 기간 동안 DAPT를 사용하고 이후에 P2Y12 inhibitor 단독사용법이 표준치료에 비해 비열등하다는 증거들이 발표되고 있다.

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MEMO

Debates in secondary prevention of IHD

이상록(전북의대)

Residual Risk Reduction in Coronary Artery Disease: Debates on Lipoprotein(a)

Sang-Rok Lee

Cardiology, Chonbuk National University Hospital

Cardiovascular disease is the leading cause of death. Observational studies showed that low-density lipoprotein cholesterol levels are positively associated with the risk of coronary heart disease. The most widely used interventions are statins, but even with intensive statin therapy some patients remain at significant residual cardiovascular risk. In addition, some people are intolerant of statin therapy. In these circumstances, additional therapeutic targets or agents may be needed. Today we will review the recent pros and cons evidences for forgotten parameter, lipoprotein(a) (Lp(a)).

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Oral Poster Session

Moderator **박영봉**(조선의대), **김송이**(제주의대)

Oral poster presentation

A case report of pulmonary embolism manifested as syncope in 17-year old male patient

이서연, 공영화, 주찬웅 (전북대학교병원 소아청소년과)

Background

폐색전증은 혈전이 폐동맥을 막아 폐로 가는 혈류를 방해하면서 발생한다. 대개 하지의 심부정맥에서 유래하는 혈전에 의해서 발생하는데, 크게는 정맥정체, 응고항진상태, 내피손상의 세 가지 기전에 의해 유발되며, 무증상부터 흉통이나 호흡곤란에 이르기까지 다양한 범위의 증상이 나타난다.

소아에서 폐색전증은 드물며, 성인과는 다르게 확인 가능한 위험인자를 가지고 있거나 심각한 기저질환이 있는 경우가 대부분이다.

우리는 몇 달 전부터 운동 시 간헐적으로 흉통과 두근거림을 겪은 적 있고 이후 실신이 발생해 폐색전증이 진단된 케이스를 보고하고자 한다. 이 사례는 소아에게서 흔치 않은 질환인 폐색전증을 실신과 같은 비전형적인 증상이 있는 경우에 면밀한 병력청취를 통하여 의심할 수 있도록 하는 좋은 예가 될 것 이다.

Case

17세 남아가 세수를 하다가 발생한 실신으로 내원했다. 의식을 잃기 전 left frontal area의 깨질 것 같은 양상의 두통과 어지럼증이 발생했고 눈앞이 흐려졌다고 했으며, 이후 세수하다 나오면서 1-3분가량의 실신이 발생해 내원했으며, 당시 eyeball deviation이나 convulsion은 없었다.

입원 당시 혈압은 100/70 mmHg, 맥박은 98회/분, 호흡수는 20회/분이었고 발열은 없었다. 신체진찰에서 맥박은 규칙적이었고 murmur/gallop/rub은 청진되지 않았으며 정상 호흡음 청진되고 간비비대 또한 없었다. 의식수준은 명료했으며 신경학적 이상소견 또한 없었다. lab에서 WBC 9900 cells / μL, Hb 18.1 g / dL, Hct 51.7 %, 혈소판 수 186000 cells / μL를 보이고, 혈청 전해질/포도당/혈액가스검사는 정상이었다. 뇌 MRI 및 뇌파검사는 모두 정상이었으며 머리 기울임 검사에서 양성 보여 미주신경성 실신 진단 하에 외래 추시 예정이었다.

그러나 환아 입원기간 중 지속적으로 흉통과 경한 호흡곤란 호소하였고, 이에 다시 병력청취를 해보았을 때 약 2달 전부터 10m만 걸어도 숨을 쉴 때 좌측 흉골연 부위의 통증과 두근거림이 간헐적으로 동반되었다 하였다. 흉부 x-ray에서는 정상이었고 천식과 같은 호흡기 질환으로 인한 흉통/호흡곤란 배제하기 위해 폐 기능 검사 시행했으나 정상이었다. 심전도에서 v1-v3에서 ST elevation 및 T wave inversion확인되었고, 24시간 홀터 모니터링을 하였으나 드문 빈도의 VPC 외에는 이상소견이 없었고, 심초음파에서 PG 42mmHg가량의 폐동맥고혈압이 확인되었으나 RV function은 정상이고 minimal TR외의 다른 이상소견은 없었다. 이에 cardiac CT를 시행했으며 양측 주 폐동맥부위의 filling defect보이고 추가 검사에서 FDP와 D-dimer가 각각 9.35 μL/mL, 2.04 mg/L로 상승되어 있어 폐색전증이 진단되었다. 그러나 호소하는 증상 및 신체진찰 상 DVT를 의심할만한 부위는 없었으며 kidney USG에서도 특이소견 없었다. 다시 병력청취를 해보았을 때 환아는 흡연자였고 몇 달 전 오토바이 사고를 당한 적이 있었으며 고등학교를 자퇴하고 거의 집에서 누워서만 생활하다시피 한 바가 있었고, BMI는 28.07 kg/m2으로 과체중이었으며, 추가적인 응고인자와 자가 면역 검사에서 모두 정상소견 보였다.

따라서 환아는 최근 거의 침상안정만 하며 활동하지 않았던 것으로 인한 폐색전증으로 생각되었으며 heparinization하며 혈전제거술을 고려할 예정이었으나 보호자 분 전원 원하여 타병원으로 전원 되었다. 이후

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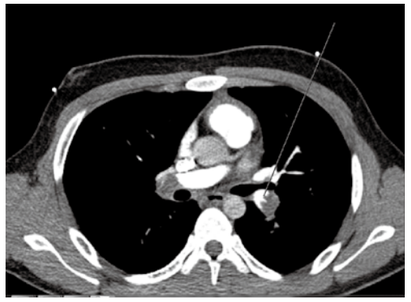
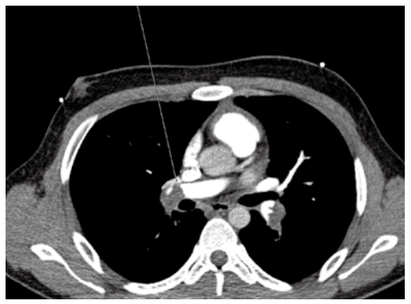
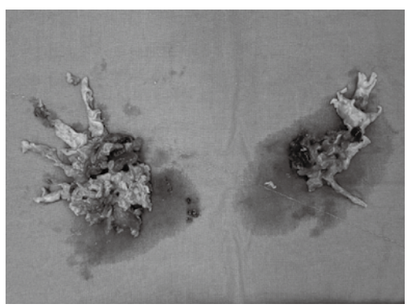
heparinization에 반응 없어 혈전제거술 시행 받고 항응고제 복용을 시작하였고 증상 호전되어 퇴원하였다. 그러나 이후 poor compliance로 폐색전증 재발하여 세 차례의 입원치료를 반복하였고, 현재는 항응고제 복용하며 외래 F/U 중이다.

Key image







MEMO

Usefulness of Diastolic Dysfunction Score in Predicting Long-term Prognosis of Acute Myocardial Infarction Patients with Preserved Ejection Fraction

Seok Oh, Sung A Bae, Kye Hun Kim, Hyukjin Park, Hyung Yoon Kim, Jae Young Cho, Hyun Ju Yoon, and Jong Chun Park

(Department of Cardiovascular Medicine,
Chonnam National University Hospital, Gwangju, Korea)

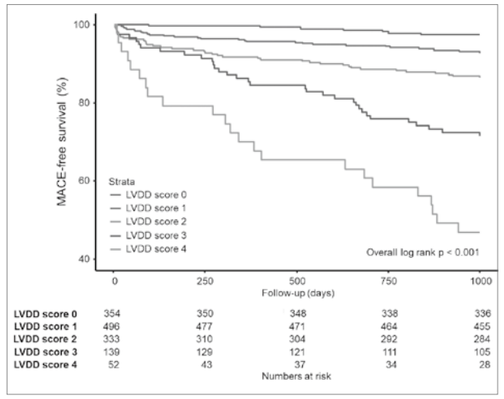
Background: To investigate the usefulness of left ventricular diastolic dysfunction (LVDD) score in the prediction of future major cardiovascular events (MACEs) in acute myocardial infarction (AMI) patients with preserved ejection fraction (EF).

Methods: Among 2,539 AMI patients from January 2012 to December 2015, a total of 1,374 patients with preserved EF and no atrial fibrillation were enrolled and were followed up for 3 years. Four parameters which were used for the categorization of DD in the current 2016 recommendation of American Society of Echocardiography (ASE) (septal e' 〈 7cm/s, E/e' 〉 14, tricuspid regurgitation velocity 〉 2.8m/s, and LAD 〉 40mm) were used for DD scoring. The integer score was assigned to each parameter as 1 point. The development of MACEs including death, recurrent MI, any revascularization, or hospitalization due to heart failure (HHF) was evaluated.

Results: Study subjects were divided into 5 groups by the current 2016 ASE criteria; LVDD score 0 (n=354), score 1 (n=496), score 2 (n=333), score 3 (n=139), and score 4 (n=52). During 3 years of clinical follow up, MACEs were developed in 271 patients; 142 death, 74 recurrent MI, 99 revascularization, and 32 HHF. MACEs were significantly increased as LVDD scores were increased; MACEs in LVDD score 0 (n=43, 12.1%), score 1 (n=73, 14.7%), score 2 (n=73, 21.9%), score 3 (n=51, 36.7%), and score 4 (n=31, 59.6%), (ptrend 〈 0.001). On Kaplan-Meier survival curve analysis, MACEs free survival was significantly lower as LVDD scores were increased (Figure 1).

Conclusion: The present study demonstrated that MACEs were significantly increased as LVDD scores were increased in AMI patients with preserved EF. Therefore, it is suggested that this novel scoring system by using the current 2016 ASE criteria for diastolic function evaluation may provide comprehensive risk assessment and thus would be useful in predicting upcoming CV events in AMI patients with preserved EF.

Figure 1. MACE free survival according to the LVDD Scoring System



MEMO

Long-term Clinical Outcomes in Angiotensin Converting Enzyme Inhibitor versus Angiotensin Type I Receptor Blocker in Acute Myocardial Infarction patients complicated with No Reflow Phenomenon ; from Korea Acute Myocardial Infarction Registry-National Institute of Health

Seok Oh (MD) [a], Joon Ho Ahn (MD)[a], Myung-Ho Jeong (MD, PhD)[a*], Youngkeun Ahn (MD, PhD)[a], Ju Han Kim (MD, PhD)[a], Young Joon Hong (MD, PhD)[a], Doo Sun Sim (MD, PhD)[a], Min Chul Kim (MD, PhD)[a], Tae Hoon Ahn (MD, PhD)[b], Chang-Hwan Yoon (MD, PhD)[c], Hyo-Soo Kim (MD, PhD)[d], Hyeon Cheol Gwon (MD, PhD)[e], In Whan Seong (MD, PhD)[f], Kyung Kuk Hwang (MD, PhD)[g], Shung Chull Chae (MD, PhD)[h], Seung-Ho Hur (MD, PhD)[i], Kwang Soo Cha (MD, PhD)[j], Seok Kyu Oh (MD, PhD)[k], Jei Keon Chae (MD, PhD)[l] and other KAMIR-NIH Registry Investigators.

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Keywords: No reflow phenomenon, ACEI versus ARB, prognosis

Abstract

Background: No reflow phenomenon is a consequence of reperfusion injury causing microvascular obstruction and dysfunction in acute myocardial infarction (AMI) patients after percutaneous coronary intervention (PCI). Angiotensin converting enzyme inhibitor (ACEI) is known to have additional protective effects to microvascular dysfunction than Angiotensin Type 1 Receptor blocker (ARB). The purpose of this study is to compare the long term clinical impact of ACEI and ARB in AMI patients who developed no reflow phenomenon.

Methods and results: A total of 249 patients between November 2011 to June 2015, who developed no reflow phenomenon after primary percutaneous coronary intervention that were registered in the Korea Acute Myocardial Infarction Registry (KAMIR-NIH) were enrolled. No reflow phenomenon was defined as Post Thrombolysis In Myocardial Infarction (TIMI) flow 0, I, II. Patients were divided into ARB (n=103) and ACEI group (n=139). The primary end point was major adverse cardiac events (MACE) defined as cardiac death, non-fatal MI, target vessel revascularization, ischemic stroke during 2 years clinical follow-up. Secondary endpoint were any repeated percutaneous coronary intervention and heart failure requiring re-hospitalization. In the baseline clinical characteristics, proportion of ST segment elevation MI patients were higher in ACEI compared to ARB group (59.1% vs. 73.4%, p=0.017). Proportion of patients infarct related artery TIMI flow grade 0,1 were higher in the ACEI group (73.6% vs. 92.1%, p<0.001) Also, patients with three vessel disease were higher in the ACEI group (10.0% vs. 20.1%, p=0.029). The total incidence and of primary endpoint MACE were similar in ACEI group compared to ARB group (12.9% vs. 20.9%; HR: 0.54; 95% CI: 0.28-1.06; p=0.072) in AMI patients with no reflow phenomenon. However, The incidence and risk of cardiac death was lower in ACEI group (3.6% vs. 13.6%; HR: 0.25; 95% CI: 0.08-0.75; p=0.013).

Conclusion: The present study resulted that the use of ACEI and ARB showed similar clinical outcomes in AMI patients who developed no reflow phenomenon. However, the risk of hard endpoint cardiac death was reduced in patients who were treated with ACEI. Further large scale multi-center randomized clinical trials are needed for optimal treatment in patients with no reflow phenomenon.

MEMO

HONAM
CIRCULATION
SOCIETY

Session II. 심혈관질환의 최신 지견 2

좌장 **조정관**(전남의대), **장경식**(조선의대)

Cryoablation of AF	**이우석** (여수제일병원)
Arrhythmias in infiltrative heart disease	**고점석** (원광의대)
Update in clinical indications of TAVAR	**박종필** (전주예수병원)

Cryoablation of AF

이우석(여수제일병원)

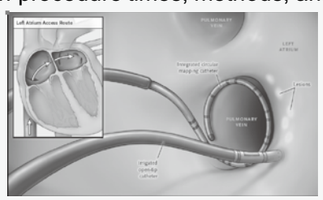
2019.9.21 126차 호남순환기학회
심혈관질환의 최신 지견 2

Cryoablation of Atrial Fibrillation

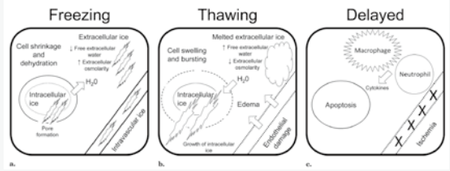
여수제일병원
심장내과
이 우 석

Traditional Point-by-point PVI using RFA

- Technically challenging
- More complex due to require navigation and mapping systems
- Challenging to achieve consistent catheter stability
- **Inconsistent** in procedure times, methods, and results



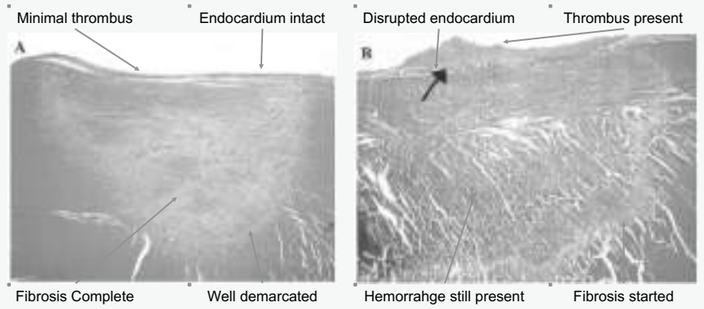
Basic Biophysics of the Cryoablation



- Hypothermia : transient electrical block
- Ice Formation (extra & intracellular) resulting in direct cell injury
- Thawing : microcirculatory injury
- Post procedure cell injury : Necrosis & Apoptosis

Whittacker DK. Ann R Coll Surg Engll. 1984;66:313
Andrade JG, et al. Pacing Clin Electrophysiol. 2012;35:1162

Preserved Extracellular Matrix and Endothelium Integrity

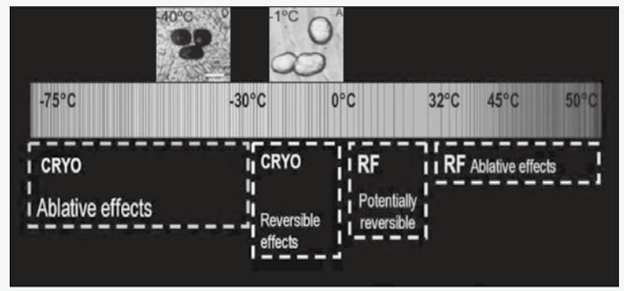


Cryoablation at 1 week (dog)
-75℃ 1 x 4min

RF lesion at 1 week (dog)
70℃ 50W 60sec

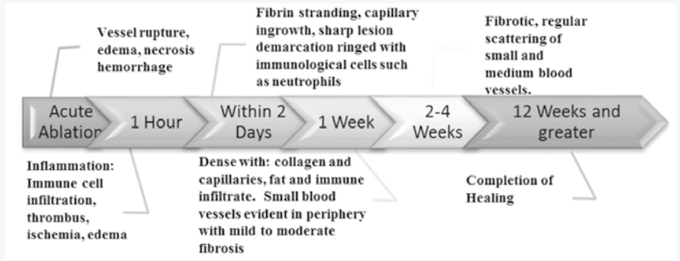
Khairy P, et al. Circulation. 2003;107:2045

Cryo ablative effects



Avitall B, Kallinski A. Heart Rhythm 2015;12:2195

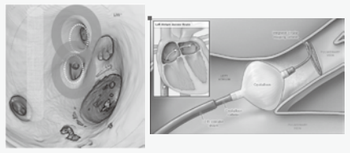
Time line of cryolesion injury
from acute ablation damage to chronic effects and healing



Avitall B, Kallinski A. Heart Rhythm 2015;12:2195

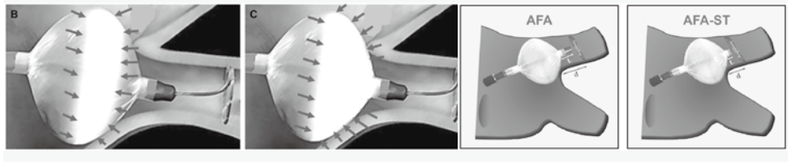
PVI with cryoballoon ablation

- Obtain pulmonary vein isolation with a continuous lesion rather than multiple, discontinuous energy deliveries
  - Reduce the complexity
  - Reduce recurrence of PV reconnection
- Reduce the risk of complications
  - thrombosis, collateral damage
  - PV stenosis, esophageal injury
- Improved procedural tolerance

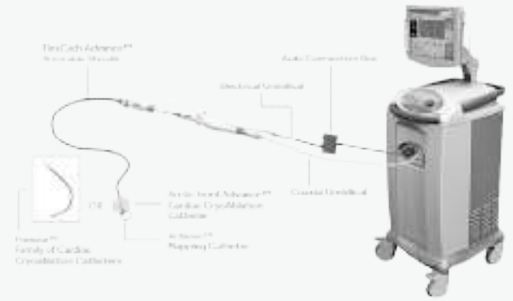


Cryoballoon Ablation of Atrial Fibrillation

- EU approval of Arctic Front cryo-balloon in July 2005
- FDA approval in US
  - Dec 2010 for Arctic Front
  - Aug 2012 for Arctic Front Advance (homogeneous cooling system)
  - Nov 2018 for Arctic Front Advance ST Pro (improved visualization of TTI)

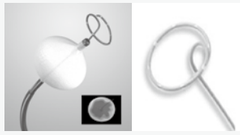


CryoConsole Cardiac Cryoablation System



ARCTIC FRONT CARDIAC CRYOABLATION CATHETER SYSTEM

- Size options for the cryoballoon : 23mm, 28mm
- The size can be chosen according to the anatomical characteristics of PVs.
- The 28mm cryoballoon is preferable because it avoids common complications that can occur when the balloon is deeply seated in PVs.



Product Specifications

Ordering Information

Order Number	
AFAPRO23	Arctic Front Advance Pro™ 23 mm
AFAPRO28	Arctic Front Advance Pro™ 28 mm

Catheter Specifications

Size	
Inflated balloon diameter	23 mm or 28 mm
Catheter size, outer diameter	10.5 Fr
Overall length	140 cm
Usable length	95 ± 2 cm
Distal tip length	8 mm
Compatibility	
Recommended introducer sheath	Compatible Medtronic 12 Fr inner diameter sheath (FlexCath Advance™ Steerable Sheath)
Guidewire compatibility	0.032"-0.035"
Recommended mapping catheter	Achieve™ family

Cryoballoon

1. Guide wire lumen. Facilitates injection of contrast to confirm occlusion of the vein. Placement of the guide wire through the lumen helps direct the catheter to the targeted vein.

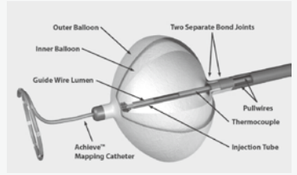
2. Outer balloon. Safety feature to contain the refrigerant in the unlikely event that the inner balloon is compromised. The outer balloon is maintained under constant vacuum.

3. Inner balloon. Refrigerant is delivered into the inner balloon and vacuumed back into the console to achieve the freezing process.

4. Pull wires. Help deflect the catheter 45 degrees in either direction.

5. Thermocouple. Monitors the temperature of the vaporized refrigerant.

6. Injection tube. Refrigerant is distributed toward the inner balloon surface through the injection tube.



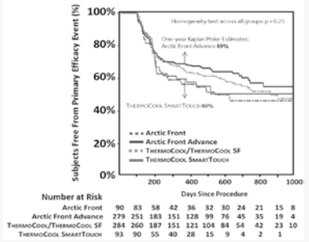
FIRE AND ICE Trial Primary Endpoints

Cryoballoon Met Non-inferiority Efficacy Endpoint

TRIAL DESIGN & METHODS (NCT01490814)

Prospective, 1:1 randomized, non-inferiority study (762 patients from 16 sites in 8 countries) compared efficacy and safety of PVI using Cryoballoon vs. Radiofrequency (RFC) ablation with CARTO® 3D mapping system in patients with PAF.

Primary Efficacy Endpoint: Time to first documented recurrence of AF>30s/AT/AFL, prescription of AAD, or repeat ablation.



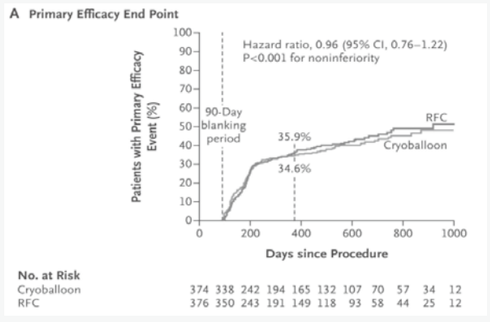
SHORTER, MORE CONSISTENT* PROCEDURE TIMES IN CRYOBALLOON GROUP

Measurement (minutes)	RFC (n=376)	Cryoballoon (n=374)	P-value**
Procedure Time***	140.9 ± 54.9	124.4 ± 39.0	<0.0001
LA Dwell Time***	108.6 ± 44.9	92.3 ± 31.4	<0.0001
Fluoroscopy Time	16.6 ± 17.8	21.7 ± 13.9	<0.0001

* Standard deviations were smaller in the cryoballoon group for all three procedure time measures, indicating more consistent times with less variation from the mean.
** t-test
*** Protocol required 30 min. waiting period after last application to assess PV isolation.

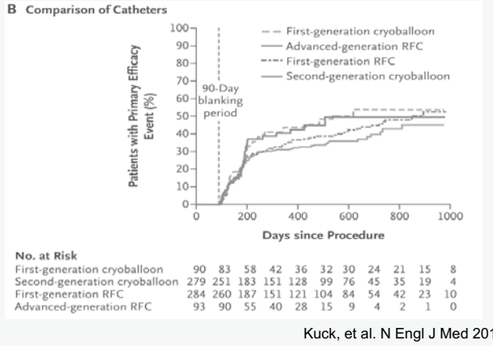
Kuck KH, et al. *N Engl J Med.* 2016;374:2235-2345

FIRE AND ICE



Kuck, et al. N Engl J Med 2016;374:2235-2245

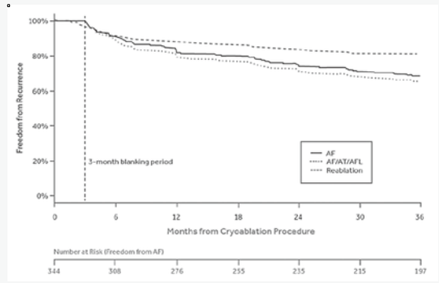
FIRE AND ICE



Kuck, et al. N Engl J Med 2016;374:2235-2245

STOP-AF PAS 3 YEAR DATA

FREEDOM FROM RECURRENCE



At a mean follow-up of 2.9 ± 0.6 years:
- Freedom from repeat ablation: 80.9%
- Freedom from AF: 68.1%
- Freedom from AF/AT/AFL: 64.1%

Knight BP, et al. JACC Clin Electrophysiol. 2019;5:306-314

CIRCA-DOSE

EHRA 2019 THE ANNUAL CONGRESS OF THE EUROPEAN HEART RHYTHM ASSOCIATION

To evaluate the safety and efficacy of:

- **Second-generation Cryoballoon vs. Contact-force Irrigated Radiofrequency Catheter Ablation for AF (CIRCA)**
- **DOuble Short (2-minute) vs. Standard (4-minute) cryoapplication Exposure (DOSE)**

CIRCA-DOSE – Patient Flow

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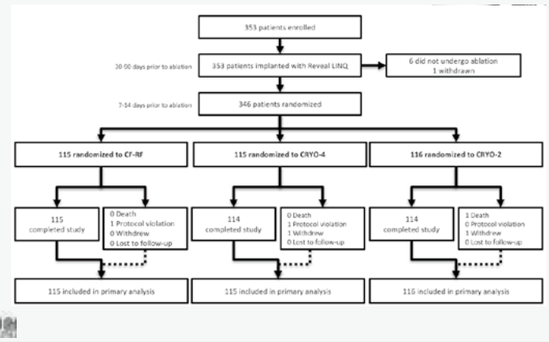

CIRCA-DOSE – Procedural Characteristics

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	CF-RF (n=115)	CRYO-4 (n=115)	CRYO-2 (n=116)
General Anesthesia, n (%)	79 (68.7%)	80 (69.6%)	79 (68.1%)
Echocardiography - intracardiac/transesophageal	9/62	16/49	16/54
Procedure duration, in minutes	*164.5** *(144.3, 198.0)*	*143.0* *(124.0, 165.3)*	*130.5†* *(110.3, 156.0)*
Left atrial time, in minutes	*143.0** *(120.0, 174.3)*	*116.5* *(104.0, 143.0)*	*104.5*** *(92.25, 130.8)*
Fluoroscopy time, in minutes	*5.2** *(2.3, 8.2)*	*17.2* *(8.1, 26.8)*	*19.0* *(8.9, 24.8)*
Median freezing temperature, in degree Celsius	---	-57.0 (-53.0, -61.0)	-55.0 (-50.0, -59.0)
Time to isolation, in seconds	---	42.0 (29.0, 57.5)	39.0 (27.0, 56.0)

*P<0.001 vs. CRYO-4 and CRYO-2, **P<0.001 vs. CRYO-4, †P=0.002 vs. CRYO-4.

Primary Outcome

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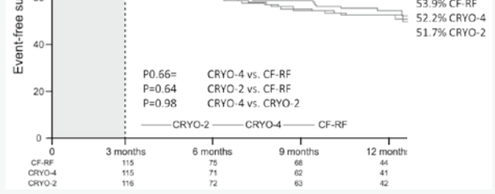
freedom from any atrial tachyarrhythmia (AF/AFL/AT) after a single ablation procedure



Secondary Outcome

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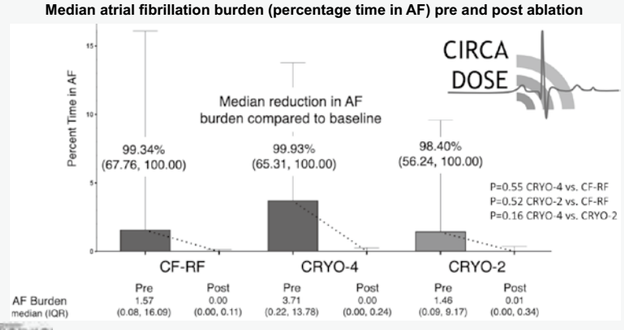
Median atrial fibrillation burden (percentage time in AF) pre and post ablation



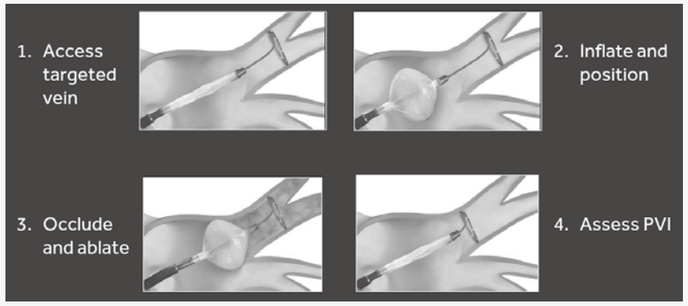
CIRCA-DOSE - Conclusions

- PVI performed by advanced generation cryoballoon or by contact-force guided RF results in comparable freedom from recurrent atrial arrhythmia
- The stark contrast between the primary endpoint (time to first event) and the reduction in AF burden highlights the need to re-appraise the optimal AF ablation study endpoint.
- Efficacy is not compromised by using a shorter cryoablation duration

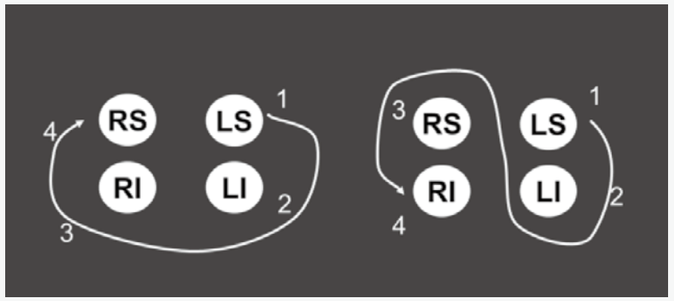
Stepwise PVI procedure overview

- Pre-procedural imaging (CT or MRI) : anatomic considerations
- Vascular access
- Transseptal access : single, low/anterior, low/middle, 상관없다 (?)
- Anticoagulation protocol : ACT ≈ 300 seconds
- PV Angiogram
- System insertion
- Assess pre-ablation PV electrogram recording – Good sealing (leakage)
- Ablation
- Temperature monitoring/Diaphragmatic motion (esp. right PV ablation, phrenic pacing in SVC)

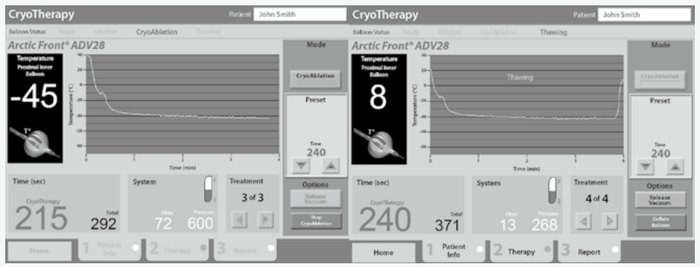
Cryoballoon and Achieve mapping catheter workflow



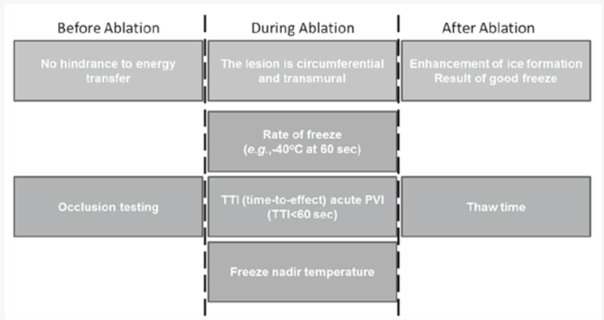
Sequence of vein ablation order



CryoTherapy and Thawing



Parameters for durable ablation



Wilber Su, et al. Heart Rhythm 2018;5:1348-1355

Good Sealing

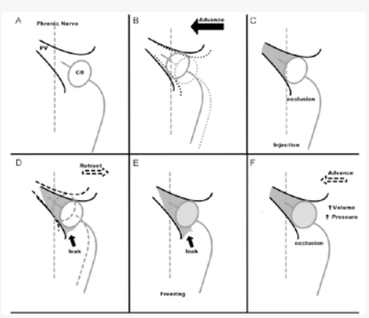
- Occlusion Score : Grade 1 Very poor (immediate rapid outflow from the PV) to Grade 4 Excellent (full retention of contrast media without visible outflow)
- Freezing time : time taken for the balloon to cool to -40℃ at 60 seconds, -30℃ at 30 seconds
- Nadir temperature (<-55℃, -35℃ for inf, -40℃ for sup at 120s)
- Thawing time : time to zero (10 seconds)

Neumann T, et al. J Am Coll Cardiol 2008;52:273-278
Ghosh J, et al. Heart Rhythm 2013;10:1311-1317

System alignment to optimize contact

- System alignment is key to obtaining vein occlusion
- Achieve – Cryoballoon – Flexcath all in alignment
- If using fluoroscopy, check system alignment in RAO and LAO
- If using ICE, ensure sheath is in view with the plane you are imaging

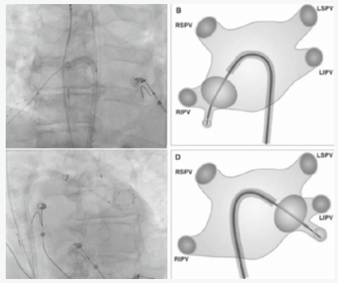
Proximal Seal Technique to verify proximal balloon position



- Staying antral and minimizing forward pushing can maximize distance between balloon and collateral structures
- Obtain occlusion (A-C), Slow retraction of the balloon while injecting contrast until small leak is observed (D), beginning of cryoablation (E), immediate increase in balloon volume and pressure eliminates leak by volume increase or by slight balloon advancement (F)

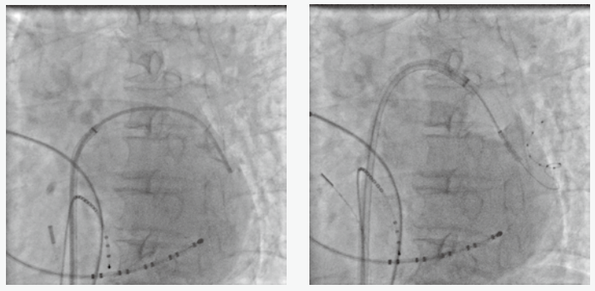
Casado-Arroyo, et al. Heart Rhythm 2013;10:1318

Aligning the system for inferior veins



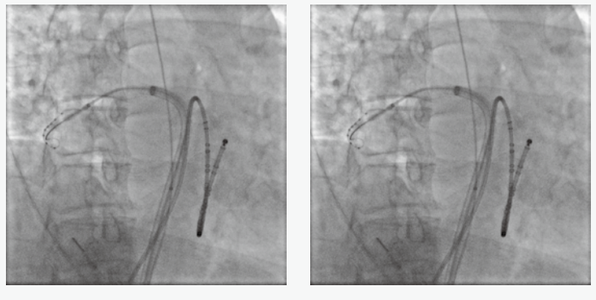
- Hockey stick technique
- The Achieve is placed distal in an early branching inferior pulmonary vein for stability

Hockey Stick Technique

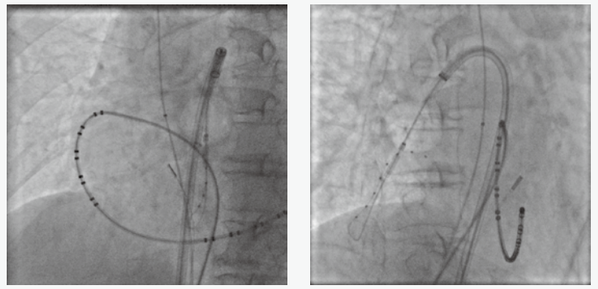


Watermelon Seed Technique

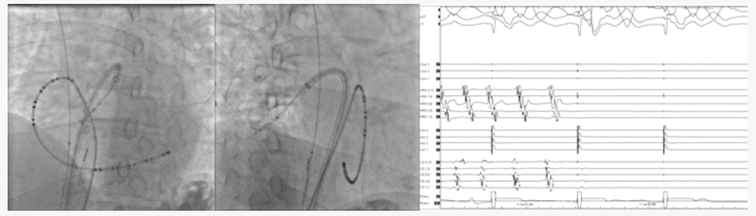
Considerations if occlusion is not possible



Modified Hockey Stick Technique



Modified Hockey Stick Technique



Acute PVI using a TTI of < 60 seconds

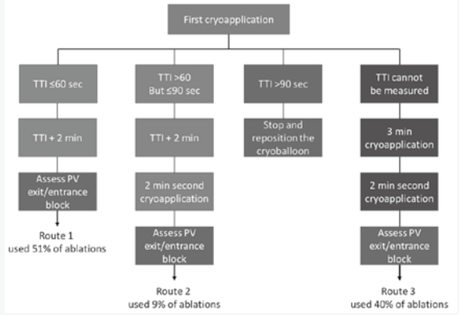
Table 1 Summary of studies examining acute PVI by using a landmark TTI of <60 s

Study	No. of patients with repeat ablation	TTI in reconnected PVs (s)	TTI in durable PVI (s)	*P*	TTI <60 s predicts durable PVI	
					Sensitivity (%)	Specificity (%)
Ciconte et al[24]	29	71.4 ± 18.8	42.3 ± 27.2	<.001	86.7	86.2
Aryana et al[25]	71	67.6 ± 19.7	39.1 ± 11.7	<.001	83.3	83.2
Ciconte et al[26]	26	71.1 ± 20.2	50.2 ± 32.9	.030	Not reported	Not reported

PV = pulmonary vein; PVI = pulmonary vein isolation; TTI = time to isolation.

Su W, et al. Heart Rhythm 2018;15:1348-1355

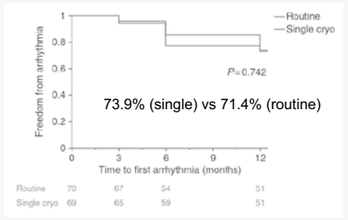
Cryoballoon dosing algorithm



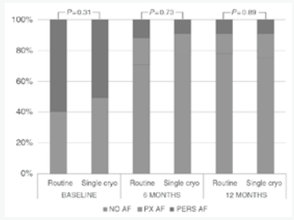
Su W, et al. Heart Rhythm 2018;15:1348-1355

Single vs Double Application

- Entrance block with loss of PV signals within 120s (TTI)
- Temperature less than -40℃ reached within 120s (TTT)



73.9% (single) vs 71.4% (routine)



After 12 months, 75.0% (single) vs. 77.9% (routine)

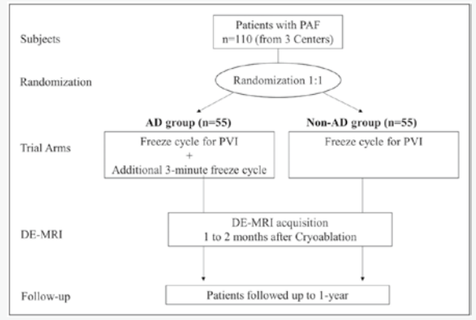
Mörtsell D, et al. Europace 2018;20:1598-1605

Single vs Double Application_Complications

Complication	Routine (*n* = 70)	Single cryo (*n* = 69)	*P*-value
Stroke, *n* (%)[a]	1 (1.4)	0	0.99
Transient ischaemic attack, *n* (%)	0	1 (1.4)	0.99
Tamponade, *n* (%)	1 (1.4)	0	0.99
Pericarditis, *n* (%)	1 (1.4)	0	0.99
Phrenic nerve paralysis, *n* (%)	4 (5.7)	1 (1.4)	0.37
Ulcus/dyspepsia, *n* (%)	1 (1.4)	0	0.99
Gastroparesis[b], *n* (%)	1 (1.4)	0	0.99
PV stenosis, *n* (%)	0	0	NA
Any complication, *n* (%)	9 (12.9)	2 (2.9)	0.03

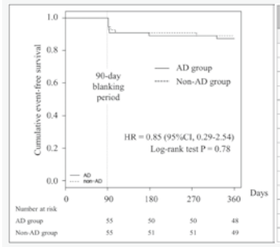
Mörtsell D, et al. Europace 2018;20:1598-1605

AD-Balloon Study



Miyamoto K, et al. Circ Arrhythm Electrophysiol 2019;12:e006989

AD-Balloon Study



	AD Group (n=55)	Non-AD Group (n=55)	OR (95% CI)	*P* Value
Complication, n (%)	10 (18.2)	8 (14.6)	1.3 (0.5–3.7)	0.61
Pericardial effusion requiring drainage, n (%)	0	1 (1.8)	…	1.00
Pericardial effusion not requiring drainage, n (%)	1 (1.8)	0	…	1.00
Cerebral infarction, n (%)	0	0	…	…
Transient ischemic attack, n (%)	0	0	…	…
Transient ST-segment elevation because of air embolism, n (%)	2 (3.6)	0	…	1.00
Transient PN paralysis, n (%)	5 (9.1)	3 (5.5)	1.7 (0.4–8.8)	0.46
Prolonged PN paralysis, n (%)	0	0	…	…
Severe PV stenosis, n (%)	1 (1.8)	0	…	1.00
Hematoma at the puncture site, n (%)	0	2 (3.6)	…	1.00
Pseudoaneurysm at the puncture site, n (%)	1 (1.8)	0	…	1.00
Arteriovenous fistula, n (%)	1 (1.8)	1 (1.8)	1 (0.04–25.7)	1.00
Gastric hypomotility, n (%)	0	1 (1.8)	…	1.00
Atrioesophageal fistula, n (%)	0	0	…	…
Death, n (%)	0	0	…	…

Miyamoto K, et al. Circ Arrhythm Electrophysiol 2019;12:e006989

Balloon Thawing Considerations

- Be prepared for Vagal response
  - Have pacing catheter in place and recording system prepared
  - More frequently observed during thawing of left PV's upon balloon deflation
- Observe the time it takes to thaw
  - Longer times may be good indicators of occlusion
- After automatic balloon deflatioin (+20℃) the catheter may still be adhered to tissue
  - Ensure balloon temperature has returned to baseline prior to system manipulation and use visualization to ensure catheter moving freely

Ghosh J, et al. Heart Rhythm 2013;10:1311-1317

Ablation reminders

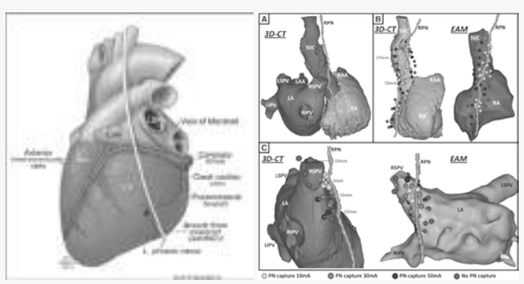
- Do not inflate or ablate with the cryoballoon inside the PV
- Ensure the Achieve is leading with system manipulation to minimize risk of perforation
- Cryoballoon position should be as antral as possible
  - Utilize the Proximal Seal Technique
- Utilize multiple views for visualization to ensure system alignment
- Be prepared for vagal responses
- Consider segmenting approach if unable to obtain full occlusion
  - If isolation not possible with cryoballoon, consider Freezor MAX or other focal catheter for touch-up

Ablation reminders

- Seek complete or best possible occlusion
  - Utilize balloon to segment the PV if occlusion not possible
- Maintain balloon occlusion pressure manually until cryoadhesion occurs - approximately 30 sec
- Do not pull on the Cryoballoon during the freeze
- Don't leave the deflated balloon inside the sheath for longer than the ACT time

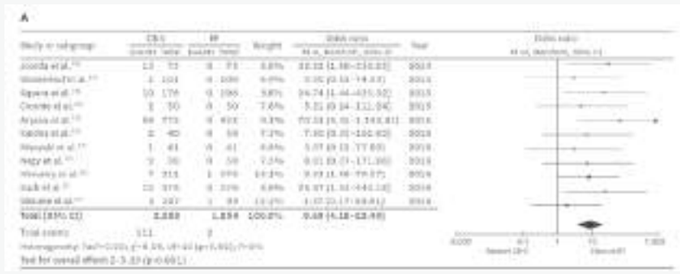
Transient Phrenic Nerve Injury with cryoballoon

- PN palsy is an important and serious complication of AF ablation
- Observed with all technologies of AF ablation, but more common with a balloon based technologies
- Mechanisms
  - Wedging or exerting force to direct the balloon into the RPV for complete PV occlusion can distort the anatomy and decrease the distance between the RPV and the right PN
  - Smaller balloon increases the risk.
- Balloon position and nadir temperatures are important controllable factors.



Squara F, et al. Circ Arrhythm Electrophysiol 2014;7:561-562

Transient Phrenic Nerve Injury

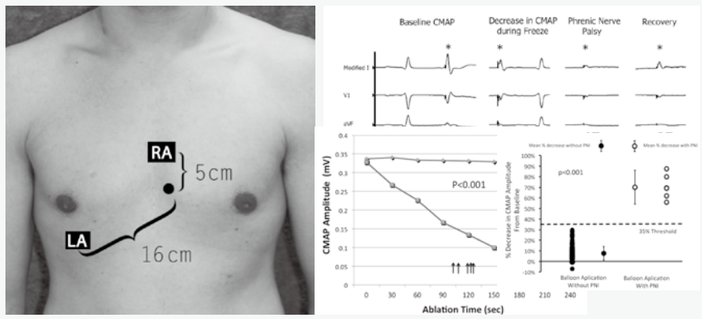


Jin ES, et al. Korean Circ J 2018;48:114-123

Minimize the Risk of PNI

- Quick detection of impending palsy can optimize quick phrenic recovery
- Avoid use of paralytics – Communicate plan to team
- Ensure antral cryoballoon position – Utilize Proximal Seal Technique
- Pace/Monitor the PN during ALL right sided PV ablations (standard method)
  - Pacing catheter above level of cryoballoon (SVC or R subclavian vein)
  - Settings: ≥ 10-20 mA, Interval 1,000-2000 ms
- Consider using an adjunctive method(s) for phrenic nerve monitoring
- Stop ablation at first signs of PN impairment– Immediate balloon deflation

Compound Motor Action Potential (CMAP)



Lakhani M, et al. Heart Rhythm 2014;11:369-374

Mitigating the risk of complications

Risk	Mitigation Strategy
Phrenic Nerve Injury	Always stay outside of the right-sided veins Actively monitor PN function during ablation of all right-sided veins (CMPA & Palptation) Stop ablation immediately at first signs of diaphragmatic compromise
Esophageal Injury	Use appropriate strategies to minimize risk of esophageal injury
Pulmonary Vein Stenosis	Maintain antral positioning of the cryoballoon Do not inflate or ablate inside the pulmonary veins
Stroke and TIA	Follow a standard anti-coagulation protocol Minimize the risk of air emboli
Tamponade	Do not manipulate or pull on the system while adhered to cardiac tissue Always lead with the circular portion of the Achieve when advancing or manipulating the cryoballoon

Group	Total (N=7)	Group	Total (N=7)
Male	6	Common PV	0
Age (years)	54.7	Procedure time (min)	149.6
BMI (Kg/m^2)	27.1	LA dwelling time (min)	109
DM	1	CB freeze number	9.6
HTN	3	LSPV (n)	1.6
HF	0	LIPV (n)	2.3
Stroke/Embolism	0	RIPV (n)	7.7
MI	0	RSPV (n)	1.6
Prev. PCI/CABG	0	LSPV TTI (Sec)	43.8
PAF	3	LIPV TTI (Sec)	33.2
		RSPV TTI (Sec)	40.0
CHA_2DS_2VASc	0.7	RIPV TTI (Sec)	39.0
LV EF (%)	65.6	Ablation time (sec)	1353.7
LA diameter (mm)	43.7	Fluoroscopic time (min)	100.8
LA VI (ml/m^2)	41.3	Any complications	0

Summary

- PVI can be done safely and efficiently using a cryoballoon technology with similar efficacy as RFA.
- Good seal and TTI are important for durable lesions.
- Permanent phrenic nerve palsy is uncommon, but can be devastating. Careful real-time monitoring of phrenic nerve injury is essential to minimize phrenic nerve injury

Summary

- Effective in isolation of pulmonary veins and a comparable alternative with a ‘single-shot’ technique
- Safe procedure with lower risk of thermal injury and PV stenosis compared to RF ablation
- Short procedure times compared to RF ablation
- Could be an ideal procedure for PV/antral based PAF

YJH Experience (7 cases)

경청해 주셔서 고맙습니다.

MEMO

Arrhythmias in infiltrative heart disease

고점석(원광의대)

Restrictive – infiltrative cardiomyopathy

RESTRICTIVE CARDIOMYOPATHY (RCM)
A rare form of heart muscle disease characterized by rigid heart walls and restrictive filling of the ventricles

Age of Onset	Symptoms	Diagnostic Tools	Etiologies	Management
< 30 years of age (due largely to genetic abnormalities) > 65 years of age	No symptoms of RCM, or very mild symptoms Over time leads to heart failure that can cause symptoms of: Exercise intolerance Dyspnea Fatigue Arrhythmias Lower extremity edema	Medical history Echocardiogram MRI FDG-PET imaging Cardiac catheterization Endomyocardial biopsy **Important to rule out:** Hypertensive heart disease Hypertrophic cardiomyopathy Constrictive pericarditis High output heart failure	**Primary/idiopathic:** Endomyocardial fibrosis Idiopathic restrictive disease **Secondary/Infiltrative:** Amyloidosis Sarcoidosis Hemochromatosis Scleroderma Carcinoid heart disease Glycogen storage diseases such as Fabry disease Radiation induced Metastatic malignancy Iron overload	**Therapy is directed towards the specific underlying disease etiologies and to:** Relieve congestive symptoms (Loop diuretics, Sodium and fluid restriction) Rhythm control with the use of antiarrhythmic agents Permanent atrioventricular sequential pacer implantation Heart transplantation

J Am Coll Cardiol. 2018;71(10):1149–66.

Conditions with increased LV mass and thickness

condition	Age at Presentation	History and Clinical Presentation	Echocardiography	ECG Profile	CMR LGE	Biopsy
Cardiac amyloid	>30 yrs	Heart failure symptoms, nephrotic syndrome, idiopathic peripheral neuropathy, unexplained hepatomegaly	Symmetrical increase in LV and RV wall thickness, dilated LA and RA, granular appearance of myocardium, pericardial effusion, decreased EF in advanced cases	Decreased or normal QRS complex voltage, pseudoinfarction in inferolateral leads	Global, diffuse, pronounced in subendocardium; RV and LV	Myocyte atrophy, amyloid replaces normal cardiac tissue
Fabry disease	Male: 11 ± 7 yrs; female: 23 ± 16 yrs	Neuropathic pain, impaired sweating, skin rashes	Symmetrical increase in LV and RV wall thickness, normal EF	Increased or normal QRS complex voltage, short or prolonged PR interval	Focal, midwall, inferolateral wall	Enlarged myocytes with clusters of concentric glycolipid (myelinoid bodies) within lysosomes
Danon disease	<20 yrs	Heart failure, skeletal myopathy, mental retardation	Very thick LV (20–60 mm), RV may or may not be thick, decreased EF	Increased or normal QRS complex voltage, short PR interval (delta wave)	Subendocardial, does not correspond to perfusion territory	Sarcoplasmic vacuolization, focal storage of PAS-positive material, myofibrillar disarray
Friedreich ataxia	25 yrs (range 2–51 yrs)	Gait abnormality	Increase in LV septal and posterior wall thickness, normal EF	Normal QRS complex voltage, ventricular tachycardia		Nonspecific

J Am Coll Cardiol. 2018;71(10):1149–66.

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Conditions with increased LV mass and thickness

Condition	Age at Presentation	History and Clinical Presentation	Echocardiography	ECG Profile	CMR LGE	Biopsy
Cardiac oxalosis	>20 yrs	Juvenile urolithiasis and nephrocalcinosis	Symmetrical increase in LV and RV wall thickness; patchy, echodense speckled reflection; normal EF	Increased or normal QRS complex voltage, complete heart block	Increased myocardium attenuation on CT	Intra- and extracellular deposition of oxalate crystals without concomitant inflammation and necrosis
Mucopolysaccharidoses	1–24 yrs (median, 10 yrs)	Variable depending on subtype, coarse facial features, delayed mental development, skeletal deformities, corneal clouding, hepatosplenomegaly	Asymmetrical septal hypertrophy, mitral and/or aortic valve stenosis or insufficiency, normal EF	Increased or decreased QRS complex voltage, malignant arrhythmia		Swollen myocytes with clear cytoplasm due to accumulation of mucopolysaccharides within lysosomes
Differential diagnosis						
Hypertrophic cardiomyopathy	17–18 yrs	Maybe asymptomatic, dyspnea, angina, syncope, sudden death	Asymmetrical hypertrophy, small LV cavity, LVOT obstruction, normal EF	Increased QRS complex voltage, pseudo-delta wave, giant T-wave inversion	Patchy, midwall, junctions of the ventricular septum and RV	Myocyte hypertrophy, myofibrillar disarray, and interstitial fibrosis
Hypertensive heart disease	Adults	History of hypertension	Symmetrical increase in LV wall thickness, mild LV dilation, normal EF	Increased QRS complex, nonspecific ST-T-wave changes	No pattern, predominantly subendocardial	Enlarged myocytes with enlarged or replicated nuclei

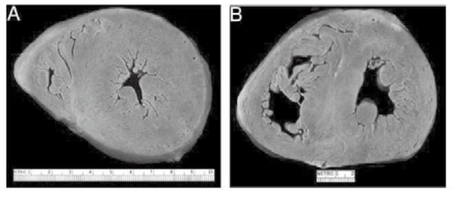
J Am Coll Cardiol. 2018;71(10):1149–66.

Conditions with dilated and infarct LV

Condition	Age at Presentation	History	Echocardiography	ECG	CMR LGE	Cardiac Biopsy
Sarcoidosis	Young adults	Congestive heart failure	Variable wall thickness, focal or global hypokinesis, LV aneurysm	Infrahisian block, atypical infarction pattern	Patchy, basal and lateral LV walls	Noncaseating, multinucleated giant cell granuloma surrounded by band of dense collagen fibers
Wegener disease	Young adults	Chronic upper and lower respiratory tract infections	Regional hypokinesis, pericardial effusion, mild MR, LV systolic dysfunction	Atrial fibrillation, atrioventricular block, atypical infarction pattern	Diffuse, midwall	Vasculitis with necrotizing granulomatous inflammation
Hemochromatosis	Hereditary hemochromatosis: >30 yrs in men, older in women; secondary hemochromatosis: any age	Hereditary hemochromatosis: liver function abnormalities, weakness and lethargy, skin hyperpigmentation, diabetes mellitus, arthralgia, impotence in men; secondary hemochromatosis: hemolytic anemia, multiple blood transfusions	Dilated LV with global systolic dysfunction	Supraventricular arrhythmia, ventricular conduction abnormality is rare		Iron deposits within the myocyte

J Am Coll Cardiol. 2018;71(10):1149–66.

Gross finding



J Am Coll Cardiol. 2018;71(10):1149–66.

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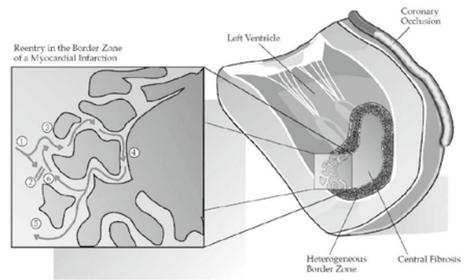
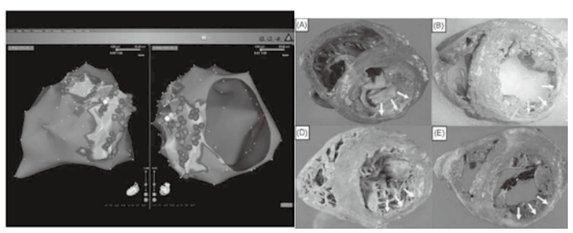
Associated arrhythmia

- AV Conduction disturbance
- Atrial tachycardia/Flutter/Fibrillation
- Ventricular tachycardia/Fibrillation

Scar related reentry

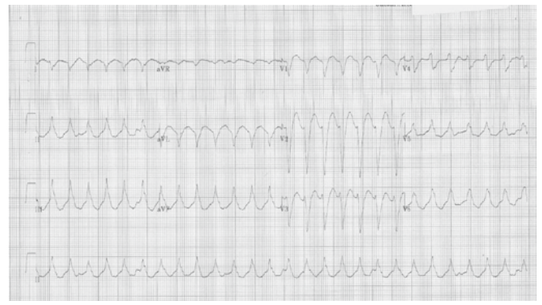


Scar related reentry

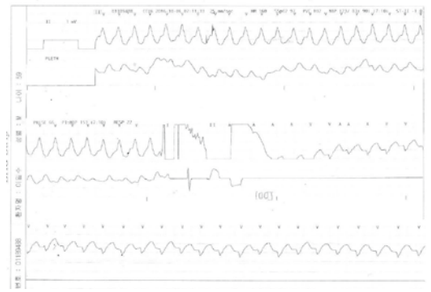


The Journal of Innovations in Cardiac Rhythm Management, 2 (2011), 187–190

증례. 60/M palpitation, dyspnea



Cardioversion

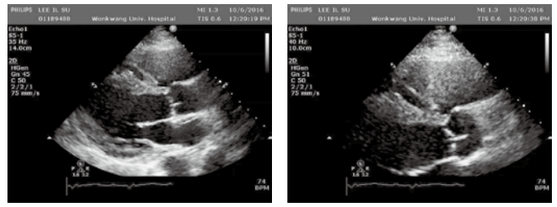


ECG after cardioversion

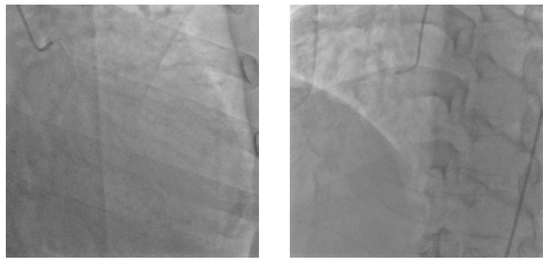
MEMO

MEMO

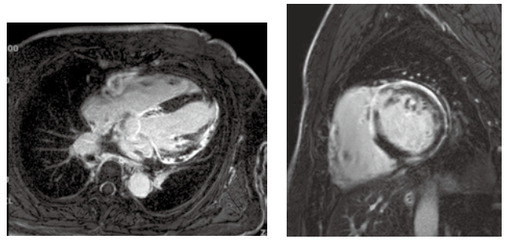
2DE



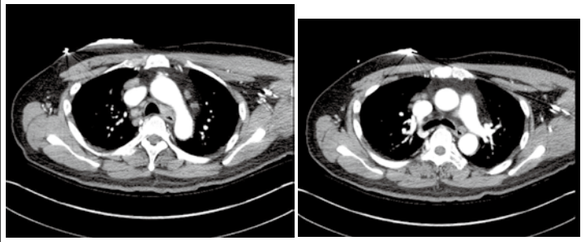
CAG



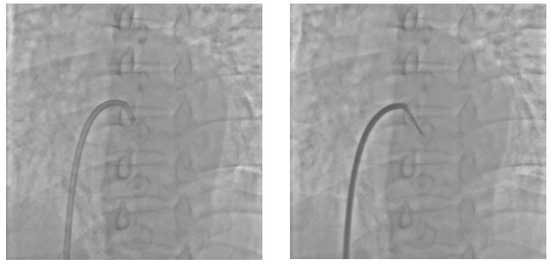
Cardiac MRI



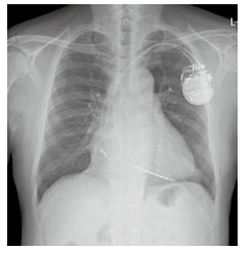
Chest CT



Cardiac Bx



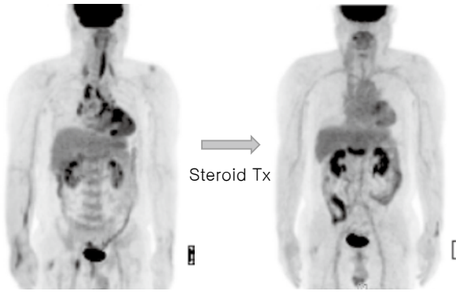
ICD



MEMO

MEMO

PET scan - sarcoidosis



2DE FU

ECG 2016.11 PR 246 ms

ECG 2017.2 PR 254 ms

ECG 2017.5 PR 272 ms

ECG 2018.4 PR 290 ms

MEMO

MEMO

ECG 2019.1 Pacing

MEMO

MEMO

Update in clinical indications of TAVAR

박종필(전주예수병원)

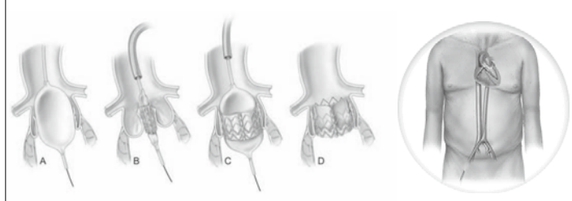
Update in Clinical indications of TAVAR

2019.9.21

예수병원 순환기내과
박 종 필

예수병원 Presbyterian Medical Center

Basic Concept : Too Simple !



Trans-Femoral Artery

Early TAVR Pioneers

- Hening Rud Andersen-

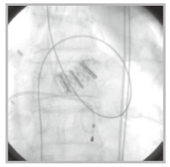
1989: First porcine implant

- Philipp Bonhoeffer-

2000: First human implant (RV to PA conduit)

April 16, 2002; FIM-TAVI, Trans-septal

15 min Post-TAVI



Valve Deployment

A long road

25 Years from BAV
18 Years from concept
10 Years from FIM
Thousands of patients enrolled in feasibility and post-market registries

Oct 2011- FDA Approval : Non Surgical Patients (PARTNER B)
Oct 2012- FDA Approval: High Risk patients (PARTNER A)
Mar 2014- FDA Approval: High Risk patients (CoreValve)
commercialization
International TF and TA Feasibility Studies
Edwards Lifesciences TF & TA
Feasibility Studies (antegrade)
F.I.M. THV implantation
Animal implantations(sheep)
« Percutaneous Valve Technology » (prototypes)
Post-mortem studies of intra-valvular stenting
F.I.M. Balloon Aortic Valvuloplasty

2007
2004
2002-03
2002
2000
1999
1994
1985

MEMO

MEMO

Good Patients, Excellent Results

PCI ~~Simple lesion~~ Complex lesion

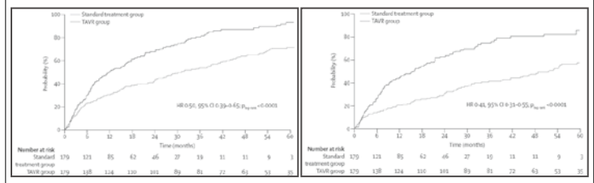
TAVR High Risk Intermediate Low

> 10 years ? 2020

5 year Outcomes for TAVR vs Medical Tx

PARTNER: Cohort B (Balloon-expandable) Patients with inoperable severe AS

All-cause mortality | Cardiovascular mortality

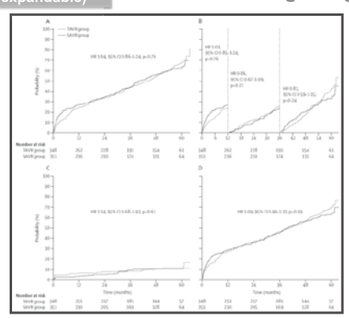


TAVR improved 5-year clinical outcomes compared to medical therapy

Kapadia et al. Lancet 2015;385:2485-91

5 year Outcomes for TAVR vs sAVR

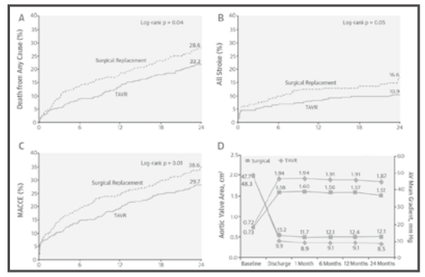
PARTNER: Cohort A (Balloon-expandable) Patients with high surgical risk



Mack et al. Lancet 2015;385:2477-84

Two-year Outcomes for TAVR vs sAVR

CoreValve (self-expandable) Patients with high surgical risk



Higher survival rate in TAVR compared to SAVR was sustained at 2 years

Reardon et al. J Am Coll Cardiol 2015;66:113-21

What about the lesser risk?

- Mortality will be lower than AVR
- Morbidity will be less
- Recovery will be quicker
- Patients will want it

Intermediate Risk AS

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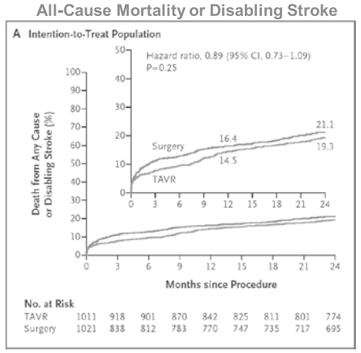
PARTNER 2a – Balloon Expandable

All-Cause Mortality or Disabling Stroke



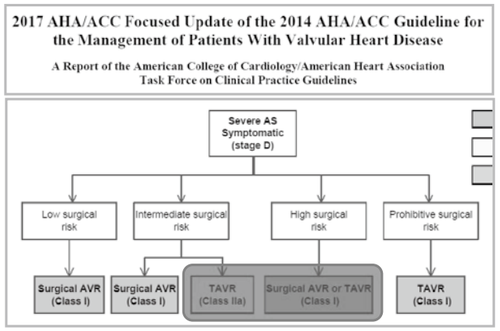
Leon MB NEJM 2016;374:1609-1620

TAVR Guidelines (2017)

The New AHA/ACC Focused Update

2017 AHA/ACC Focused Update of the 2014 AHA/ACC Guideline for the Management of Patients With Valvular Heart Disease

A Report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines



Epub ahead of print, Mar 2017 Circulation

Low Risk AS

NOTION-Denmark RCT

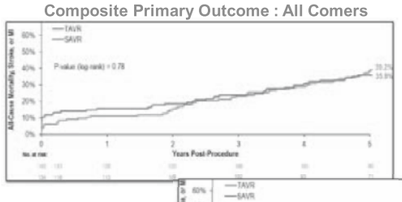
CoreValve 2009-2013	TAVI n=145	sAVR n=135	P value
Age (yr)	79.2 ± 4.9	79.0 ± 4.7	0.71
Male sex (%)	53.8	52.6	0.84
STS Score	2.9 ± 1.6	3.1 ± 1.7	0.30
STS Score < 4% (%)	83.4	80	0.46
NYHA III or IV (%)	48.6	45.5	0.61
Logistic EuroSCORE I	8.4 ± 4.0	8.9 ± 5.5	0.38

Primary Outcome (ITT) :
TAVR 13.1% vs. sAVR 16.3%
composite of all cause of death, stroke or MI at 1 year

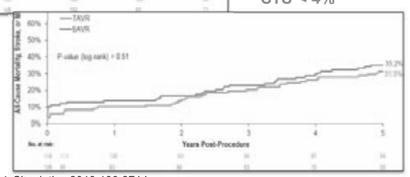
JACC 2015;65:2184 & PCR 2016

NOTION- 5 Year FU

Composite Primary Outcome : All Comers



STS < 4%



Thyregod et al. Circulation 2019;139:2714

Low Risk AS : Real RCTs

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The PARTNER 3 Trial

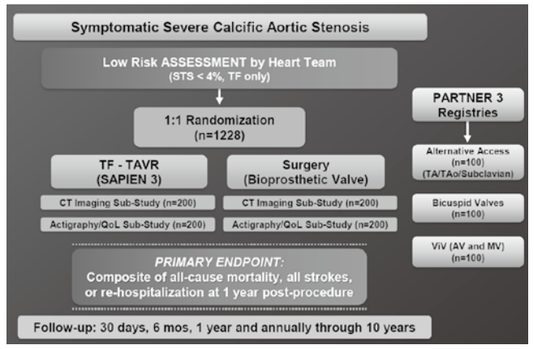
The NEW ENGLAND JOURNAL of MEDICINE

ESTABLISHED IN 1812 MAY 2, 2019 VOL. 380 NO. 18

Transcatheter Aortic-Valve Replacement with a Balloon-Expandable Valve in Low-Risk Patients

M.J. Mack, M.B. Leon, V.H. Thourani, R. Makkar, S.K. Kodali, M. Russo, S.R. Kapadia, S.C. Malaisrie, D.J. Cohen, P. Pibarot, J. Leipsic, R.T. Hahn, P. Blanke, M.R. Williams, J.M. McCabe, D.L. Brown, V. Babaliaros, S. Goldman, W.Y. Szeto, P. Genereux, A. Pershad, S.J. Pocock, M.C. Alu, J.G. Webb, and C.R. Smith, for the PARTNER 3 Investigators*

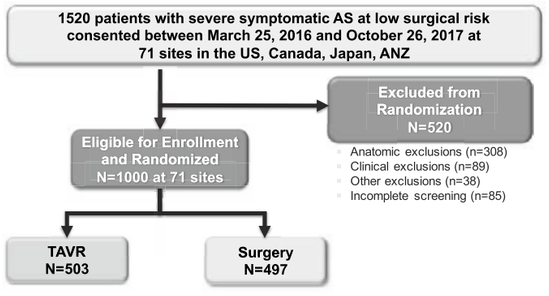
The PARTNER 3 Trial



Mack MJ et al. N Engl J Med 2019;380:1695

The PARTNER 3 Trial

Study Flow and Follow-Up



Mack MJ et al. N Engl J Med 2019;380:1695

The PARTNER 3 Trial

Baseline Patient Characteristics

% or mean ± SD

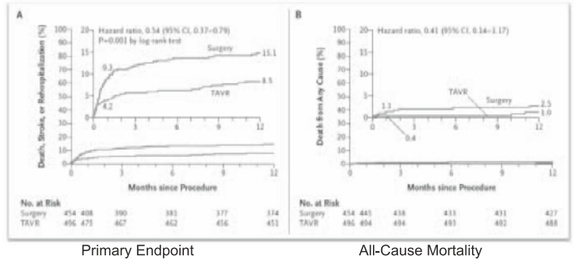
Demographics & Vascular Disease	TAVR (N=496)	Surgery (N=454)	Other Co-Morbidities	TAVR (N=496)	Surgery (N=454)
Age (years)	73.3 ± 5.8	73.6 ± 6.1	Diabetes	31.3%	30.2%
Male	67.5%	71.1%	COPD (any)	5.1%	6.2%
BMI – kg/m²	30.7 ± 5.5	30.3 ± 5.1	Pulmonary Hypertension	4.6%	5.3%
STS Score	1.9 ± 0.7	1.9 ± 0.6	Creatinine > 2mg/dL	0.2%	0.2%
NYHA Class III or IV*	31.3%	23.8%	Frailty (overall; > 2/4+)	0	0
Coronary Disease	27.7%	28.0%	Atrial Fibrillation (h/o)	15.7%	18.8%
Prior CABG	3.0%	1.8%	Permanent Pacemaker	2.4%	2.9%
Prior CVA	3.4%	5.1%	Left Bundle Branch Block	3.0%	3.3%
Peripheral Vascular Disease	6.9%	7.3%	Right Bundle Branch Block	10.3%	13.7%

*p = 0.01

Mack MJ et al. N Engl J Med 2019;380:1695

The PARTNER 3 Trial

Results

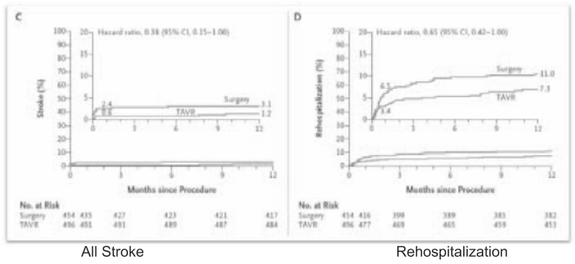


Primary Endpoint All-Cause Mortality

Mack MJ et al. N Engl J Med 2019;380:1695

The PARTNER 3 Trial

Results



All Stroke Rehospitalization

Mack MJ et al. N Engl J Med 2019;380:1695

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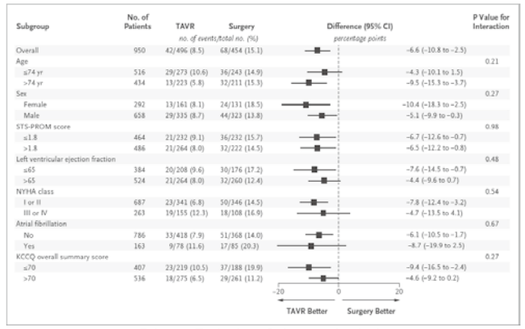
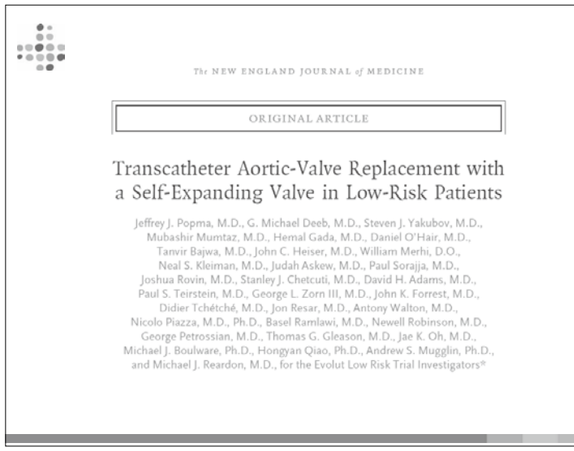
The PARTNER 3 Trial



Subgroup	No. of Patients	TAVR	Surgery	Difference (95% CI)	P Value for Interaction
		no. of events/total no. (%)		percentage points	
Overall	950	42/496 (8.5)	68/454 (15.1)	-6.6 (-10.8 to -2.5)	
Age					0.21
≤74 yr	516	29/273 (10.6)	36/243 (14.9)	-4.3 (-10.1 to 1.5)	
>74 yr	434	13/223 (5.8)	32/211 (15.3)	-9.5 (-15.3 to -3.7)	
Sex					0.27
Female	292	13/161 (8.1)	24/131 (18.5)	-10.4 (-18.3 to -2.5)	
Male	658	29/335 (8.7)	44/323 (13.8)	-5.1 (-9.9 to -0.3)	
STS-PROM score					0.98
≤1.8	464	21/232 (9.1)	36/232 (15.7)	-6.7 (-12.6 to -0.7)	
>1.8	486	21/264 (8.0)	32/222 (14.5)	-6.5 (-12.2 to -0.8)	
Left ventricular ejection fraction					0.48
≤65	384	20/208 (9.6)	30/176 (17.2)	-7.6 (-14.5 to -0.7)	
>65	524	21/264 (8.0)	32/260 (12.4)	-4.4 (-9.6 to 0.7)	
NYHA class					0.54
I or II	687	23/341 (6.8)	50/346 (14.5)	-7.8 (-12.4 to -3.2)	
III or IV	263	19/155 (12.3)	18/108 (16.9)	-4.7 (-13.5 to 4.1)	
Atrial fibrillation					0.67
No	786	33/418 (7.9)	51/368 (14.0)	-6.1 (-10.5 to -1.7)	
Yes	163	9/78 (11.6)	17/85 (20.3)	-8.7 (-19.9 to 2.5)	
KCCQ overall summary score					0.27
≤70	407	23/219 (10.5)	37/188 (19.9)	-9.4 (-16.5 to -2.4)	
>70	536	18/275 (6.5)	29/261 (11.2)	-4.6 (-9.2 to 0.2)	

-20 0 20
TAVR Better | Surgery Better

Primary Endpoint - Subgroup Analysis



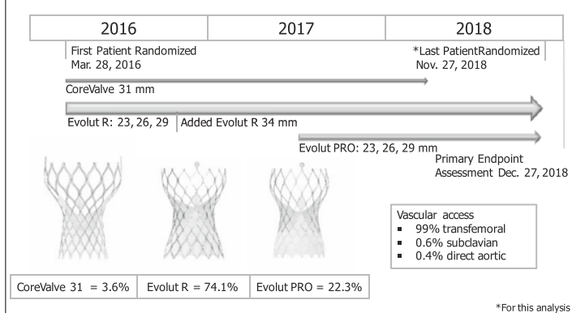
The NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTICLE

Transcatheter Aortic-Valve Replacement with a Self-Expanding Valve in Low-Risk Patients

Jeffrey J. Popma, M.D., G. Michael Deeb, M.D., Steven J. Yakubov, M.D., Mubashir Mumtaz, M.D., Hemal Gada, M.D., Daniel O'Hair, M.D., Tanvir Bajwa, M.D., John C. Heiser, M.D., William Merhi, D.O., Neal S. Kleiman, M.D., Judah Askew, M.D., Paul Sorajja, M.D., Joshua Rovin, M.D., Stanley J. Chetcuti, M.D., David H. Adams, M.D., Paul S. Teirstein, M.D., George L. Zorn III, M.D., John K. Forrest, M.D., Didier Tchétché, M.D., Jon Resar, M.D., Antony Walton, M.D., Nicolo Piazza, M.D., Ph.D., Basel Ramlawi, M.D., Newell Robinson, M.D., George Petrossian, M.D., Thomas G. Gleason, M.D., Jae K. Oh, M.D., Michael J. Boulware, Ph.D., Hongyan Qiao, Ph.D., Andrew S. Mugglin, Ph.D., and Michael J. Reardon, M.D., for the Evolut Low Risk Trial Investigators*

Study Design



Popma JJ et al. N Engl J Med 2019;380:1706

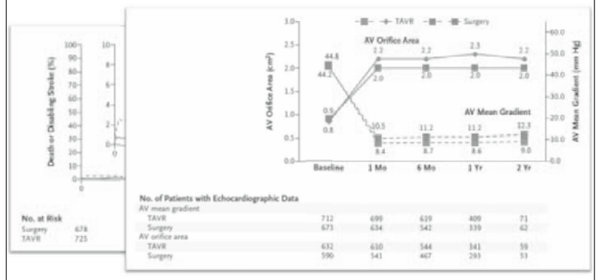
Baseline Cardiac Risk Factors

Mean ± SD or %	TAVR (N=725)	SAVR (N=678)
SYNTAX Score	1.9 ± 3.7	2.1 ± 3.9
Permanent pacemaker, CRT or ICD	3.2	3.8
Prior CABG	2.5	2.1
Previous PCI	14.2	12.8
Previous myocardial infarction	6.6	4.9
Atrial fibrillation/flutter	15.4	14.5
Aortic valve gradient, mm Hg	47.0 ± 12.1	46.6 ± 12.2
Aortic Valve area, cm^2	0.8 ± 0.2	0.8 ± 0.2
Left ventricular ejection fraction, %	61.7 ± 7.9	61.9 ± 7.7

There are no significant differences between groups.

Popma JJ et al. N Engl J Med 2019;380:1706

Results



Future Perspective

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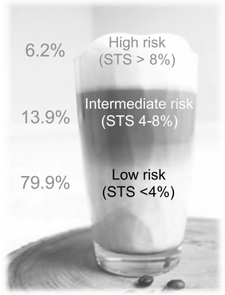
JAMA Cardiology | Original Investigation

Trends and Outcomes of Off-label Use of Transcatheter Aortic Valve Replacement

Insights From the NCDR STS/ACC TVT Registry

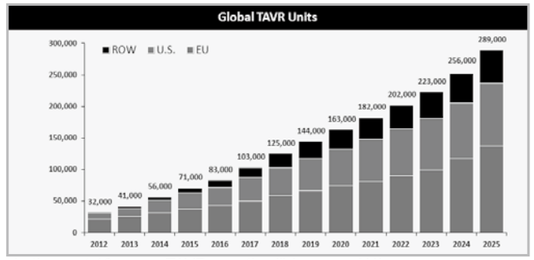
Ravi S. Hira, MD; Sreekanth Vemulapalli, MD; Zhuokai Li, PhD; James M. McCabe, MD; John S. Rumsfeld, MD, PhD; Samir R. Kapadia, MD; Mahboob Alam, MD; Hani Jneid, MD; Creighton Don, MD, PhD; Mark Reisman, MD; Saket S. Virani, MD, PhD; Neal S. Kleiman, MD



Since 2007, in the U.S., >15,000 patients have been enrolled in FDA studies (including 8 RCTs) with multiple generations of two TAVR systems!

Hira RS JAMA cardiol. 2017

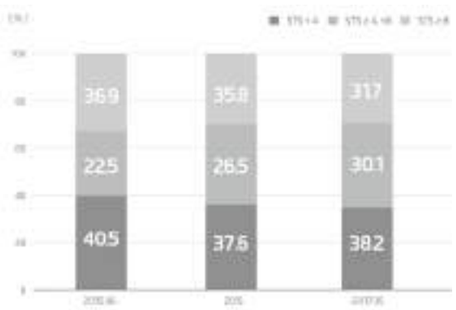
Estimated Global TAVR Growth



In the next 10 years, TAVR growth will increase X4!

Hamm et al. Eur Heart J 2016;37:803-10

K-TAVI Registry : 1st cohort

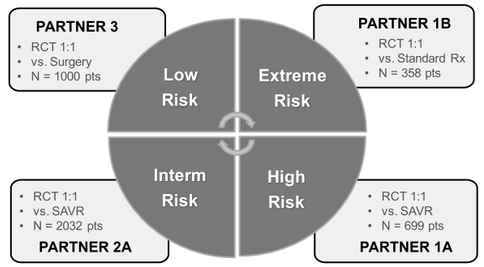


Yu CW, Kim WJ et al KCJ 2018 Mar

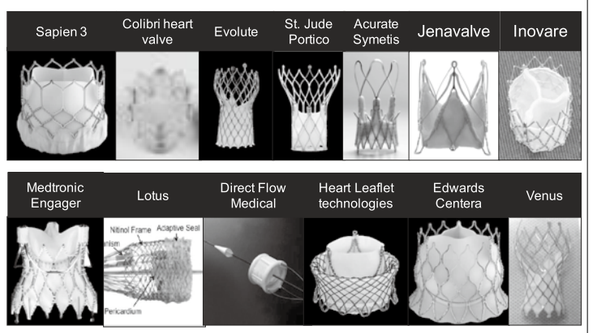
Evolution of the Treatment of Aortic Stenosis

- SAVR is the only treatment
- SAVR is the gold standard treatment
- SAVR is the preferred treatment for low and intermediate risk patients
- TAVR are performed in intermediate risk patients
- SAVR is performed in patients with contraindication to TAVR

Game Over !!



Still Developing



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경청해 주셔서 감사합니다

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CIRCULATION
SOCIETY

Session III. Session for Rising Stars

좌장 **길광채**(가슴뛰는내과), **오석규**(원광의대)

Current status of PCI in STEMI and multivessel disease	**김민철** (전남의대)
Differential clinical outcomes of antiplatelet regimens according to lesion locations in patients with PAD	**조재영** (원광의대)
LV dyssynchrony between RV septal pacing and RV apical pacing	**김성수** (조선의대)
How to optimize CRT performance in HF patients	**정래영** (전북의대)

Current status of PCI in STEMI and multivessel disease

김민철(전남의대)

MEMO

Differential clinical outcomes of antiplatelet regimens according to lesion locations in patients with PAD

조재영(원광의대)

Differential clinical outcomes of antiplatelet regimens according to lesion locations in patients with peripheral artery diseases.

Background: There is no consensus about optimal antiplatelet regimens in patients with peripheral artery diseases who received endovascular treatment (EVT).

Objectives: The aim of this study is to evaluate clinical outcomes of different antiplatelet regimens in peripheral artery disease patients requiring EVT.

Methods: From the Korean Vascular Intervention Society (K-VIS) endovascular therapy in lower limb artery disease (ELLA) registry, 2959 patients who underwent EVT were divided into three groups regarding antiplatelet regimens after discharge; single antiplatelet therapy (SAPT, n=712), dual antiplatelet therapy (DAPT, n=1,474) and triple antiplatelet therapy (TAPT, n=773). Primary endpoints were defined as major adverse limb event (MALE); composite of major amputation, minor amputation, or target vessel re-intervention. Secondary endpoints were major adverse events (MAE; death, myocardial infarction and stroke), components of MALE and major bleeding. We performed subgroup analysis according to lesion location of aorto-iliac, femoropopliteal and infrapopliteal disease.

Results: On median 701 days follow-up, there were no differences between three groups in terms of MALE. However, incidence of minor amputation and stroke was significantly lower in TAPT group than other groups (4.9% vs 3.7% vs 1.7%, p=0.002; 3.4% vs 2.2% vs 1.2%, p=0.015). On subgroup analysis according to lesion location, MALE was significantly higher in SAPT group on aorto-iliac lesion (7.5% vs 3.0% vs 4.8%, p=0.024), mainly driven by reintervention (7.0% vs 3.0% vs 4.0%, p=0.043).

Conclusion: Triple antiplatelet therapy may prevent minor amputation and stroke than single or dual antiplatelet therapy in peripheral arterial disease without increasing major bleeding. Moreover, triple antiplatelet therapy may prevent reintervention in aorto-iliac artery disease compared to other antiplatelet regimen.

MEMO

LV dyssynchrony between RV septal pacing and RV apical pacing

김성수(조선의대)

LV dyssynchrony in PPM
(RV septum vs. RV apex)

Sung Soo Kim, Hee Jin Park, Hyun Huk Kim, Young Jae Ki, Geun Ho Park, Dong Hyun Choi, Jung Hwa Jeong, Kyung Sik Jang

Division of Cardiology of Chosun University Hospital

Our story ~

89/F ER visit

C/C DOE, NYHA class IV (onset: several days ago)

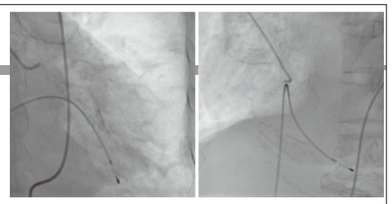
P/H HTN,HL

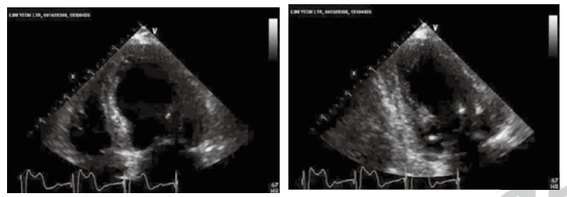
CXR Cardiomegaly, pleural effusion, both

TPM insertion

2D echo Mild hypokinesia (EF 46%)

Lab proBNP 6,716





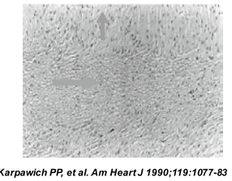
What's your choice?

1) CRT–P — No insurance
2) PPM, His pacing — Not available
3) PPM, Septal pacing
4) PPM, RV apex pacing

Deleterious Effects of RV apex pacing

❖ Remodeling
- Modified regional blood flow patterns
- Increased oxygen consumption without increase in blood flow
- Abnormal thickening of LV wall

❖ Cellular disarray
- Fibrosis (away from pacing lead location)
- Fat deposition
- Calcification
- Mitochondrial abnormalities



Karpawich PP, et al. Am Heart J 1990;119:1077-83

Right ventricular pacing in permanent pacemaker causes ventricular dyssynchrony because of non physiologic electrical conduction system.

→ Heart failure and increases hospital admission rate, mortality . – *DAVID and MOST trials*

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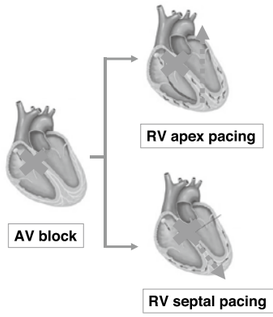
Alternative RV pacing sites



- **Retrograde conduction**
- Electrical/Mechanical dyssynchrony
- PPM induced CMP

- **Antegrade conduction**
- Electrical/Mechanical synchrony
- Improved LV function and structure

Alternative RV pacing sites

❖ **RV septal pacing (RVS) can potentially prevent the long term adverse effects associated with RV apical pacing (RVA).**

RV septal vs. RV apex

Study methods

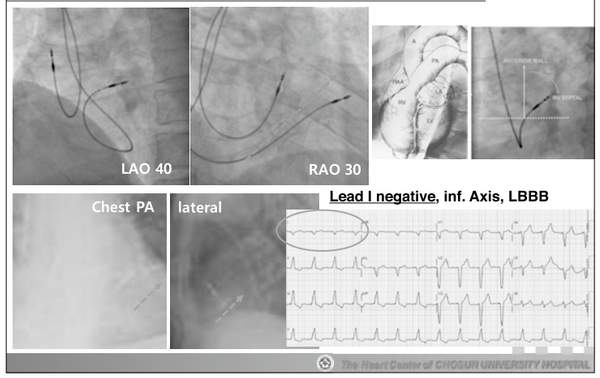
❖ **CAVB patients with de novo PPM were divided into the 2 groups according to pacing site (RV septal pacing vs. RV apex) from 2017 to 2018 in ChoSun University Hospital.**

❖ **Clinical characteristics, surface 12-leads ECG, echocardiography, were evaluated after 1 year.**

PPM (n=36) (CAVB,VP >90%)

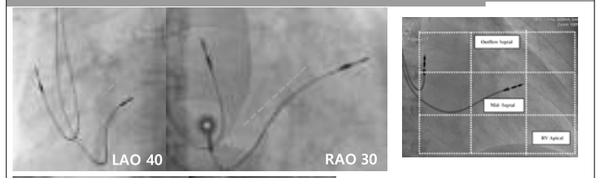
RV septal pacing (n=18) | **RV apex pacing (n=18)**

RVOT pacing



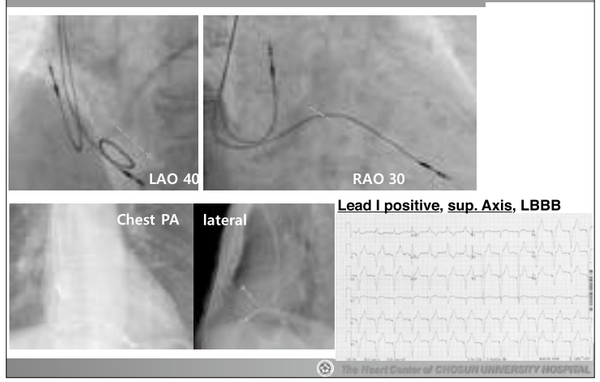
Lead I negative, inf. Axis, LBBB

RV septal pacing



Lead I positive, inf. Axis, LBBB

RV apex pacing



Lead I positive, sup. Axis, LBBB

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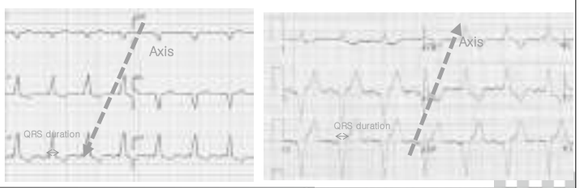
Baseline Characteristics

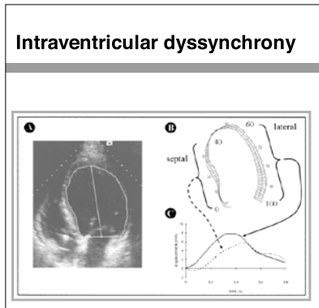
	RVS (n=18)	RVA (n=18)	P value
Age	74.5±10.5	70.8±11.2	0.318
Sex (Male)	6 (33.3%)	5 (27.8%)	0.717
Cardiovascular risk factor			
Diabetes mellitus	8 (44.4%)	4 (22.2%)	0.157
Hypertension	14 (77.8%)	9 (50.0%)	0.083
Coronary artery disease	2(11.1%)	2 (11.1%)	1.000
Cerebrovascular disorder	2(11.1%)	3 (16.7%)	0.630
Atrial fibrillation	1 (5.6%)	0 (0%)	1.000
Device related parameter			
Manufacturer – Abbott	18 (100%)	18 (100%)	1.000
Number of lead			
Single chamber	1 (5.6%)	0 (0%)	1.000
Dual chamber	17 (94.4%)	18 (100%)	
Active lead	18 (100%)	18 (100%)	1.000
Intrinsic R wave (mV)	10.1 ± 2.14	12.0 ± 1.79	0.006
Pacing threshold (V)	0.84 ± 0.24	0.62 ± 0.15	0.003
Impedance (ohm)	599.4 ± 89.6	602.6 ± 106.5	0.922
Complication	0 (0%)	0 (0%)	1.000

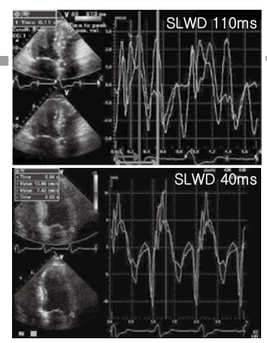
Electrocardiography

ECG change	RVS (n=18)	RVA (n=18)	P value
At implantation			
iQRS Duration	144.79±34.09	138.27±40.56	0.667
Infra his block	14 (77.8%)	9 (50.0%)	0.083
After one year			
pQRS duration	163.7 ± 7.7	172.3 ± 10.8	0.009
QRS Axis	77.39 ± 23.9	-70.72 ± 35.5	<0.001



Intraventricular dyssynchrony





Tissue doppler image – apical four chamber view
: endocardial border was outlined manually and regional fractional area changes were ; *measurement of septal to lateral wall delay > 65ms*

-- Bax, J. J., Bleeker, G. B. Left ventricular dyssynchrony predicts response and prognosis after cardiac resynchronization therapy. J Am Coll Cardiol 2004 44, 1834-40.

2D echocardiography

	RVS (n=18)	RVA (n=18)	P value
At implantation			
LA diameter	39.0±5.6	36.4±6.2	0.076
LVEDD	50.9±5.6	50.6±7.1	0.815
Ejection fraction	66.1±9.1	67.0±9.5	0.550
1 Year follow up			
LA diameter	39.5±6.4	39.6±6.4	0.956
LVEDD	50.3±±5.3	49.8±4.0	0.412
Ejection fraction	62.4±8.9	60.4±8.5	0.234
Dyssynchrony parameter			
Septal to lateral wall delay	48.3±26.4	92.2±76.2	0.031
SLWD >65ms	3 (16.7%)	12 (66.7%)	0.006

1 Year Clinical Outcomes

	RVS (n=18)	RVA (n=18)	P value
All cause mortality, n(%)	1 (5.6%)	1 (5.6%)	1.000
Cardiac death	0 (0%)	0 (0%)	
Non cardiac death	1 (5.6%)	1 (5.6%)	1.000
Hospitalization d/t HF	1 (5.6%)	0 (0%)	1.000

◆ Hospitalization d/t HF → AF, VVI 90/min, R on T phenomenon

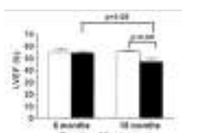
◆ Non cardiac death → Sepsis, Lung cancer

Confusing results……

❖ **RV septal pacing**
: Relatively narrower QRS (163 vs 172)
(Never narrow QRS !)
→ Waiting for His bundle pacing

❖ **Other medical status (AF, HR…..)**

❖ **Small pilot study, short term follow up**
→ Large number, Long term trials!



Tse et al JACC 2002

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Conclusion

- ❖ RVS pacing has narrower paced QRS complex, lesser ventricular dyssynchrony compared with RVA pacing.
- ❖ However, these results were not correlated with clinical outcome during one year follow up.

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How to optimize CRT performance in HF patients

정래영(전북의대)

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HONAM
CIRCULATION
SOCIETY

Special Lecture

좌장 **고영엽**(조선의대), **안영근**(전남의대)

Clinical use of PCSK9 inhibitor — **홍영준** (전남의대)

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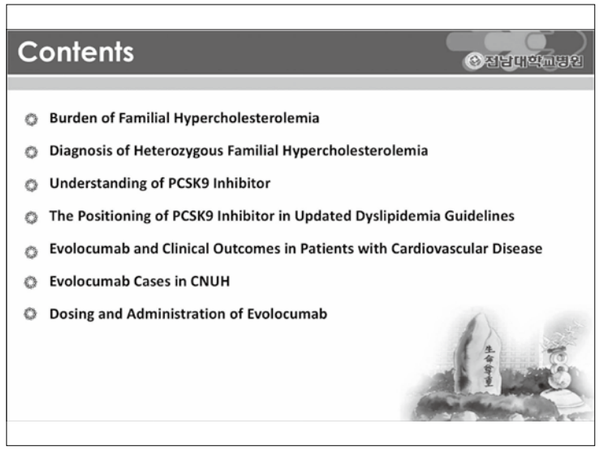
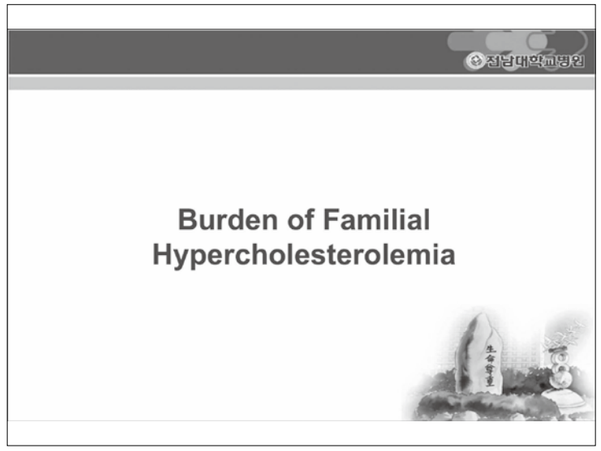
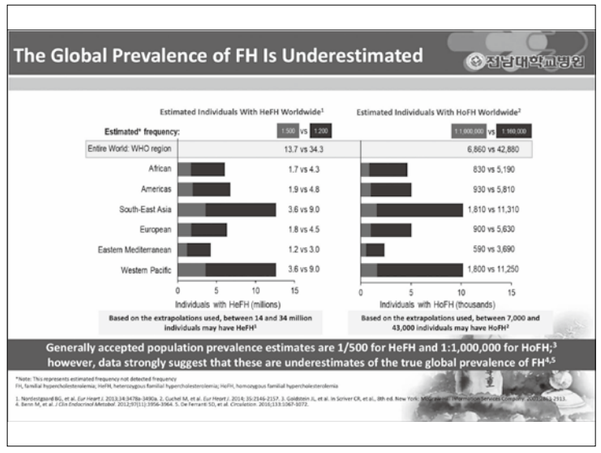
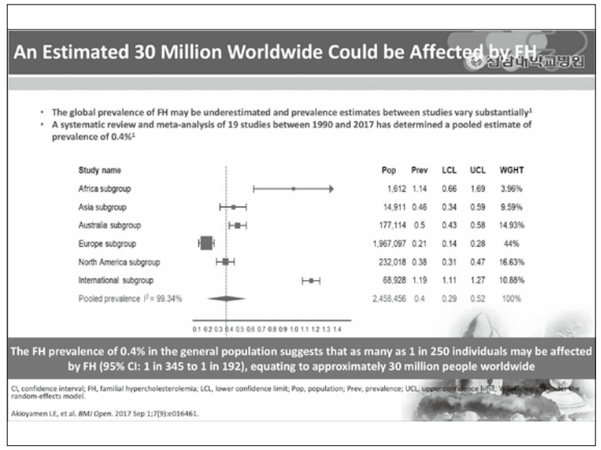
Clinical use of PCSK9 inhibitor

홍영준(전남의대)









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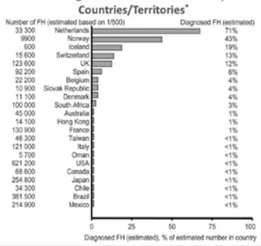
Diagnosis of FH Varies and Is Underdiagnosed in Many Countries

Estimated Percent of Individuals Diagnosed With FH Based on Expected Prevalence in Different Countries/Territories*



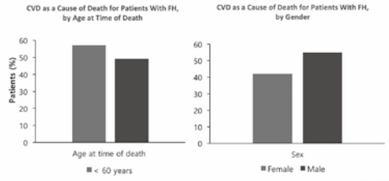
Diagnosis of FH is approximately < 1% of estimated prevalence in the US

*As a fraction of those theoretically predicted based on a frequency of 1:500 in the general population. As most countries do not have valid nationwide registries for FH, several values have been estimated from studies with their respective countries. †Countries with ≤ 1% of patients diagnosed with FH also include Australia, France, Taiwan, Italy, Oman, Canada, Japan, Chile, Brazil, and Mexico.

FH, familial hypercholesterolemia.

Nordestgaard BG, et al. *Eur Heart J*. 2013;34:3478-3490.

CVD Is the Major Cause of Death in Patients With FH



Untreated FH increases the risk of premature atherosclerosis and CVD; CVD was the main cause of death for 50% of patients and was present in 93% of patients at the time of death

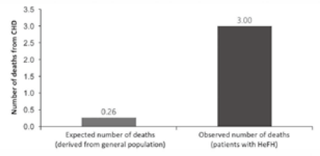
The presence of CVD, lipid profile, medical treatment, and cause of death was characterized in all deceased Norwegian FH patients, of whom medical records were accessible (n = 66, from 1980 to 2010).

CHD, coronary heart disease; CVD, cardiovascular disease; FH, familial hypercholesterolemia.

Krogh HW, et al. *Eur Heart J*. 2016; 37:1398-1405.

Risk of Death from CHD Remains 11.5x Higher in Young Adult Patients with FH Compared to the General Population

Long-Term Prospective Registry Study of 3,382 Patients With HeFH Evaluated Coronary Mortality After Widespread Use of Statins



Despite widespread use of statin therapy from 1992 to 2006, risk of death from CHD remained 11.5 x higher for HeFH patients aged 20–39 years compared with the general population

Median follow-up: 14.5 years for men and 14.1 years for women.

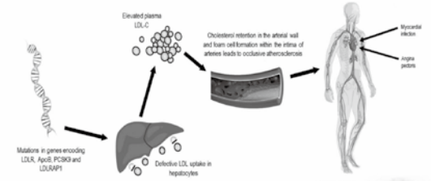
CHD, coronary heart disease; FH, familial hypercholesterolemia; HeFH, heterozygous familial hypercholesterolemia.

Neil A, et al. *Eur Heart J*. 2008;29(2625-2633.

Diagnosis of Heterozygous Familial Hypercholesterolemia

Mutations in LDLR, ApoB, and PCSK9 Lead to Decreased Uptake of LDL-C, Atherosclerosis, and CHD

Pathophysiology of HeFH[1-3]

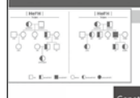


Elevated LDL-C levels and cholesterol retention in the arterial wall leads to occlusive atherosclerosis and CHD[1]

ApoB, apolipoprotein B; CHD, coronary heart disease; HeFH, heterozygous familial hypercholesterolemia; LDL-C, low-density lipoprotein cholesterol; LDLR, low-density lipoprotein receptor; LDLRAP1, low-density lipoprotein receptor adaptor protein 1; MI, myocardial infarction; PCSK9, proprotein convertase subtilisin kexin type 9.

1. Nordestgaard BG *et al. Eur Heart J*. 2013;34:3478-3490. 2. Soutar AK and Naoumova RP. *A Nat Clin Cardiovasc Med*. 2007;4(4):214-225. 3. Perak AM, *et al. Circulation*. 2016;134:e13-e14.

Characteristics of Homozygous and Heterozygous FH



	HeFH	HoFH
Genetic mutation[1]	One mutated allele	Two mutated alleles
Prevalence[1-4]	More prevalent	Less prevalent
Total cholesterol[1,5]	310–580 mg/dL	460–1160 mg/dL
LDL-C levels[1-4]	≥ 190 mg/dL	> 500 mg/dL
Physical presentation[1-3,6]	Xanthomas[a] or corneal arcus	Xanthomas[a] or corneal arcus in childhood
Acute Myocardial Infarction[2,6,7]	Usually > 30 years old	Early childhood/adolescence[b]
CHD development[1-3,5]	< 55–60 years	Childhood/adolescence[c]

[a]Subcutaneous cholesterol deposits in peripheral tissues.[8]
[b]If left untreated, patients with HoFH die before the age of 20.[1,6]
[c]For FH homozygotes, > 40% of individuals will develop CHD before the age of 20.[5]

CHD, coronary heart disease; HeFH, heterozygous familial hypercholesterolemia; HoFH, homozygous familial hypercholesterolemia; LDL-C, low-density lipoprotein cholesterol; LDLR, low-density lipoprotein receptor; MI, myocardial infarction.

1. NCEP. *Circulation*. 2002;106:3143-3421. 2. Raal FJ, et al. *Atherosclerosis*. 2012;223:262-268. 3. Reiner Z. *Nat Rev Cardiol*. 2013;10:519-529. 4. Robinson JG. *J Manag Care Pharm*. 2007;13(2 Suppl A):10-16. 5. Nordestgaard BG, et al. *Eur Heart J*. 2013;34:3478-3490a. 6. Cuchel M, et al. *Eur Heart J*. 2014;35:2146-2157. 7. Goldstein JL, et al. *Arterioscler Thromb Vasc Biol*. 2009;29:431-438. 8. Soutar AK and Naoumova RP. *Nat Clin Pract Cardiovasc Med*. 2007;4:214-225.

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Mutations in Genes Encoding Proteins Involved in LDL Uptake Are the Underlying Cause of FH

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Types of Mutations Causing FH[1-4]

Gene	Mechanism of gene mutation	Prevalence
LDLR	LDLR is absent or has decreased capacity to clear LDL from the circulation	85–90%
ApoB	Mutations impair binding of LDL to the LDLR, reducing LDL uptake	5–10%
PCSK9	Gain of function mutations increase PCSK9 activity leading to increased LDLR degradation and decreased surface expression of LDLR, thus reducing uptake of LDL-C	Rare
LDLRAP1	Loss of function mutations in the protein required for clathrin-mediated internalization reduce uptake of the LDLR–LDL-C complex	Rare (autosomal recessive hypercholesterolemia [ARH])

Although over 1,250 distinct *LDLR* mutations have been described,[1,3] novel FH mutations continue to be identified[3,5]

The National Lipid Association (NLA) recognizes three genes as primary contributors to the FH phenotype, although mutations in *LDLRAP1* have also been described[2,3]

ApoB, apolipoprotein B; FH, familial hypercholesterolemia; LDL, low-density lipoprotein; LDL-C, low-density lipoprotein cholesterol; LDLR, low-density lipoprotein receptor; LDLRAP1, LDLR adaptor protein 1; PCSK9, proprotein convertase subtilisin/kexin type 9.

1. Nordestgaard BG, et al. *Eur Heart J*. 2013;34:3478a-3490a. 2. de Castro-Oros I, et al. *Appl Clin Genet*. 2010;3:53-64.
3. Fouchy AM, et al. *J Clin Lipidol*. 2016;10:970-986. 4. Goldberg AC, et al. *J Clin Lipidol*. 2011;5:S1-S8. 5. Ahmad Z, et al. *Int Cardiovasc Genet*. 2012;5:666-675.

FH Is Most Commonly Caused by Mutations in the LDL Receptor

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- LDLR mutation databases currently list > 1,200 different mutations identified as underlying causes of FH, including:[3,5]
  - Large rearrangements
  - Premature stop codons
  - Single AA substitutions
  - Promoter region mutations
- The heterogeneity of plasma LDL-C levels and CHD risk observed in patients with FH is due to differences in the type of the mutation in the LDLR[1,6]
- FH characterized by null allele mutations of LDLR shows a more severe clinical phenotype and more advanced atherosclerosis than FH with receptor-defective mutations[3]

Most cases of FH are caused by loss-of-function mutations in LDLR, the gene encoding the LDL receptor, leading to reduced uptake of LDL-C[1,4]

AA, amino acid; ApoB, apolipoprotein B; ARH, autosomal recessive hypercholesterolemia; CHD, coronary heart disease; ER, endoplasmic reticulum; FH, familial hypercholesterolemia; IDL, intermediate-density lipoprotein; LDL, low-density lipoprotein; LDL-C, low-density lipoprotein cholesterol; LDLR, low-density lipoprotein receptor; LDLRAP1, LDLR adaptor protein 1; PCSK9, proprotein convertase subtilisin/kexin type 9.

1. Reiner Z. *Nat Rev Cardiol*. 2015;12:565–575. 2. Cuchel M, et al. *Eur Heart J*. 2014; 35:2146-2157. 3. Soutar AK and Naoumova RP. *A Nat Clin Cardiovasc Med*. 2007;4(4):214-225. 4. Nordestgaard BG et al. *Eur Heart J*. 2013;34:3478a-3490a. 5. Sturm AC, et al. *J Am Coll Cardiol*. 2018;72:662-680.

FH Phenotype Can be Characterized by LDL Deposition in Collagenous Connective Tissues

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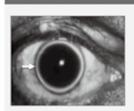
Xanthomas[1,2]

- Tendon xanthomas may be present at any age and are most commonly found in the Achille tendon and finger extensor tendons, but can also occur in patellar and tricep tendons[3]
- In HoFH, cutaneous or tendon xanthomas may be present in children < 10 years old, and are highly suggestive of diagnosis[4]
- Variability in the age at appearance and extension of xanthomas can be partly explained by the underlying mutations; earlier appearance is associated with receptor-negative vs receptor-defective status[4]

Corneal Arcus[2]



- The deposition of lipids in the human cornea, macroscopically observed as corneal arcus, is greatly accelerated in patients with HoFH[2]
- In addition to xanthomas, evidence of arcus corneae reinforces the clinical diagnosis of HoFH[4]

FH, familial hypercholesterolemia; HoFH, homozygous familial hypercholesterolemia; LDL, low-density lipoprotein.

1. Zech LA, Hong M. *Lipids in Health and Disease*. 2008;7(7). doi: 10.1186/1476-511X-7-7. 2. Garvey J, et al. *Can J Cardiol*. 2014;30:1471-1481. 3. Goldberg AC, et al. *J Clin Lipidol*. 2011;5:S1-S8. 4. Sturm AC, et al. *J Am Coll Cardiol*. 2014;35:2146-2157.

Dutch Lipid Clinic Network Score for HeFH

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표 5-8. heFH 진단을 위한 Dutch 기준

	기준	점수
가족력	일단계(first degree) 친척 중에 조기 심혈관질환이 있거나 LDL-C >95백분위수인 경우	1
	일차적 친척중에 건의 황색종(tendon xanthoma)이 있거나 <15세인 자녀가 LDL-C >95백분위수인 경우	2
과거력	조기 관상동맥질환 (남자 <55세, 여자 <60세)	2
	조기 뇌혈관/말초혈관질환	1
신체검사	건의 황색종	6
	65세 이전에 각막륜(arcus cornealis)이 있는 경우	4
LDL-C, mg/dL	≥ 325	8
	251–325	5
	191–250	3
	155–190	1
DNA 분석	*LDLR, APOB, PCSK9* 유전자 중에 기능상 돌연변이 존재	8
Definite heFH		점수 >8
Probable heFH		점수 6–8
Possible heFH		점수 3–5
진단 없음		점수 <3

1. 한국지질동맥경화학회. Korean guidelines for the management of dyslipidemia. 이상지질혈증 진료지침 4판.

Simon Broome Diagnostic Criteria for HeFH

전남대학교병원

표 5-7. heFH 진단을 위한 Simon Broome 기준

Definite heFH	콜레스테롤 기준 – 16세 미만: 총콜레스테롤 >260 mg/dL 혹은 LDL 콜레스테롤 >155 mg/dL – 16세 이상: 총콜레스테롤 >290 mg/dL 혹은 LDL 콜레스테롤 >190 mg/dL 〈콜레스테롤 기준을 만족하면서 아래 2가지 중 한가지 이상을 만족할 때〉 1. 본인이나, 일, 이단계 가족[1]에게 건 황색종이 있는 경우 2. *LDL* 돌연변이, familial defective apo B-100, 또는 *PCSK9* 돌연변이에 대한 DNA 증거가 있는 경우
Possible heFH	콜레스테롤 기준 – 16세 미만: 총콜레스테롤 >260 mg/dL 혹은 LDL 콜레스테롤 >155 mg/dL – 16세 이상: 총콜레스테롤 >290 mg/dL 혹은 LDL 콜레스테롤 >190 mg/dL 〈콜레스테롤 기준을 만족하면서 아래 2가지 중 한가지 이상을 만족할 때〉 1. 심근경색의 가족력: 1) 일단계 가족[1] 중 60세 이하 2) 이단계 가족[1] 중 50세 이하 2. 고콜레스테롤혈증 가족력: 1) 16세 미만 자녀, 형제, 자매 중 총콜레스테롤 >260 mg/dL 2) 일, 이단계 16세 이상 가족[1] 중 총콜레스테롤 >260 mg/dL

[1]일단계 가족: 부모, 형제, 자녀/이단계 가족: 조부모, 부모의 형제

1. 한국지질동맥경화학회. Korean guidelines for the management of dyslipidemia. 이상지질혈증 진료지침 4판.

Understanding of PCSK9 Inhibitor

전남대학교병원

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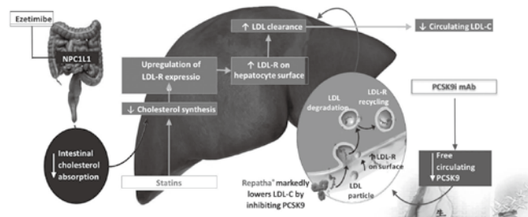
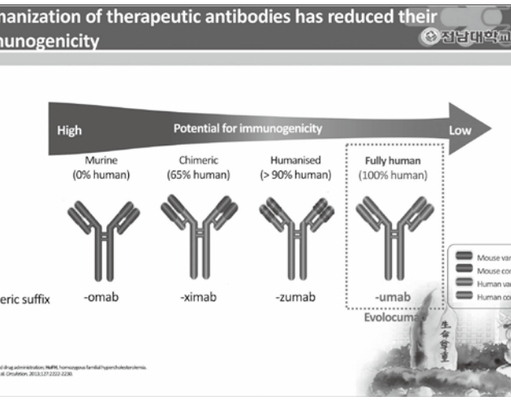
Repatha® Works Differently From, But Is Used With Other Lipid-Lowering Medications



Mechanism of action representations are for illustrative purposes only and not meant to imply clinical efficacy. mAb = monoclonal antibody.
1. Landmesser U, et al. *Eur Heart J*. 2017;38:2245-2255. 2. Repatha® (evolocumab) Prescribing Information, Amgen.

Humanization of therapeutic antibodies has reduced their immunogenicity



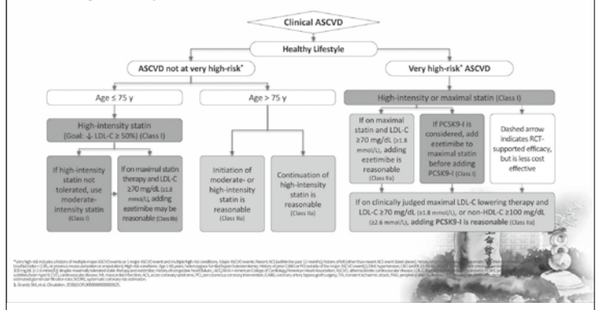
FDA, food and drug administration; HoFH, homozygous familial hypercholesterolemia.
1. Frith PA, et al. *Circulation*. 2013;127:2222-2230.

Selected PCSK9 inhibitors

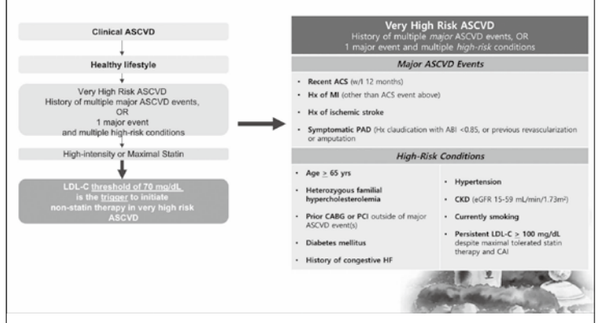
Company	molecule	Description	Clinical use
Regeneron/sanofi	Alirocumab (Praluent®)	mAb	yes
Amgen	Evolocumab (Repatha®)	mAb	yes
Pfizer	Bococizumab	mAb	withdrawn
Roche	RG-7652	mAb	Phase 2
Eli Lilly	LY3015014	mAb	Phase 2
Alnylam	ALN-PCS02	RNAi	Phase 1

The Positioning of PCSK9 Inhibitor in Updated Dyslipidemia Guidelines

2018 ACC/AHA guideline



2018 ACC/AHA guideline: LDL-C > 70 mg/dL is a THRESHOLD to Intensify Lipid-Lowering Therapy in Very High Risk ASCVD



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2018 ACC/AHA guidelines

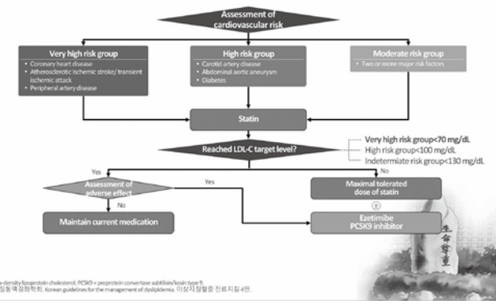
: Two patient populations with specific threshold for whom PCSK9 inhibitors can be appropriate

Very High Risk ASCVD	Primary Severe Hypercholesterolemia
Threshold*	Threshold*
≥70 mg/dL	≥100 mg/dL (FH baseline LDL-C ≥ 190mg/dL)
	≥130 mg/dL (Hypercholesterolemia with baseline LDL-C ≥ 220mg/dL)

* When on clinically judged maximally tolerated lipid-lowering therapy (statins + ezetimibe)

Grundy S, et al. J Am Coll Cardiol. 2018; DOI: 10.1016/j.jacc.2018.11.003.

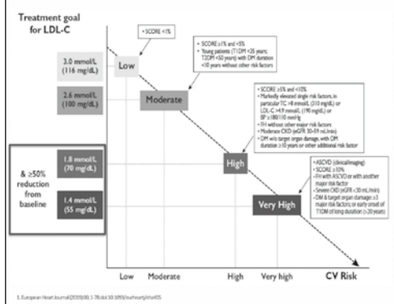
2018 Korean guidelines for management of dyslipidemia



LDL-C = low-density lipoprotein cholesterol; PCSK9 = proprotein convertase subtilisin/kexin type 9

1. 한국지질동맥경화학회. Korean guidelines for the management of dyslipidemia. 이상지질혈증 진료지침 4판.

2019 ESC/EAS Guidelines for the Management of Dyslipidemia
Treatment Goals for LDL-C Across Categories of Total Cardiovascular Disease



In **patients at very-high risk and with persistent high-risk** despite being treated with a maximally tolerated statin, combination with ezetimibe is recommended and, **if still not at goal, the addition of a** PCSK9 inhibitor **is recommended.**

2019 ESC/EAS Guidelines for the Management of Dyslipidemia
Recommendations for Treatment Goals for LDL-C

Recommendations	COR	LOE
In secondary prevention for patients at very-high risk, an LDL-C reduction of **≥50%** from baseline **and** an LDL-C goal of <1.4 mmol/L **(<55 mg/dL)** are recommended.	I	A
In primary prevention for individuals at very-high risk but without FH, an LDL-C reduction of >_50% from baselined and an LDL-C goal of <1.4 mmol/L (<55 mg/dL) are recommended.	I	C
In primary prevention for individuals with FH at very-high risk, an LDL-C reduction of >_50% from baseline and an LDL-C goal of <1.4 mmol/L (<55 mg/dL) should be considered.	IIa	C
For patients with ASCVD who experience **a second vascular event within 2 years** (not necessarily of the same type as the first event) while taking maximally tolerated statin-based therapy, **an LDL-C goal of <1.0 mmol/L (<40 mg/dL) may be considered.**	IIb	B
In patients at high risk, an LDL-C reduction of >_50% from baselined and an LDL-C goal of <1.8 mmol/L (<70 mg/dL) are recommended.	I	A
In individuals at moderate risk, an LDL-C goal of <2.6 mmol/L (<100 mg/dL) should be considered.	IIa	A
In individuals at low risk, an LDL-C goal <3.0 mmol/L (<116 mg/dL) may be considered.	IIb	A

ASCVD = atherosclerotic cardiovascular disease; FH = familial hypercholesterolaemia; LDL-C = low-density lipoprotein cholesterol.

1. European Heart Journal (2019) 00, 1–78 doi:10.1093/eurheartj/ehz455

2019 ESC/EAS Guidelines for the Management of Dyslipidemia
Recommendations for the Detection and Tx. of Patients with Heterozygous FH

Recommendations	COR	LOE
It is recommended that a diagnosis of FH is considered in patients with CHD aged <55 years for men and <60 years for women, in people with relatives with premature fatal or non-fatal CVD, in people with relatives who have tendon xanthomas, in people with severely elevated LDL-C [in adults >5 mmol/L (>190 mg/dL), in children >4 mmol/L (>150 mg/dL)], and in first-degree relatives of FH patients.	I	C
It is recommended that FH should be diagnosed using clinical criteria and confirmed, when possible, via DNA analysis.	I	C
Once the index case is diagnosed, family cascade screening is recommended.	I	C
It is recommended that FH patients with ASCVD or who have another major risk factor are treated as very-high-risk, and that those with no prior ASCVD or other risk factors are treated as high-risk.	I	C
For FH patients with ASCVD who are at very high risk, treatment to achieve a ≥50% reduction from baseline and an LDL-C <1.4 mmol/L (<55 mg/dL) is recommended. If goals cannot be achieved, a drug combination is recommended.	I	C

ASCVD = atherosclerotic cardiovascular disease; FH = familial hypercholesterolaemia; LDL-C = low-density lipoprotein cholesterol.

1. European Heart Journal (2019) 00, 1-78 doi:10.1093/eurheartj/ehz455

2019 ESC/EAS Guidelines for the Management of Dyslipidemia- Highlights of ESC Dyslipidemia Guidelines

- More intensive LDL-C reduction across all CV risk categories
- **PCSK9i moved from class IIb to Class Ia**, the highest possible level of recommendation, for secondary prevention within 3 years
- **No lower limit for LDL-C values**, the lower the better
- Very-high risk patient population redefined and is in-line with ASCVD patient population in FOURIER CV outcomes study and Evolocumab prescribing information
- **Only LDL-C goals recommended, not threshold** – Risk and LDL-C level determine treatment
  - **Very-high risk** > 50% LDL-C reduction **AND** LDL-C < 55mg/dL (Class Ia)
  - **Recurrent events** : LDL-C < 40mg/dL should be considered for ASCVD patient experiencing second vascular event within 2 years (Class IIb)
- **ACS patients**, re-evaluate lipids 4-6 weeks and then again 4-6 weeks later, if LDL-C < 55mg/dL not achieved on max statin + ezetimibe, add PCSK9i (ie, within 8 weeks)
- First ever recommendation for **ACS patients** to consider PCSK9i initiation as early as in-hospital, for patients already taking maximal lipid lowering therapy and not at LDL-C goal.
- Cost-effectiveness analysis relied only on US data rather than EU studies
  - Acknowledged cost-effectiveness is a function of baseline risk
  - Variations in cost-effectiveness exist between countries

1. European Heart Journal (2019) 00, 1–78
doi:10.1093/eurheartj/ehz455

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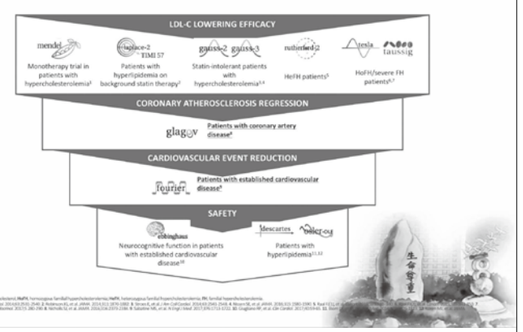
Evolocumab and Clinical Outcomes in Patients with Cardiovascular Disease

Evolocumab was studied in over 30,000 Patients

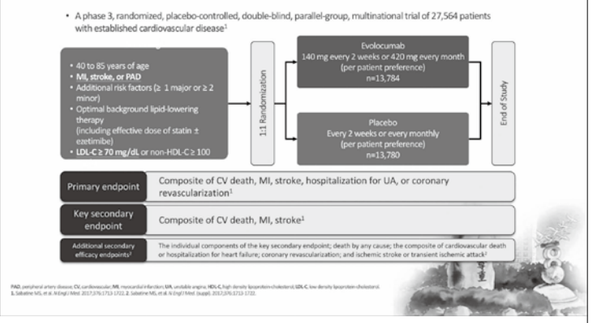


FOURIER

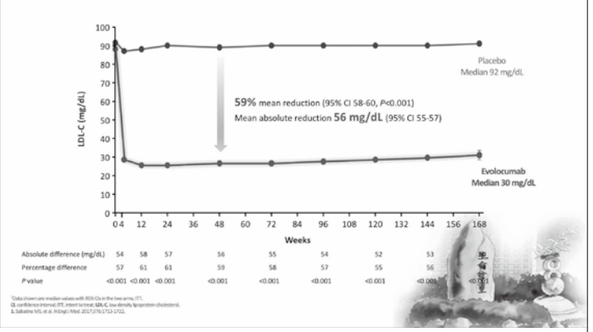
Further Cardiovascular Outcomes Research With PCSK9 Inhibition in Subjects With Elevated Risk

:The Further cardiovascular OUtcomes Research with PCSK9 Inhibition in subjects with Elevated Risk (FOURIER) trial

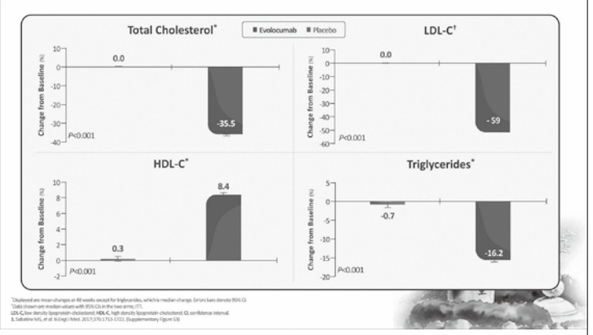
FOURIER: Study design



Median LDL-C levels over time: All patients



Lipid Measures



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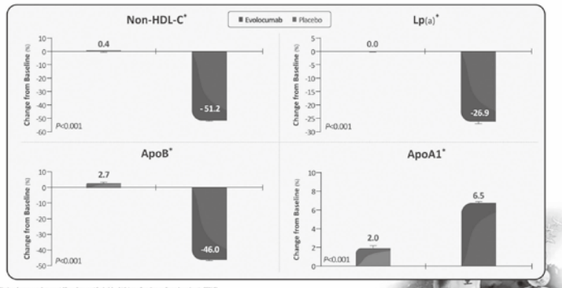
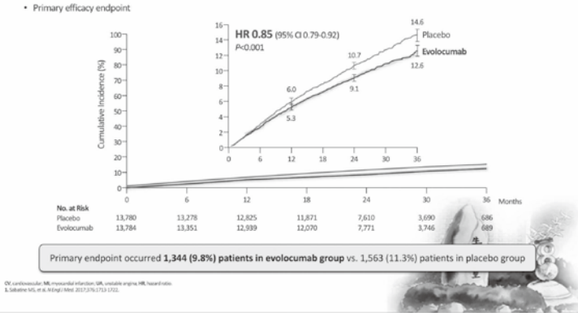
Lipid Measures



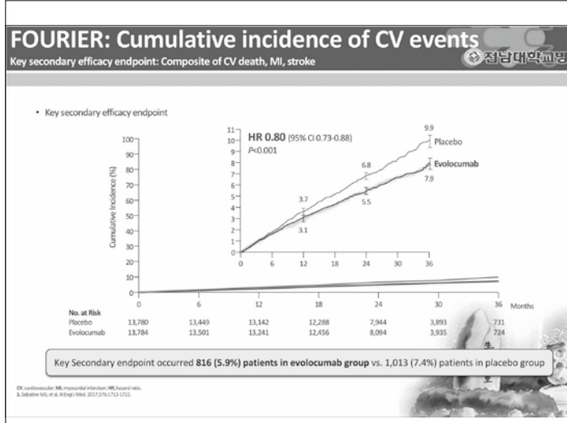
FOURIER: Cumulative incidence of CV events

Primary efficacy endpoint: Composite of CV death, MI, stroke, hospitalization for UA, or coronary revascularization



FOURIER: Cumulative incidence of CV events

Key secondary efficacy endpoint: Composite of CV death, MI, stroke



FOURIER: Adverse events and laboratory test results (followed up for a median of 2.2 years)

Outcome	Evolocumab (n=13,769)	Placebo (n=13,756)
Adverse events - no. of patients (%)		
Any	*10,664 (77.4)*	*10,644 (77.4)*
Serious	*3,410 (24.8)*	*3,404 (24.7)*
Thought to be related to the study agent and leading to discontinuation of study regimen	226 (1.6)	201 (1.5)
Injection-site reaction*	296 (2.1)	219 (1.6)
Allergic reaction	420 (3.1)	393 (2.9)
Muscle-related event	682 (5.0)	656 (4.8)
Rhabdomyolysis	8 (0.1)	11 (0.1)
Cataract	228 (1.7)	242 (1.8)
Adjudicated case of new-onset diabetes†	677 (8.1)	644 (7.7)
Neurocognitive event	217 (1.6)	202 (1.5)
Laboratory results - no. of patients/total no. (%)		
Aminotransferase level > 3 times the upper limit of the normal range	240/13,543 (1.8)	242/13,523 (1.8)
Creatine kinase level > 5 times the upper limit of the normal range	95/13,543 (0.7)	99/13,523 (0.7)

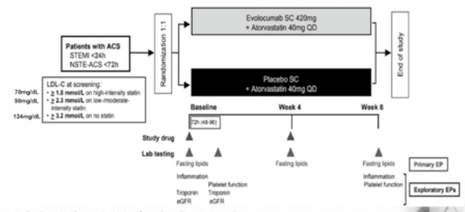
No significant between-group differences were seen in the overall **rates of adverse events**

EVOPACS

EVOlocumab for early reduction of LDL-cholesterol levels in Patients with Acute Coronary Syndromes (EVOPACS)

EVOlocumab for early reduction of LDL-cholesterol levels in Patients with Acute Coronary Syndromes (EVOPACS) – Study Design

PCSK9 inhibition with Evolocumab, administered in the early phase of ACS, is well tolerated and results in greater reduction of LDL-C levels at 8 weeks compared with placebo in patients receiving with high-intensity statin treatment.



- **Primary Endpoint** : % Change in LDL-C from baseline to 8 weeks
- **Secondary Endpoint** : Safety and tolerability
- **Exploratory Endpoints** : hs-CRP and other inflammatory biomarkers, platelet reactivity, Contrast-induced acute kidney injury, post-PCI myocardial injury

JACC August 2019 DOI: 10.1016/j.jacc.2019.08.018

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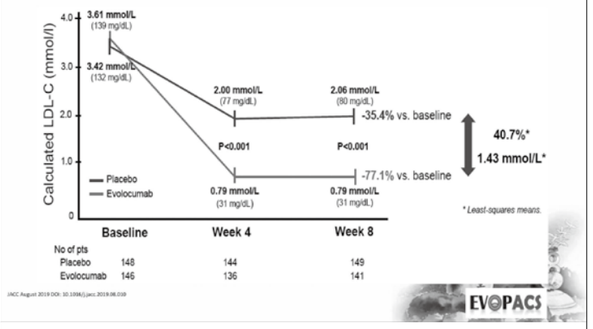
EVOlocumab for early reduction of LDL-cholesterol levels in Patients with Acute Coronary Syndromes (EVOPACS) – Primary endpoint: % Change in LDL-C at 8 weeks



EVOlocumab for early reduction of LDL-cholesterol levels in Patients with Acute Coronary Syndromes (EVOPACS) – Secondary Endpoint: Safety

	Evolocumab	Placebo	p-value
Any adverse event	78 (50.3)	77 (50.7)	0.72
Serious adverse event	12 (7.7)	11 (7.2)	0.84
Adverse event resulting in IP discontinuation	2 (1.3)	3 (2.0)	0.65
Events of special interest			
ALT increase >3x ULN	2 (1.3)	2 (1.3)	0.97
Symptomatic overdose	0 (0.0)	0 (0.0)	-
General allergic reaction	1 (0.6)	0 (0.0)	1.00
Local injection site reaction	5 (3.2)	3 (2.0)	0.48
Pregnancy	0 (0.0)	0 (0.0)	-
Neurocognitive event	1 (0.6)	0 (0.0)	1.00
Muscle pain	9 (5.8)	4 (2.6)	0.16
Nasopharyngitis	4 (2.6)	3 (2.0)	0.71
Diarrhoea	6 (3.9)	3 (2.0)	0.30

JACC August 2019 DOI: 10.1016/j.jacc.2019.08.010

EVOlocumab for early reduction of LDL-cholesterol levels in Patients with Acute Coronary Syndromes (EVOPACS) – Summary

In patients presenting with ACS and elevated LDL-C levels, in-hospital initiation of Evolocumab on top of high-intensity statin therapy for 8 weeks:

- Achieved average LDL-C levels of 0.79mmol/L (30mg/dL) vs. 2.06 mmol/L (80mg/dL) with statin alone.
- Rendered >90% of patients (vs. 11% of placebo-treated patients) within currently recommended target levels was safe and well tolerated during the short duration of the study.
- In this first randomized trial assessing a PCSK9 inhibitor in the very high risk acute setting of ACS, Evolocumab added to high-intensity statin therapy resulted in substantial reduction in LDL-C levels without raising safety concerns.
- The clinical impact of very early LDL-C lowering with Evolocumab initiated in the acute setting of ACS warrants further investigation in a dedicated CV outcomes trial.

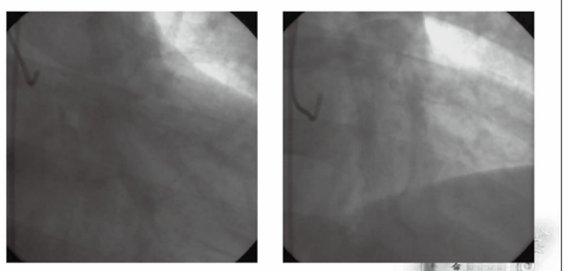
JACC August 2019 DOI: 10.1016/j.jacc.2019.08.010

Evolocumab Cases in CNUH

Case 1

- **Male/ 59 year-old**
- **Ex-smoker (1PPDx20yrs)**
- **Prior PCI 2007.4 OM branch stenting (Taxus)**

NSTEMI (2007.4)



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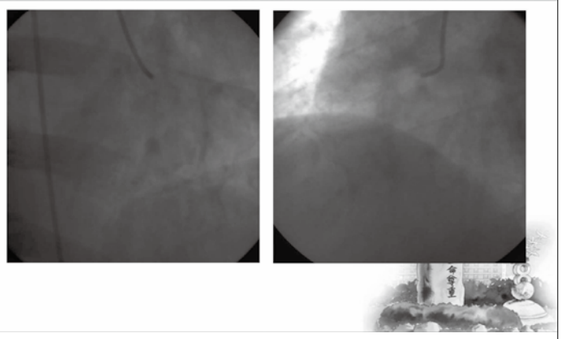
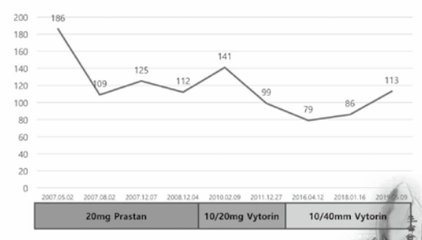
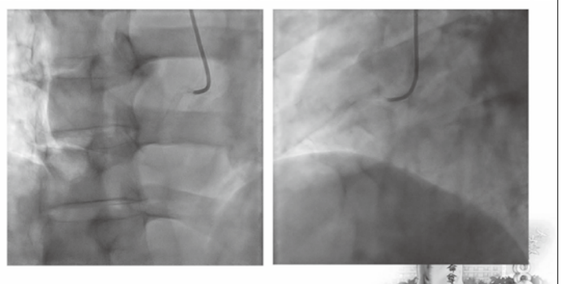
NSTEMI (2007.4)



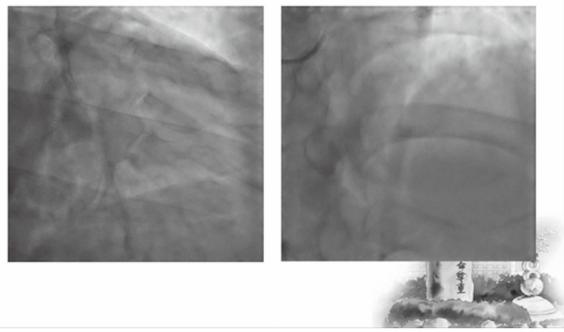
LDL Cholesterol Level



Dizziness, CAG (2019.5.10)



Dizziness, CAG (2019.5.10)



LDL Cholesterol Level

Case 2

- Male/ 45 year-old
- C/C For F/E of DL on regular health check-up **(2015.11.11)**
- Current smoker (1PPDx25yrs)
- F/H Father, Brother ; DL
- Lab TC/TG/LDL/HDL 344/89/264/68
- Local CCTA ; mild stenosis in 3 vvs

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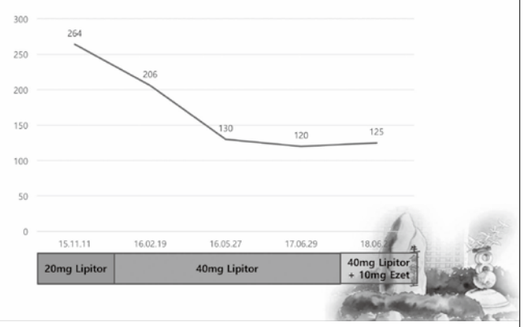
LDL Cholesterol Level



Chest pain (2018.11.28)

2018년 11월 28일 (수)
[활력징후 측정일시:20181128-1010, 측정과:CV]
BP:156/87mmHg, HR:83
Subjective & Objective
10일전에 새벽 가슴통증이 있어서 참여서 결
sublingual NTG 복용 후 증상 좋아짐
nature : 압박함
duration : 지속적
reliving factor : NTG
평소 활동시, 식사시 통증은 없었음

3년전 공연
술은 거의 먹지않음
Assessment
Dyslipidemia (r/o familial hypercholesterolemia)
Plan
12/17 Admission
12/18 CAG with ERGT

Cardiac enzymes

Troponin-I	<0.005	ng/mL

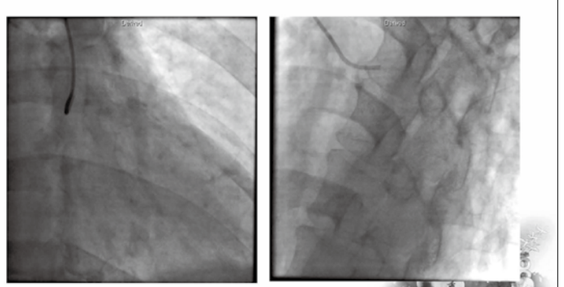
Acute phase reactants

CRP	0.07	mg/dL

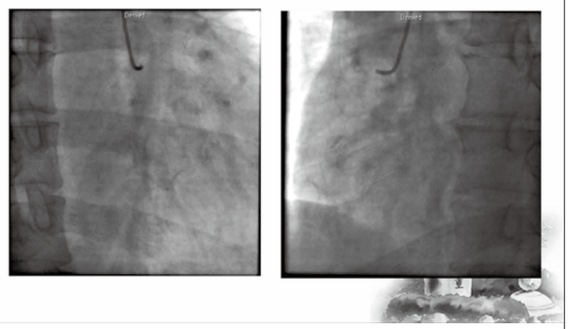
Lipid profiles

TC	152	mg/dL
TG	68	mg/dL
LDL	83	mg/dL
HDL	60	mg/dL

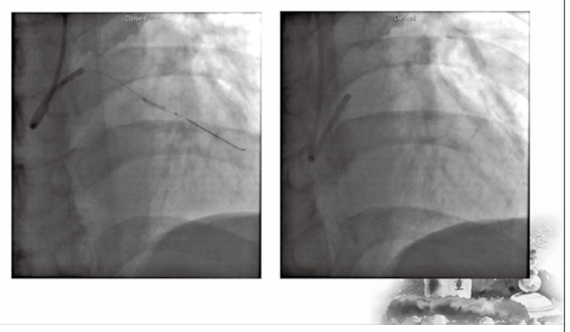
CAG (2018.12.28)



CAG (2018.12.28)



CAG (2018.12.28)



LDLR gene mutation (2018.12.18)

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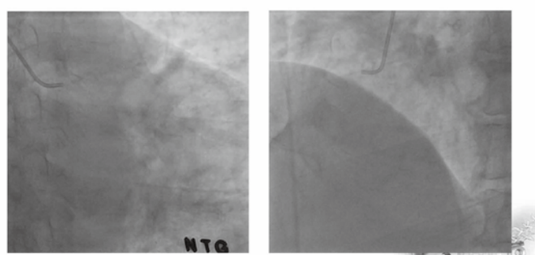
LDL Cholesterol Level

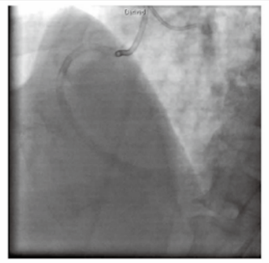
Case 3

- Male/ 57 year-old
- C/C Chest pain (2019.4.17)
- F/H Father; MI, Brother ; PCI c stent
- 2018.10 TC/TG/LDL 266/186/224
- 2019.4.25 TC/TG/LDL/HDL 266/309/169/37, Non-HDL 229

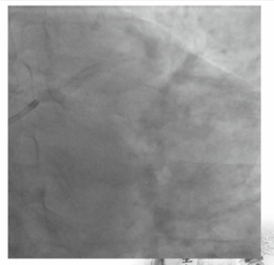
CAG (2019.4.25)



PCI (2019.4.30 & 5.3)

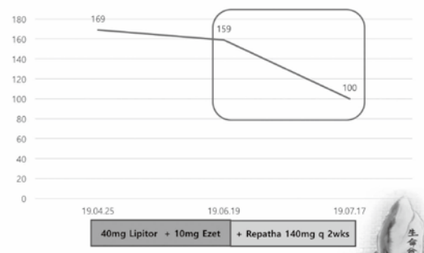


Resolute onyx 2.5x38mm, 2.75x38mm and 3.0x38mm



Resolute Onyx 3.5x30mm

LDL Cholesterol Level



Dosing and Administration of Repatha® (evolocumab)

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Indications of Repatha® (evolocumab)

고콜레스테롤혈증 및 혼합형 이상지질혈증

원발성 고콜레스테롤혈증 (이형접합 가족성 고콜레스테롤혈증 포함) 또는 혼합형 이상지질혈증 환자에서 식이요법에 대한 보조요법으로 투여

- 최대 내약 용량의 스타틴으로 충분히 LDL-콜레스테롤(LDL-C)이 조절되지 않는 환자에서 스타틴 또는 스타틴과 다른 지질 저하 요법과 병용 투여
- 스타틴 불내성 환자에서 이 약 단독 또는 다른 지질 저하 요법과 병용 투여

죽상경화성 심혈관계 질환 (한 달 약가 : 284,622원; 2주 1회 투여 기준)

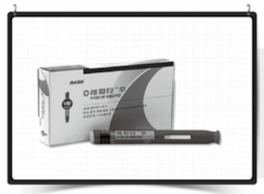
확립된 죽상경화성 심혈관계 질환(심근경색, 뇌졸중 또는 말초 동맥 질환)을 가진 성인 환자에서 다른 위험들의 교정에 대한 보조요법으로 LDL-C 수준을 저하시킴으로써 심혈관계 위험을 감소시키기 위해 **최대 내약 용량의 스타틴 또는 스타틴과 다른 지질저하 요법과 병용 투여**

동형접합 가족성 고콜레스테롤혈증

만 12세 이상의 소아 및 성인의 동형접합 가족성 고콜레스테롤혈증 환자에서 다른 지질저하제(스타틴, 에제티미브, 지질분리반출법 등)와 병용 투여

- LDL, low density lipoprotein; LDL-C, low density lipoprotein cholesterol.
- 1. Repatha® (evolocumab) Prescribing Information, Amgen Korea. 2018.

Repatha® (evolocumab) instructions for price



레파타™ (evolocumab) 약가[1]

- **포장단위 :** 140 mg/ 프리필드펜
- **약가: 142,311원/프리필드펜**

[보험 급여 기준*]

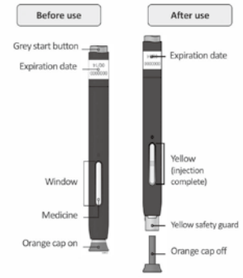
만 12세 이상의 소아 및 성인의 동형접합 가족성 고콜레스테롤혈증 환자에서 다음의 기준을 모두 만족하는 경우 HMG-CoA reductase inhibitor와 Ezetimibe에 병용 투여

가. 치료 전 LDL-C ≥ 500 mg/dL 또는 유전자 검사 (*LDLR, LDLR-APT, APOB, PCSK9*)로 확진된 경우

나. 고용량 HMG-CoA reductase inhibitor와 Ezetimibe를 투여하였으나, 반응이 불충분한 경우 (LDL-C 수치가 기저치 대비 50% 이상 감소되지 않거나 LDL-C ≥ 70 mg/dL인 경우)

- HMG-CoA, 3-Hydroxy-3-methylglutaryl-CoA; LDL-C, low density lipoprotein cholesterol.
- 1. 약제 급여 목록 및 급여 상한금액표, 보건복지부 고시 제2018-148호. 2. 레파타™ (evolocumab) 보험 급여 기준(보건복지부 고시 제2018-16호)

Repatha® (evolocumab) is available in a pre-filled auto-injector pen



- Keep Evolocumab refrigerated (2°C to 8°C).
- Allow to warm to room temperature for 30 minutes prior to use.
- No overall differences in safety or effectiveness were observed between patients ≥ 65years old and younger patients
- No dose adjustment necessary for patients with mild to moderate renal impairment or mild hepatic impairment (Child-Pugh class A).

- 3. Repatha® (evolocumab) Prescribing Information, Amgen Korea. 2018.

Ideal candidates for evolocumab in uninsured state

- **Familial hypercholesterolemia**
- **Very high-risk ASCVD**

- **Poly-vascular disease**
- **Progressive ASCVD despite optimal medical therapy**
- **Not adequate control of risk factors (NIDDM, current smoker)**

Summary

Evolocumab shows following effects

- **Evolocumab** is a fully human monoclonal antibody that binds PCSK9, **preventing PCSK9 from binding to the LDLR** and hence **reduce LDL-C levels.**[1]
- **Evolocumab lowered LDL-C levels**[2] and **delivered proven coronary atherosclerosis regression,**[5] **reduced the risk of cardiovascular events.**[2*]
- Subject to the limitations of observational studies, **general AEs and AEs of special interest did not increase** in incidence during continued exposure to evolocumab of up to 4 years[3]
- **Evolocumab 140 mg Q2W** or **420 mg QM** can be self-administered SC for patients with **HoFH, HeFH, established cardiovascular disease.**[4]

QM, once monthly; **HoFH**, homozygous familial hypercholesterolemia; **PCSK9**, proprotein convertase subtilisin/kexin type 9; **LDL**, low-density lipoprotein; **LDL-C**, LDL cholesterol; **LDLR**, LDL receptor; **SC**, subcutaneous.

3. Chan JCY, et al. Proc Natl Acad Sci USA. 2009;106:9820-9825. 5. Sabatine MS, et al. N Engl J Med. 2017;376:1713-1722. 3. Koren MJ, et al. JAMA Cardiol. 2017;2:598-607. 4. Repatha® (evolocumab) Prescribing Information, Amgen Korea. 2018; 018; 2579; 2304.

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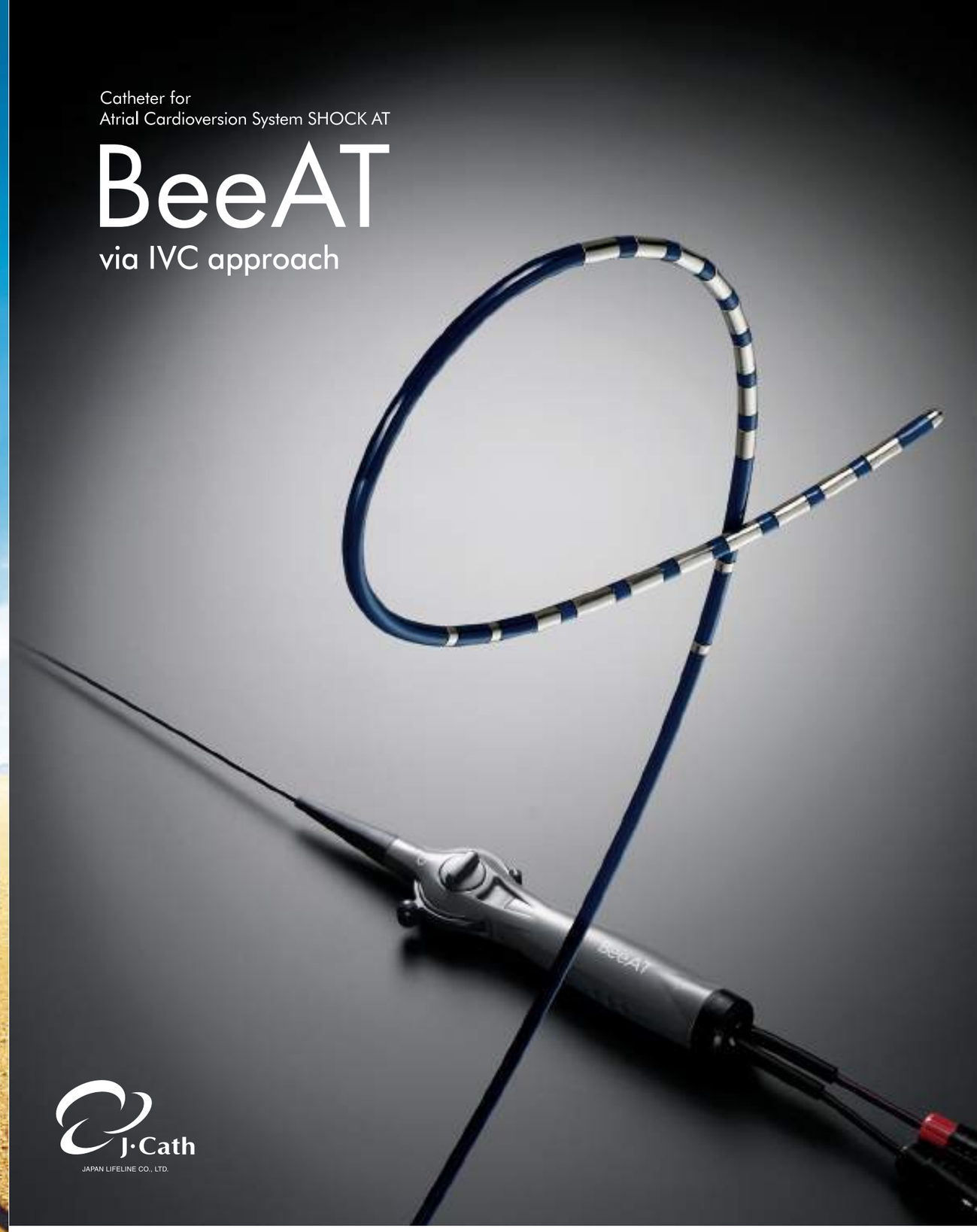

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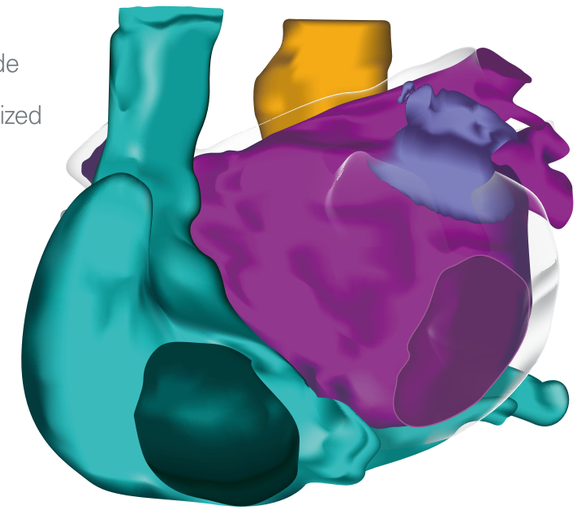
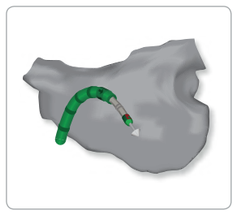
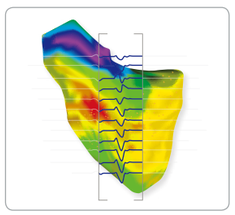
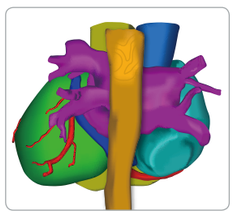




CARTO VIZIGO™
Software



CARTO® CONFIDENSE® Module
with Pattern Matching



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Usability
Enhancements

†When compared to CARTO® 3 System Version 4.3.5.
*When compared to point-by-point mapping with your THERMOCOOL SMARTTOUCH® Catheter. Pre-clinical study by Biosense Webster, Inc. Pre-clinical test results may not necessarily be indicative of clinical performance (Body Surface Morphology Matching Pre-Clinical Evidence Report).

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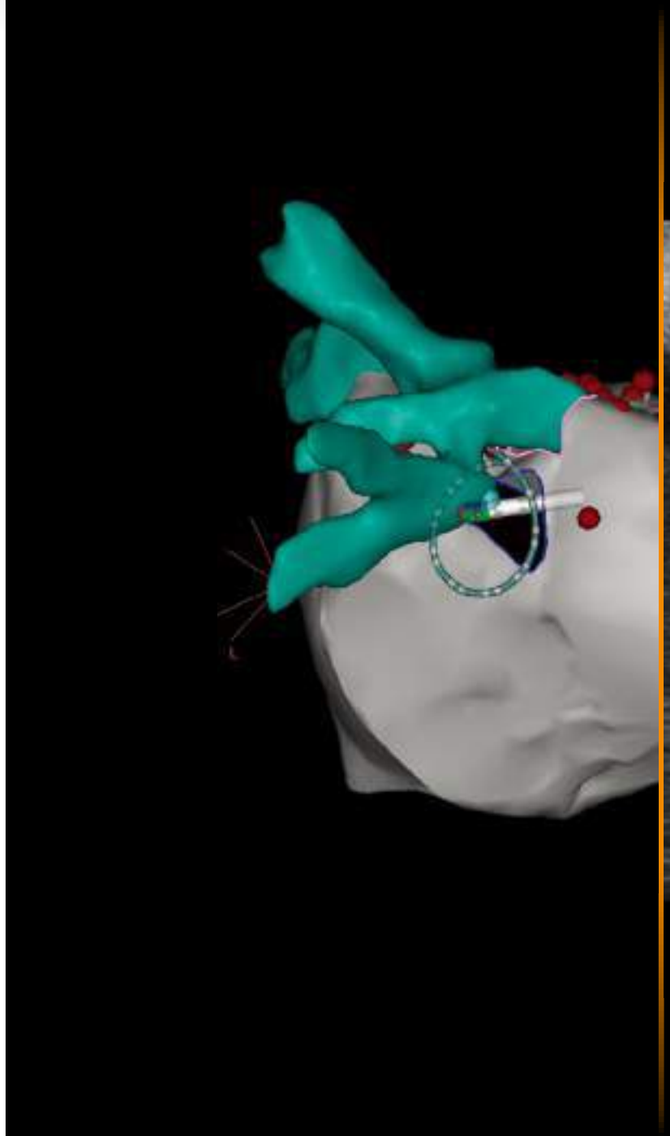

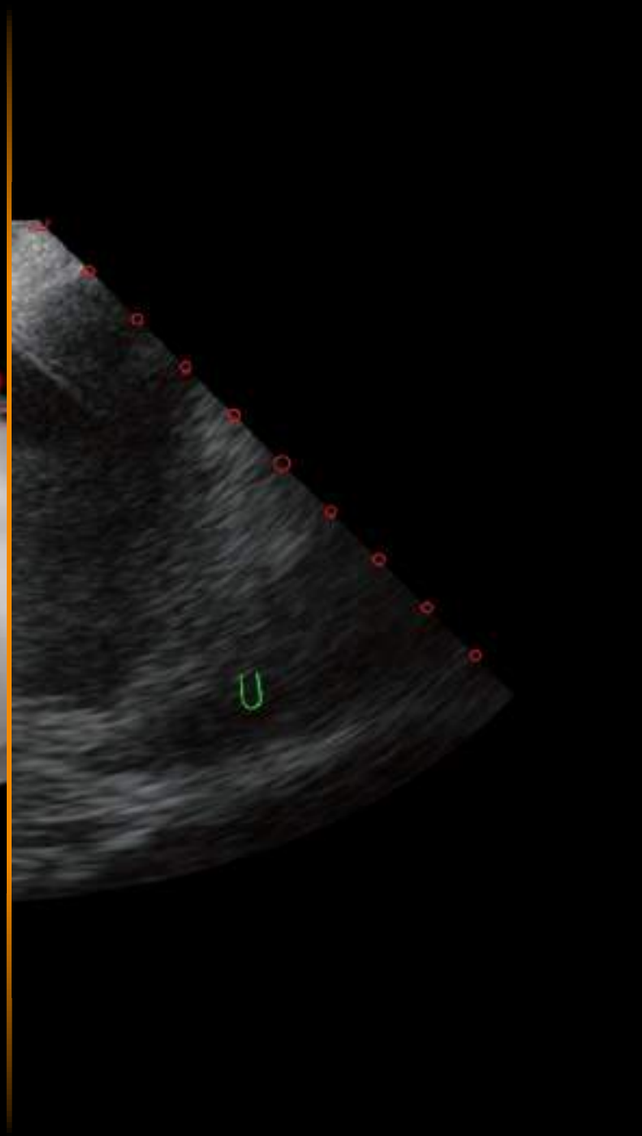

CARTOSOUND® MODULE

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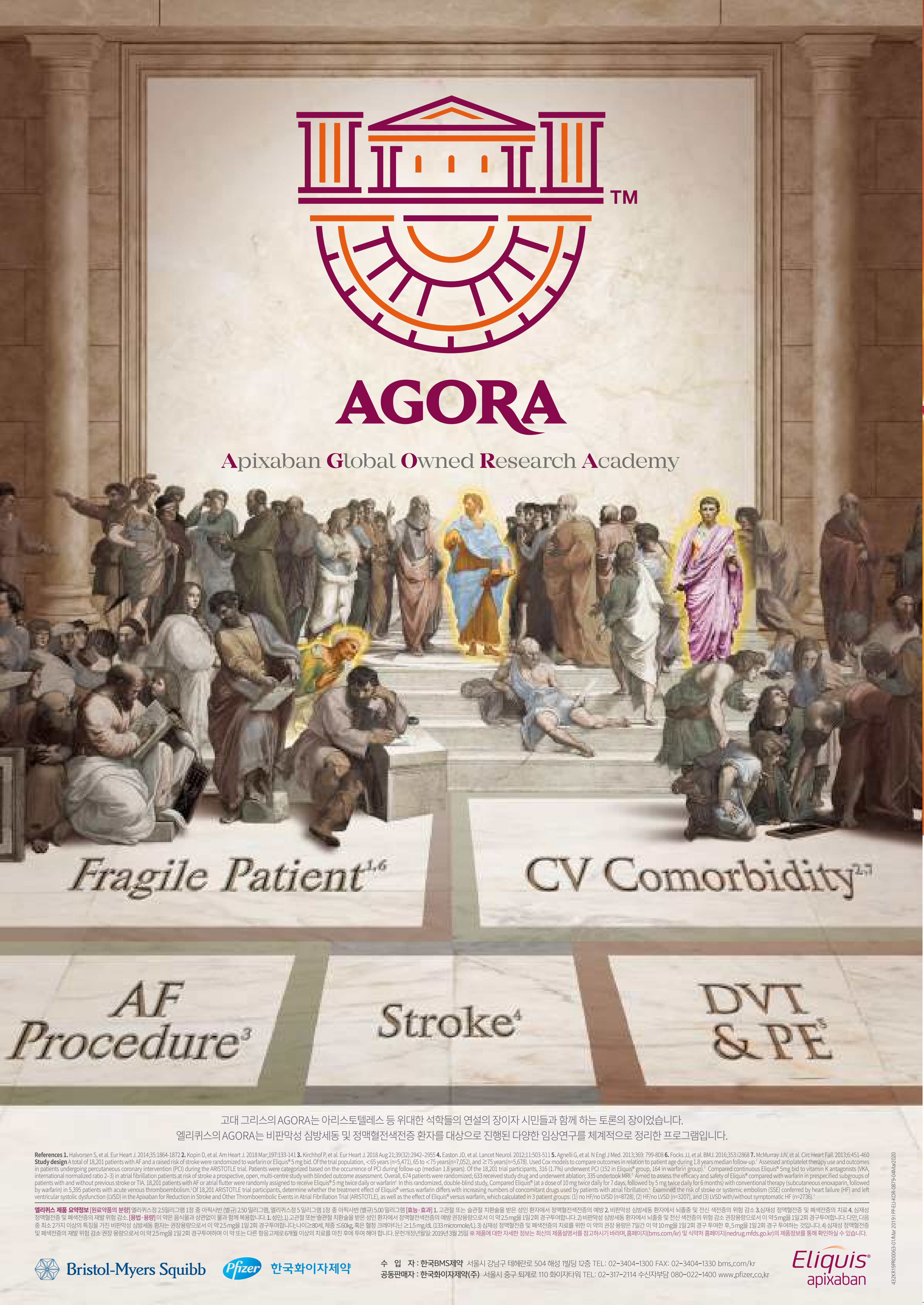
TM
AGORA
Apixaban Global Owned Research Academy
Fragile Patient[1,6]
CV Comorbidity[2,7]
AF Procedure[3]
Stroke[4]
DVT & PE[5]
고대 그리스의 AGORA는 아리스토텔레스 등 위대한 석학들의 연설의 장이자 시민들과 함께 하는 토론의 장이었습니다.
엘리퀴스의 AGORA는 비판막성 심방세동 및 정맥혈전색전증 환자를 대상으로 진행된 다양한 임상연구를 체계적으로 정리한 프로그램입니다.
References 1. Halvorsen S, et al. Eur Heart J. 2014;35:1864-1872 2. Kopin D, et al. Am Heart J. 2018 Mar;197:133-141 3. Kirchhof P, et al. Eur Heart J. 2018 Aug 21;39(32):2942–2955 4. Easton JD, et al. Lancet Neurol. 2012;11:503-511 5. Agnelli G, et al. N Engl J Med. 2013;369: 799-808 6. Focks JJ, et al. BMJ. 2016;353:i2868 7. McMurray JJV, et al. Circ Heart Fail. 2013;6:451-460
Study design A total of 18,201 patients with AF and a raised risk of stroke were randomized to warfarin or Eliquis® 5 mg bid. Of the trial population, <65 years (n=5,471), 65 to <75 years(n=7,052), and ≥75 years(n=5,678). Used Cox models to compare outcomes in relation to patient age during 1.8 years median follow-up.[1] Assessed antiplatelet therapy use and outcomes in patients undergoing percutaneous coronary intervention (PCI) during the ARISTOTLE trial. Patients were categorized based on the occurrence of PCI during follow-up (median 1.8 years). Of the 18,201 trial participants, 316 (1.7%) underwent PCI (152 in Eliquis® group, 164 in warfarin group).[2] Compared continuous Eliquis® 5mg bid to vitamin K antagonists (VKA, international normalized ratio 2–3) in atrial fibrillation patients at risk of stroke a prospective, open, multi-centre study with blinded outcome assessment. Overall, 674 patients were randomized; 633 received study drug and underwent ablation; 335 undertook MRI.[3] Aimed to assess the efficacy and safety of Eliquis® compared with warfarin in prespecified subgroups of patients with and without previous stroke or TIA. 18,201 patients with AF or atrial flutter were randomly assigned to receive Eliquis® 5 mg twice daily or warfarin[4] In this randomized, double-blind study, Compared Eliquis® (at a dose of 10 mg twice daily for 7 days, followed by 5 mg twice daily for 6 months) with conventional therapy (subcutaneous enoxaparin, followed by warfarin) in 5,395 patients with acute venous thromboembolism.[5] Of 18,201 ARISTOTLE trial participants, determine whether the treatment effect of Eliquis® versus warfarin differs with increasing numbers of concomitant drugs used by patients with atrial fibrillation.[6] Examined the risk of stroke or systemic embolism (SSE) conferred by heart failure (HF) and left ventricular systolic dysfunction (LVSD) in the Apixaban for Reduction in Stroke and Other Thromboembolic Events in Atrial Fibrillation Trial (ARISTOTLE), as well as the effect of Eliquis® versus warfarin, which calculated in 3 patient groups: (1) no HF/no LVSD (n=8728), (2) HF/no LVSD (n=3207), and (3) LVSD with/without symptomatic HF (n=2736).[7]
엘리퀴스 제품 요약정보 [원료약품의 분량] 엘리퀴스정 2.5밀리그램 1정 중 아픽사반 (별규) 2.50 밀리그램, 엘리퀴스정 5 밀리그램 1정 중 아픽사반 (별규) 5.00 밀리그램 [효능·효과] 1. 고관절 또는 슬관절 치환술을 받은 성인 환자에서 정맥혈전색전증의 예방 2. 비판막성 심방세동 환자에서 뇌졸중 및 전신 색전증의 위험 감소 3.심재성 정맥혈전증 및 폐색전증의 치료 4. 심재성 정맥혈전증 및 폐색전증의 재발 위험 감소. [용법·용량] 이 약은 음식물과 상관없이 물과 함께 복용합니다. 1. 성인: 1) 고관절 또는 슬관절 치환술을 받은 성인 환자에서 정맥혈전색전증의 예방 권장용량으로서 이 약 2.5 mg을 1일 2회 경구투여합니다. 2) 비판막성 심방세동 환자에서 뇌졸중 및 전신 색전증의 위험 감소 권장용량으로서 이 약 5 mg을 1일 2회 경구투여합니다. 다만, 다음 중 최소 2가지 이상의 특징을 가진 비판막성 심방세동 환자는 권장용량으로서 이 약 2.5 mg을 1일 2회 경구투여합니다; 나이≥80세, 체중 ≤60kg, 혹은 혈청 크레아티닌 ≥1.5 mg/dL (133 micromole/L). 3) 심재성 정맥혈전증 및 폐색전증의 치료를 위한 이 약의 권장 용량은 7일간 이 약 10 mg을 1일 2회 경구 투여한 후, 5 mg을 1일 2회 경구 투여하는 것입니다. 4) 심재성 정맥혈전증 및 폐색전증의 재발 위험 감소 권장 용량으로서 이 약 2.5 mg을 1일 2회 경구투여하며 이 약 또는 다른 항응고제로 6개월 이상의 치료를 마친 후에 투여 해야 합니다. 문헌개정년월일: 2019년 3월 25일 ※ 제품에 대한 자세한 정보는 최신의 제품설명서를 참고하시기 바라며, 홈페이지(bms.com/kr) 및 식약처 홈페이지(nedrug.mfds.go.kr)의 제품정보를 통해 확인하실 수 있습니다.
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Reference. 1) Atarashi H et al : Am J Cardiol 78(6), 694-697, 1996 2) Okishige K et al : Am Heart J140(3), 437-444, 2000 3) Ogawa et al : 心電圖 17(2), 191-197, 1997 4) 中島 光好 他 臨床医薬 5(4) 661-678 1989
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항혈소판제 병용요법으로 인한 GI RISK 관리

란소톤 LFDT

LANSOPRAZOLE

이 도와드립니다.[1,2,3]

항혈소판제 요법을 필요로 하는 환자 중 위장관 출혈 고위험군에서는

PPI 병용 요법이 추천됩니다.[4]

Adapted from 1. Frelinger AL 3rd *et al*, A randomized, 2-period, crossover design study to assess the effects of dexlansoprazole, lansoprazole, esomeprazole, and omeprazole on the steady-state pharmacokinetics and pharmacodynamics of clopidogrel in healthy volunteers, *J Am Coll Cardiol* 2012;59(14):1304-11. And online appendix available at http://www.sciencedirect.com/science/article/pii/S073510971200246X accessed Jun 12, 2018. 2. Abraham NS *et al*, ACCF/ACG/AHA 2010 expert consensus document on the concomitant use of proton pump inhibitors and thienopyridines: a focused update of the ACCF/ACG/AHA 2008 expert consensus document on reducing the gastrointestinal risks of antiplatelet therapy and NSAID use. A Report of the American College of Cardiology Foundation Task Force on Expert Consensus Documents. *J Am Coll Cardiol* 2010;56(24):2051-66. 3. Lai KC *et al*, Lansoprazole for the prevention of recurrences of ulcer complications from long-term low-dose aspirin use. *N Engl J Med* 2002;346(26):2033-8. 4. Levine GN *et al*, 2016 ACC/AHA Guideline Focused Update on Duration of Dual Antiplatelet Therapy in Patients With Coronary Artery Disease: A Report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines. *J Am Coll Cardiol* 2016;68(10):1082-115.

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1) Ernst ME et al, Am J Hypertens, 2010 Apr;23(4):440-6. 2) Ernest ME et al, N Engl J Med, 2009 Nov 26;361:2153-64. 3) Pareek AK et al, J Am Coll Cardiol, 2016 Feb 2;67(4):379-89.
4) ALLHAT Collaborative Research Group, JAMA, 2002 Dec 18;288(23):2981-97. 5) NICE guideline, Hypertension in adults : diagnosis and management(CG127).
6) Hong SJ et al, Clin Ther, 2017;39 (10):2049-60.

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[a] 55세 이상, 흡연, 고혈압, 낮은 HDL-C 콜레스테롤치 또는 조기 관상동맥 심질환의 가족력 등. [b] 망막병증, 알부민뇨, 흡연, 또는 고혈압 등 / 모든 적응증은 제품 설명서를 참고해주세요

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Reference 1. 리피토 제품설명서(개정년월일 : 2017.06.24)

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