



31 GIORNATE CARDIOLOGICHE TORINESI

TURIN
October
24th-26th
2019



Management for cardiogenic shock : interventional session

"I would not look for impella, I trust my IABP"

Dr. Pierluigi Omedè

Division of Cardiology

Department of Medical Science

Città della Salute e della Scienza, University of Turin

pierluigiomede@gmail.com



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IABP

BACKGROUND

Intra Aortic Balloon Pump

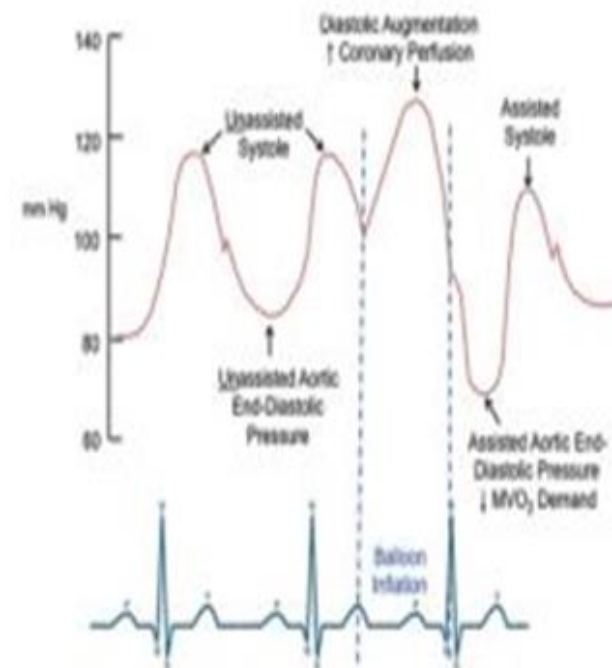
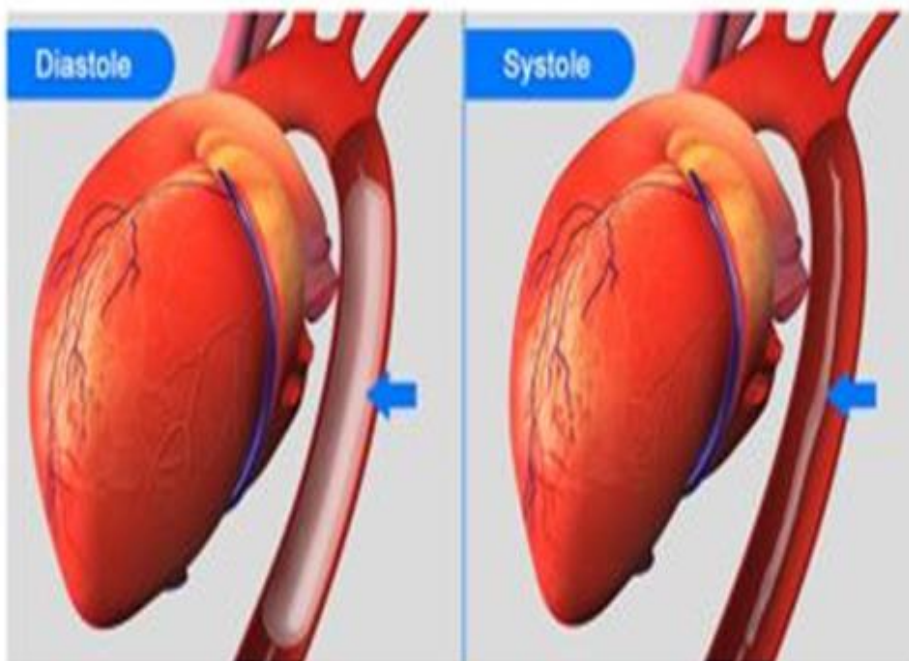
- Designed by Dr Adrian Kantrowitz in 1960's
- It is the most commonly used temporary MCS device, >50000 annually
- Placed via arterial access into the descending aorta
- Proximal tip is placed distal to left subclavian artery and the distal tip of the balloon proximal to renal arteries
- Inflates during diastole using contrapulsation increasing diastolic pressure and coronary perfusion
- During systole deflates rapidly, creating a temporary vacuum that reduces aortic pressure (afterload) and enhances LV unloading





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Hemodynamic effect of IABP

- Decrease in systolic pressure (decrease afterload)
- Increase diastolic pressure
- Decrease wall tension
- Mild increase in CO
- Increase coronary perfusion
- Decrease in wedge pressure
- Decrease Myocardial oxygen demand



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Physiological Effects of IABP

Cardiac Index \uparrow 40%
(L/min/M²)

Arterial Lactate \downarrow 42%
(mmol/L)

**Coronary
Blood Flow** \uparrow 34%
(M²/100g/min)

Cardiac Output \uparrow 500 ml/min

Heart Rate \downarrow 7 bts/min

Systolic BP \downarrow 20 mmHg

Diastolic BP \uparrow 30 mmHg


—Sheidt, NEJM 1973; Mueller, Circ 1972



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Contraindication

- 
- Moderate to severe Aortic valve insufficiency
 - Aortic dissection
 - Abdominal aorta aneurysm
 - Contraindication to anticoagulation

Complications

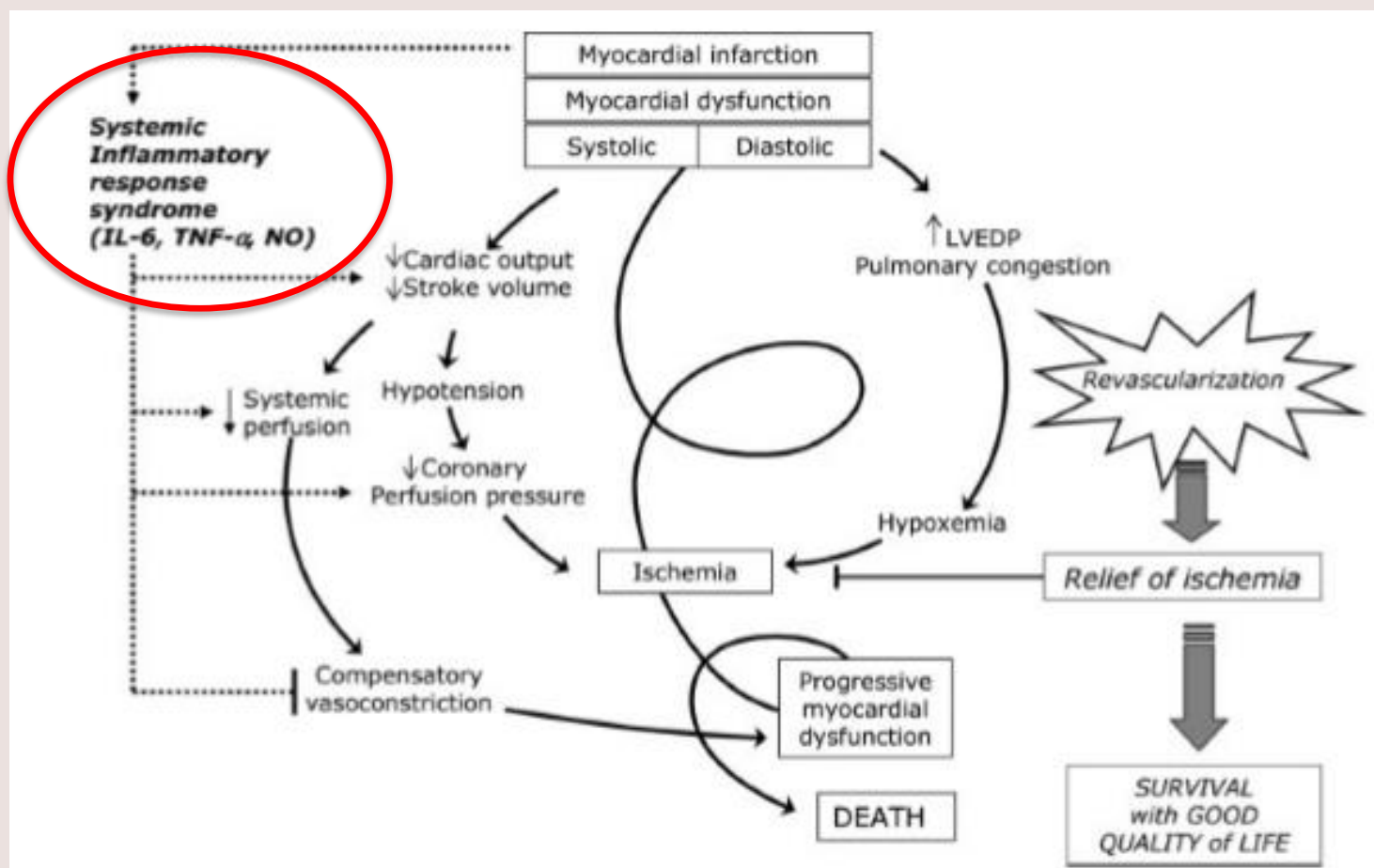
- Bleeding
- Vascular injury
- Infection
- Thrombocytopenia
- Aortic rupture/dissection
- Air or plaque embolism
- Thrombosis



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CARDIOGENIC SHOCK



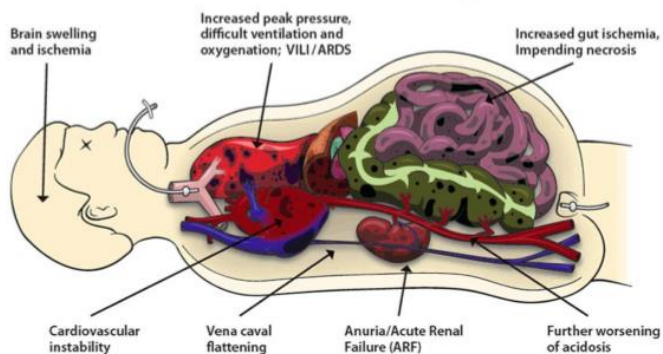


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Acute heart failure & shock is a '**sepsis like***'
condition.

Onset of Multiple Organ Dysfunction Syndrome (MODS)
IAP > 20 mmHg



Underperfusion of the intestine and the hematogenous release of endotoxin in patients with HF has been proposed as a mechanism for progression of HF and CRS type 1



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Hemo-Metabolic Shock has a Poor Prognosis

Treat Shock Before Metabolic Failure Begins

Time from Onset of Cardiogenic Shock

Hemodynamic Shock

GFR > 47 ml/min
Non-Mixed LFT Profile
36% patients (50/140)

The
Door to Support
Time

Hemometabolic Shock

GFR ≤ 47 ml/min
Mixed LFT Profile
30% patients (42/140)

27%

71%

In Hospital Mortality



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Traditional Definition of Cardiogenic Shock

Persistent SBP < 90 mm Hg not responsive to fluid administration alone

Secondary to cardiac dysfunction

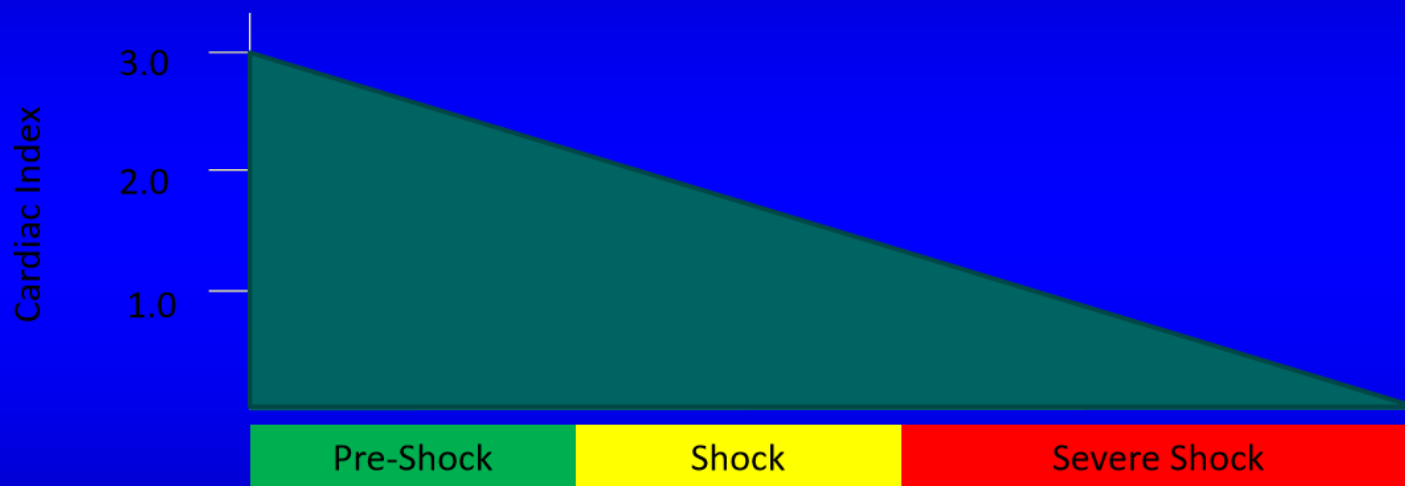
Associated with signs of hypoperfusion of a CI < 2.2 L/min/m² and a PCWP > 15 mmg Hg



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Cardiogenic Shock – Defined by NCDR as C.I. less than 2.2
Clinical Definition usually linked cardiac failure leading to lack of perfusion to vital organs and eventual acidosis and circulatory collapse





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IABP SHOCK II TRIAL

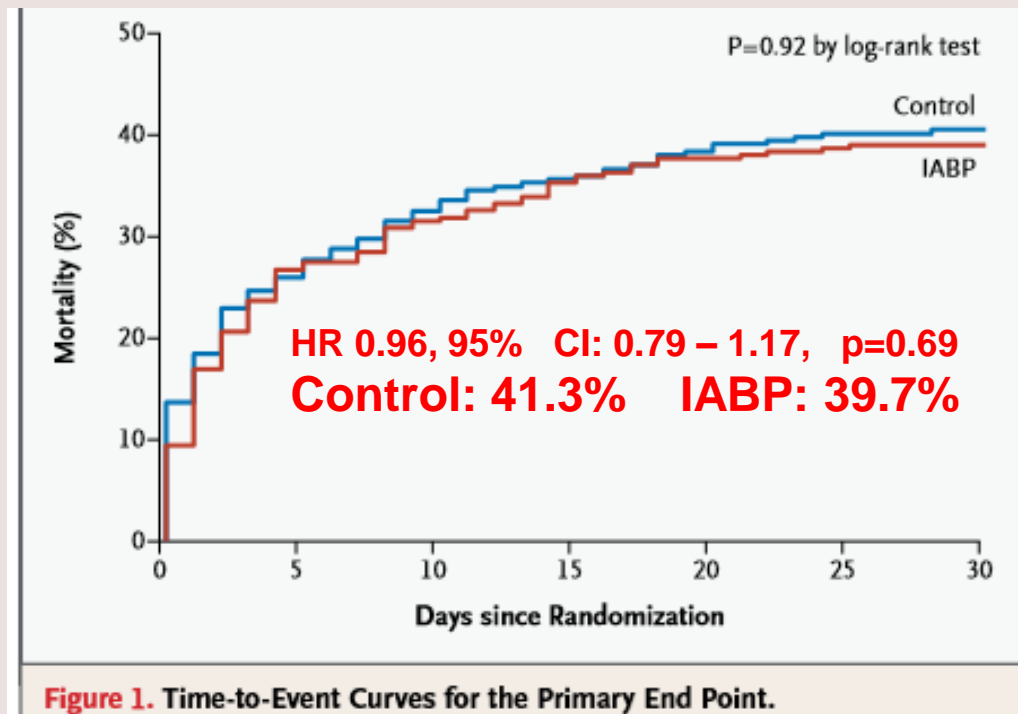


Figure 1. Time-to-Event Curves for the Primary End Point.

Time-to-event curves are shown through 30 days the primary end point of all-cause mortality. Event Meier estimates.

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Intraaortic Balloon Support for Myocardial Infarction with Cardiogenic Shock

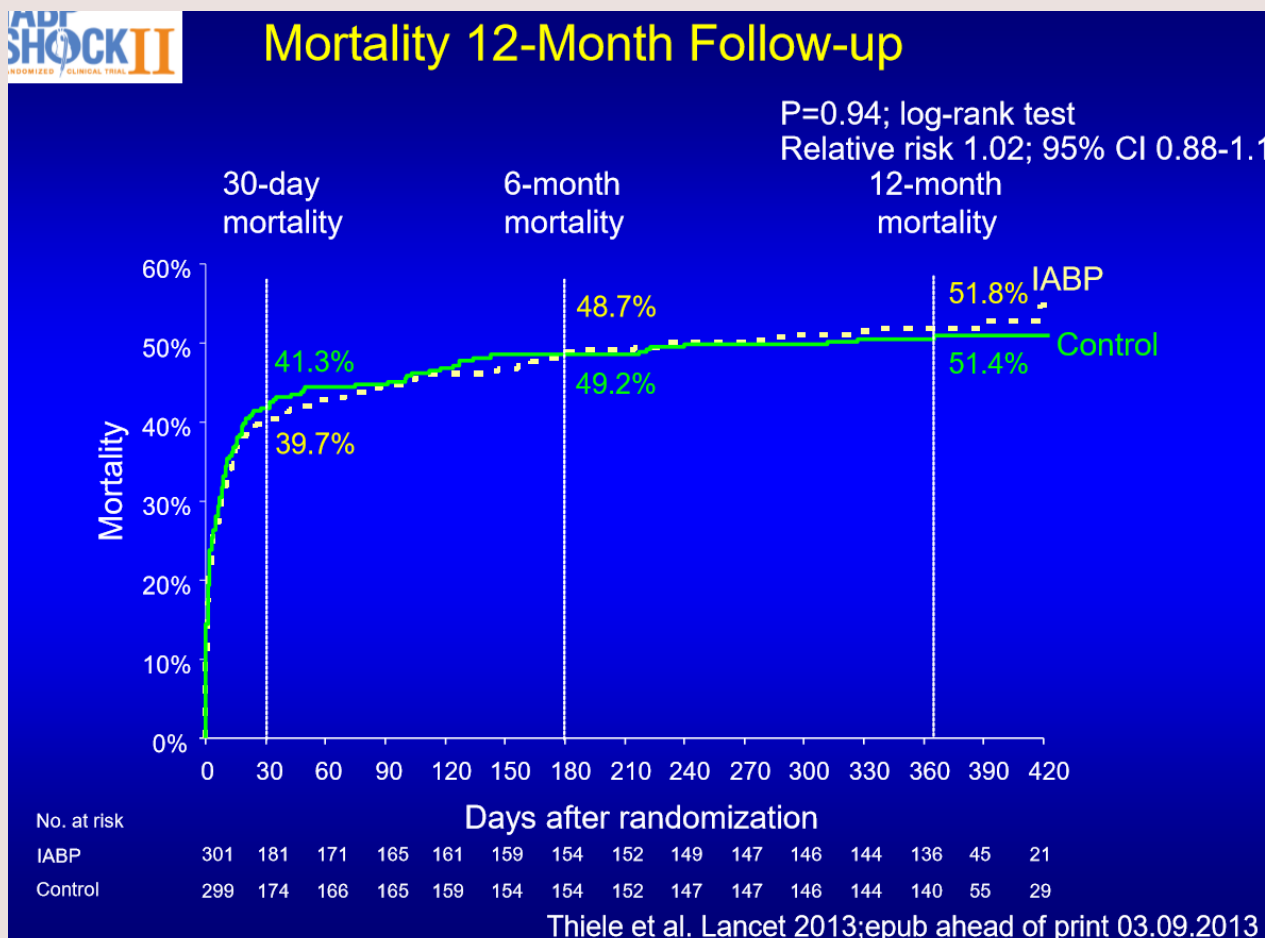
Holger Thiele, M.D., Uwe Zeymer, M.D., Franz-Josef Neumann, M.D., Miroslaw Ferenc, M.D., Hans-Georg Olbrich, M.D., Jörg Hausleiter, M.D., Gert Richardt, M.D., Marcus Hennersdorf, M.D., Klaus Empen, M.D., Georg Fuernau, M.D., Steffen Desch, M.D., Ingo Eitel, M.D., Rainer Hambrecht, M.D., Jörg Fuhrmann, M.D., Michael Böhm, M.D., Henning Ebelt, M.D., Steffen Schneider, Ph.D., Gerhard Schuler, M.D., and Karl Werdan, M.D., for the IABP-SHOCK II Trial Investigators*



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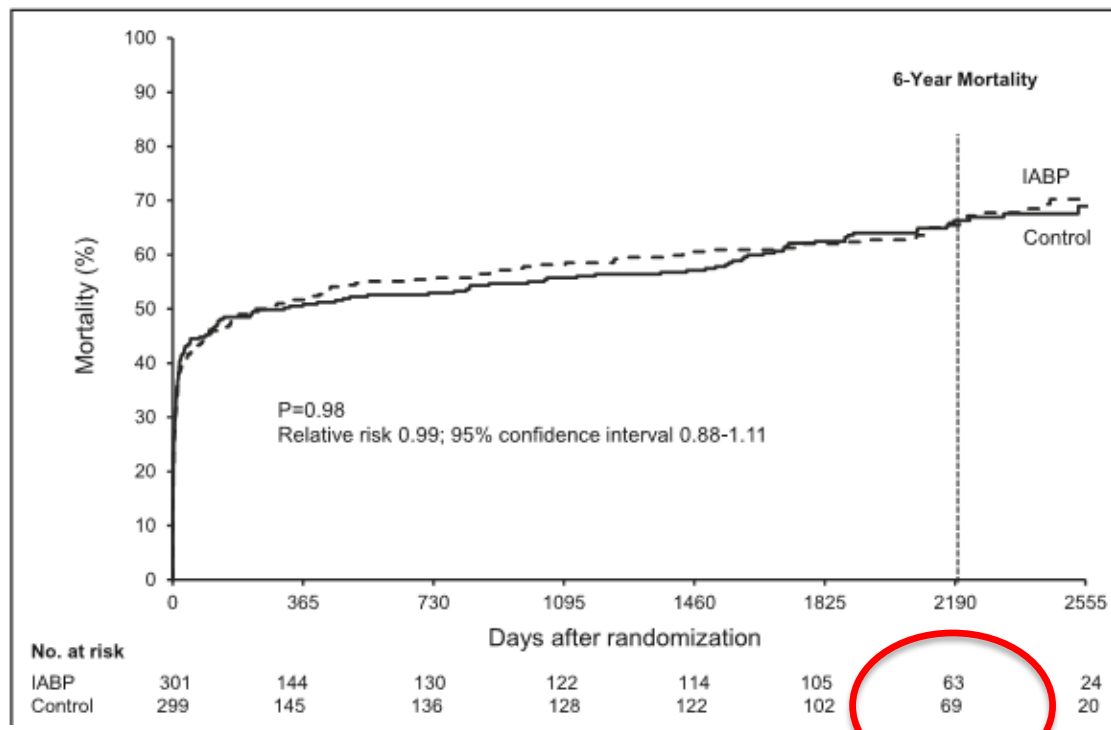




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IABP SHOCK II TRIAL



Circulation

ORIGINAL RESEARCH ARTICLE

Intraaortic Balloon Pump in Cardiogenic Shock Complicating Acute Myocardial Infarction

Long-Term 6-Year Outcome of the Randomized IABP-SHOCK II Trial

based on the log-rank test. Event rates represent Kaplan-Meier estimates. IABP indicates



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IABP SHOCK II TRIAL

Thiele et al

Long-Term Follow-Up of IABP-SHOCK II

Table 2. Predictors of 6-Year Mortality in Univariable and Stepwise Multivariable Cox Regression Analysis

Variable	Univariable		Stepwise Multivariable	
	Hazard Ratio (95% CI)	P Value	Hazard Ratio (95% CI)	P Value
Altered mental status	1.37 (1.08–1.74)	0.009	–	–
Mechanical ventilation	1.00 (0.82–1.22)	0.99	–	–
Current smoking	0.68 (0.54–0.84)	<0.001	–	–
History of arterial hypertension	1.41 (1.12–1.77)	0.003	–	–
Hemoglobin, mmol/l	0.87 (0.81–0.93)	<0.001	–	–
Hematocrit, %	0.11 (0.03–0.42)	0.001	–	–
Sinus rhythm	0.72 (0.57–0.90)	0.005	–	–
ST-elevation myocardial infarction	0.76 (0.62–0.94)	0.01	–	–
pH <7.36 at admission	1.37 (1.11–1.69)	0.004	–	–
Age, per 10 y	1.39 (1.27–1.52)	<0.001	1.33 (1.20–1.47)	<0.001
History of stroke	1.99 (1.41–2.80)	<0.001	1.52 (1.06–2.05)	0.02
Baseline arterial lactate, per 10 mmol/l	2.79 (2.22–3.51)	<0.001	2.68 (2.06–3.49)	<0.001
Baseline creatinine, per 100 µmol/l	1.03 (1.02–1.04)	<0.001	1.02 (1.00–1.03)	0.004
Oliguria (<30 mL/h)	1.68 (1.36–2.06)	<0.001	1.28 (1.01–1.62)	0.04
Multivessel coronary artery disease	1.37 (1.17–1.52)	<0.001	1.28 (1.05–1.46)	0.02
Cold, clammy skin and extremities	1.49 (1.11–2.00)	0.008	1.48 (1.06–2.05)	0.02
Left bundle-branch block	1.99 (1.53–2.60)	<0.001	1.52 (1.13–2.03)	0.005

Baseline patient variables related to mortality on univariable analysis defined by a *P* value <0.10. The first 9 variables initially entered into the model were not independently associated with mortality in the stepwise multivariable model.

ORIGINAL RESEARCH
ARTICLE



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 **ESC**
European Society
of Cardiology
European Heart Journal (2019) 40, 87–165
doi:10.1093/eurheartj/ehy394

ESC/EACTS GUIDELINES

2018 ESC/EACTS Guidelines on myocardial revascularization

The Task Force on myocardial revascularization of the European Society of Cardiology (ESC) and European Association for Cardio-Thoracic Surgery (EACTS)

8.2.2.1 Intra-aortic balloon pump

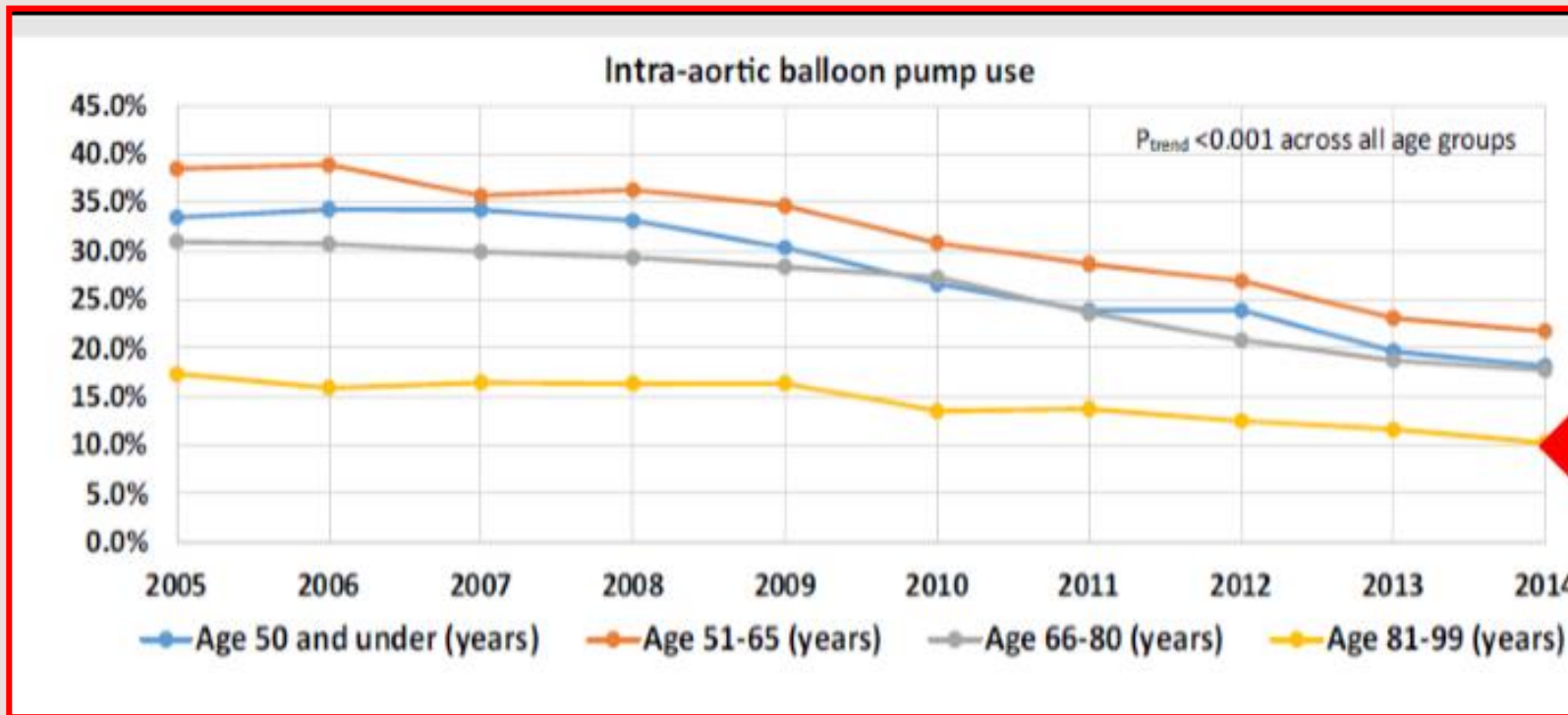
IABPs are low-cost devices that are easy to insert and remove. They moderately increase cardiac output and coronary and cerebral perfusion, while decreasing ventricular workload. In patients with cardiogenic shock complicating acute MI, the IABP-SHOCK II (Intraaortic Balloon Pump in Cardiogenic Shock II) randomized trial (600 patients) showed that the use of IABPs did not reduce 30 day mortality and that there was no evidence of long-term benefit.^{260,261} A recent Cochrane review of seven trials (790 patients) showed that IABPs may have a beneficial effect on some haemodynamic parameters but did not result in survival benefits.²⁶² Thus, the routine use of IABPs in patients with cardiogenic shock complicating acute MI is not recommended.

Revascularizations in patients with cardiogenic shock		
Emergency invasive evaluation is indicated in patients with acute heart failure or cardiogenic shock complicating ACS.	I	B
Emergency PCI is indicated for patients with cardiogenic shock due to STEMI or NSTEMI-ACS, independent of time delay of symptom onset, if coronary anatomy is amenable.	I	B
Emergency CABG is recommended for patients with cardiogenic shock if the coronary anatomy is not amenable to PCI.	I	B
Routine use of IABP in patients with cardiogenic shock due to ACS is not recommended.	III	B



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Shah et al. Clin Res Cardiol 2018;107:287-303



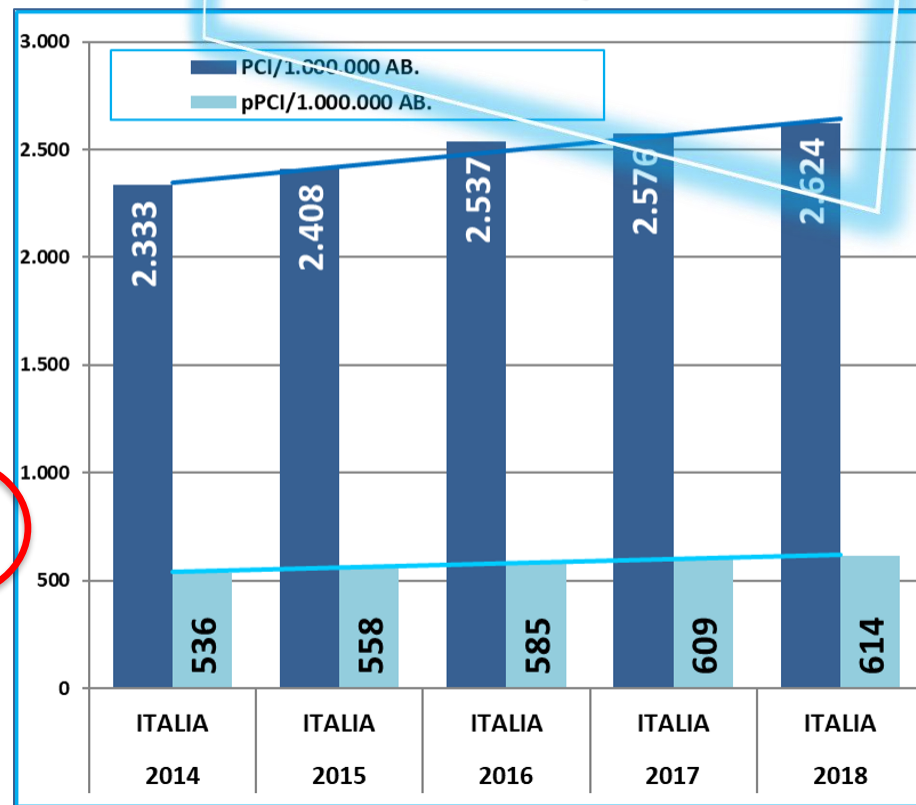
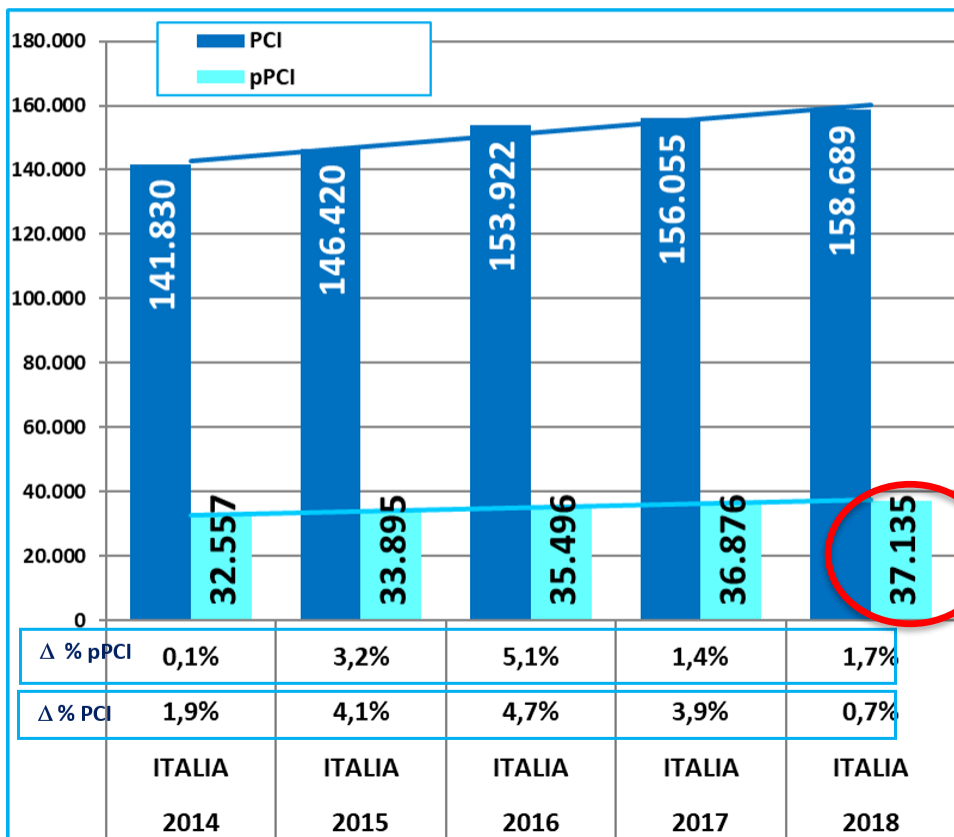
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Auditorium Antonianum
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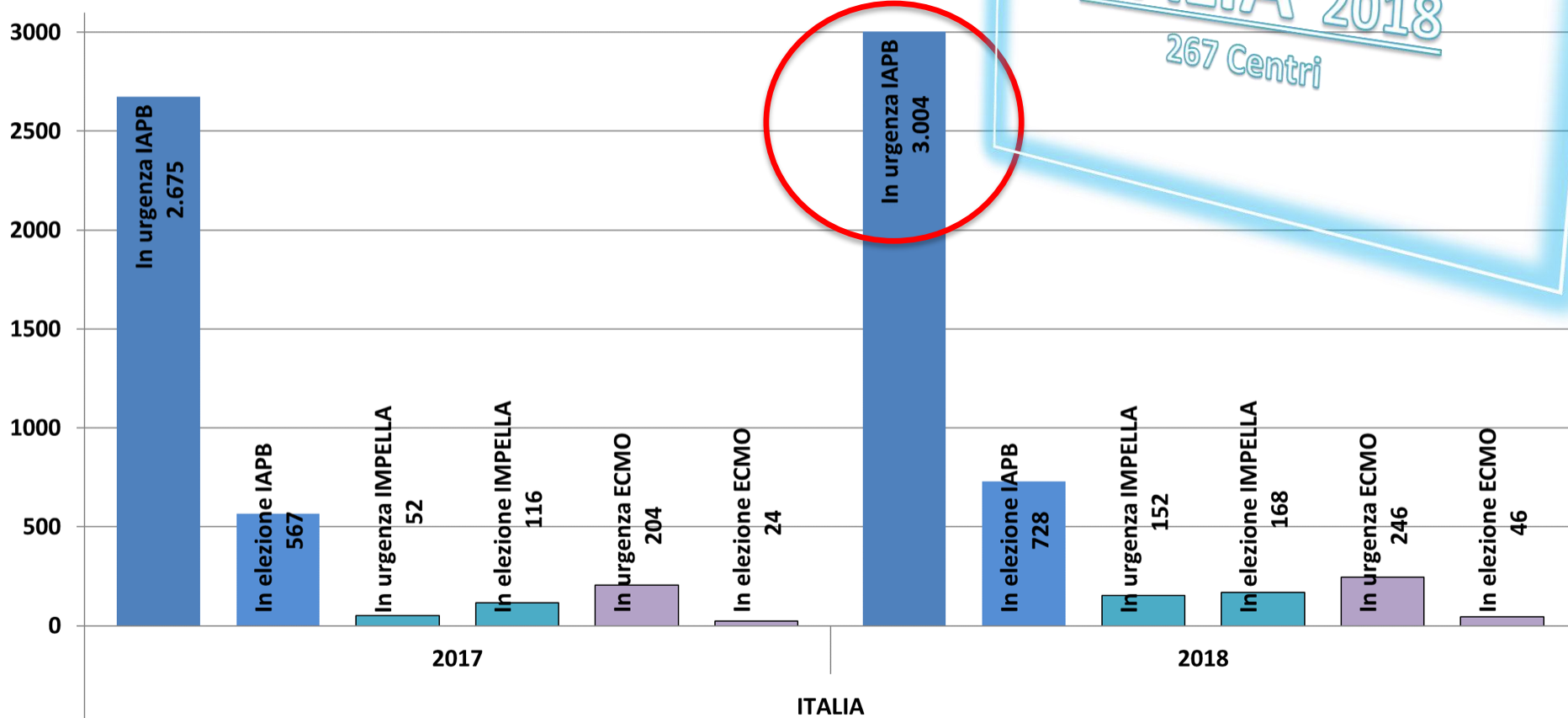
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Auditorium Antonianum

3-4 maggio 2019

ASSISTENZA VENTRICOLARE IN DOTAZIONE ITALIA 2018 E 2017

ITALIA' 2018
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IPOTESI DIAGNOSTICA / MOTIVO DEL RICOVERO

CORONAROGRAFIA IN COROTC POSITIVA PER ATEROMASIA TC E STENOSI CRITICHE
IVA I-II, CX I E CDX

PATIENT # 1

FRC: ex fumatore, ateromasia TSA non critica (dopplerTSA 02/2019: ICA dx 45-40%)

NEGA ALLERGIE

APR: 2005 prostatectomia per adenoma. BPCO in FU pneumologico. Pregressi interventi di artrodesi alle mai e polsi. Artrite reumatoide in terapia con Leflunomide dal 2016 (pregresse terapie con idrossiclorochina, MTX e sali d'oro). Anterolistesi nota C1-C2 sottoposto ad agosto us ad intervento NCH di stabilizzazione

Anamnesi cardiologica:

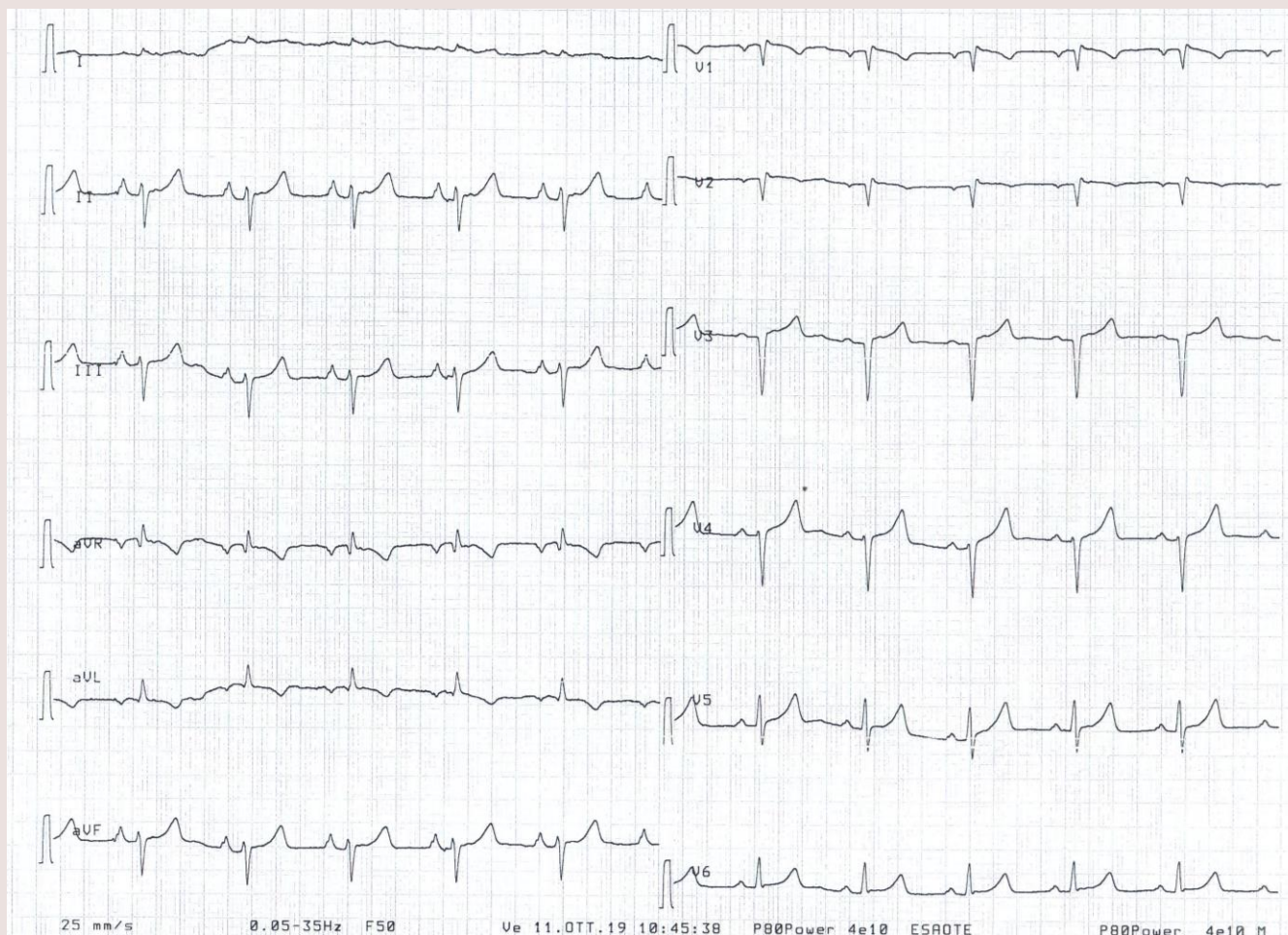
Cardiopatia valvolare: steno-insufficienza aortica moderata in FU ecocardiografico. All'ecoTT 06/2018 dubbia aorta bicuspidale per cui eseguita RM cardiaca (08/2018) che mostrava morfologia tricuspide con lembi calcifici e confermava il quadro di steno-insufficienza aortica lieve-moderata. Ultimo ecoTT 06/2019: VS di norma, FE 63%, cinesi conservata, stenoinufficienza aortica moderata stabile (grad 33/18 mmHg, AVA LTI 1,1 cmq), IM ed IT lievi.

Da alcuni mesi dispnea per sforzi moderati (NYHA II), mai a riposo, nega ortopnea/DPN, mai sincopi/lipotimie. Nega sintomatologia anginosa. Eseguita coroTC (09/2019): ateromasia TC, IVA I-II subocclusa, stenosi critica Cx I, ateromasia diffusa CDx che determina stenosi critiche > 70% sequenziali. Si osserva inoltre ateromasia dell'aorta addominale e lieve falsa di versamento pericardico. Posta indicazione dal Curante a studio coronarografico, motivo dell'attuale ricovero.



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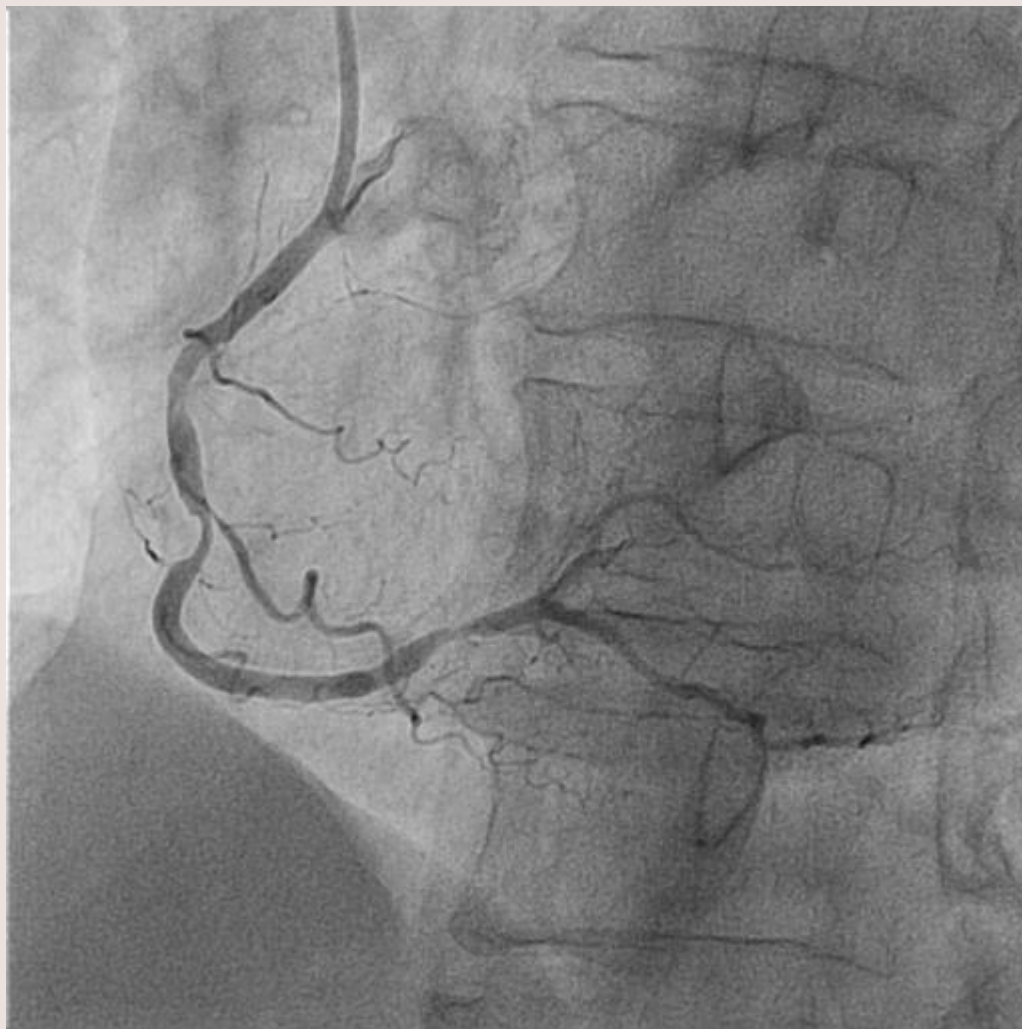
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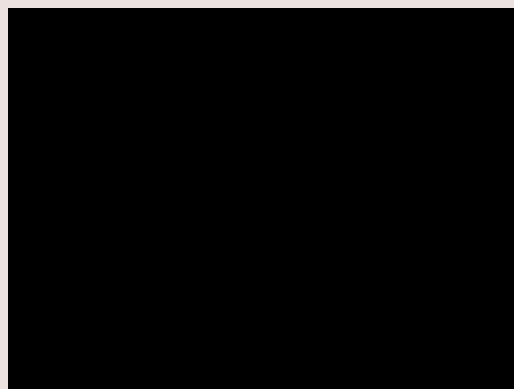
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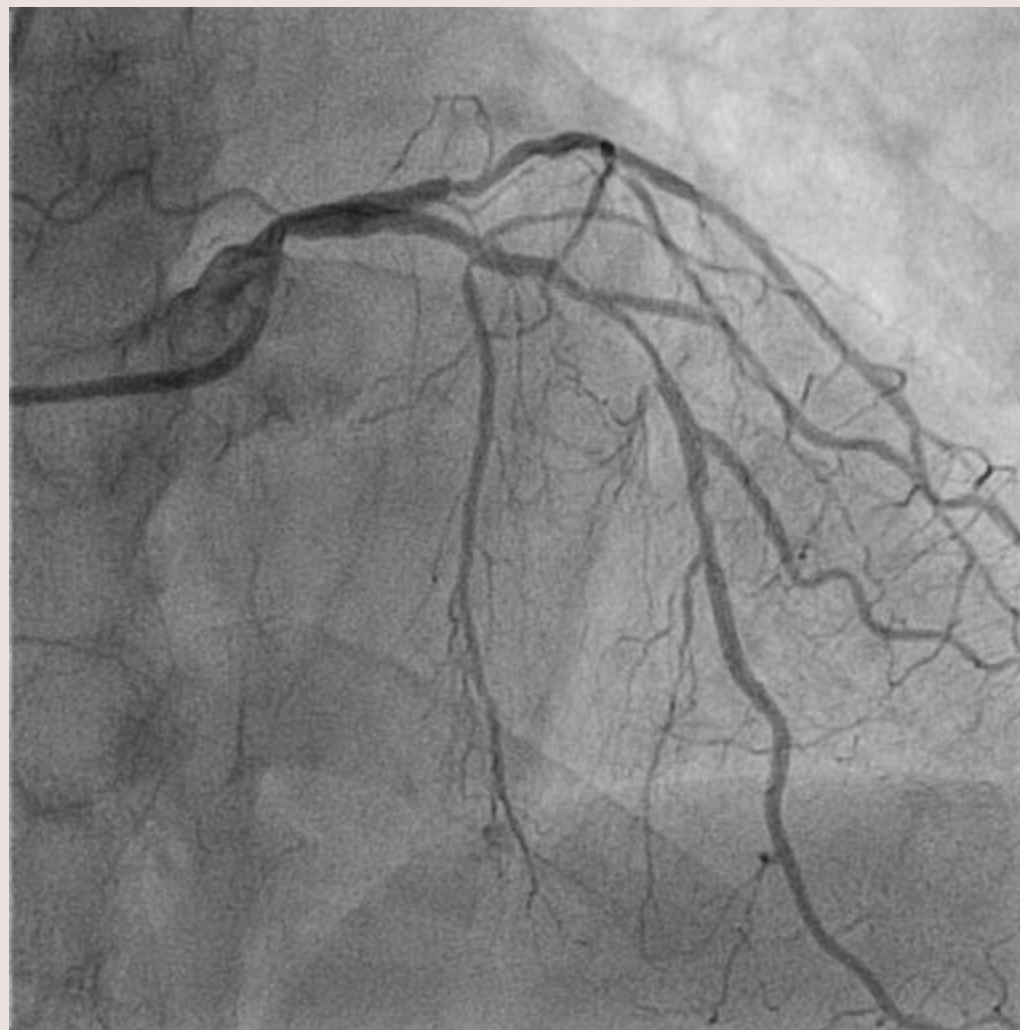
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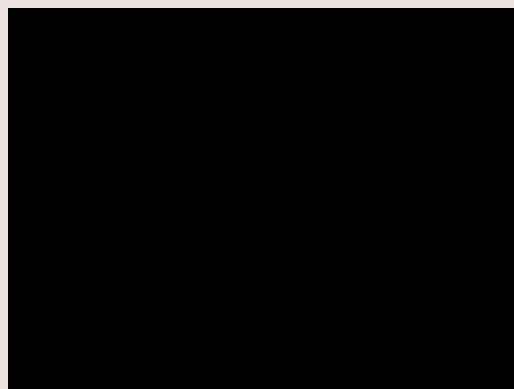
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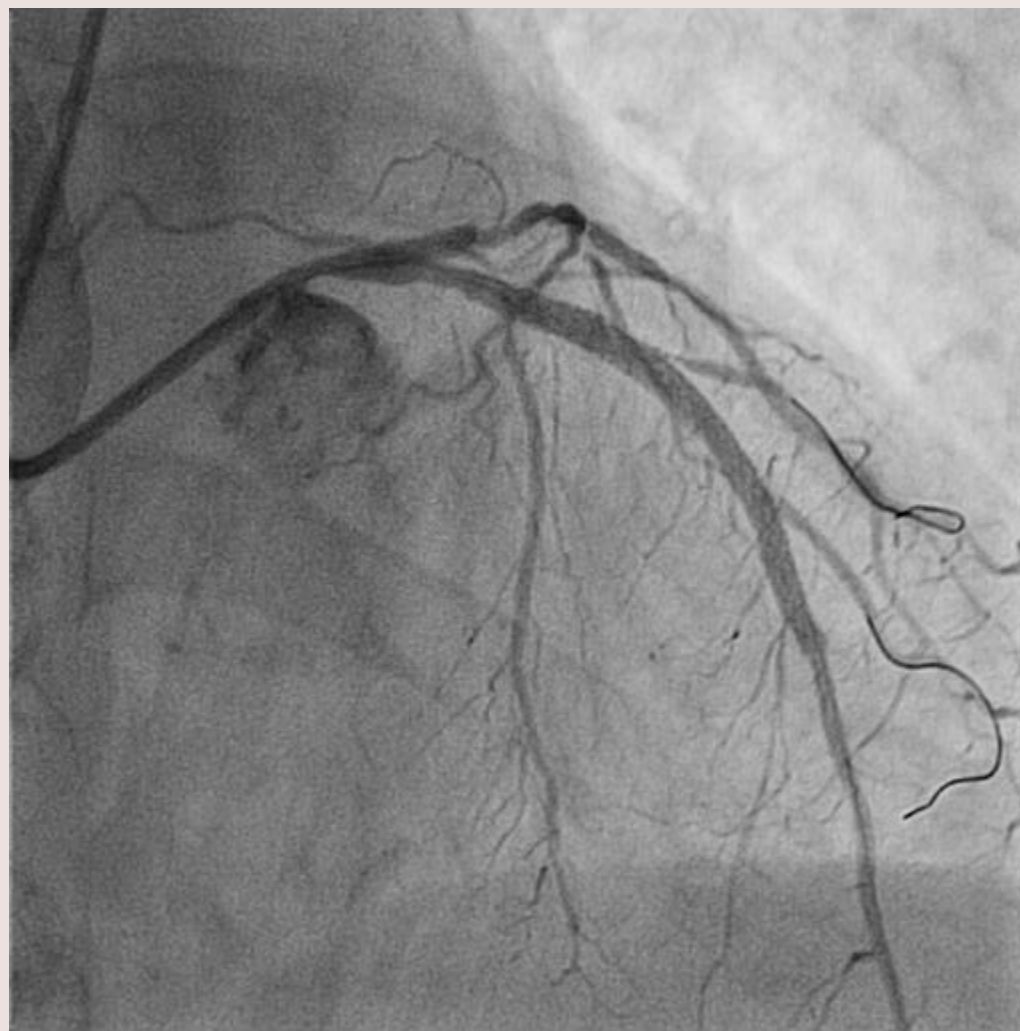
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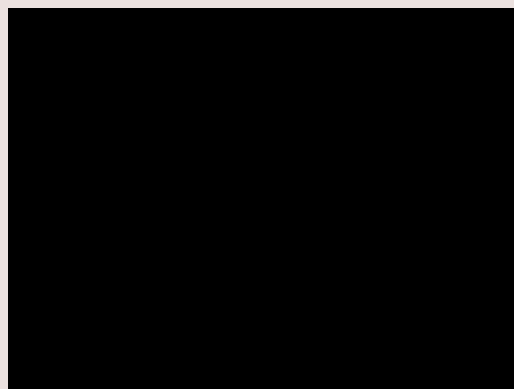
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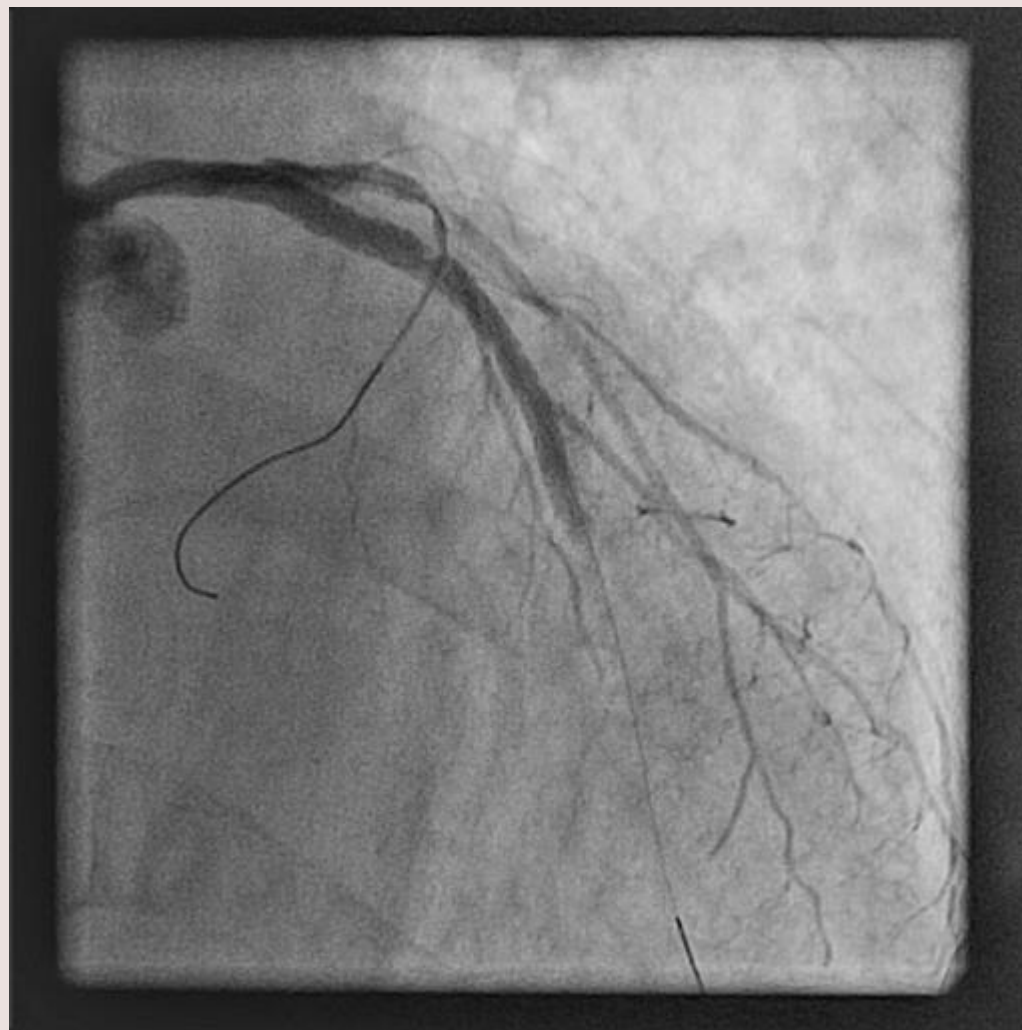
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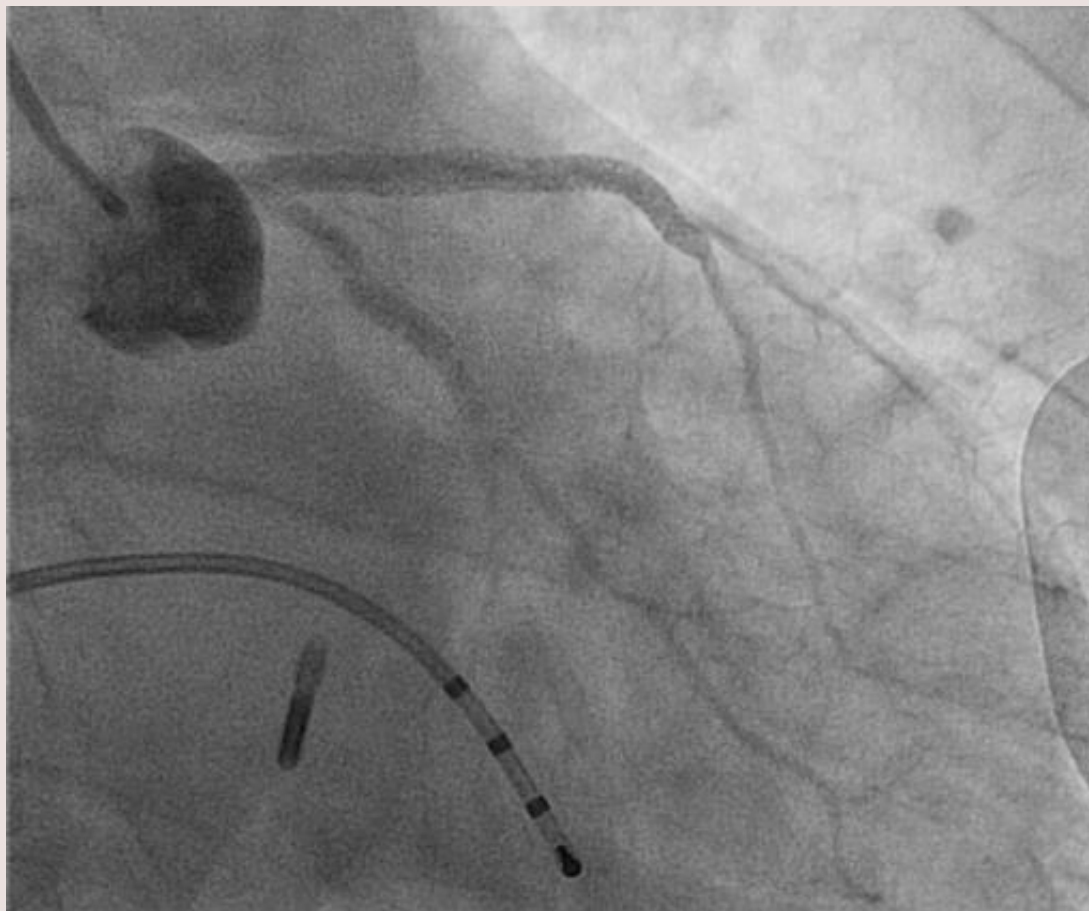
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« ongoing SHOCK during PCI » ...



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PATIENT # 2

Ipotesi diagnostica/Motivo del ricovero
STEMI ANTERIORE AD ARRIVO TARDIVO

Uomo di 67 anni

Fumo attivo (20 sig/die)

Pregressa ernioplastica inguinale destra, psoriasi in adolescenza, ulcera gastrica recidivante

Circa 20 giorni fa riferisce di essersi svegliato durante la notte da intenso dolore puntorio spalla sinistra regredito spontaneamente dopo circa 2-3 ore. Non assunti farmaci. Non franche limitazioni funzionali in seguito. Nega episodi di angor da sforzo.

Da circa tre giorni peggioramento netto della capacità funzionale, dispnea parossistica notturna nelle ultime due notti. Questa mattina episodio di intensa dispnea e comparsa di intenso dolore puntorio sottomammario sinistro per cui assunto acido acetilsalicidico e alle ore 8,30 accedeva in DEA. PA 120/80 mmHg, FC 100 bpm. All' ECG: fibrosi in sede anteriore con ST sopraslivellato V3-V5 come da aneursima elettrico.

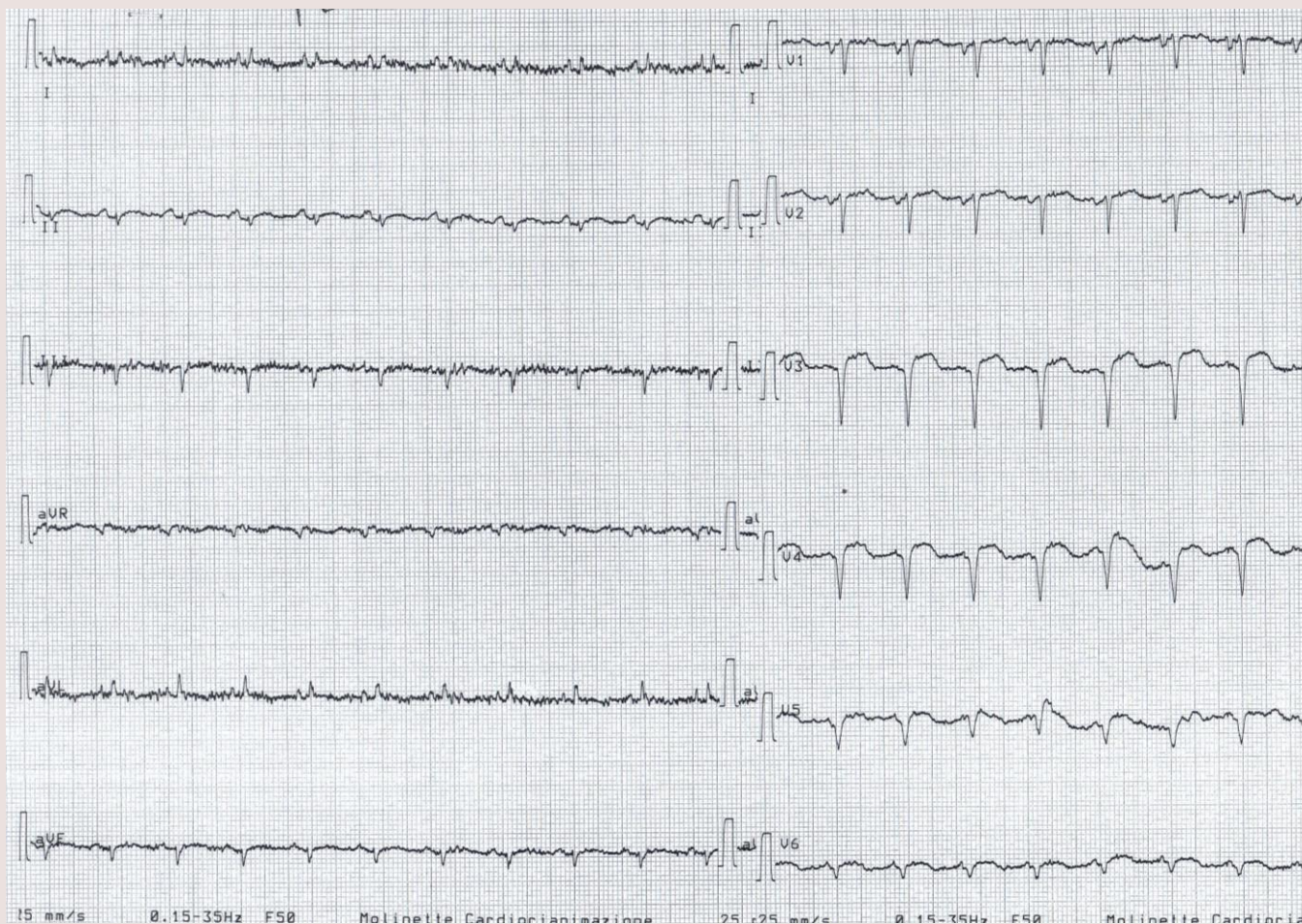
Somministrato carico di clopidogrel, ASA 300 mg, eparina 4000 Ui e trasferito in sala di emodinamica per coronarografia urgente che ha mostrato TC 95%, IVA I 100%, Cfx 0-II 75%. Previo posizionamento IABP eseguita angioplastica ed impianto di due DES su IVA I e TC-IVA.

Trasferito in UTIC per le cure del caso.



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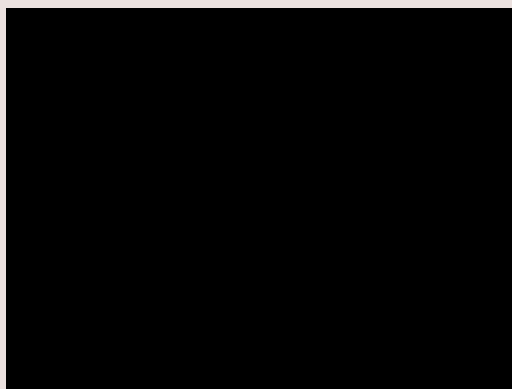
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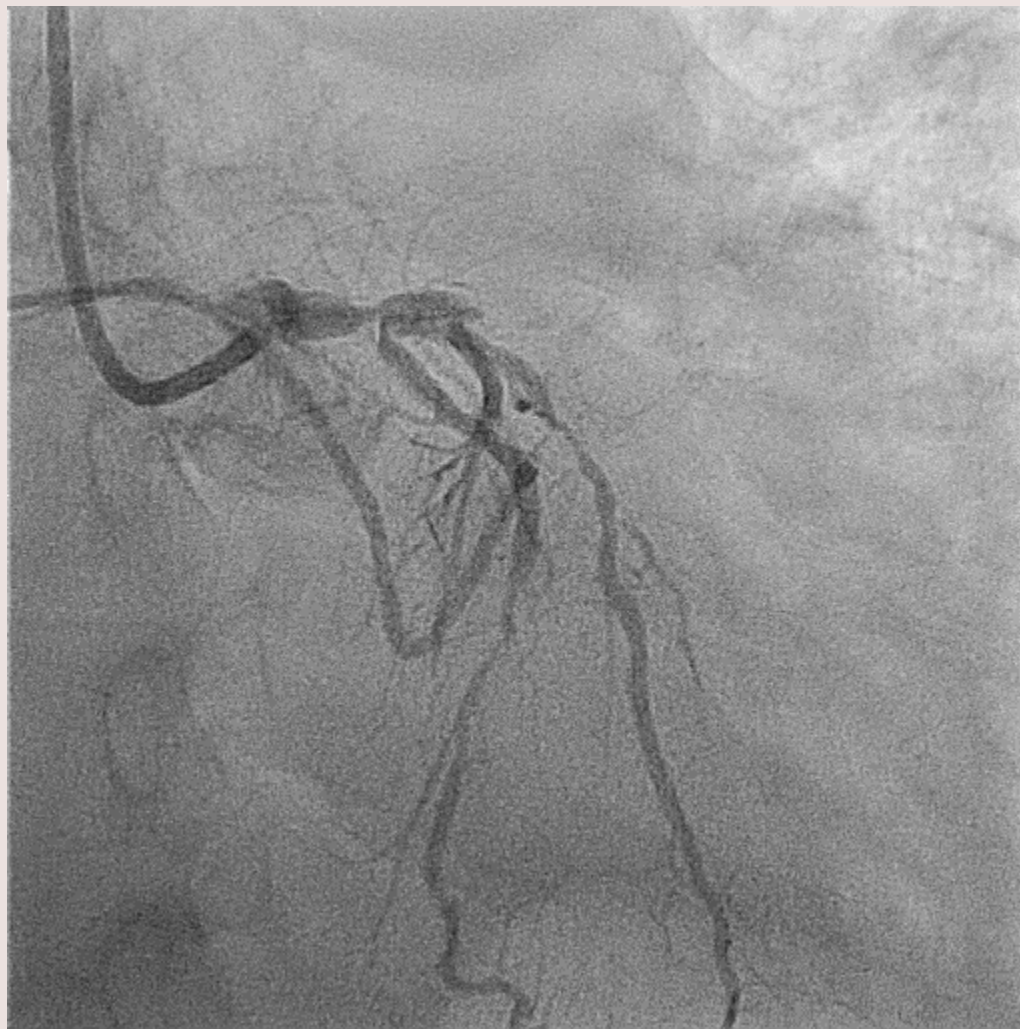
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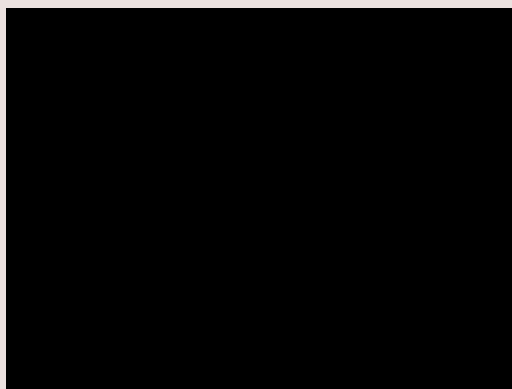
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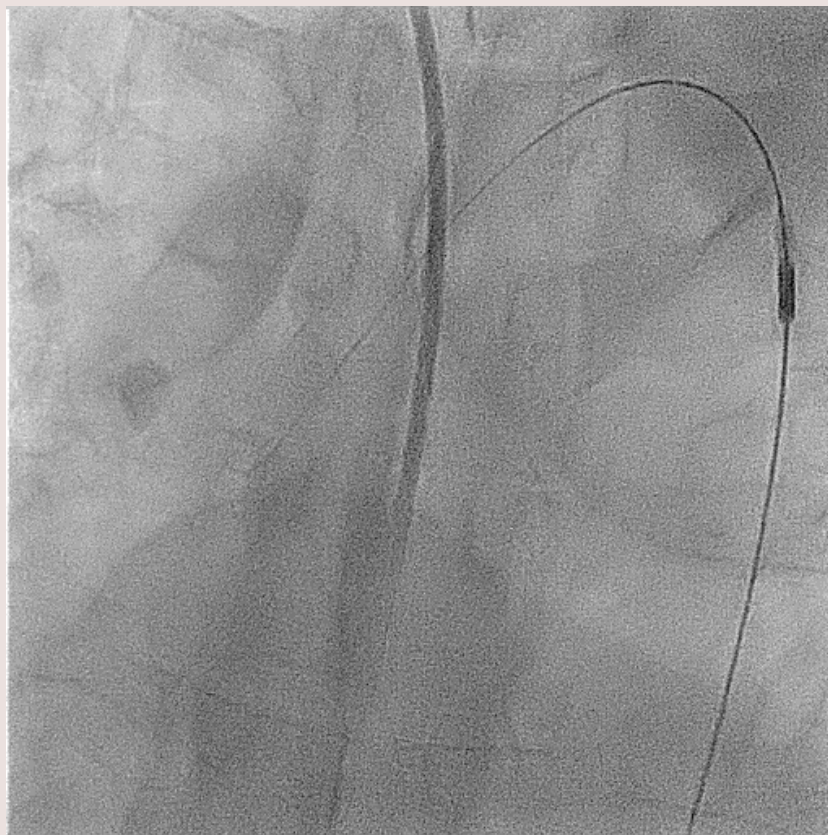
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« imminent SHOCK before pPCI »



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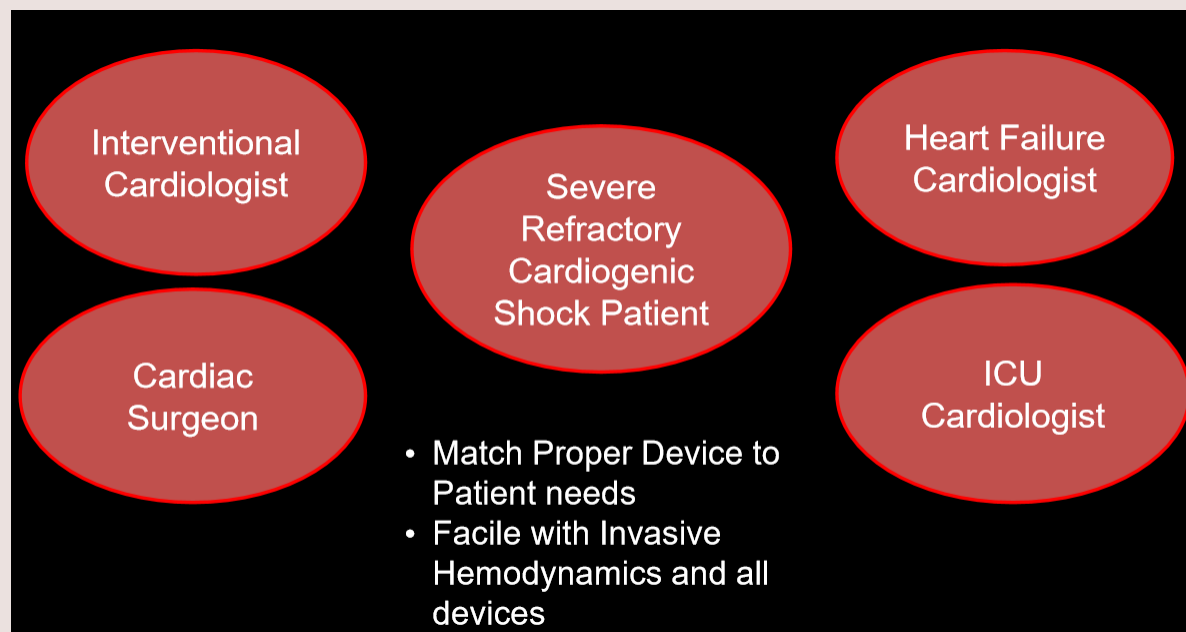


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... my conclusion ...

- THE MORTALITY OF ACUTE CARDIOGENIC SHOCK REMAINS HIGH
- THE ROLE OF MECHANICAL CIRCULATORY ASSISTENCE IS ESSENTIAL BUT REQUIRES «TEAM APPROACH»



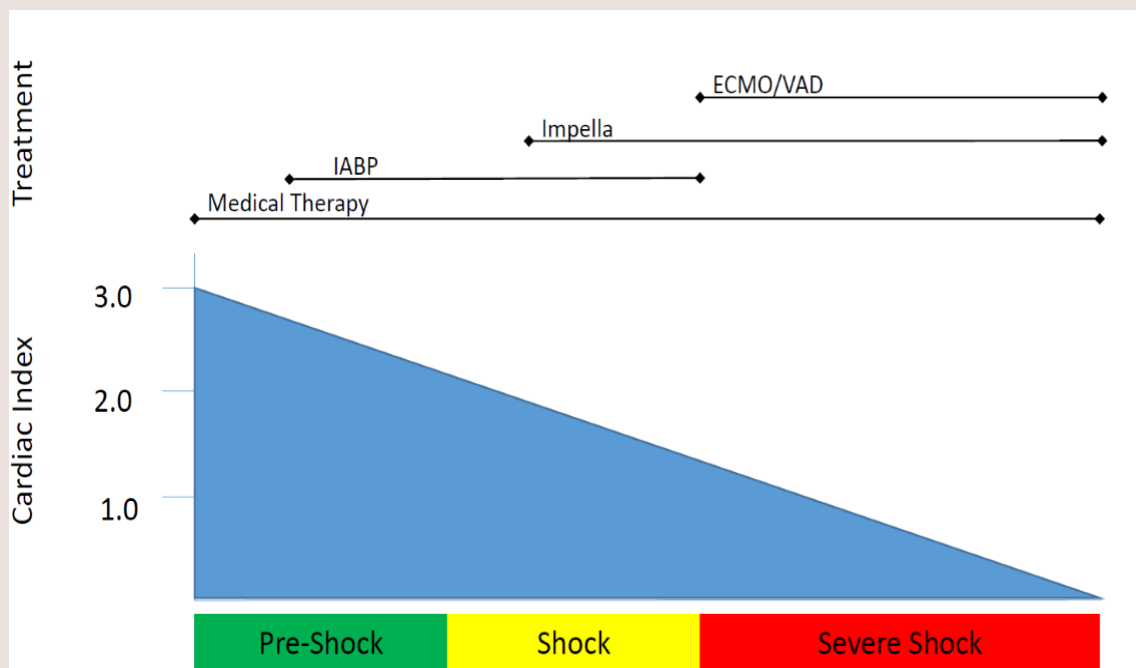


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but open issues :

- WHICH LEFT VENTRICULAR SUPPORT CAN PROVIDE BENEFIT ?
- WHEN IS THE BEST TIME TO START ?
- CAN WE IDENTIFY PATIENTS WHO BENEFIT ?





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... at the end ...

- IAPB STILL HAS A ROLE
 - > ALWAYS AVAILABLE
 - > EASILY PLACED
- IABP CAN BE «A BRIDGE» TO OTHER DEVICE
- IABP HAS NO EVIDENCE OF ROUTINE USE IN ACUTE («ISCHEMIC») CARDIOGENIC SHOCK



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ANAMNESI:

- 10.2010 Il paziente effettua una visita cardiologica per dispnea e cardiopalmo. All'ecocardiogramma TT: severa disfunzione sistolica globale e presenza di trombo apicale in Vsx.
Diagnosi di CMP dilatativa.
Ricovero AZ.OSP.OSP.SANTA CORONA (PIETRA LIGURE) PER Depressione funzione sistolica e trombo apicale Vsx. Eseguì biopsia endomiocardica che esclude miocardite e pone diagnosi di CMP dilatativa idiopatica.
- 20.10.2010 coronarografia (CT): coronarie indenni da lesioni.
- 12.2010 Impianto s-ICD c/o Ospedale di Catania.
- 21.05.2014 Coro. Coronarie epicardiche indenni da lesioni.
- 15.09.2014 TEST ERGOMETRICO: VO2MAX 9 ML/KG [PARI AL 28%]; SA 5,4 ML/KG;
Non raggiunto limite per esaurimento forza muscolare (Cardiologia Os. S. Corona - Pietra Ligure SV)
- 18.10.2014 Ricovero Medicina Urgenza Osp. S. Corona (Pietra Ligure-SV) per dispnea ingravescente.
Evidenza di TEP bilaterale, potenziata terapia anti-coagulante (con Xarelto)
TAC PER TORACE. Evidenza di TEP bilaterale.
- 20.10.2014 Ecodoppler AZ.OSP.OSP.SANTA CORONA (PIETRA LIGURE) PER ECODOPPLER VENOSO E ARTERIOSO AAIL. Pervio e comprimibile il sistema venoso profondo di entrambi gli arti.
ECT AZ.OSP.OSP.SANTA CORONA (PIETRA LIGURE) PER ECO ADDOME COMPLETO. Steatosi del fegato senza lesioni focali. Colecisti vie biliari reni e milza nella norma.
- 21.10.2014 ECOCARDIOGRAMMA: VS 60/53 MM; AS 44 MM; FE 20%; SETTO 12 MM; PP 12 MM; TAPSE 18 MM; RADICE AO 33,0 MM;
Vsx dilatato con ipocinesia globale. Trombosi ventricolare dell'apice (2 cm x 2 cm).
- 29.10.2014 Giunge in visita da Ospedale Pietra Ligure.
Lamenta forte astenia (plurimi ricoveri per scompenso cardiaco) e dispnea per sforzi lievi (NYHA III)

24.01.2017 Trapianto di cuore ortotopico

Data	DAL TRAPIANTO			BEM	Sintesi anamnestica
	Anni	Mesi	Giorni		
24.01.2017					CATERETERISMO CARDIACO: BASALE - IC 1,82 I/MIN/M?;
31.01.2017			7	OR	BEM: C4d neg
10.02.2017			17		ECOCARDIOGRAMMA: VS 48/39 MM; FE 60%; SETTO 11 MM; PP 10 MM; Vsin normali dimensioni, no alterazioni della cinesi; VDx nella norma. Non vizi valvolari. Minima falda di versamento 5mm
14.02.2017			21		Non sintomi cardiologici limitanti. In corso riabilitazione c/o Maugeri di Veruno.
21.02.2017			28	OR	Non sintomi cardiologici limitanti. In corso riabilitazione c/o Maugeri di Veruno. CATERETERISMO CARDIACO: BASALE - PAP 23/5/11; PIC 6,00 MMHG; PC 5,47 I/MIN; IC 2,68 I/MIN/M?; RPA 0,91 UW; PVC 3 MMHG; BEM: C4d neg
08.03.2017		1	12		Non sintomi cardiologici limitanti. CATERETERISMO CARDIACO: BASALE - PAP 27/6/12; PIC 7,00 MMHG; PC 6,10 I/MIN; IC 3,02 I/MIN/M?; RPA 0,82 UW; PVC 2 MMHG;

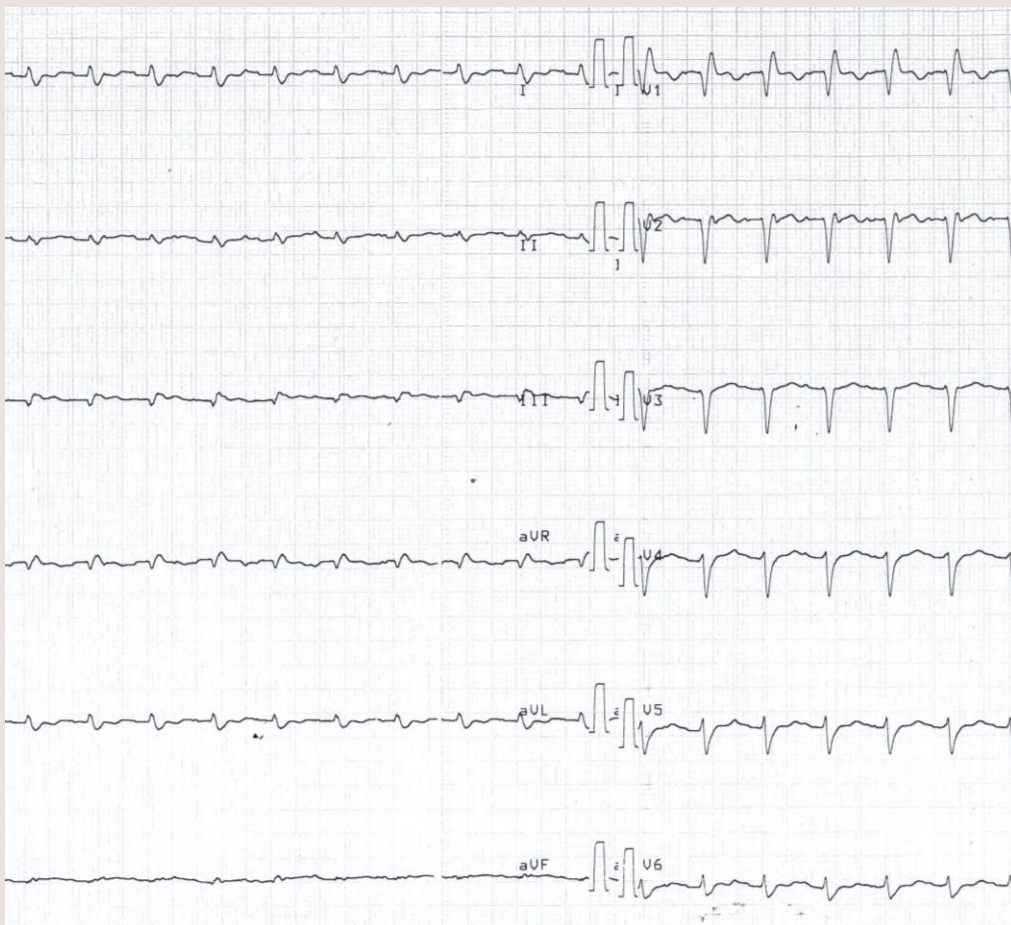


01.07.2019	2	5	5	Recente ricovero c/o H Santa Corona per TVP , intrapresa terapia anticoagulante. Dalla dimissione soggettivo benessere. Normoteso a domicilio dopo potenziamento terapeutico con ARB. ECOCARDIOGRAMMA: VS 52 MM; FE 60%; SETTO 13 MM; PP 11 MM; TAPSE 12 MM; PAPS 27 MMHG; Vsin normali dimensioni, lieve ipertrofia. Non alterazioni della cinesi. VDx ai limiti superiori (44 mm) IM 1+; IT 1+. Assente versamento.
11.09.2019	2	7	16	Stazionario, buon compenso emodinamico. Asintomatico.



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TURIN
October
24th-26th
2019



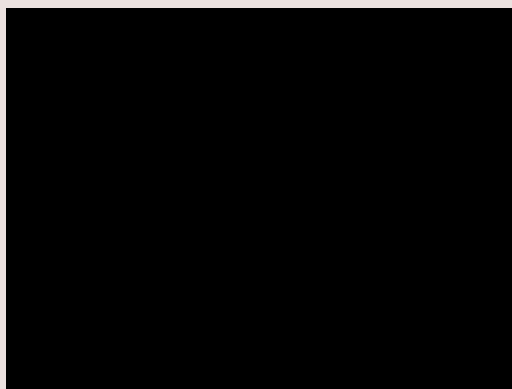
Risultati		Crit. Basso	Riferimento Basso	Alto	Crit. Alto
Misurati					
pH	7.11	[--	--	--	--]
pCO ₂	48	mmHg	[--	--	--]
pO ₂	99	mmHg	[--	--	--]
Na ⁺	145	mmol/L	[--	--	--]
K ⁺	3.8	mmol/L	[--	--	--]
Cl ⁻	103	mmol/L	[--	--	--]
Ca ⁺⁺	0.98	mmol/L	[--	--	--]
Hct	45	%	[--	--	--]
Glu	125	mg/dL	[--	--	--]
Lac	16.2	mmol/L	[--	--	--]
CO-Ossimetro					
tHb	14.7	g/dL	[--	--	--]
O ₂ Hb	93.8	%	[--	--	--]
COHb	2.1	%	[--	--	--]
MetHb	0.9	%	[--	--	--]
HHb	3.1	%	[--	--	--]
sO ₂	96.8	%	[--	--	--]
Derivati					
BEecf	-14.3	mmol/L	[--	--	--]
AG	31	mmol/L	[--	--	--]
P/F Ratio	99	mmHg	[--	--	--]
HCO ₃ (c)	15.2	mmol/L	[--	--	--]
HCO ₃ std	13.7	mmol/L	[--	--	--]
A-aDO ₂	554	mmHg	[--	--	--]
Hct(c)	44	%	[--	--	--]
Altre informazioni					
O ₂ / Vent					
FIO ₂	100.0	%			

« acute non-ischemic cardiogenic SHOCK »



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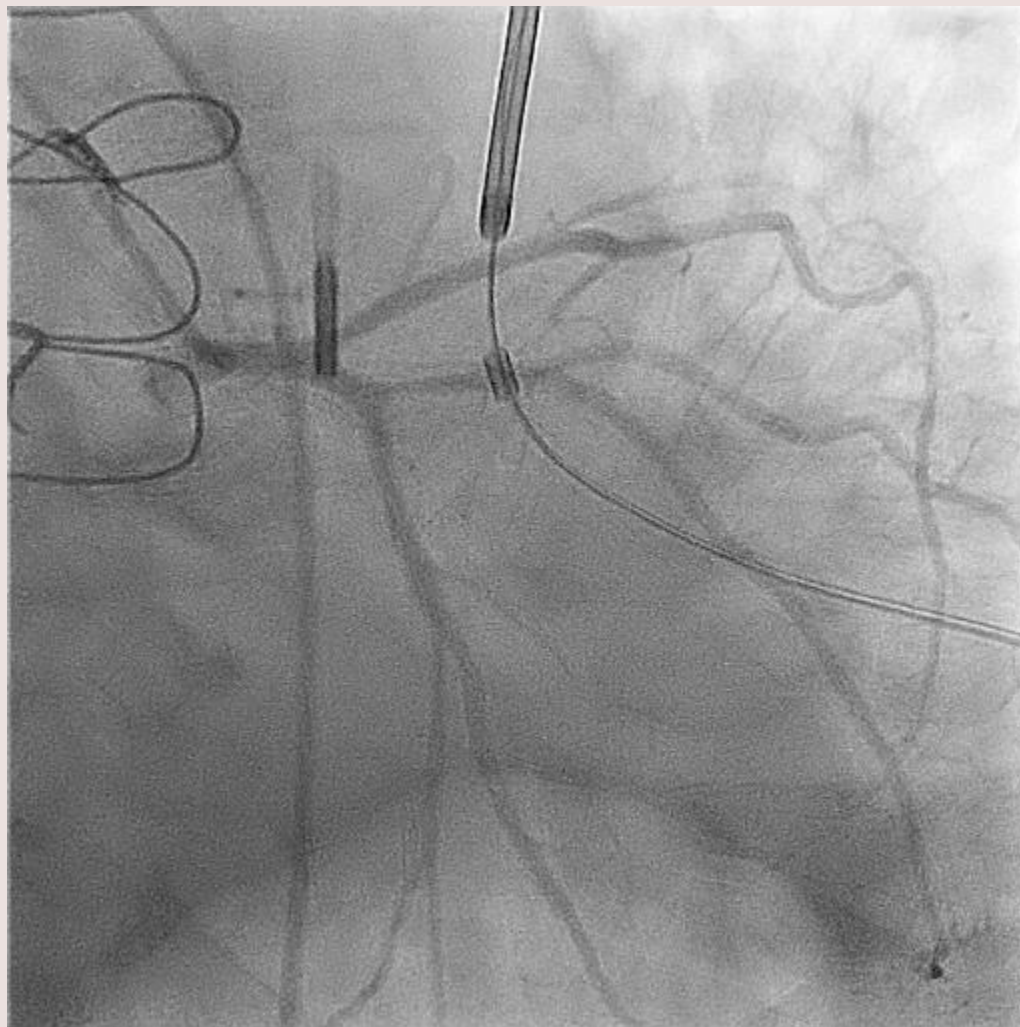
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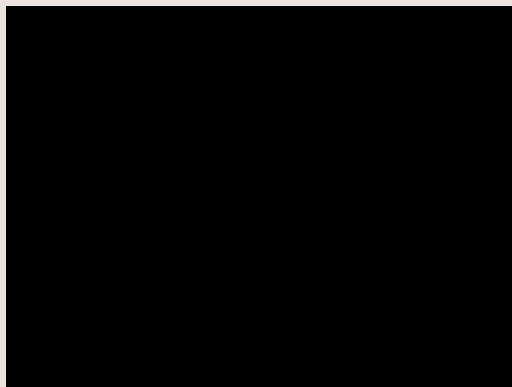
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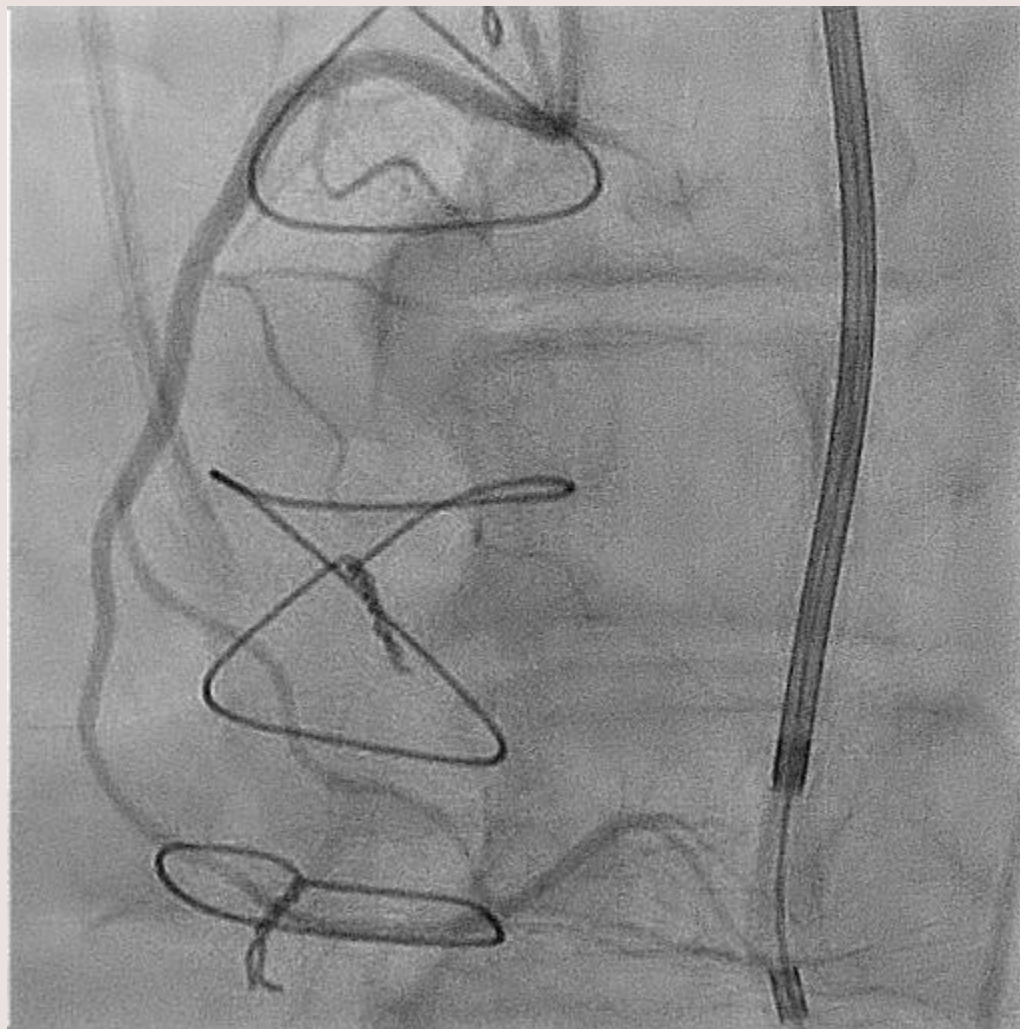
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EuroIntervention 2019; 15:571-573

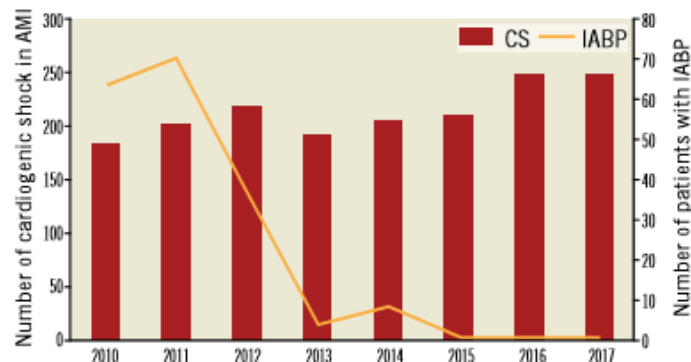


Figure 1. Number of cardiogenic shock cases and use of IABP in two tertiary heart centres in Denmark 2010-2017, covering 3.9 million inhabitants. Data adapted from Helgestad et al, 2019³.

EDITORIAL

EuroIntervention 2019; 15:571-573

Mechanical circulatory support for decompensated heart failure: the last remaining indication for intra-aortic balloon pump?



Jesper Kjaergaard^{1*}, MD; Jacob Eifer Møller², MD; Christian Hassager³, MD

1. Department of Cardiology, Copenhagen University Hospital Rigshospitalet, Copenhagen, Denmark; 2. Department of Cardiology, Odense University Hospital, Odense, Denmark; 3. Department of Cardiology, Rigshospitalet and Department of Clinical Medicine, University of Copenhagen, Copenhagen, Denmark



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**.... MY IABP STILL
REMAIN
A GOOD FRIEND!**