



Post-procedural hypertension following transcatheter aortic valve implantation: incidence and clinical significance

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DISCLOSURES

None

Hemodynamics of Aortic Valve treatments

- Increases in Blood Pressure (BP) after surgical AVR reported in the 1970's (1,2)
- Recent reports recommend antihypertensive treatment for the improvement of remodeling after AVR (3)
- Post-procedural reports of TAVI describe decreased BP as a consequence of complications (4)
- Gotzmann et al. reported a rise of systolic BP immediately after TAVI (5)

1. Layton et al. Lancet, 1973
CardioThora Surg, 2005

2. Estafanous et al. BHJ, 1978

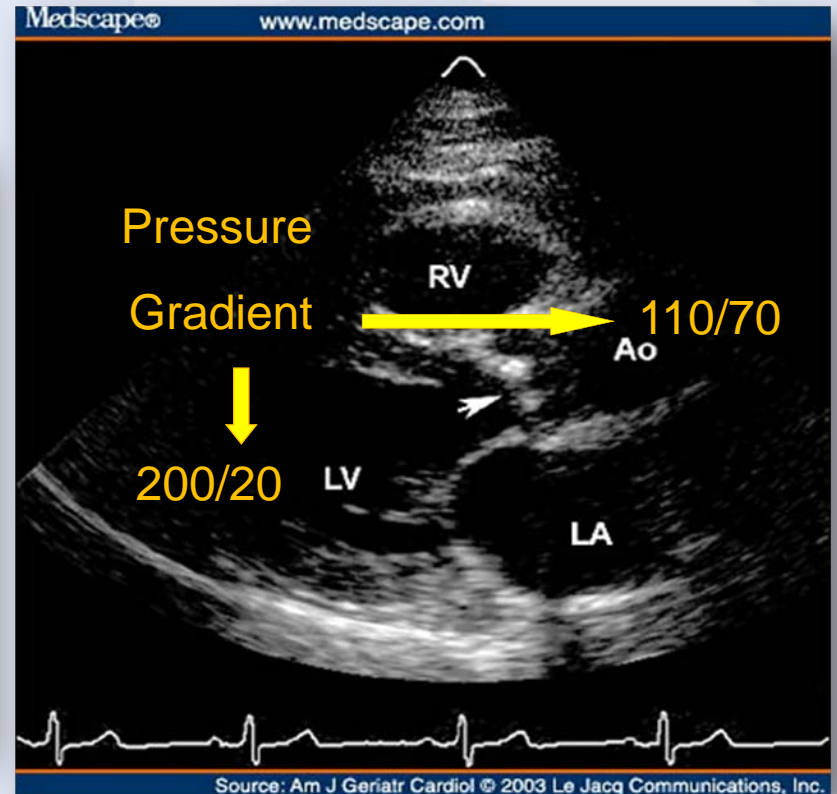
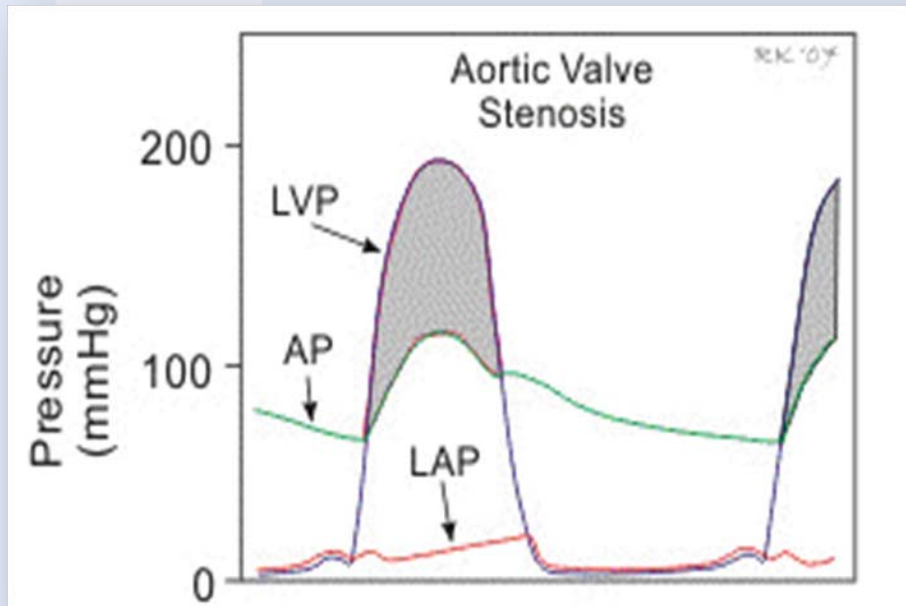
3. Imanaka et al. Euro J of
4. Covello et al, Minerva Anesthesiol, 2010

5. Gotzmann et al. AHJ, 2010

Transcatheter Aortic Valve Implantation (TAVI)

- Transcatheter Aortic Valve Implantation is a rapidly expanding procedure for the treatment of Aortic Stenosis (AS)
- Currently TAVI is being offered to elderly patients instead of surgical Aortic Valve Replacement (AVR)
- In a typical series of 168 patients from Vancouver (6) the median age was 84 , Logistic Euroscore was 28.6 and 64.9% of the patients were hypertensive

Cavity pressures in Aortic Valve Stenosis



Is TAVI like a dam breaking?



Objective

To investigate the blood pressure response after TAVI and its clinical correlation with short- and mid-term clinical outcomes

Methods

- 105 consecutive AS patients admitted to the ICCU after TAVI
- Continuous monitoring of BP for 5 days after TAVI, detailed recording of medical therapy
- Valve area and gradients, and cardiac output calculated by Doppler Echocardiograms
- Arterial compliance calculated as:
Stroke volume/ Pulse pressure (ml/mm Hg) (7)

Clinical Outcomes

Clinical events recorded:

- In-hospital
- 30 days, 12 months

Serious Adverse Events:

- Death
- Worsening Heart Failure
- Myocardial Infarction
- Stroke
- Recurrent hospital admissions

Classification of TAVI patients based on BP response

Increased BP after TAVI was defined according to one of the following:

1. A sustained (>48 hours) increase of systolic pressure > 140 or diastolic pressure > 90 mmHg
2. Increased (more than two-fold) dosage of an anti-hypertensive drug to control systemic BP.
3. Addition of an anti-hypertensive drug to control systemic BP

Study population (n=105)

Variable	Increased BP (n = 53)	Stable BP (n = 52)	p Value
Age, yrs	81 ± 6	80 ± 7	0.46
Male	25 (47)	25 (48)	1.0
BMI, units	26.5 ± 4.2	28.8 ± 5.9	0.04
Logistic EuroSCORE	23.5 ± 15.3	23.2 ± 14.9	0.91
Ejection fraction, %	54.8 ± 11.7	56.8 ± 12.0	0.39
HTN	44 (83)	41 (79)	0.63
Number of anti-HTN drugs	2.47 ± 1.23	3.21 ± 1.67	0.01
Coronary artery disease	30 (57)	28 (54)	0.84
Previous CABG	15 (28)	11 (21)	0.49
NYHA score	3.15 ± 0.36	3.17 ± 0.51	0.81
Chronic renal failure	6 (11)	7 (13)	0.77
Diabetes	17 (32)	20 (38)	0.54

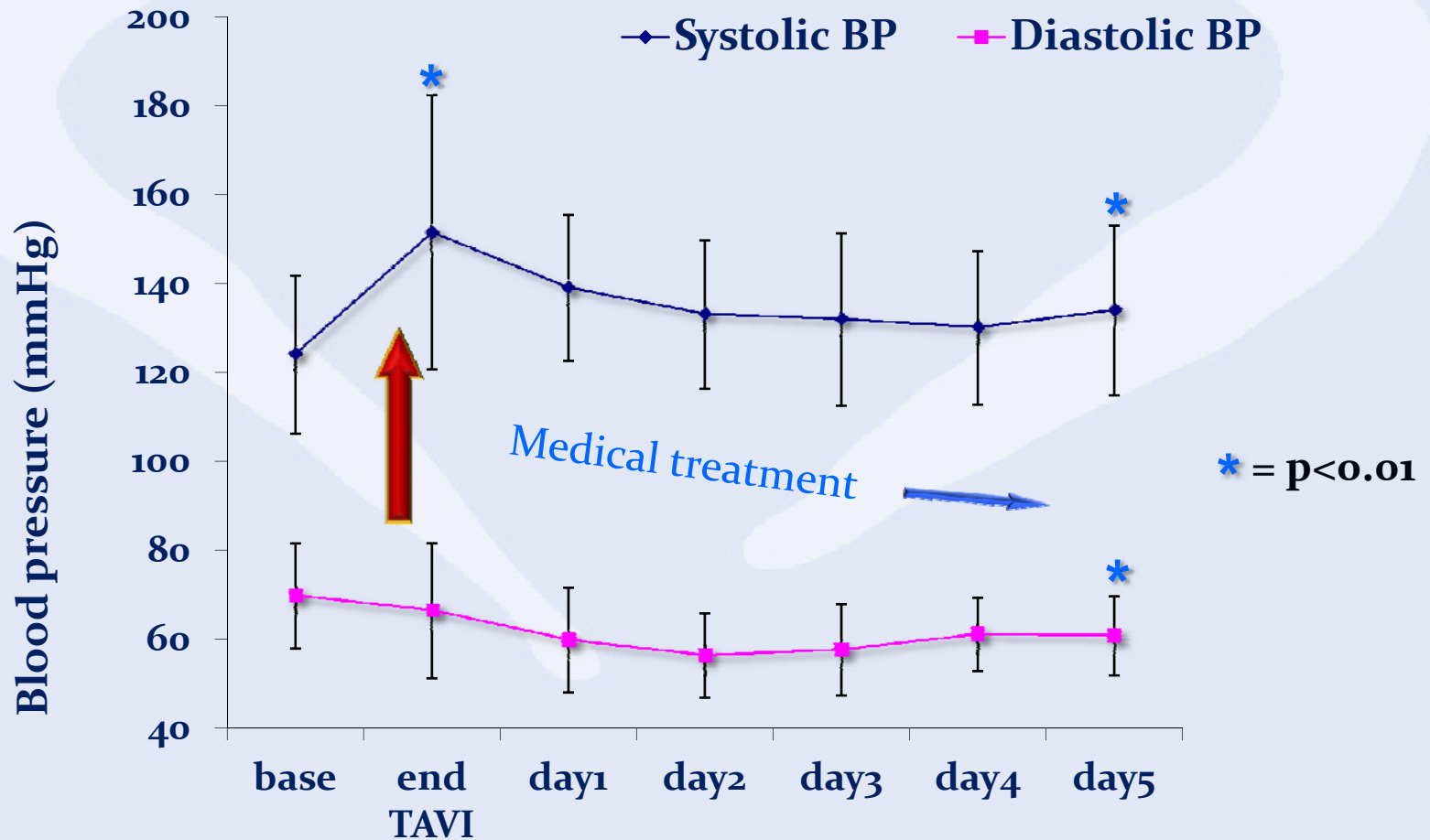
Values are mean ± SD or n (%).

BMI = body mass index; BP = blood pressure; CABG = coronary artery bypass graft; EuroSCORE = European System for Cardiac Operative Risk Evaluation; HTN = hypertension; NYHA = New York Heart Association; TAVI = transcatheter aortic valve implantation.

Procedure technique and related complications were similar in both BP groups

- Similar approach, 85% femoral
- Similar valves, 85% Medtronic Corevalve
- Similar Complications:
 - Preprocedural death – 0/53 vs. 1/52 (P=0.49)
 - Tamponade – 2/53 vs. 3/52 (P=0.67)
 - Major bleeding – 29/55 vs. 22/52 (P=0.24)
 - Moderate or Severe AR – 7/53 vs. 8/52 (P=0.89)

Blood pressure response after TAVI – in the entire cohort



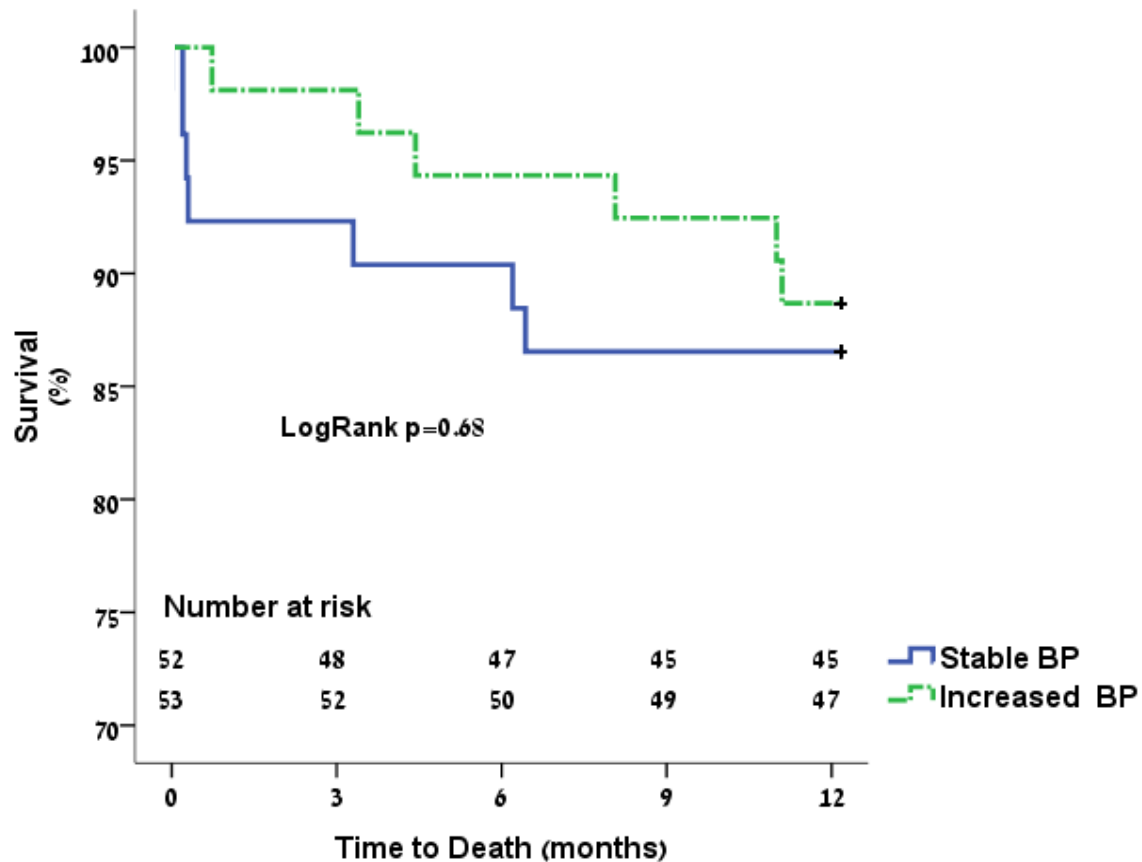
Baseline hemodynamic and Echo data

Variable	Increased BP (n = 53)	Stable BP (n = 52)	p Value
Baseline data			
Systolic BP, mm Hg	128.6 ± 18.0	124.6 ± 17.1	0.25
Diastolic BP, mm Hg	68.0 ± 11.6	68.6 ± 10.0	0.78
Pulse pressure, mm Hg	60.6 ± 14.8	56.0 ± 17.2	0.15
Aortic valve area, cm ²	0.65 ± 0.18	0.66 ± 0.17	0.77
Maximal gradient, mm Hg	74.8 ± 19.8	69.2 ± 22.2	0.18
Mean gradient, mm Hg	46.2 ± 13.4	43.3 ± 14.7	0.29
Arterial compliance, ml/mm Hg	1.11 ± 0.47	1.26 ± 0.45	0.11
Systemic vascular resistance, dyn/cm	1,702 ± 606	1,562 ± 460	0.2
Cardiac output, l/min	4.3 ± 1.2	4.5 ± 1.4	0.43
Cardiac index, l/min	2.4 ± 0.7	2.5 ± 0.8	0.56
Stroke volume, ml	64 ± 19	68 ± 21	0.33

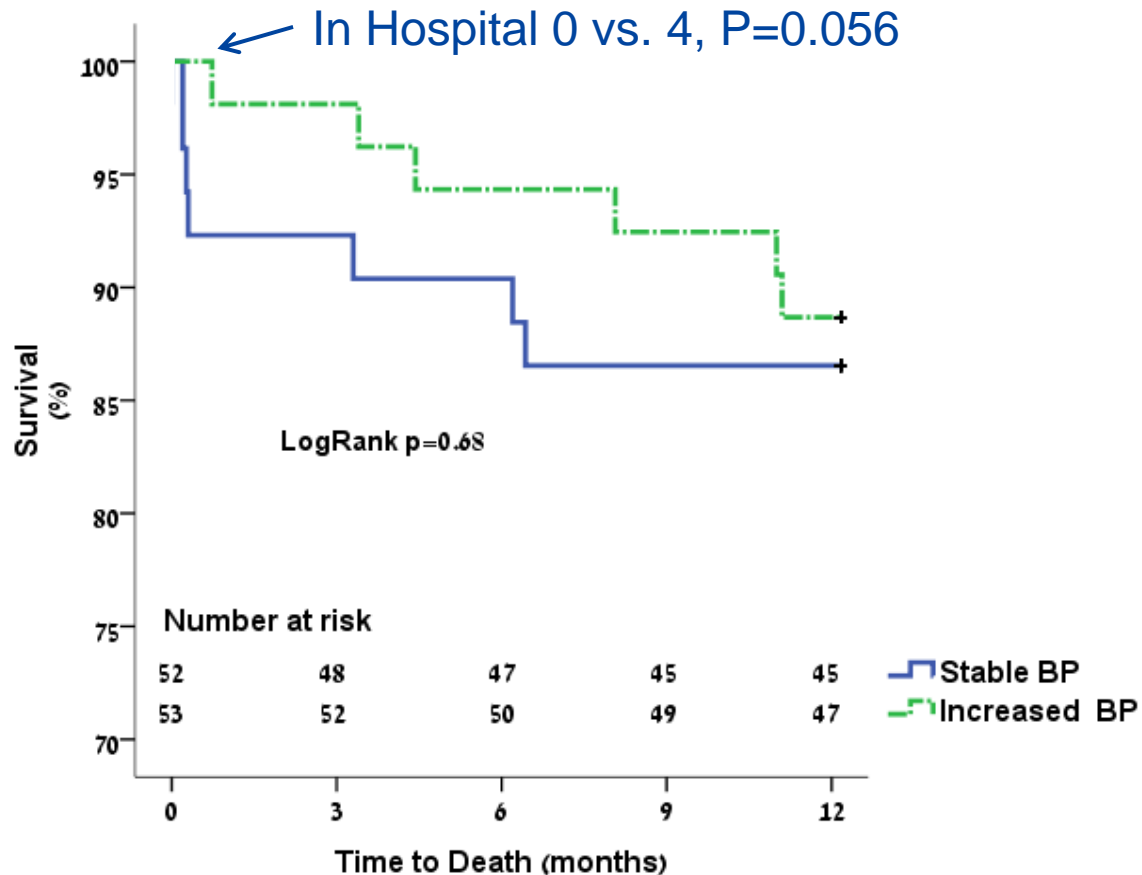
Post TAVI hemodynamic and Echo data

Variable	Increased BP (n = 53)	Stable BP (n = 52)	p Value
Systolic BP immediately after TAVI, mm Hg	154.9 ± 29.9	126.1 ± 24.4	<0.01
Diastolic BP immediately after TAVI, mm Hg	64.3 ± 14.1	59.6 ± 16.3	0.17
Pulse pressure immediately after TAVI, mm Hg	90.6 ± 24.7	66.6 ± 19.9	<0.01
Cardiac output increase, l/min	0.26 ± 1.3	-0.44 ± 1.5	<0.05
Cardiac index increase, l/min/m ²	0.14 ± 0.7	-0.27 ± 0.9	<0.05
Stroke volume increase, ml	0.32 ± 22.1	-11.07 ± 23.31	<0.05
Systemic vascular resistance, dyn/cm	1,642 ± 524	1,581 ± 564	0.61
Aortic valve area, cm ²	1.72 ± 0.59	1.74 ± 0.51	0.85
Maximal gradient, mm Hg	15.4 ± 5.8	15.3 ± 7.5	0.93
Mean gradient, mm Hg	8.4 ± 3.6	8.2 ± 4.3	0.79

Survival after TAVI according to Blood Pressure group

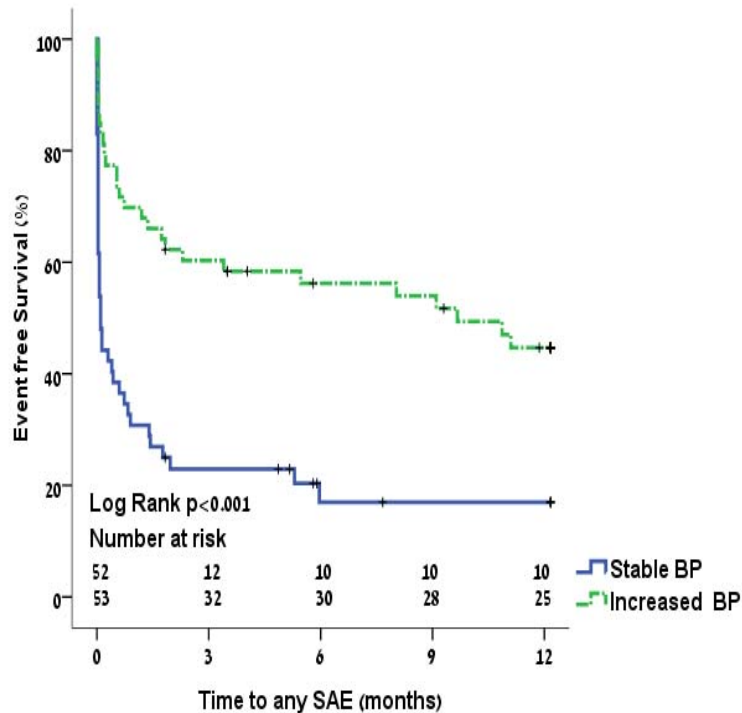


Survival after TAVI according to Blood Pressure group

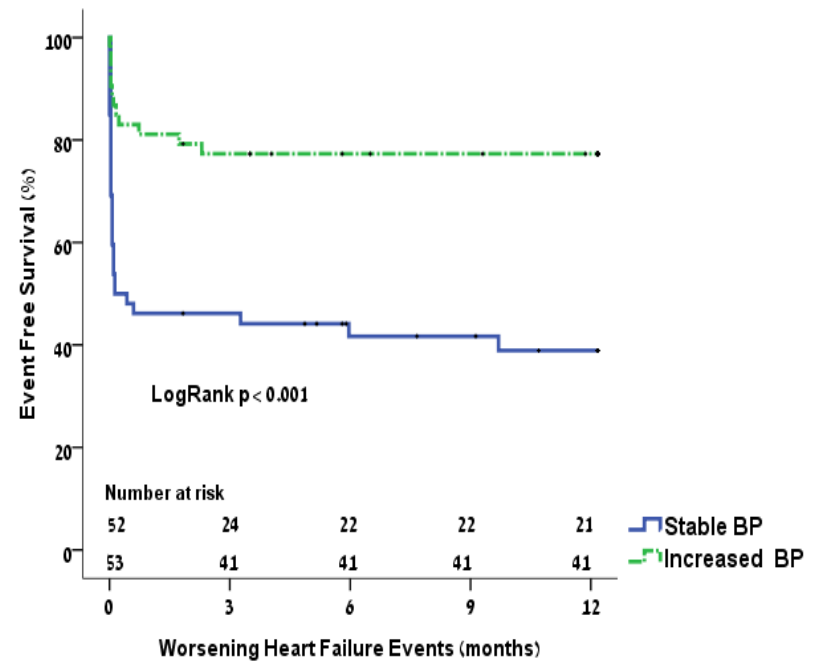


Clinical outcomes after TAVI according to BP group

Any Adverse Event



Heart Failure Events



What could be the mechanism of the improved outcome of patients with increased BP?

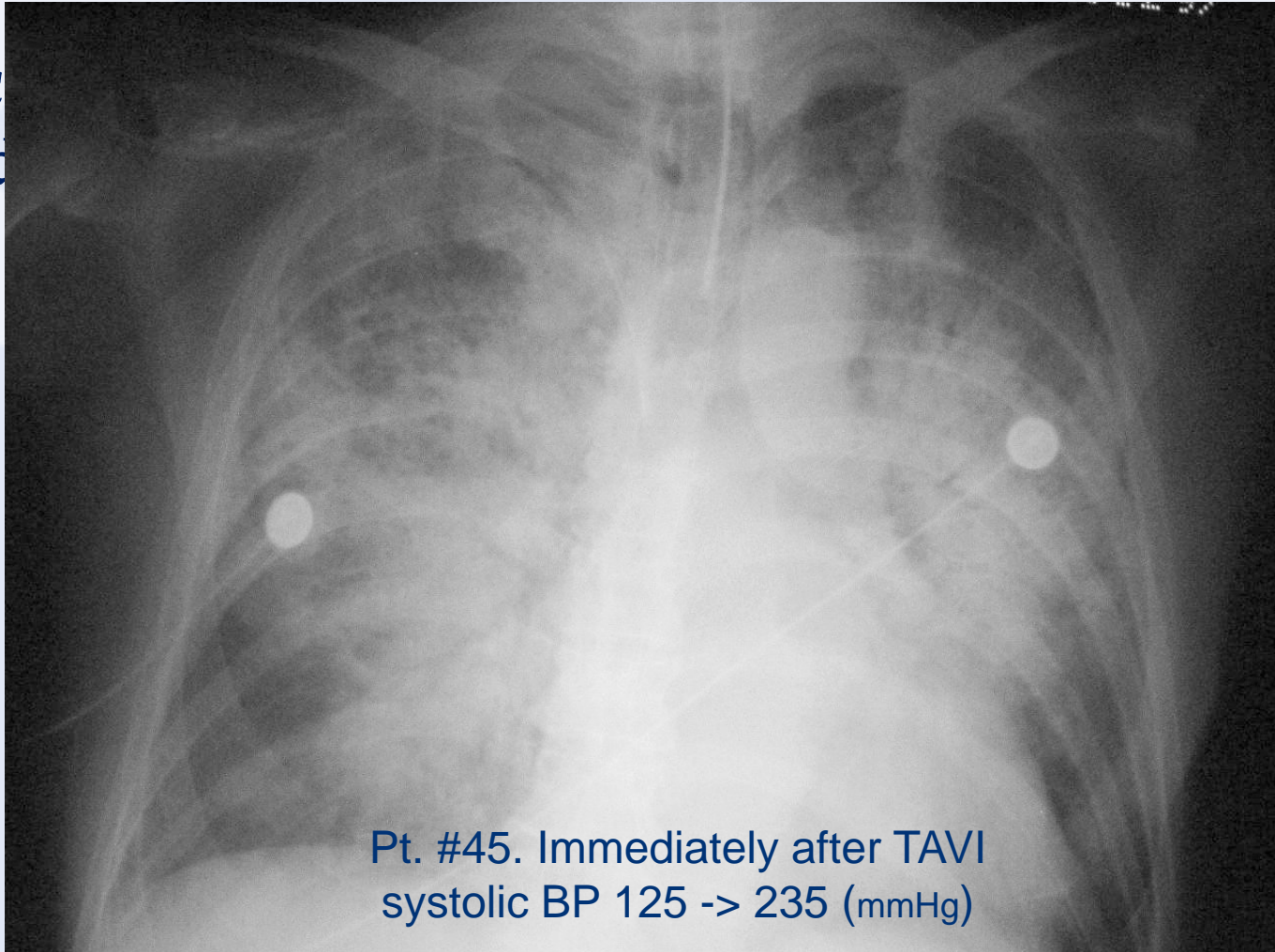
- Increased BP correlates with better **cardiac Function** (Cardiac output, Stroke volumes)
- Increased BP can also mean in some patients **no procedure related complications**
- Increased BP requires/enables drugs associated with improved cardiovascular outcomes (eg. ACEI)

Clinical implications of increased systolic blood pressure

- Accelerated HTN post-TAVI can cause cardiac, cerebral and renal damage

Clinical implications of increased systolic blood pressure

- Acc
card

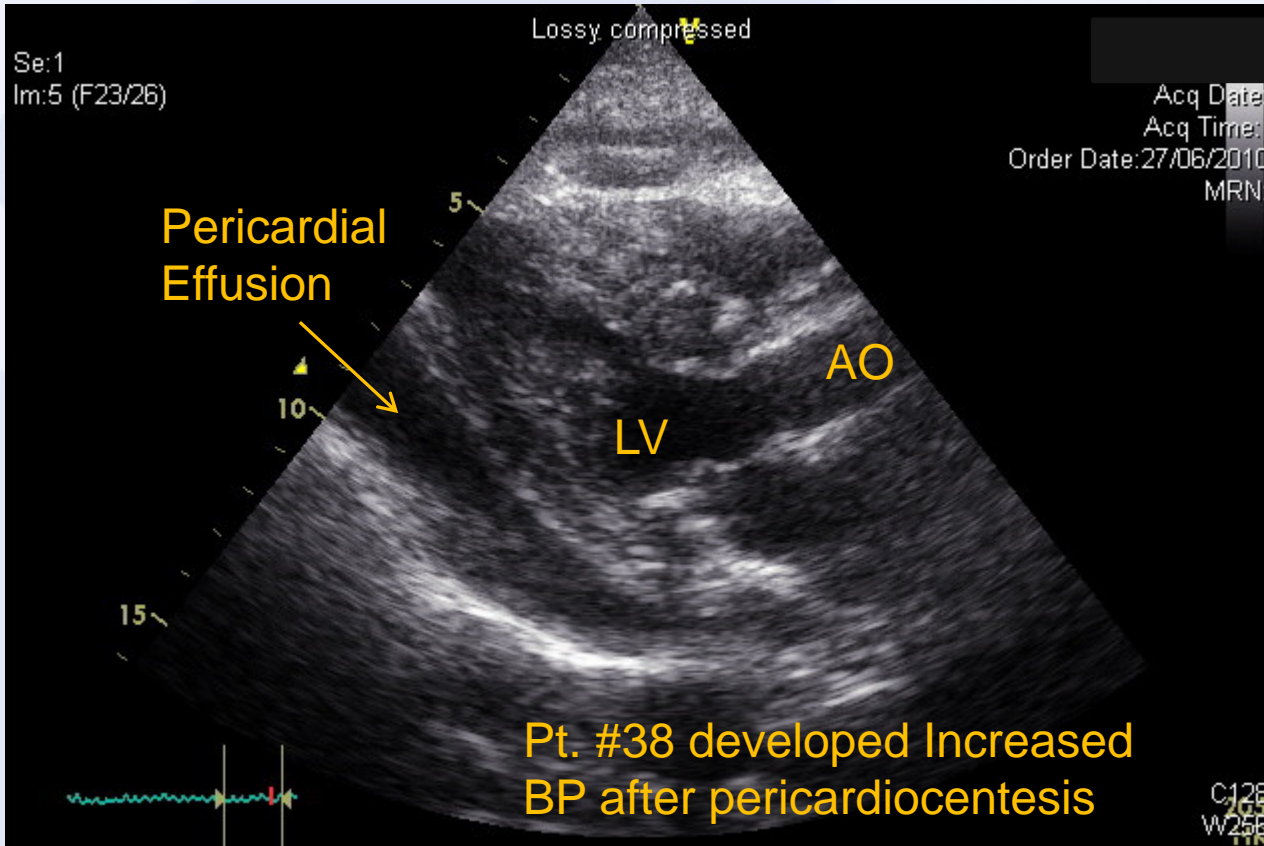


Pt. #45. Immediately after TAVI
systolic BP 125 -> 235 (mmHg)

Clinical implications of increased systolic blood pressure

- Accelerated HTN post-TAVI can cause cardiac, cerebral and renal damage
- Parenteral anti-hypertensive therapy was required in 27 patients (26%)
- Anti-hypertensive therapy was intensified in 53 patients (51%)
- HTN was newly diagnosed in 9 patients (17%)

Tamponade masking the BP increase





Conclusions

- Increased and sustained HTN appeared in 51% of the patients post-TAVI
- Increased BP required immediate and long term treatment
- Increased BP is associated with better cardiac function
- Increased BP predicts a favorable outcome