

# TAVI – technika, výkon

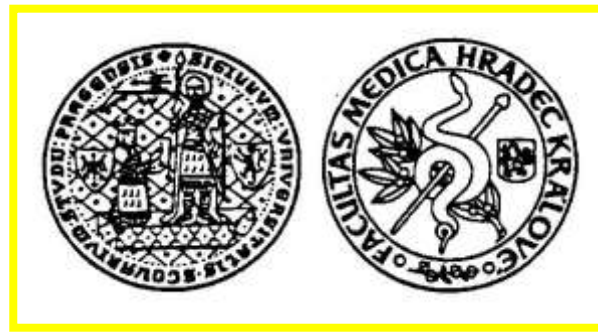
*J. Št'ásek*

**I.interní kardiologická klinika**

**Kardiochirurgická klinika**

**Lékařská fakulta UK Hradec Králové**

**Kardiocentrum Fakultní nemocnice Hradec Králové**





# TAVI – technika, výkon

## Aortální stenóza (degenerovaná Ao vada s převahou stenózy)

- ***balónková aortální valvuloplastika (BAV)***

  - hrubě paliativní výkon

  - „jednoduché“ a rychle řešení

  - stabilizace akutního stavu s následným řešením

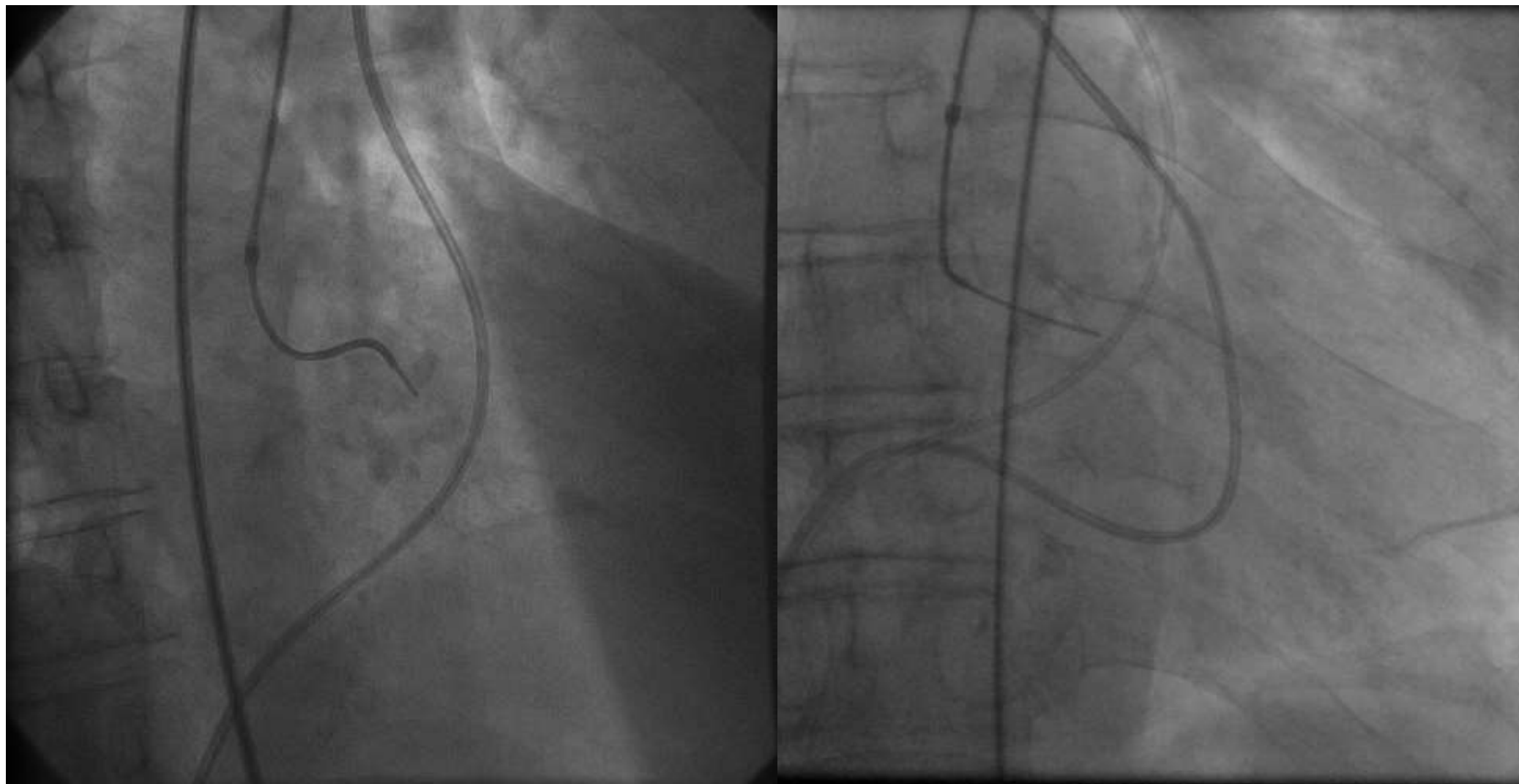
  - možnost posouzení prognózy nemocného

- ***katéetrová implantace implantace (TAVI)***

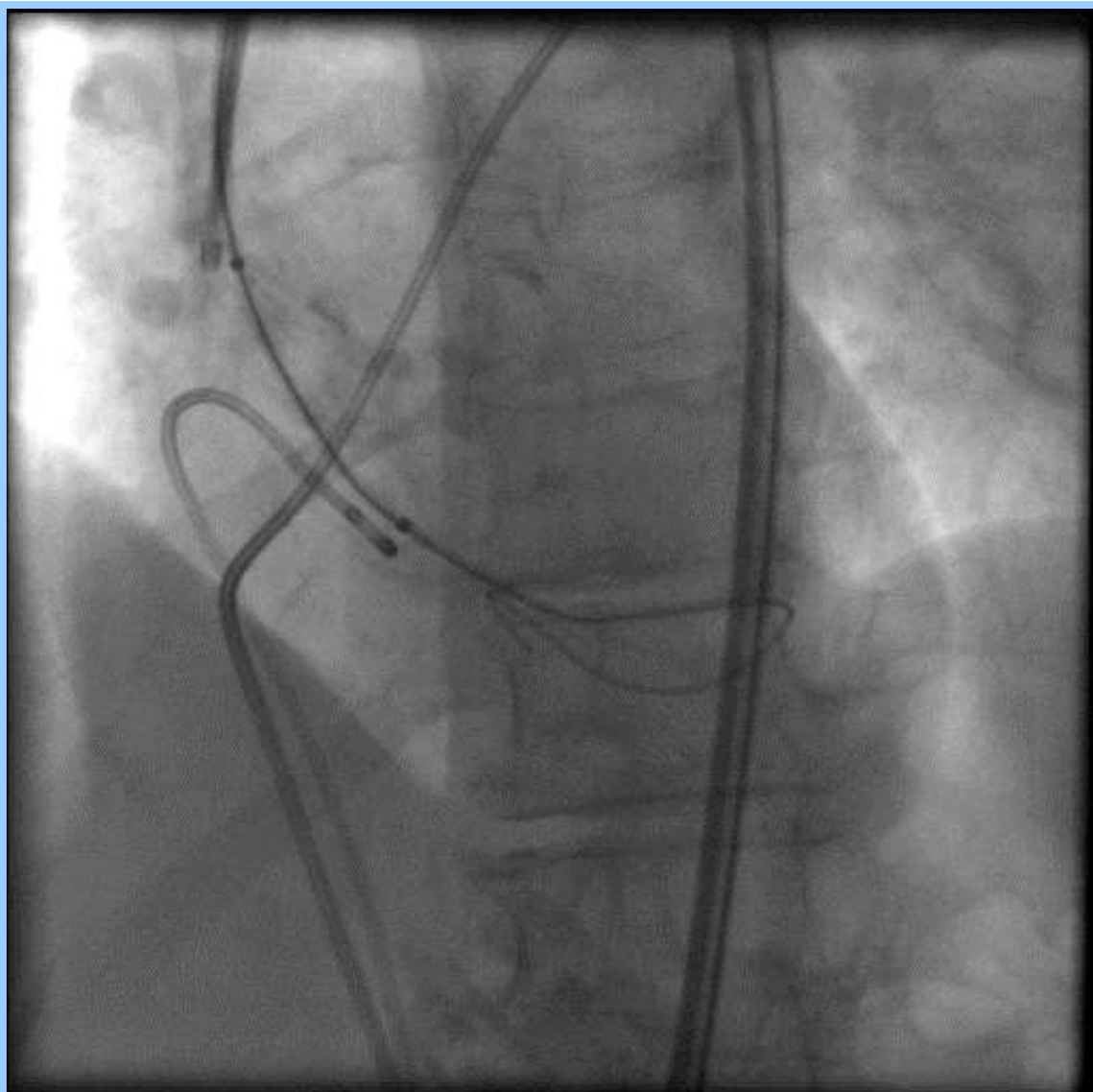
  - zavedená metoda léčby Ao stenózy s vysokým rizikem chir. náhrady,*

  - nově i u nemocných se středním rizikem*

# TAVI – technika, výkon

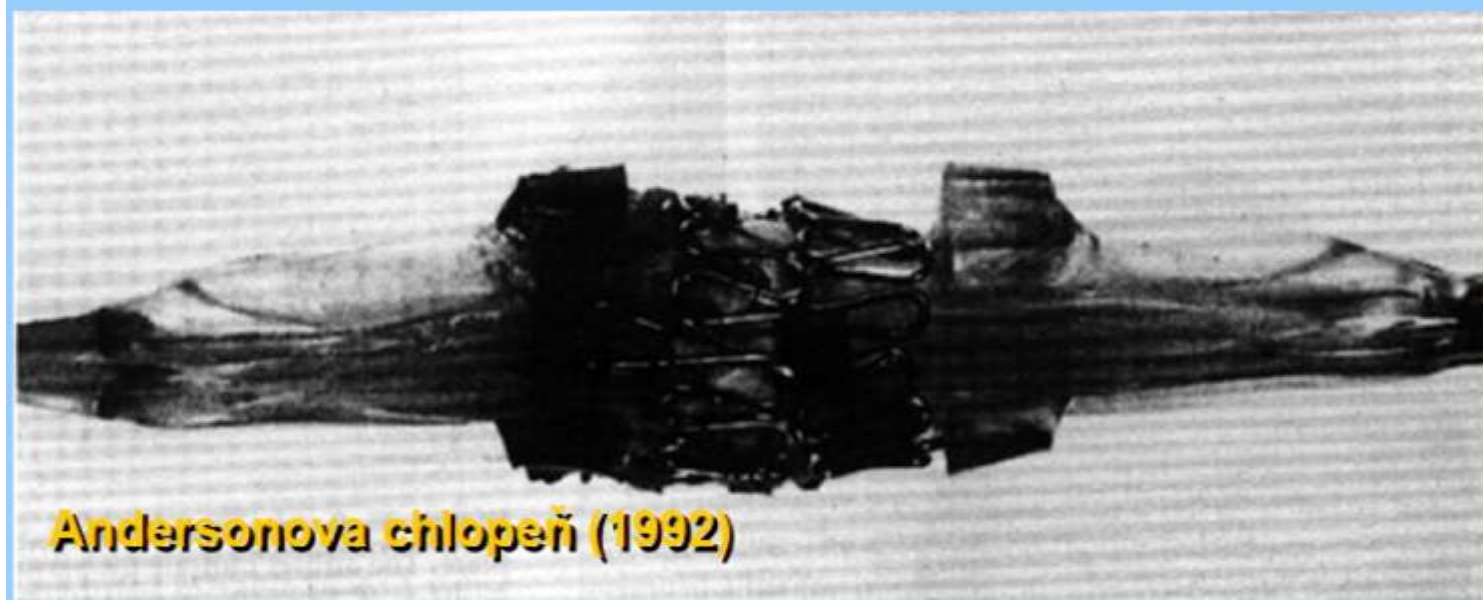
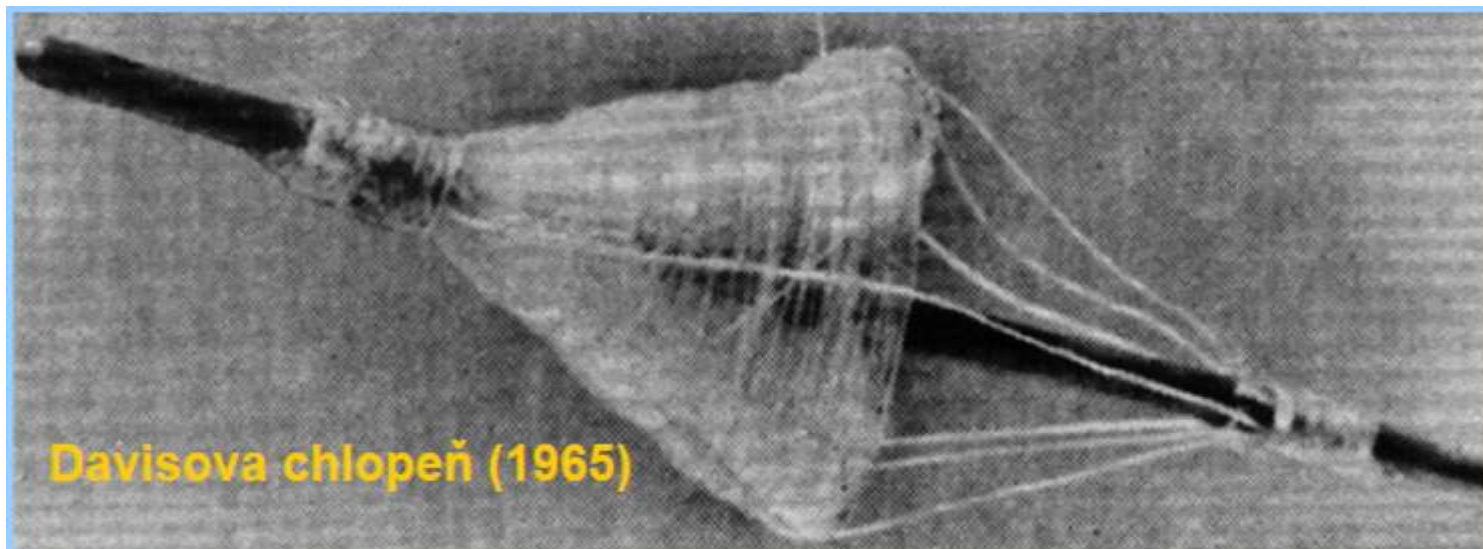


# TAVI – technika, výkon





## TAVI – technika, výkon



## TAVI – technika, výkon



Andersonova hand made



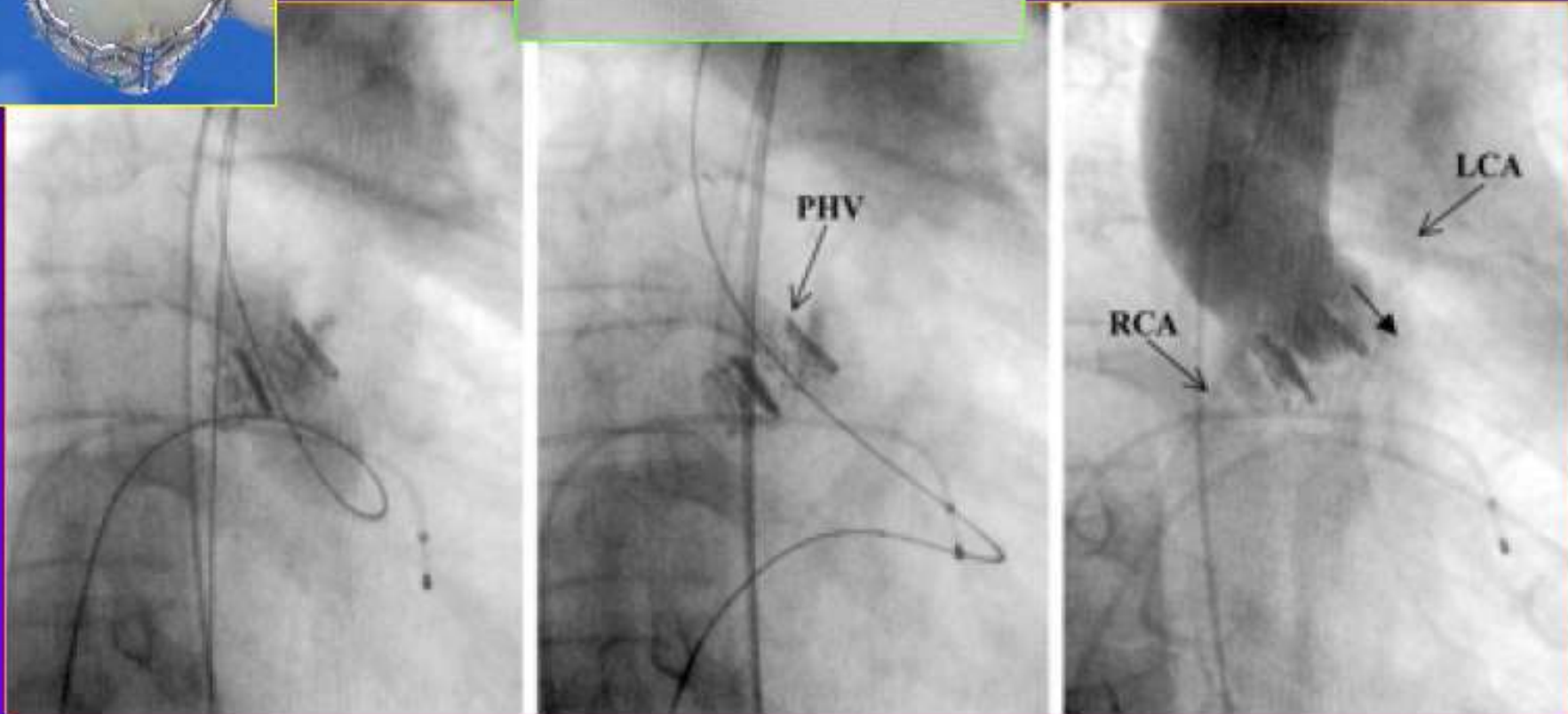
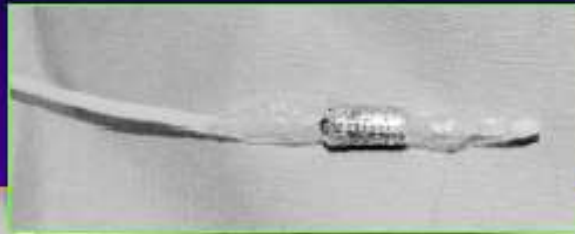
Cribier - Edwards





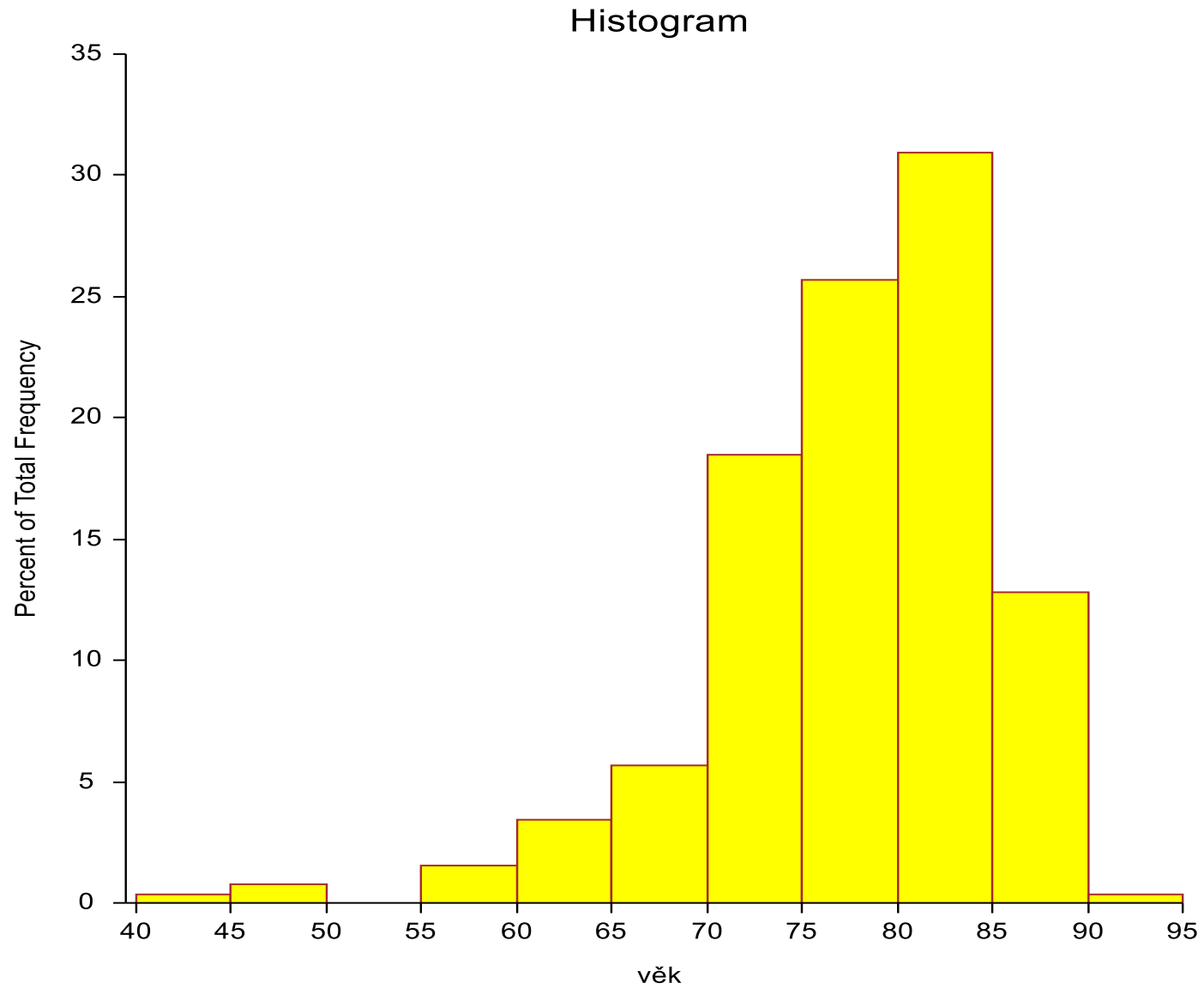
# Percutaneous Transcatheter Implantation of an Aortic Valve Prosthesis for Calcific Aortic Stenosis

## First Human Case Description



Alain Cribier, *Circulation* 2002 106: 3006-3008

# Zkušenosti kardiocentra FN Hradec Králové



# TAVI – technika, výkon

## Aortální stenóza - perkutánní implantace chlopně

- dva koncepty implantace  
(stent s upevněnou biologickou chlopní)
  - \* balónem dilatované „stent“ chlopně
  - \* samoexpandabilní „stent“ chlopně
  
- přístupové cesty
  - \* **transfemorální**
  - \* transapikální
  - \* transaortální
  - \* subclaviální
  - \* transkavální

# Risk Trends in Transcatheter Aortic Valve Therapy

*The NEW ENGLAND JOURNAL of MEDICINE*

REPRINTED FROM THE JOURNAL OF MEDICINE  
OCTOBER 21, 2010 VOL. 363 NO. 17

**Transcatheter Aortic-Valve Implantation for Aortic Stenosis in Patients Who Cannot Undergo Surgery**

Martin B. Leon, M.D., Craig R. Smith, M.D., Michael Mack, M.D., D. Craig Miller, M.D., Jeffrey W. Moses, M.D., Lars G. Svensson, M.D., Ph.D., E. Murat Tuzcu, M.D., John G. Webb, M.D., Gregory P. Fontana, M.D., Raj R. Makkar, M.D., David L. Brown, M.D., Peter C. Blöck, M.D., Robert A. Guyton, M.D., Augusto D. Pichard, M.D., Joseph E. Bavaria, M.D., Howard C. Herrmann, M.D., Pamela S. Douglas, M.D., John L. Petersen, M.D., Jodi J. Alair, M.S., William N. Anderson, Ph.D., Duolao Wang, Ph.D., and Stuart Pocock, Ph.D., for the PARTNER Trial Investigators\*

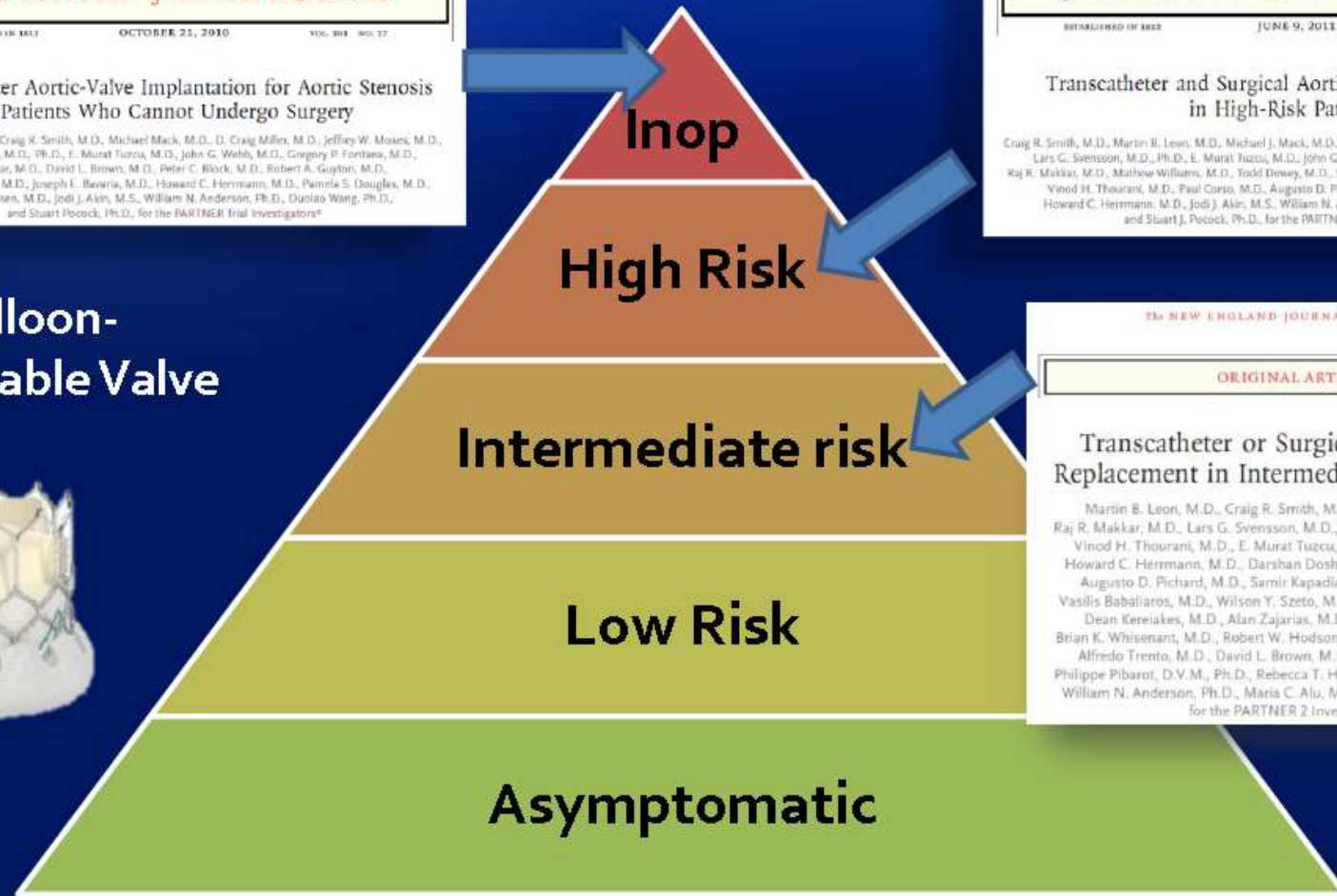
*The NEW ENGLAND JOURNAL of MEDICINE*

REPRINTED FROM THE JOURNAL OF MEDICINE  
JUNE 9, 2011 VOL. 364 NO. 23

**Transcatheter and Surgical Aortic-Valve Replacement in High-Risk Patients**

Craig R. Smith, M.D., Martin B. Leon, M.D., Michael J. Mack, M.D., D. Craig Miller, M.D., Jeffrey W. Moses, M.D., Lars G. Svensson, M.D., Ph.D., E. Murat Tuzcu, M.D., John G. Webb, M.D., Gregory P. Fontana, M.D., Raj R. Makkar, M.D., Matthew Williams, M.D., Todd Dewey, M.D., Samir Kapadia, M.D., Vasilis Babaliaros, M.D., Vinod H. Thourani, M.D., Paul Corso, M.D., Augusto D. Pichard, M.D., Joseph E. Bavaria, M.D., Howard C. Herrmann, M.D., Jodi J. Alair, M.S., William N. Anderson, Ph.D., Duolao Wang, Ph.D., and Stuart J. Pocock, Ph.D., for the PARTNER Trial Investigators\*

**Balloon-expandable Valve**



*The NEW ENGLAND JOURNAL of MEDICINE*

ORIGINAL ARTICLE

**Transcatheter or Surgical Aortic-Valve Replacement in Intermediate-Risk Patients**

Martin B. Leon, M.D., Craig R. Smith, M.D., Michael J. Mack, M.D., Raj R. Makkar, M.D., Lars G. Svensson, M.D., Ph.D., Susheel K. Kodali, M.D., Vinod H. Thourani, M.D., E. Murat Tuzcu, M.D., D. Craig Miller, M.D., Howard C. Herrmann, M.D., Darshan Doshi, M.D., David J. Cohen, M.D., Augusto D. Pichard, M.D., Samir Kapadia, M.D., Todd Dewey, M.D., Vasilis Babaliaros, M.D., Wilson Y. Szeto, M.D., Matthew R. Williams, M.D., Dean Kereiakes, M.D., Alan Zajarias, M.D., Kevin L. Greason, M.D., Brian K. Whisenant, M.D., Robert W. Hodson, M.D., Jeffrey W. Moses, M.D., Alfredo Trento, M.D., David L. Brown, M.D., William F. Fearon, M.D., Philippe Pibarot, D.V.M., Ph.D., Rebecca T. Hahn, M.D., Wael A. Jaber, M.D., William N. Anderson, Ph.D., Maria C. Alu, M.M., and John G. Webb, M.D., for the PARTNER 2 Investigators\*



# Risk Trends in Transcatheter Aortic Valve Therapy

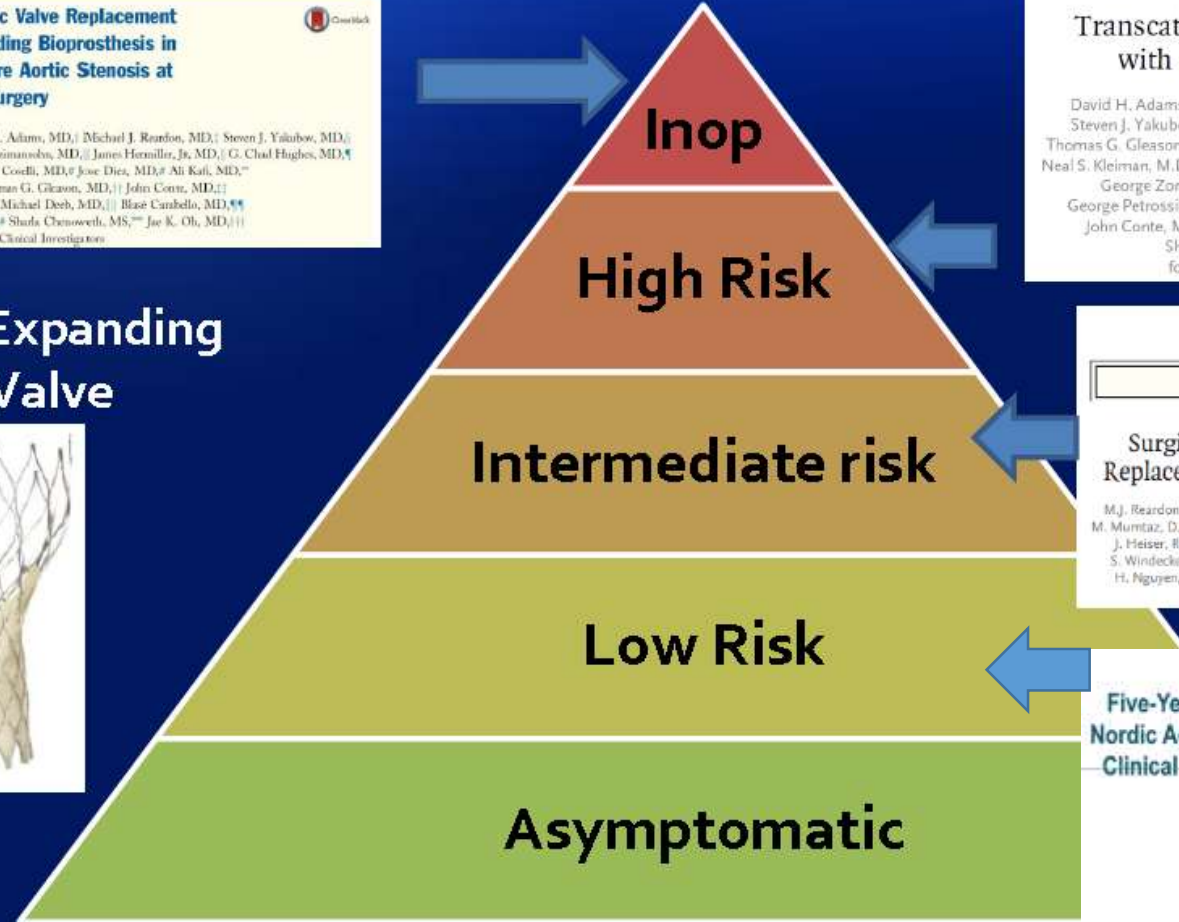
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No. 19, No. 19, 2014  
ISSN 0885-0666/14/\$36.00  
http://dx.doi.org/10.1016/j.jacc.2014.02.036

**Transcatheter Aortic Valve Replacement Using a Self-Expanding Bioprosthesis in Patients With Severe Aortic Stenosis at Extreme Risk for Surgery**

Jeffrey J. Popma, MD,\* David H. Adams, MD,† Michael J. Reardon, MD,‡ Steven J. Yakubov, MD,§ Neal S. Kleiman, MD,¶ David Heimansohn, MD,|| James Hermiller, Jr, MD,|| G. Chad Hughes, MD,¶ J. Kevin Harrison, MD,¶ Joseph Coselli, MD,¶ Jose Diaz, MD,¶ Ali Kati, MD,™ Theodore Schreiber, MD,™ Thomas G. Gleason, MD,|| John Conte, MD,|| Maurice Buchbinder, MD,|| G. Michael Deeb, MD,|| Blaise Cambello, MD,¶¶ Patrick W. Serruys, MD, PhD,¶¶ Sharda Chenoweth, MS,™™ Jae K. Oh, MD,|||| for the CoreValve United States Clinical Investigators

Self-Expanding Valve



THE NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTICLE

**Transcatheter Aortic-Valve Replacement with a Self-Expanding Prosthesis**

David H. Adams, M.D., Jeffrey J. Popma, M.D., Michael J. Reardon, M.D., Steven J. Yakubov, M.D., Joseph S. Coselli, M.D., G. Michael Deeb, M.D., Thomas G. Gleason, M.D., Maurice Buchbinder, M.D., James Hermiller, Jr., M.D., Neal S. Kleiman, M.D., Stan Chetcuti, M.D., John Heiser, M.D., William Merhi, D.O., George Zorn, M.D., Peter Tadros, M.D., Newell Robinson, M.D., George Petrossian, M.D., G. Chad Hughes, M.D., J. Kevin Harrison, M.D., John Conte, M.D., Brijeshwar Maini, M.D., Mubashir Mumtaz, M.D., Sharla Chenoweth, M.S., and Jae K. Oh, M.D., for the U.S. CoreValve Clinical Investigators\*

THE NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTICLE

**Surgical or Transcatheter Aortic-Valve Replacement in Intermediate-Risk Patients**

M.J. Reardon, N.M. Van Mieghem, J.J. Popma, N.S. Kleiman, L. Sondergaard, M. Mumtaz, D.H. Adams, G.M. Deeb, B. Maini, H. Gada, S. Chetcuti, T. Gleason, J. Heiser, R. Lange, W. Merhi, J.K. Oh, P.S. Olsen, N. Piazza, M. Williams, S. Windecker, S.J. Yakubov, E. Grube, R. Makkar, J.S. Lee, J. Conte, E. Vang, H. Nguyen, Y. Chang, A.S. Mugglin, P.W.J.C. Serruys, and A.P. Kappetein, for the SURTAVI Investigators\*

**Five-Year Outcomes From the All-Comers Nordic Aortic Valve Intervention Randomized Clinical Trial in Patients with Severe Aortic Valve Stenosis**

H. Gustav Hersted Thyregod, MD, PhD  
Department of Cardiovascular Surgery  
Copenhagen University Hospital, Denmark

On behalf of the NOTION Investigators

ACC.18

# TAVI – technika, výkon

Balloon-expandable

SAPIEN  
\*no longer available



SAPIEN XT



S3



Colibri Heart Valve



Self-expandable

CoreValve



Evolut-R



Portico



Venus



ACURATE



Other designs

LOTUS Edge

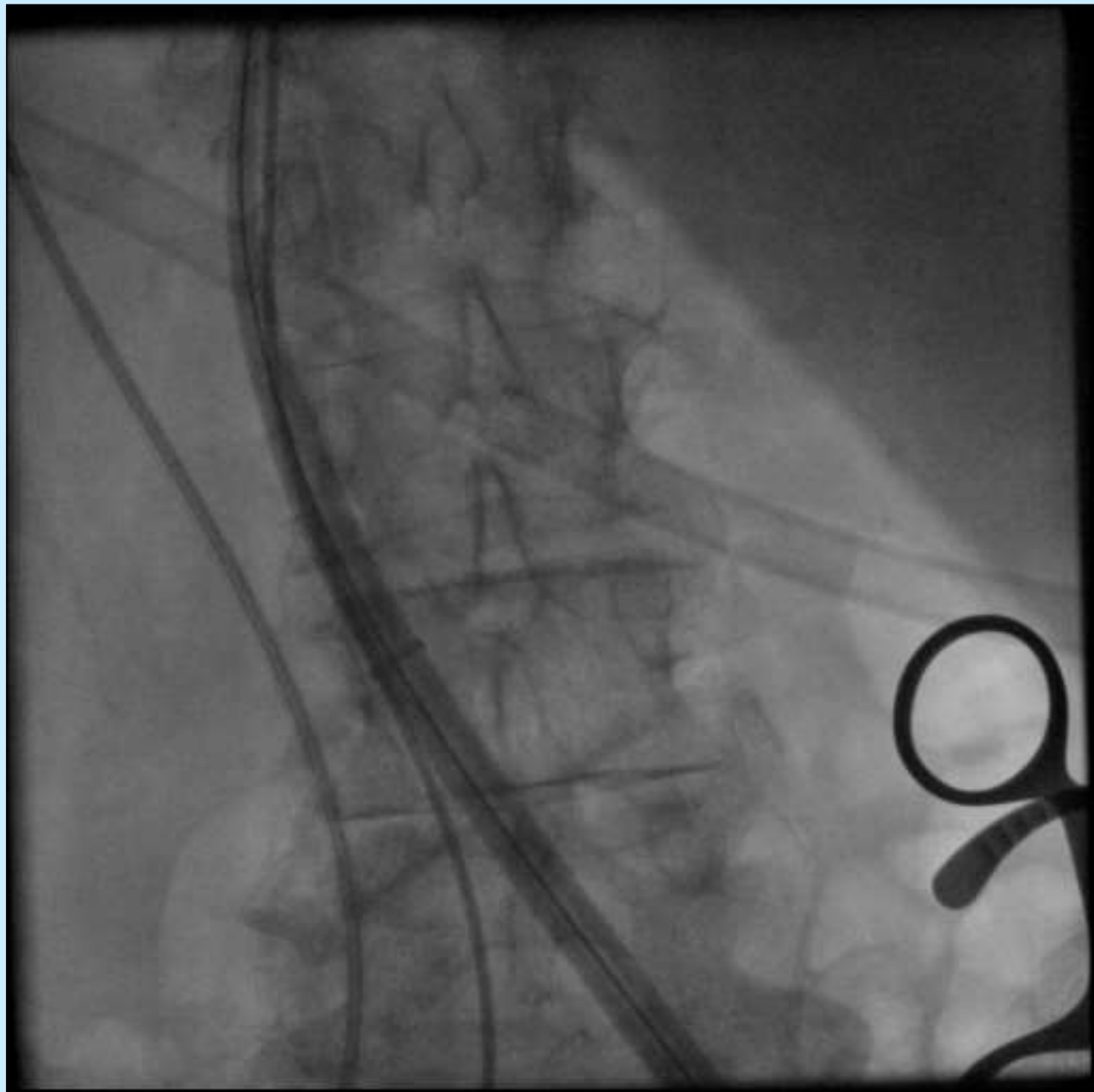


JenaValve

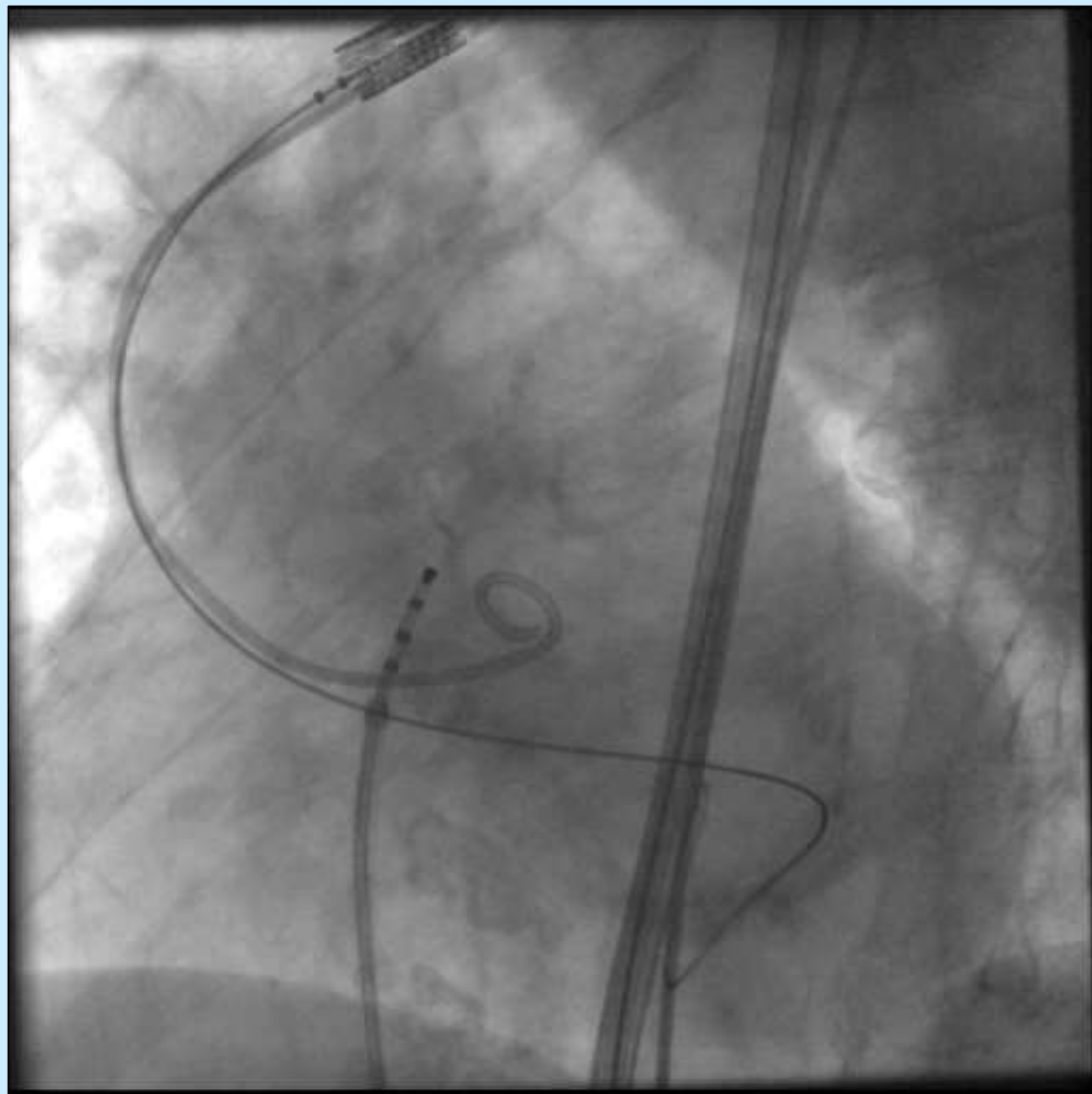
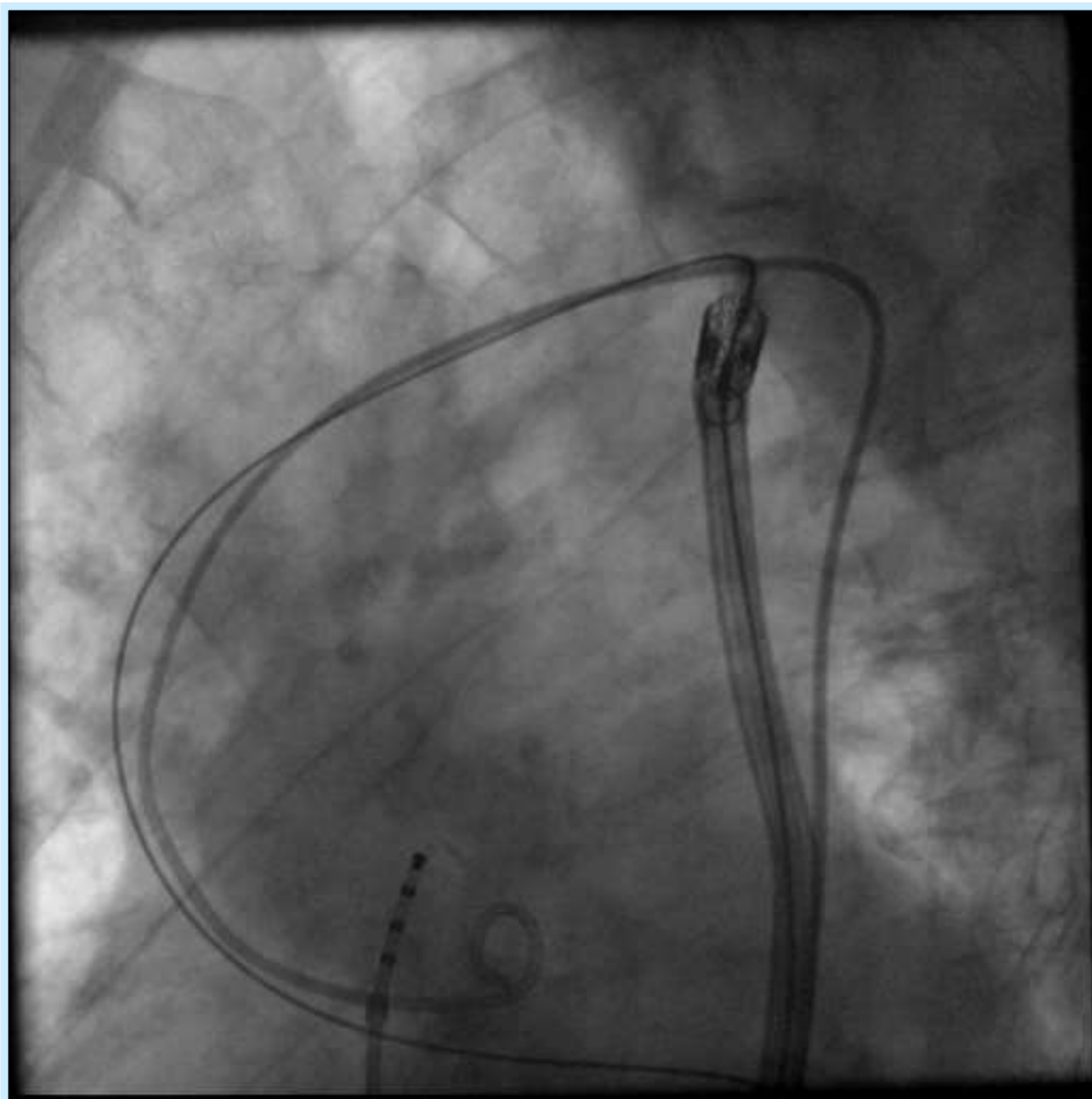


Meridian

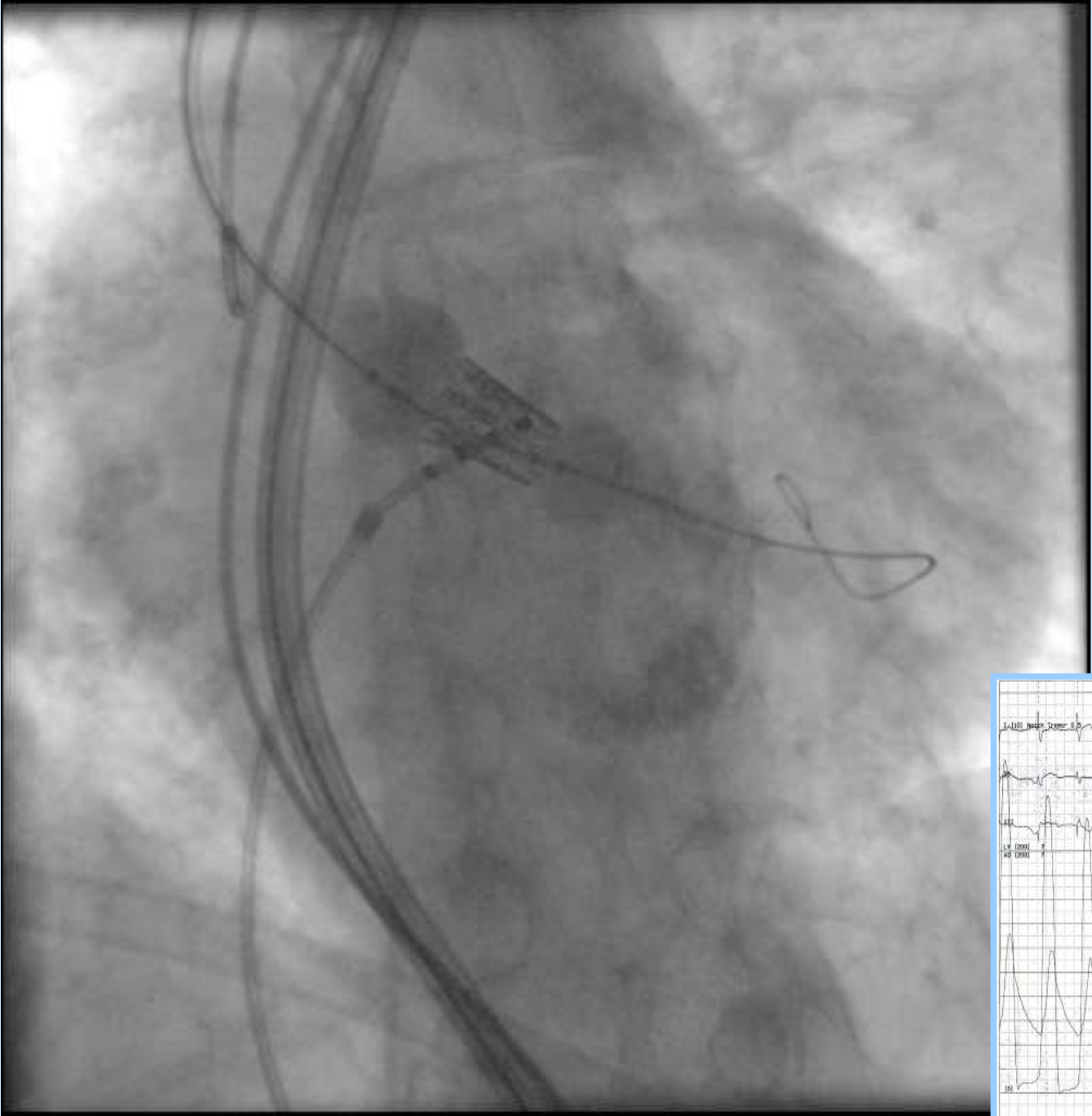




# TAVI – technika, výkon



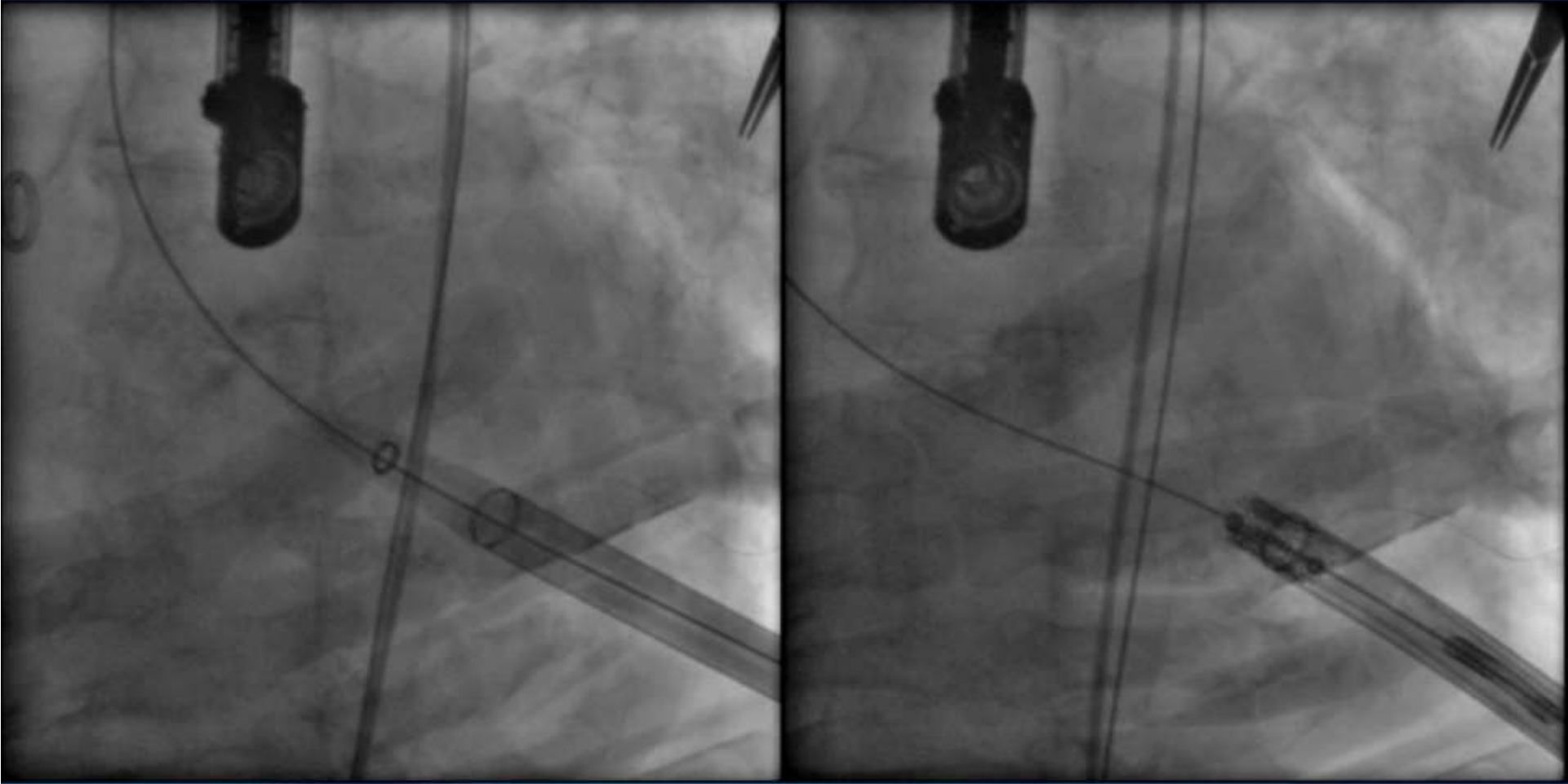




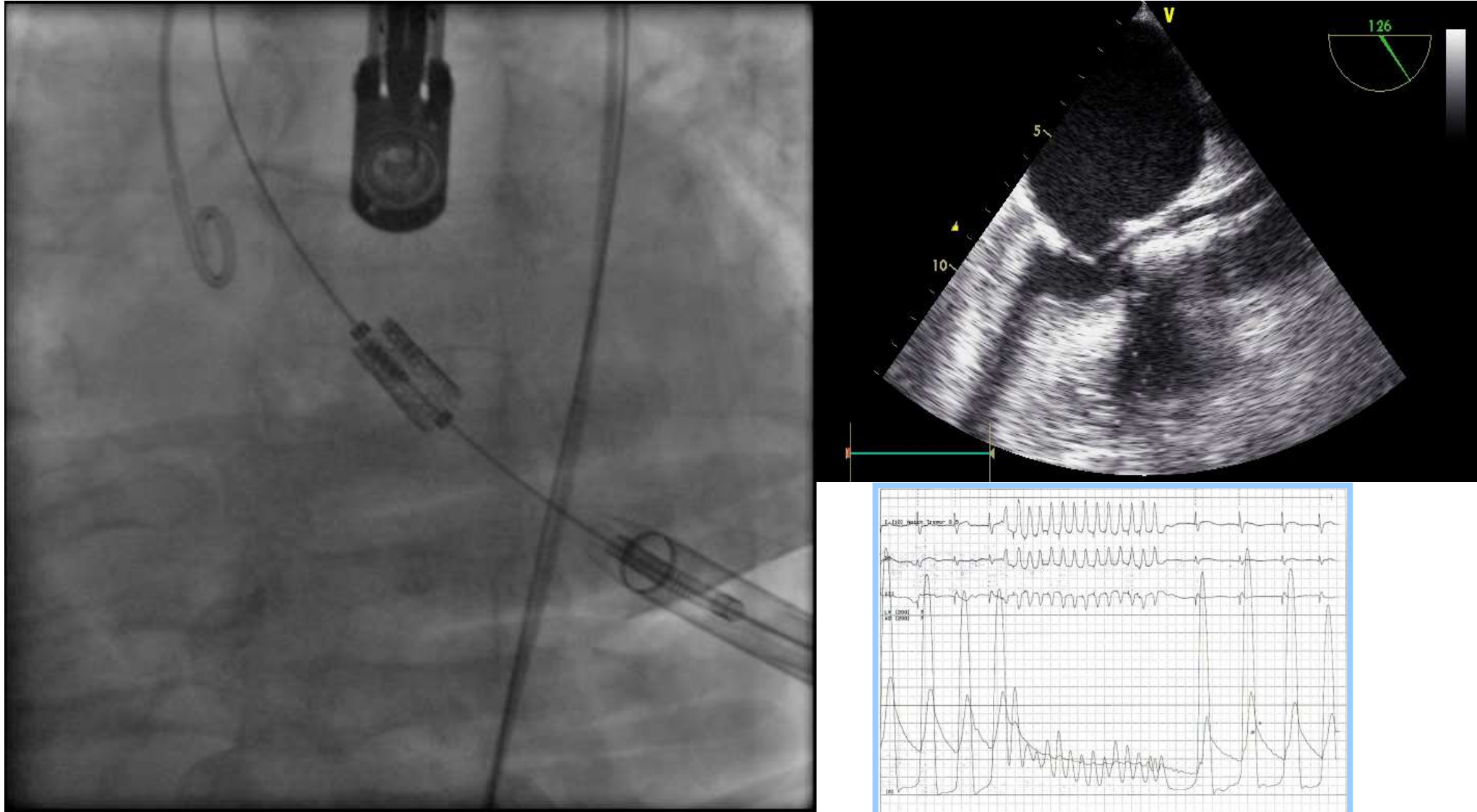
18. 12. 08 IKEM  
samoexpand. chl.

15. 1. 09 HK  
balnem exp. chl.

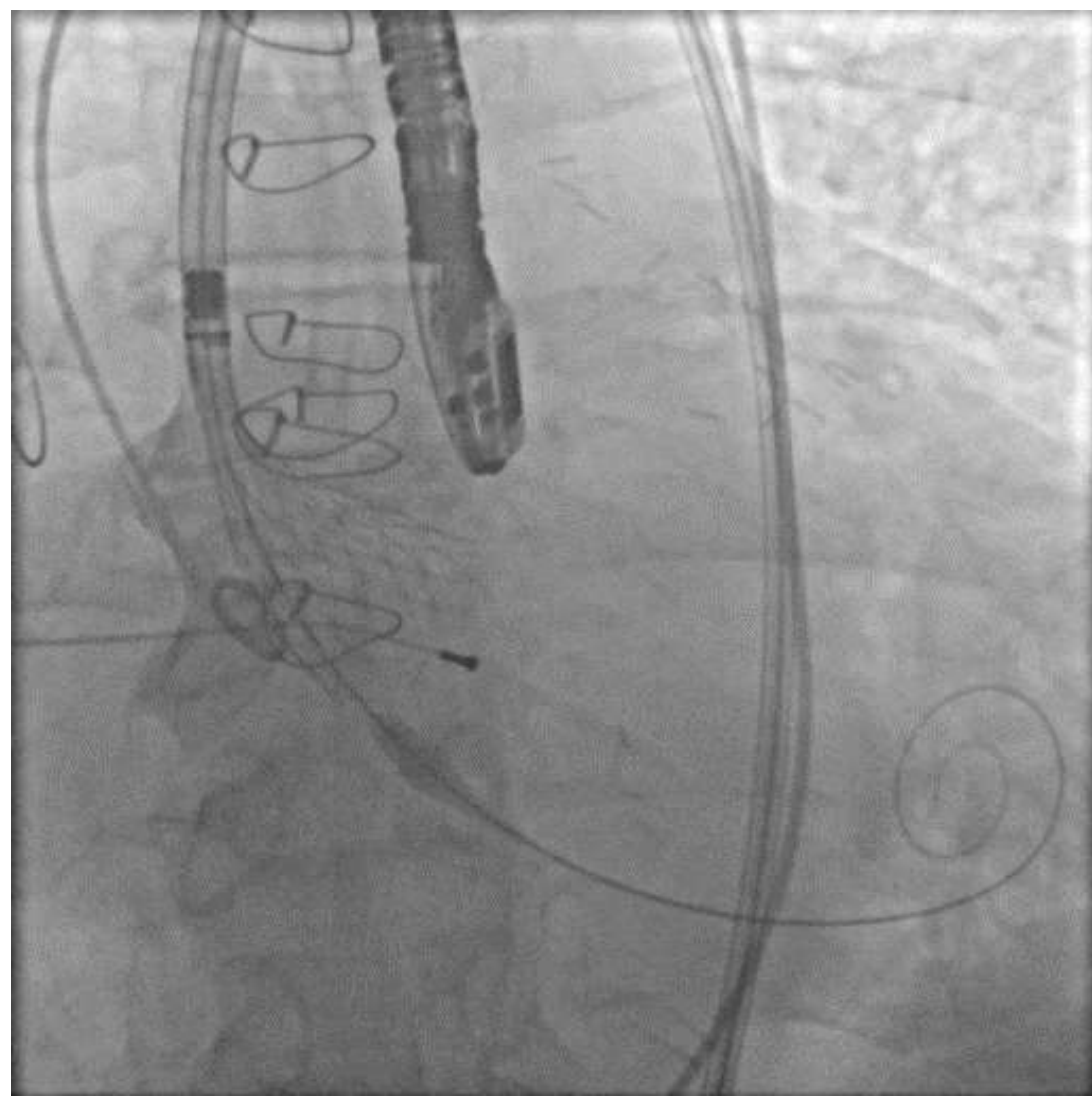




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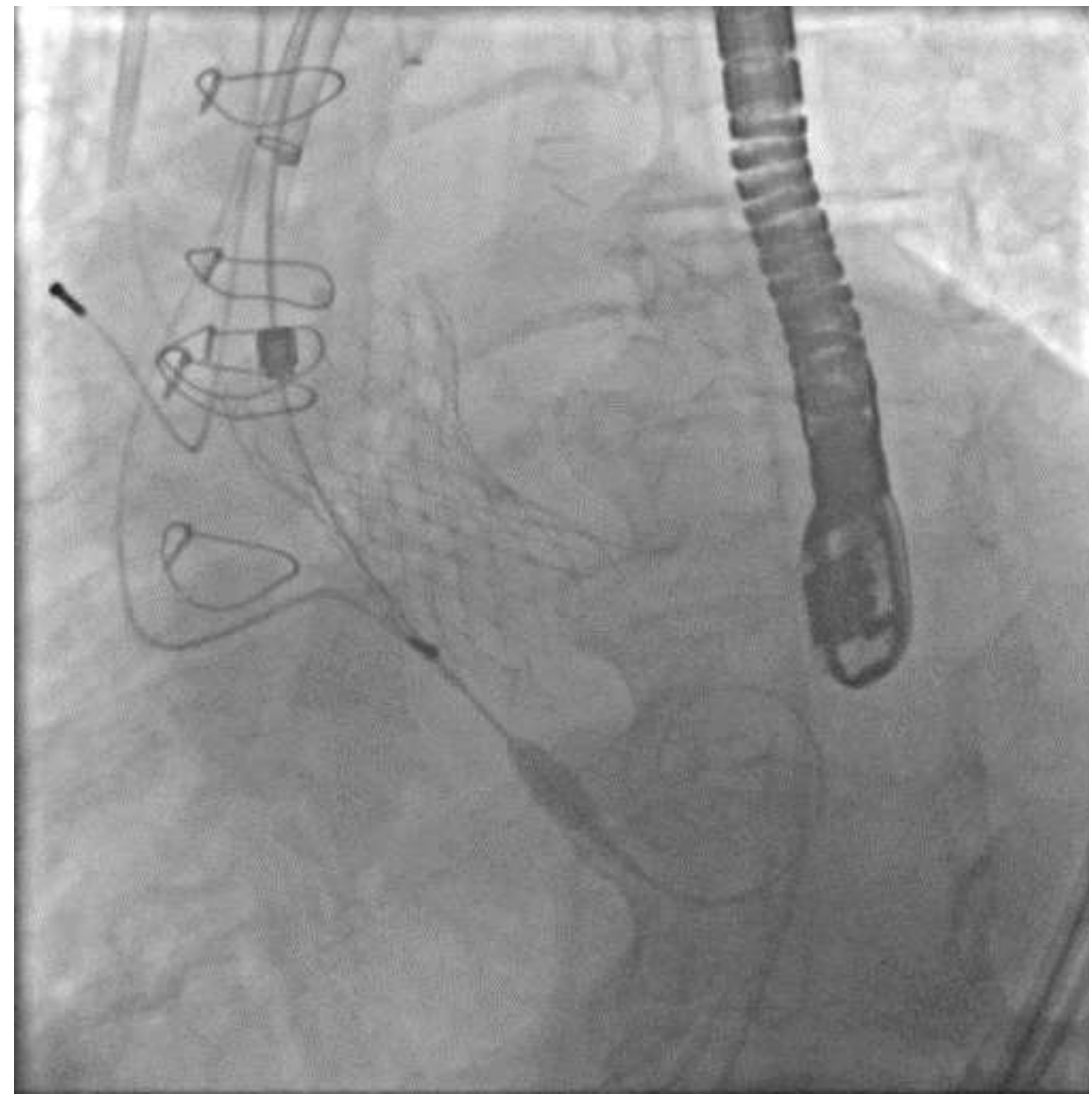
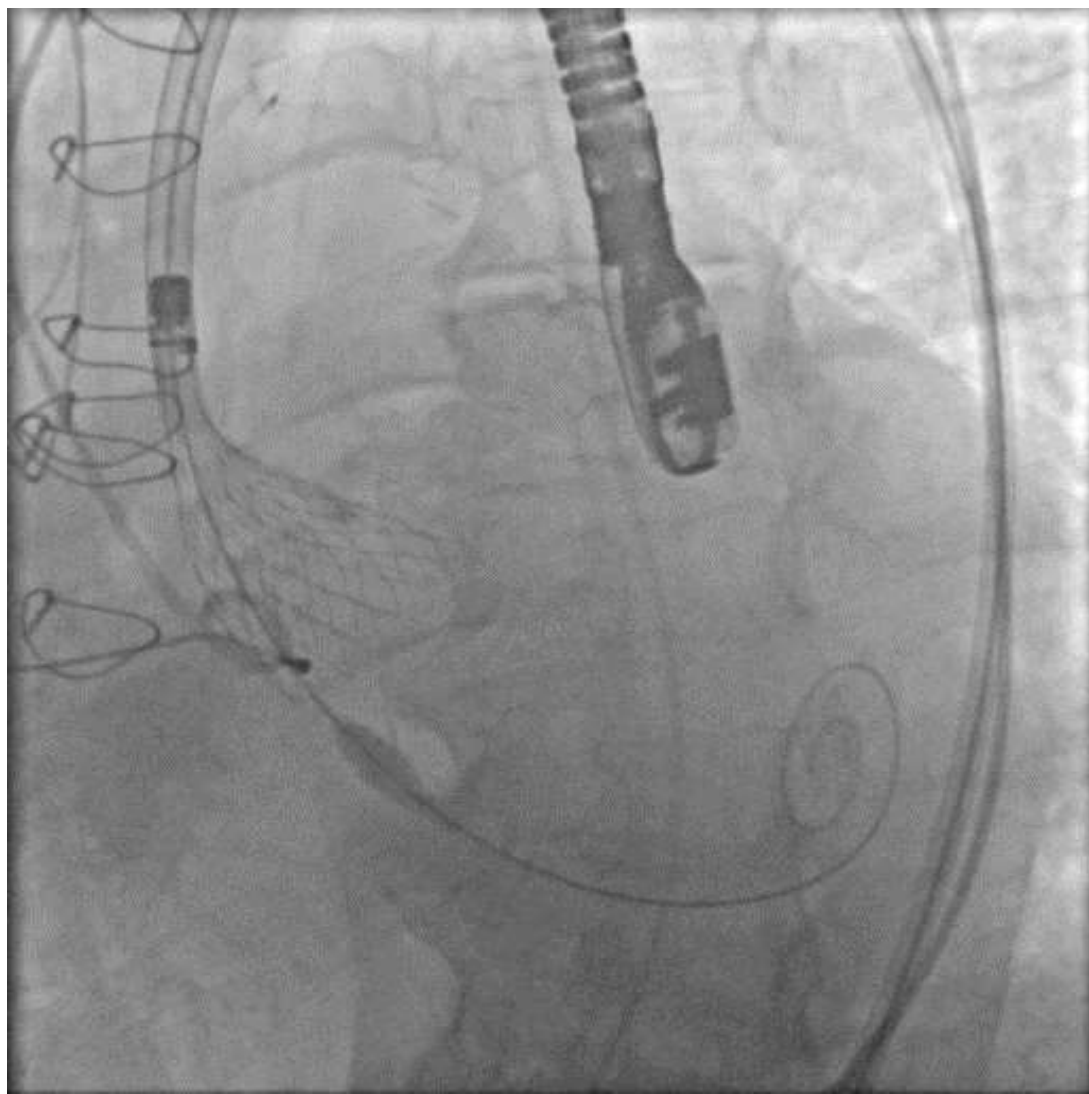


# TAVI – technika, výkon





# TAVI – technika, výkon





22 nebo 24 F zavaděč

18 nebo 19 F zavaděč pro XT



**Kompletně katetrizační přístup**



# Evolution of the Edwards Balloon-Expandable Transcatheter Valves



**Cribier-Edwards**

**2002**



**SAPIEN**

**2006**



**SAPIEN XT**

**2009**



**SAPIEN 3**

**2013**



**24F**



**22F**



**16F**



**14F**

\* Sheath compatibility for a 23 mm valve

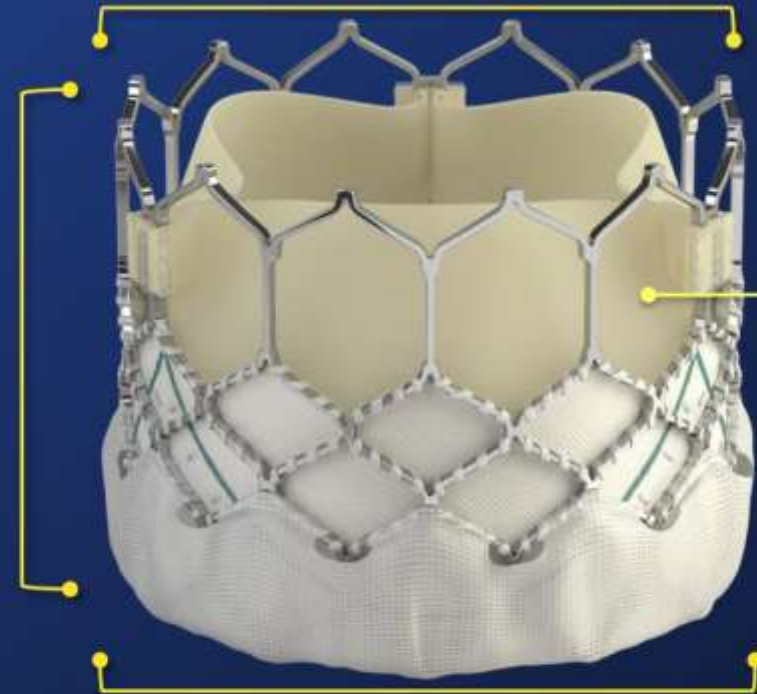
# Edwards SAPIEN 3 transcatheter heart valve

## Frame design

- Enhanced frame geometry for ultra-low delivery profile
- High radial strength for circularity and optimal hemodynamics

## Low frame height

- Respects the cardiac anatomy



## Bovine pericardial tissue

- Optimized leaflet shape
- Carpentier-Edwards ThermoFix\* process for anti-calcification

## Outer skirt

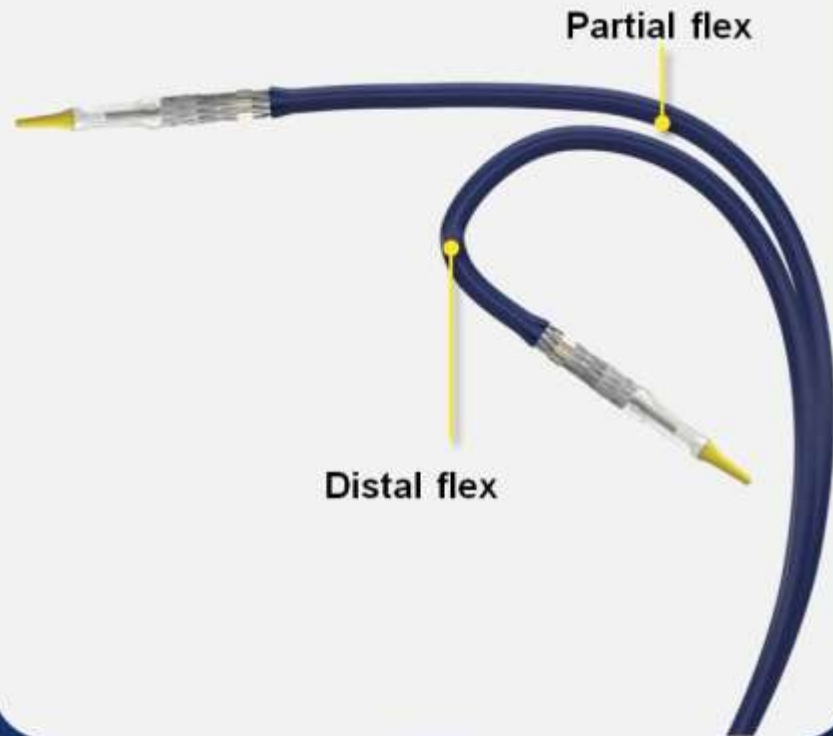
- Designed to reduce paravalvular leak

\* No clinical data are available which evaluate the long-term impact of the Carpentier-Edwards ThermoFix process in patients

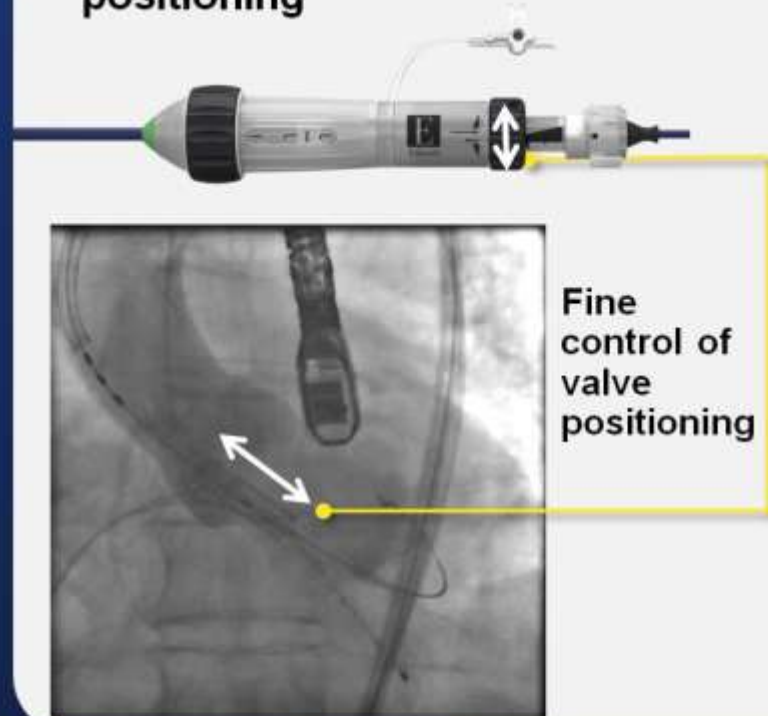


# Edwards Commander delivery system for the transfemoral approach

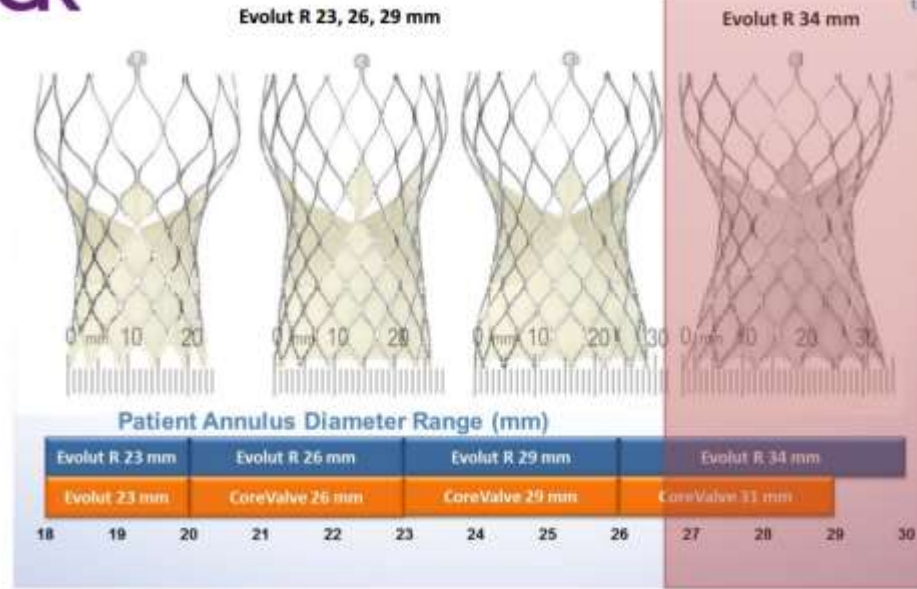
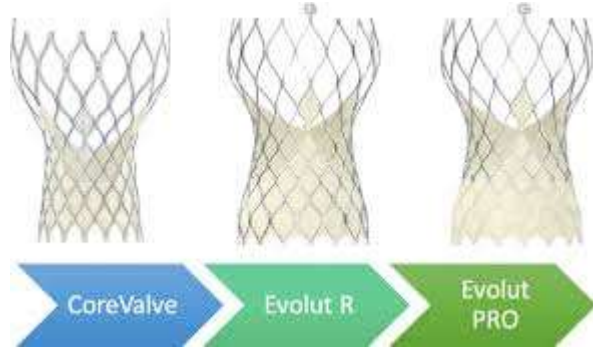
- Dual articulation for coaxiality even in challenging anatomies



- Trusted balloon-expandable design with improved control of valve positioning



\*14F eSheath compatible for 20, 23, and 26 mm valves. 16F eSheath compatible for 29 mm valve .



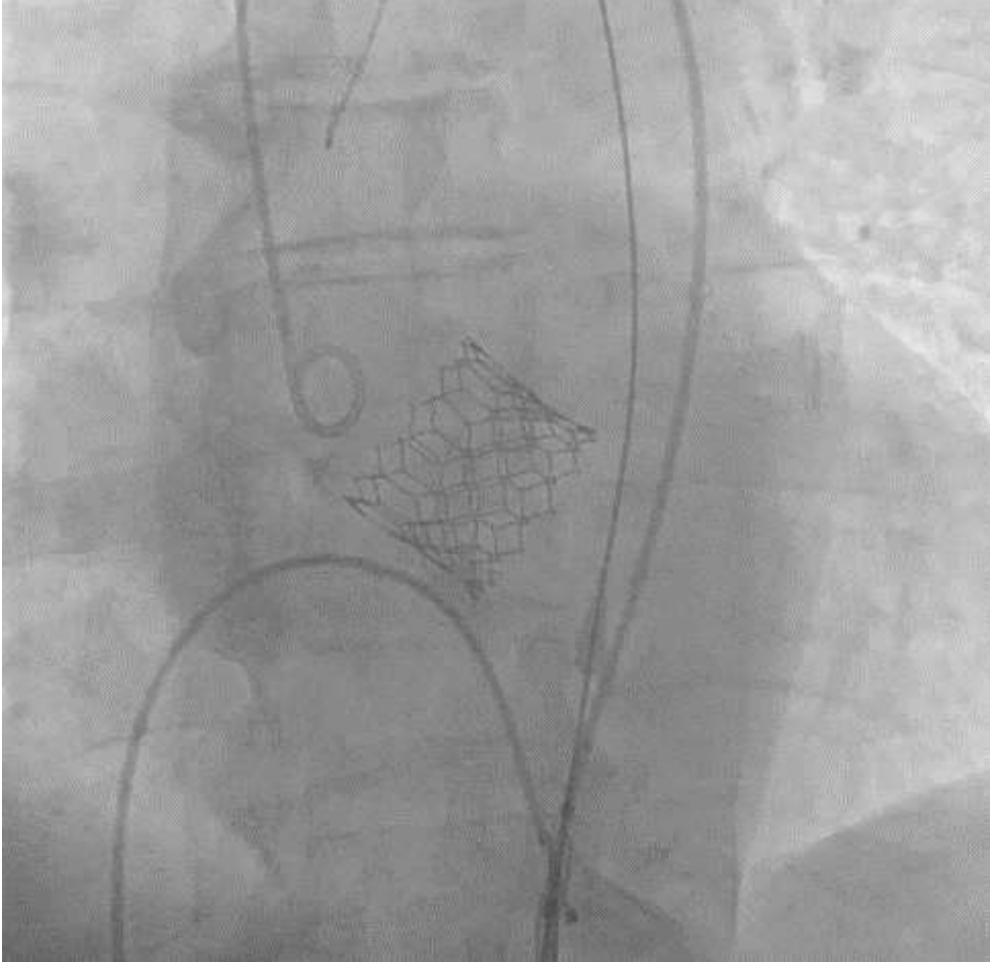
Manufacturer	Edwards Lifesciences	
Valve	<ul style="list-style-type: none"> <li>Edwards SAPIEN XT*</li> <li>Edwards SAPIEN 3*</li> </ul>	<ul style="list-style-type: none"> <li>CoreValve® Evolut R*</li> </ul>
Type	Balloon expandable 	Self-expanding 
Benefits	<ul style="list-style-type: none"> <li>Lower delivery profile, requiring smaller sheaths (14-20 Fr)</li> <li>Sealing skirt to reduce PVR</li> </ul>	<ul style="list-style-type: none"> <li>Repositionable to maximize positioning and reduce PVR</li> </ul>
Risks	<ul style="list-style-type: none"> <li>Increased risk of annulus rupture</li> <li>Increased risk of coronary occlusions</li> </ul>	<ul style="list-style-type: none"> <li>Increased chance patient will need permanent pacemaker</li> </ul>
Similar endpoints	Mortality, stroke, repeat hospitalizations, vascular or bleeding events, acute renal injury, impaired valve hemodynamics, and reduced durability performance	
Approved TAVR approach	TF, TA, TAO	TF, TAx, TAO









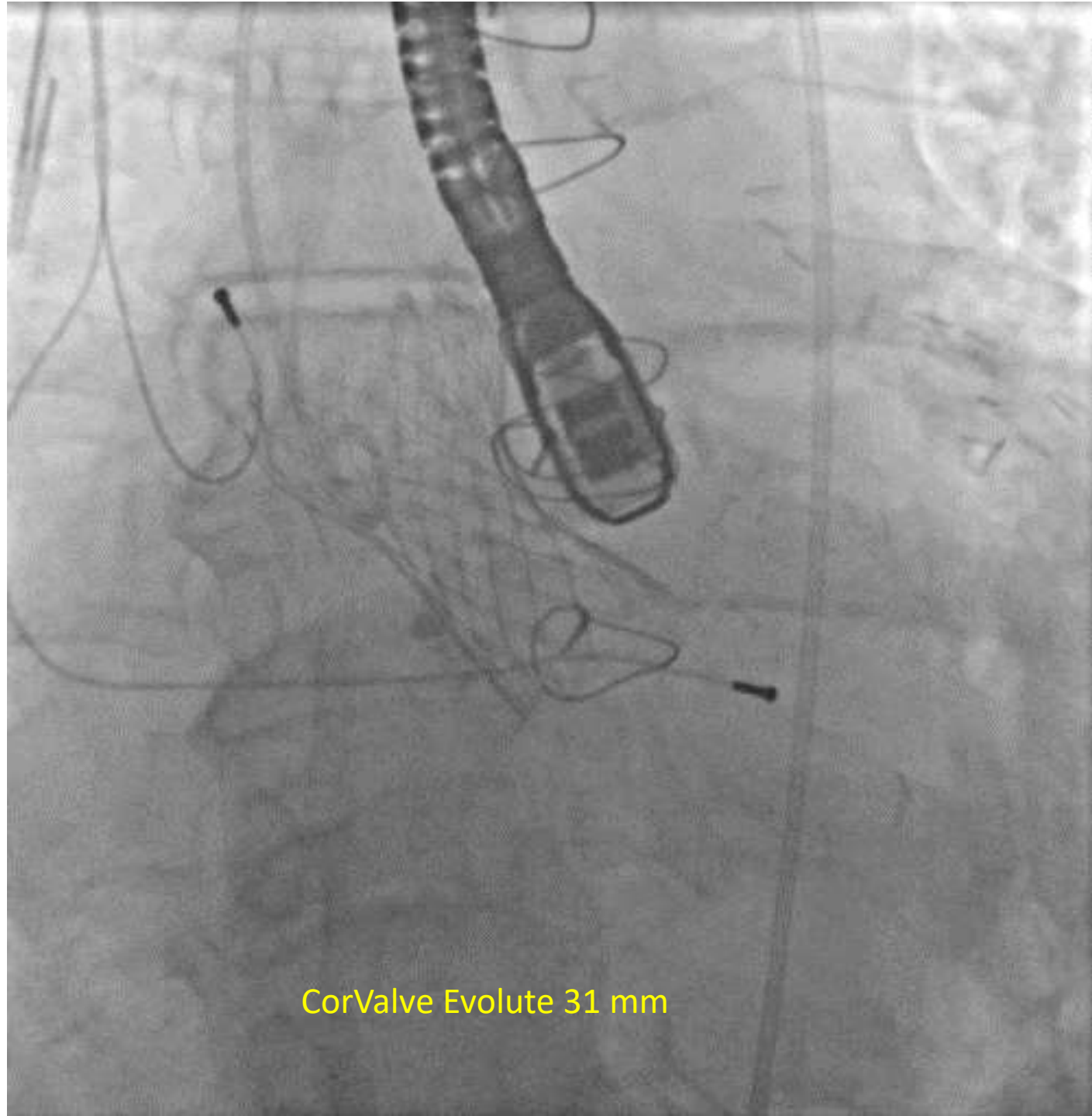


Edwards Sapien S3 26 mm



A grayscale medical image showing a heart valve, specifically an Edwards SAPIEN 3, 29 mm. The valve is positioned in the center of the frame, with its leaflets and stent structure visible. The surrounding area is dark, likely representing the heart chamber or the surrounding tissue. The text "Edwards SAPIEN 3, 29 mm" is overlaid on the image in a white font.

Edwards SAPIEN 3, 29 mm



CorValve Evolute 31 mm

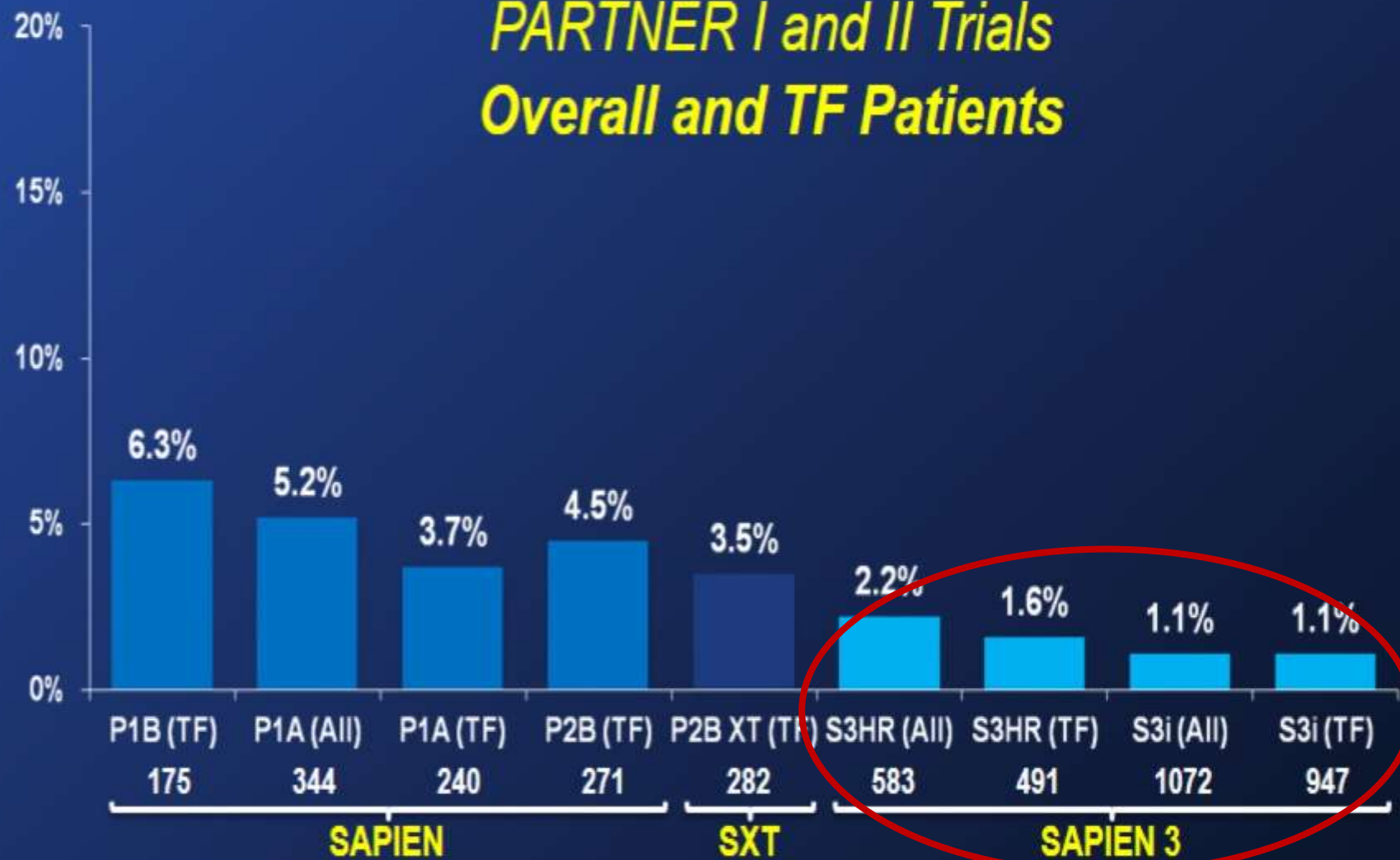


# All-Cause Mortality at 30 Days

Edwards SAPIEN Valves (As Treated Patients)



*PARTNER I and II Trials  
Overall and TF Patients*



# TAVI – technika, výkon

## Zkušenosti kardiocentra FN Hradec Králové

Rok implantace	Rok úmrtí											1.1. 2019- 25.1.2019	Celkem úmrtí	Počet žijících	Počet implantací
	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018					
2009	1	2		2	1			1	2	2			11	1 (8%)	12
2010		1	4	3	1	3	3	3	1				19	6 (24%)	25
2011			1	1	2	2	1		2	1			10	7 (41%)	17
2012							2	5	4	2			13	6 (31%)	19
2013					1		2	1	2	2			8	8 (50%)	16
2014						1	2	3	2	3			11	14 (56%)	25
2015							2	4	3			1	10	29 (74%)	39
2016								1	1	3			5	33 (87%)	38
2017									6	3			9	43 (83%)	52
2018										5			5	50 (91%)	55
2019														18(100%)	18
<b>Celkový součet</b>	<b>1</b>	<b>3</b>	<b>5</b>	<b>6</b>	<b>5</b>	<b>6</b>	<b>12</b>	<b>18</b>	<b>23</b>	<b>21</b>	<b>1</b>	<b>101</b>	<b>213(67%)</b>	<b>316</b>	

Průměrná doba dožití zemřelých s chlopní 3,2 roky

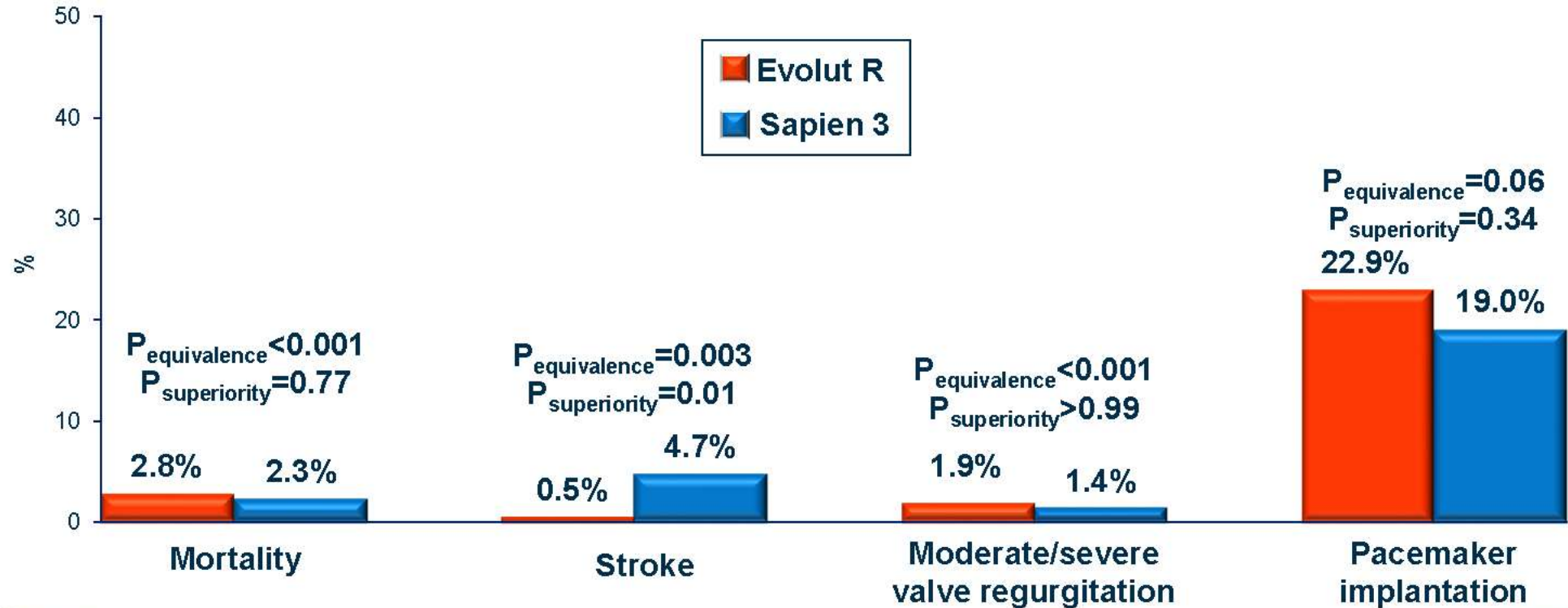
# TAVI – technika, výkon

## Zkušenosti kardiocentra FN Hradec Králové ( k 1.3.19)

- Exitus letalis	3x ( 0.94%)
- do 30 dnů	2x ( 1,58%)
- akutní verze na chir. náhradu	2x
- akutní chir. revize	1x
- chir . revize, bypass v třísle	4x
- stentgraft a. ill	2x
- valve- in -valve	3x
- pv. regurgitace > 2	4x

# Endpoints – Valve Strategy

Individual components primary endpoint





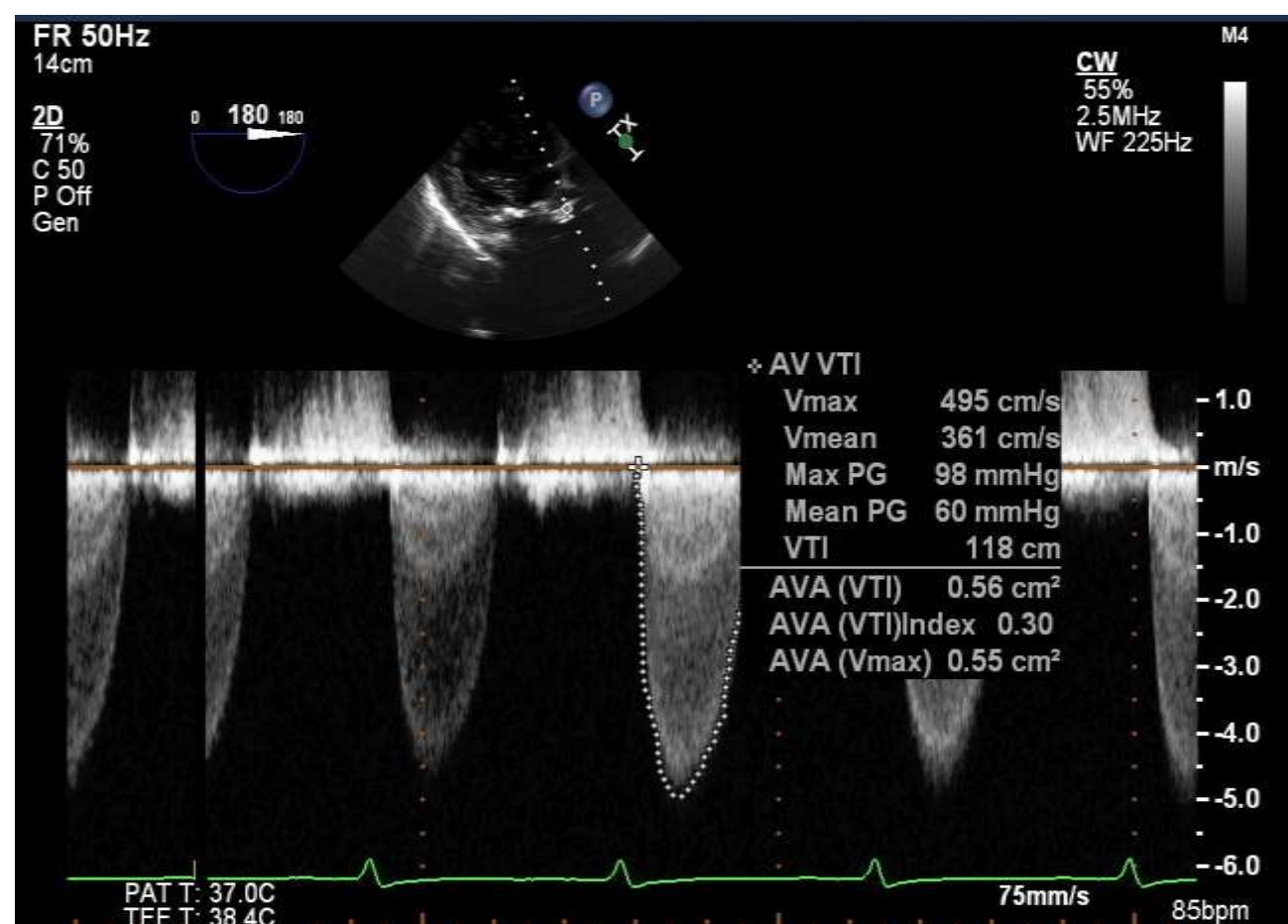
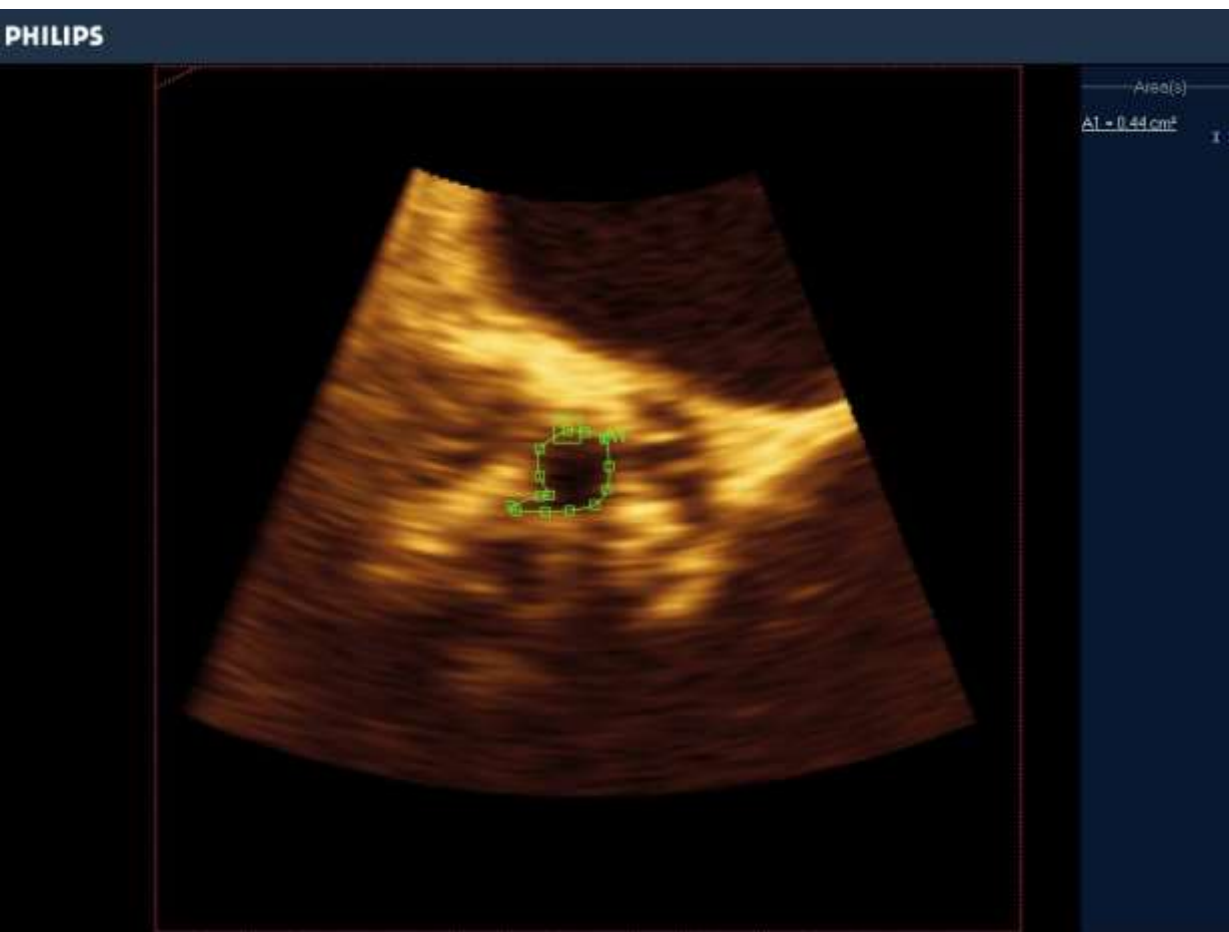
# TAVI – technika, výkon

## Katétrová chlopeň - valve in valve

- Ao, Mi a Tr pozice
- valva in ring v Mi pozici

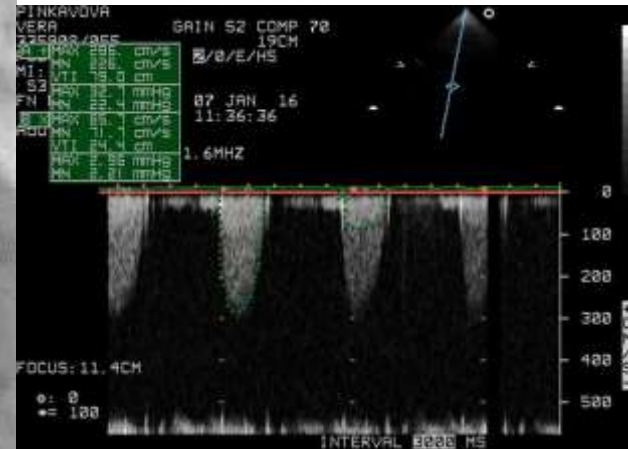
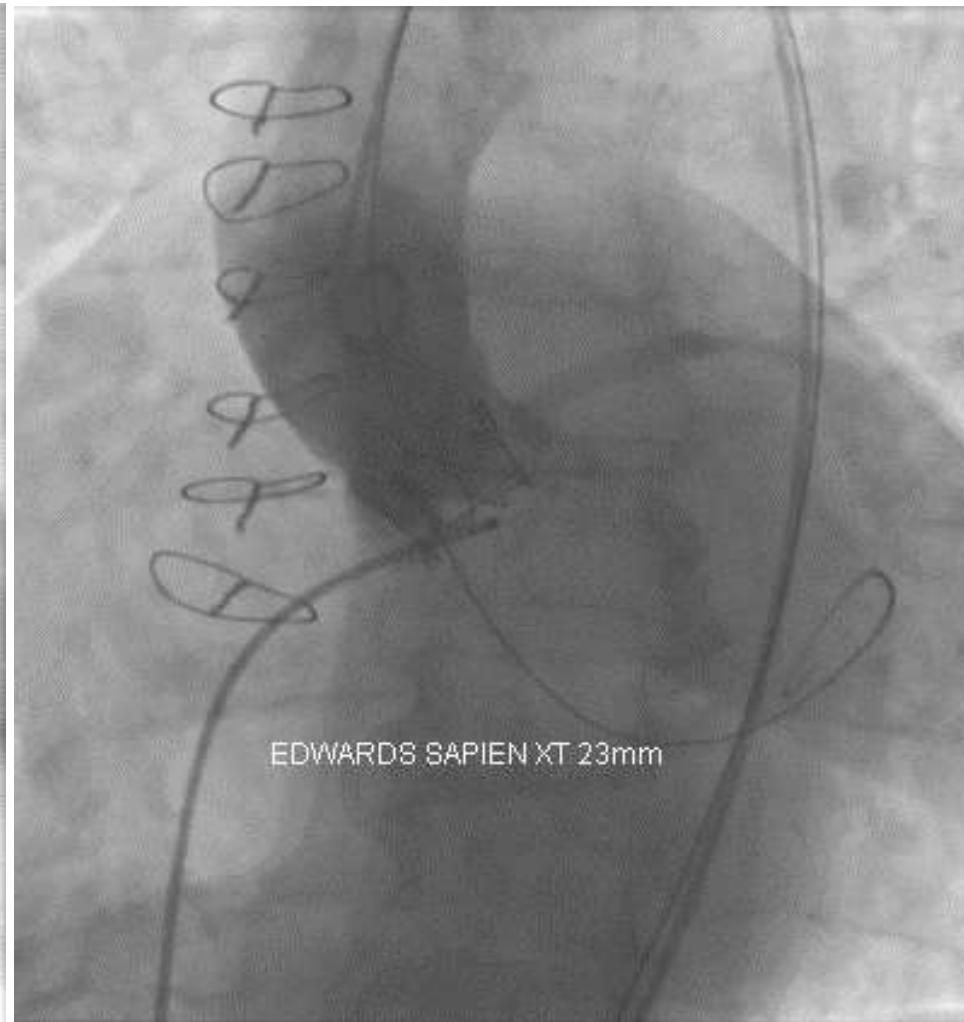
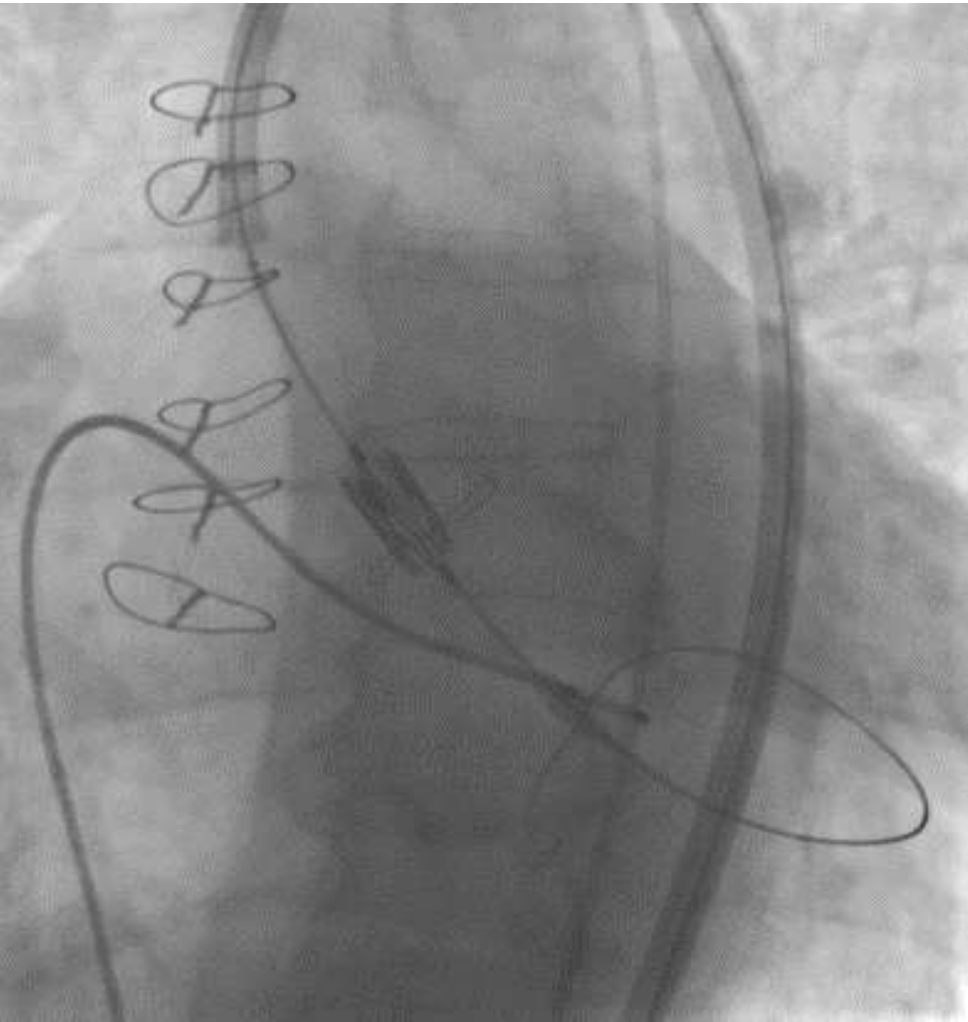
# TAVI – technika, výkon

## Degenerovaná Bioprotéza v Ao pozici



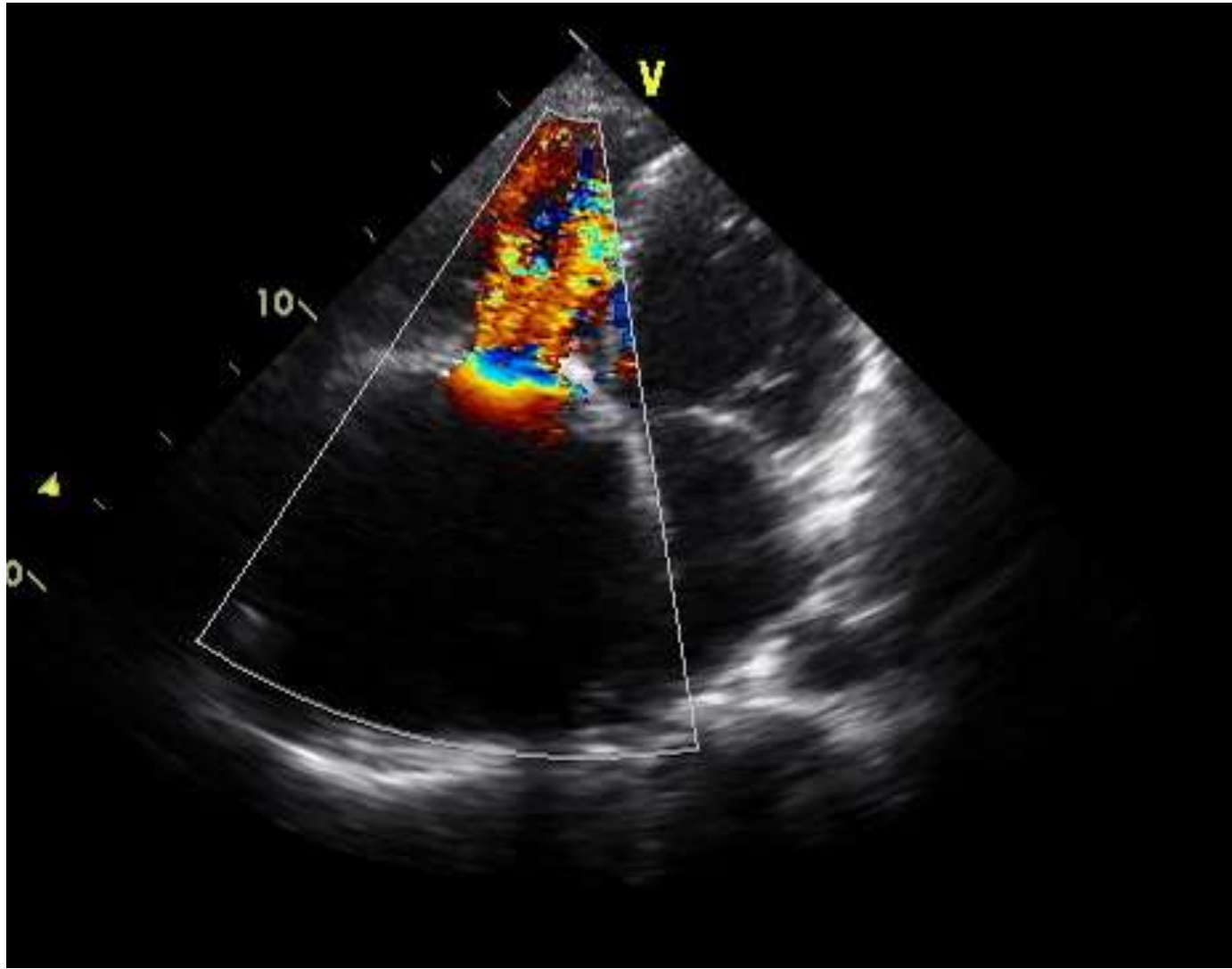
# TAVI – technika, výkon

## Valvi in valve v Ao pozici

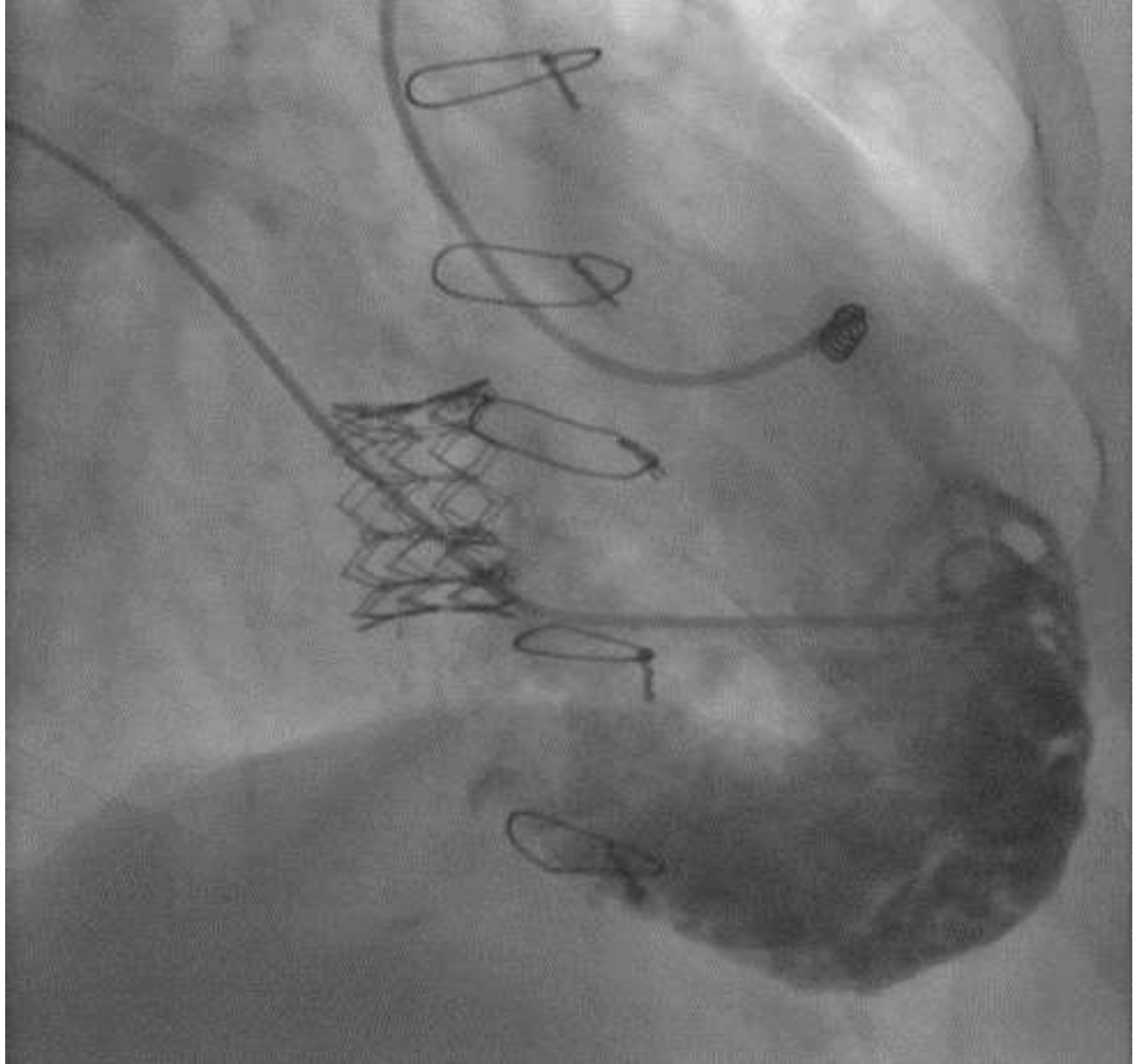


# TAVI – technika, výkon

## Degenerovaná bioprotéza v Tr. pozici

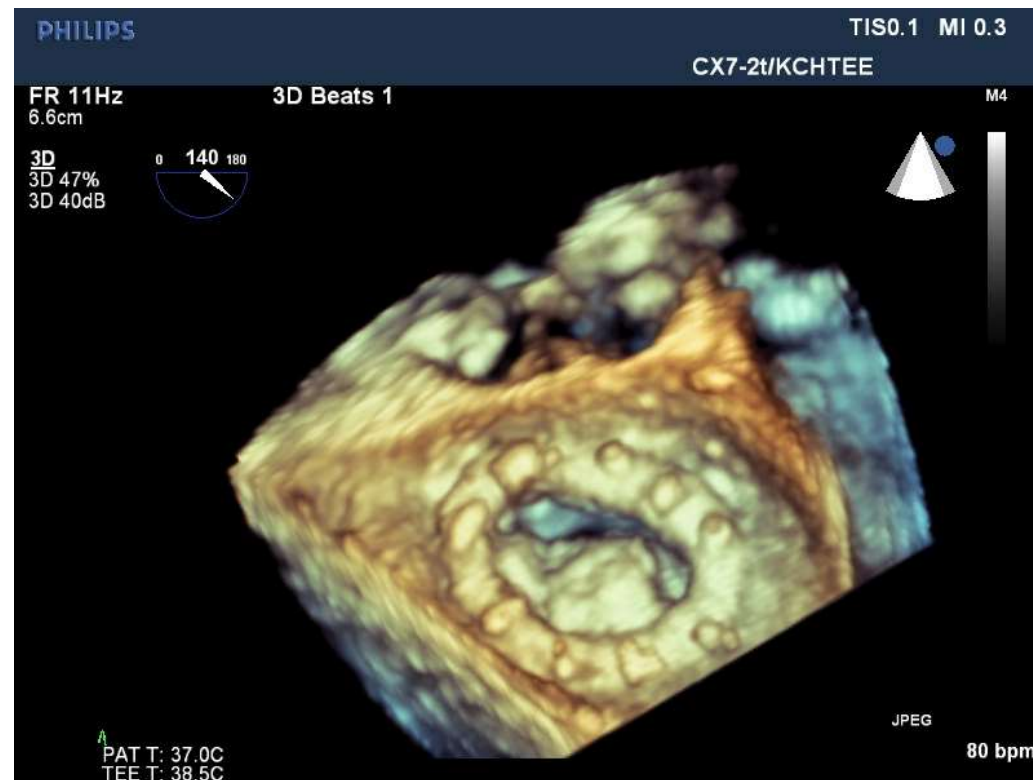
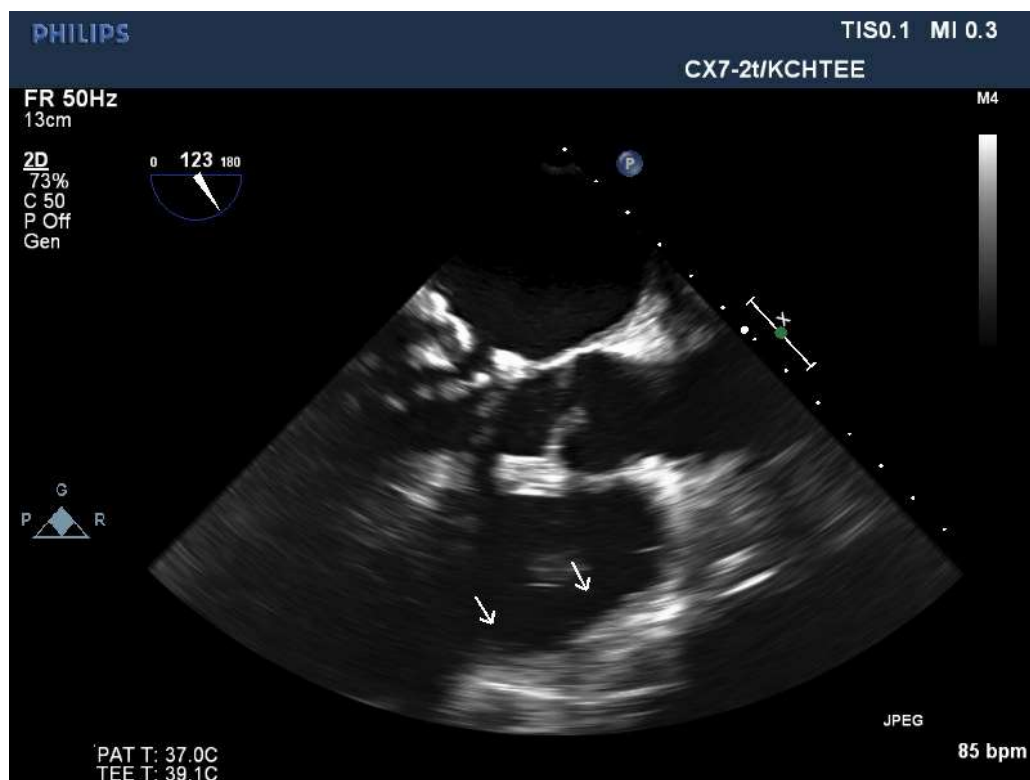






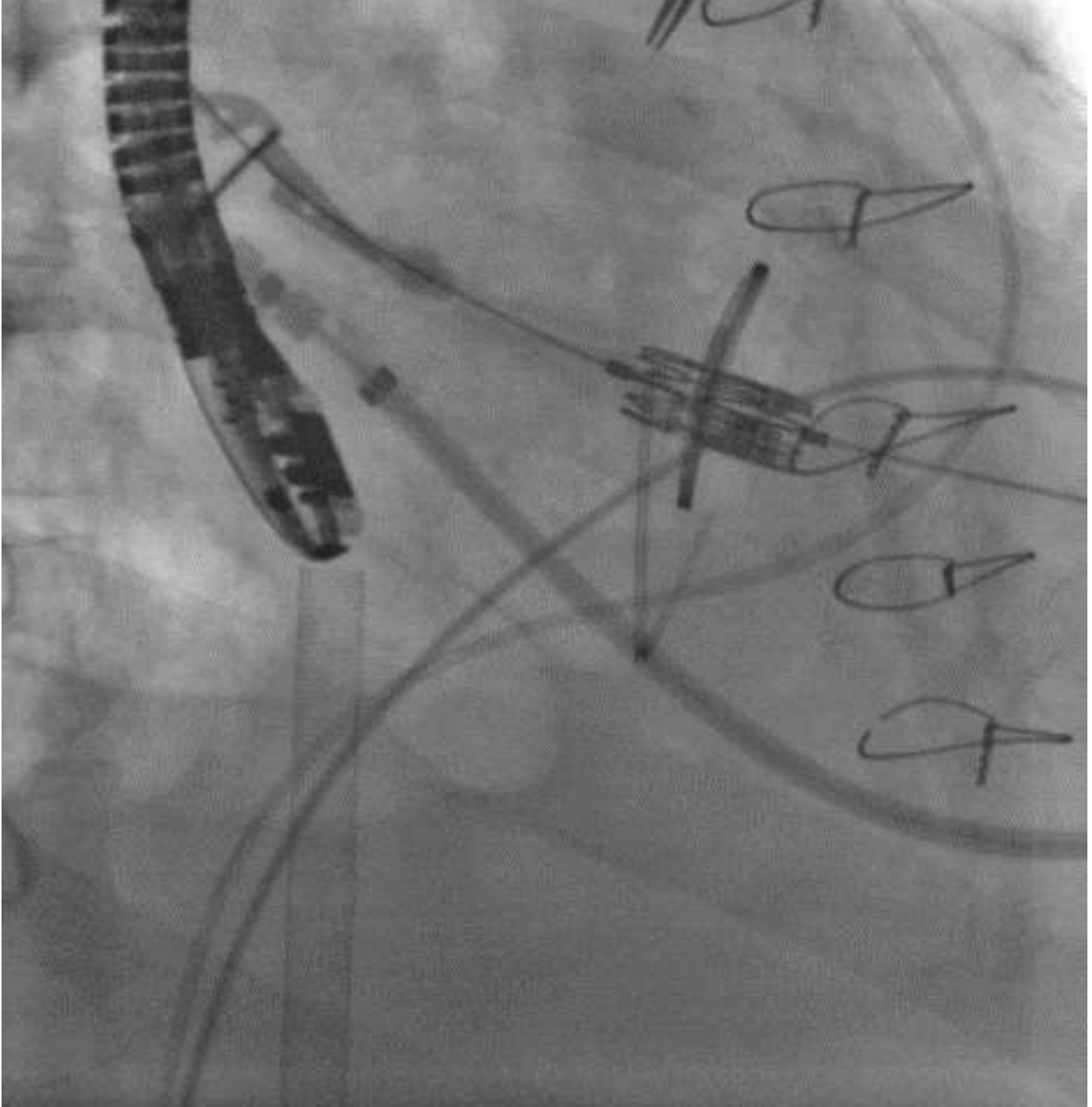
# TAVI – technika, výkon

## Degenerovaná Mi chlopeň, Mi ring



MPR: 1,14cm<sup>2</sup> (0,5cm<sup>2</sup>/m<sup>2</sup> )

PG: 22/10 mmHg

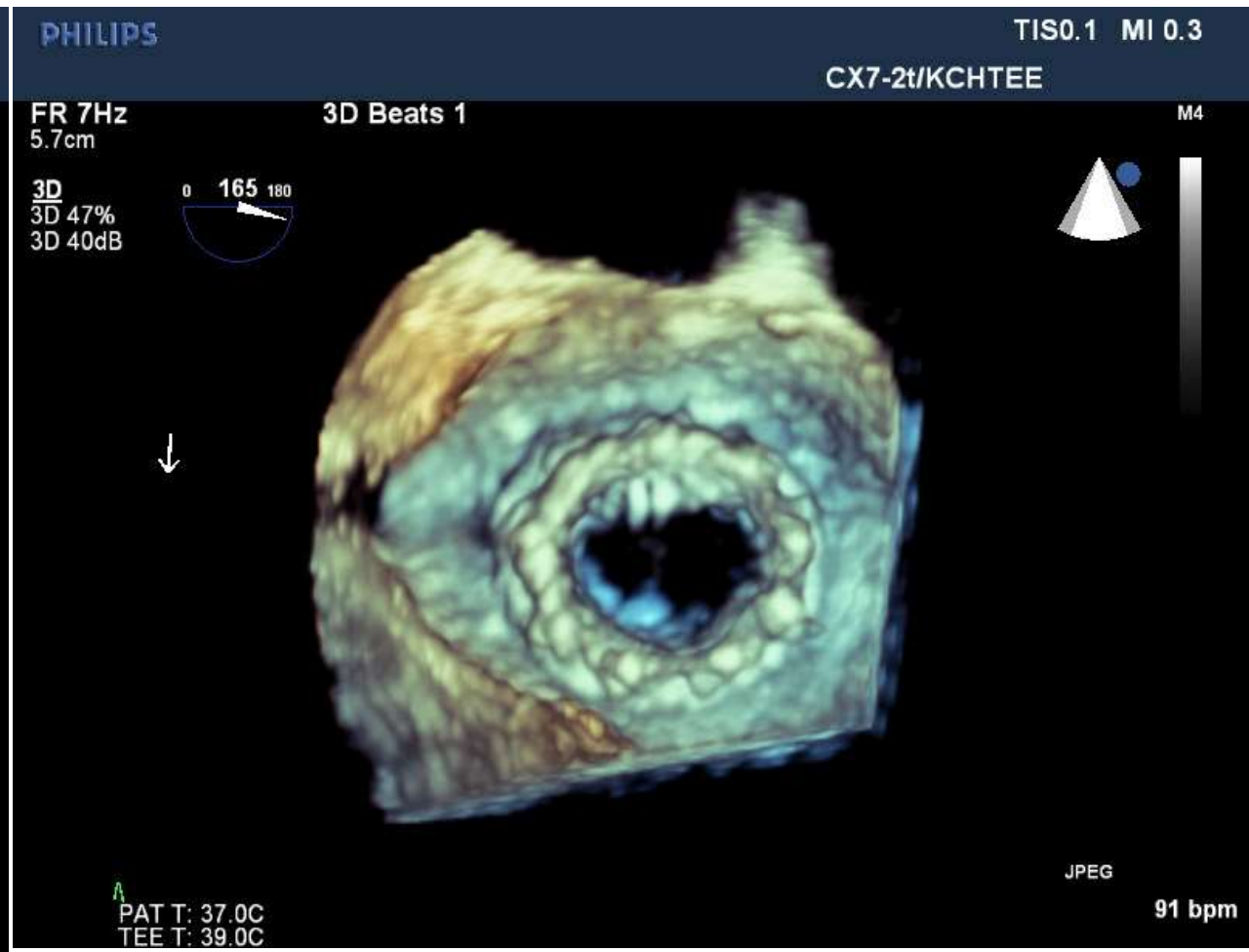
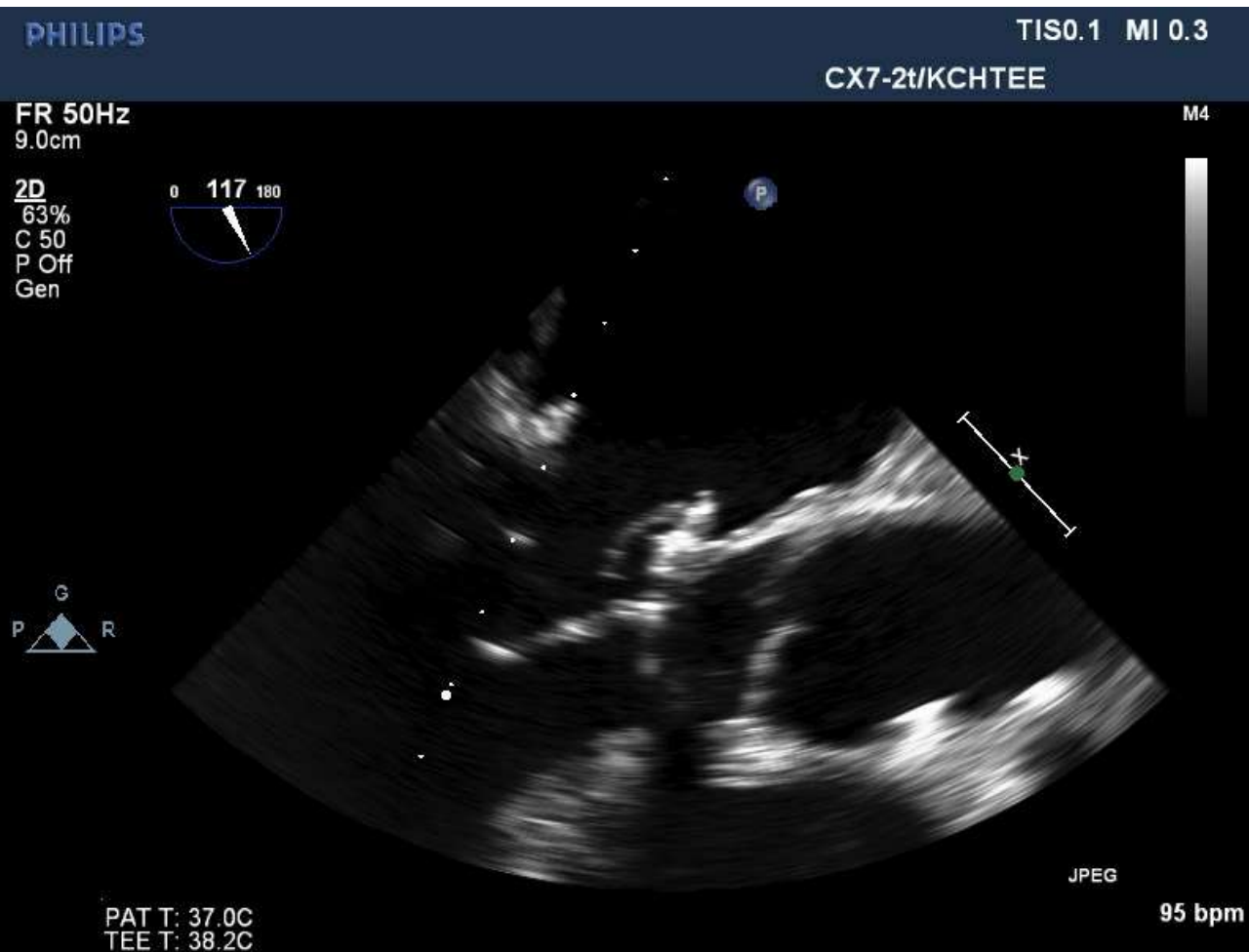






# TAVI – technika, výkon

## Valve – in – valve v Mi. pozici



# TAVI – technika, výkon

## Podmínky úspěšné implantace katéetrové chlopně

- *správná klinická indikace*
- *přesná předoperační vyšetření*
  - UZ vyšetření – morfologie chlopně, Ca, asc. Ao (TEE,3D)*
  - CT vyšetření - morfologie chlopně, Ca, asc. Ao a přístupových tepeny*
- *dostatečná katetrizační praxe*
- *rutinní zvládnutí použité technologie*

**TAVI – technika, výkon**

***Děkuji za pozornost***