



# A Novel Polymeric Leaflet Based TAVR System (Inflow)

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On Behalf of the Cardvalve Consortium

Innovations for Heart and Vessels



**TCT**

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# Disclosure Statement of Financial Interest

Within the past 12 months, I or my spouse/partner have had a financial interest/arrangement or affiliation with the organization(s) listed below.

## Affiliation/Financial Relationship

Major Stock Shareholder/Equity

Ownership/Founder

Intellectual Property Rights

## Company

Innovation for Heart and Vessels  
American Heart of Poland

Innovation for Heart and Vessels  
American Heart of Poland

Innovation for Heart and Vessels

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Faculty disclosure information can be found on the app

# **NEW CONCEPTS AND DEVELOPMENTS OF TAVR – UNMET CLINICAL AND PUBLIC HEALTHCARE NEED**

*Although TAVR has revolutionized healthcare, further developments are required*

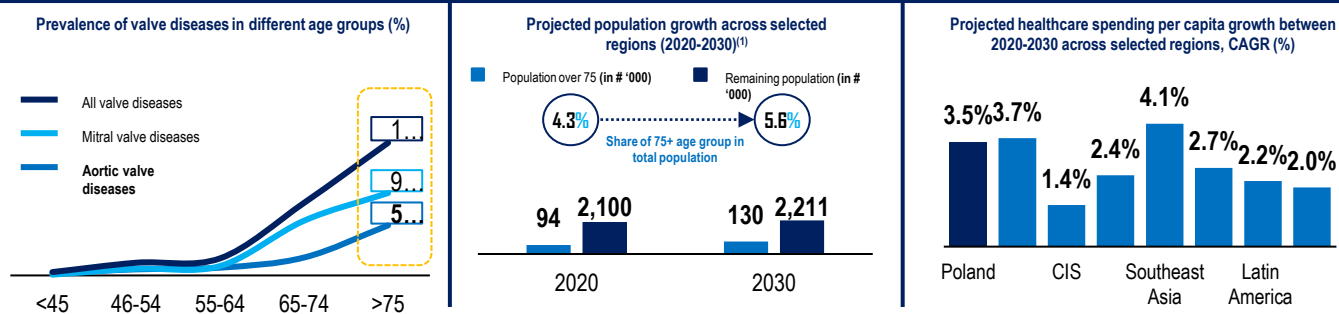
- Younger population eligible for TAVR, thus longer durability required
- Access site complications due to large bore catheters comprise of ca. 20% procedures
- Improper valve positioning may result in paravalvular leakage comprising 20-30% procedural complications
- Myocardial injury and traumatization of LV (perforation, tamponade)
- Long term biomechanical durability with structural valve deterioration (SVD) reaching 12-22% % at long term follow up (5-7 years)
- Accessibility to TAVR (impaired by complexity of procedure and its cost): Demand >>>Supply

# TAVR – NOVEL, MINIMALLY INVASIVE TREATMENT REVOLUTIONISING CARDIAC SURGERY AND PERCUTANEOUS INTERVENTIONS MARKET

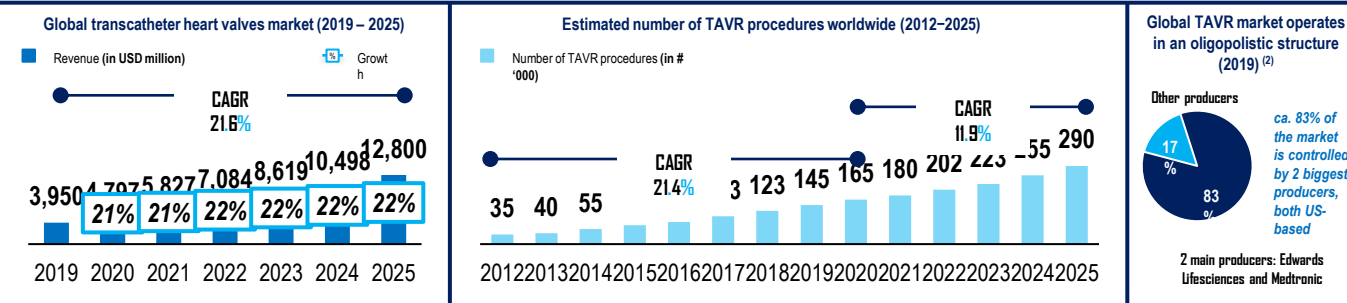
As TAVR is a safe and efficacious solution for aortic stenosis, the treatment remains highly recommended not only for elderly patients but in any case of severe aortic valve problem. Therefore, TAVR market has been developing with >20% CAGR since 2012 and still provides a vast headroom for growth



## The prevalence rate of aortic stenosis increases along with age and TAVR emerges as the pre-eminent treatment method in an ever wider scope of AS cases



## Fuelled by global demographic and healthcare trends, TAVR market is experiencing a strong momentum in response to the rising demand



Source: Trigon analysis, Department of Economic and Social affairs, United Nations database, Arizton, The Insight Partners, Edwards com

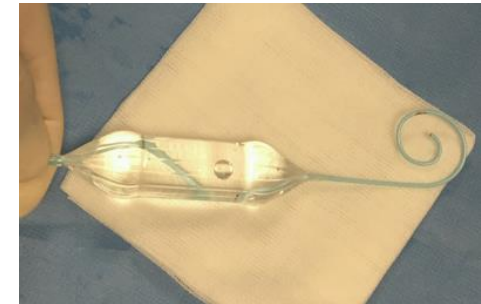
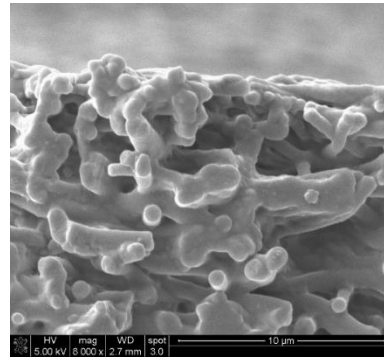
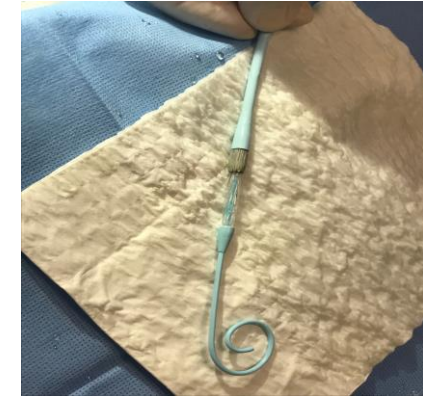
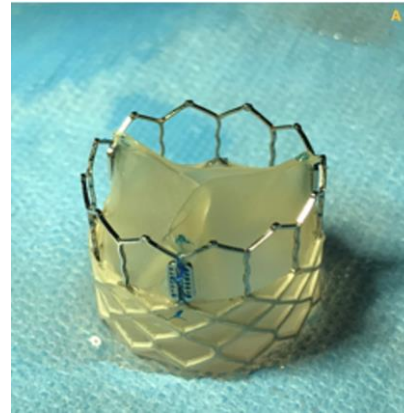
(1) Poland, Western Europe, CEE region, Commonwealth of Independent States (CIS), South-Eastern Europe Health Network (SEEHN), Southeast Asia, North Africa, Latin America and the Caribbean

(2) Exemplary snapshot of the market distribution based on the unit sales of TAVR producers as of Q3 2019

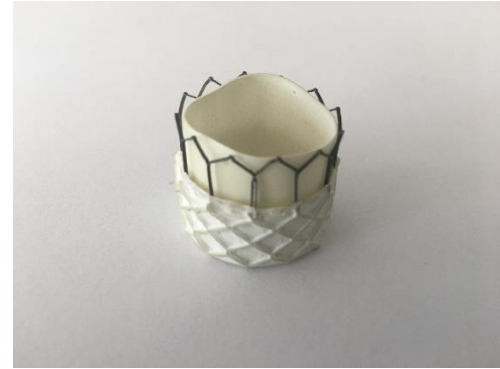
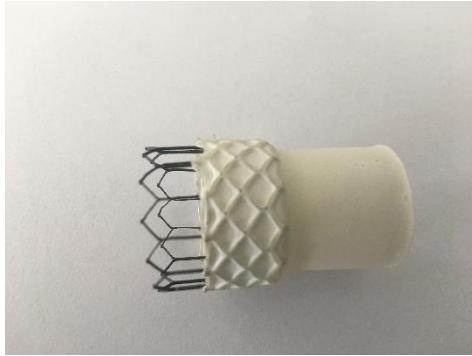
# Main concept of a novel Polymeric Inflow TAVR system

## Developed by interventionalists, to meet unmet clinical needs

- True 14 Fr profile
- Biocompatible, proprietary polymeric valve material:
  - The copolymers of Chronoflex Ar 22%(polyurethane-co-carbonate)(PU) and Chronosil AL80A5%(polycarbonate-co-silicone) (PUS)
- Proprietary leaflet - valve formation from weaved sleeve over a stent,
  - Sutureless - attached polymer to the metal frame using the electrospinning method
  - Simple commissure attachment
  - low production cost
- Self positioning balloon expandable system
- Atraumatic tip of a delivery system for LV protection
- New stent design for improved radial force
- Simplified TAVR procedure



# Weaved over stent polymer sleeve and valve formation



LS-DYNA keyword deck by LS-PrePost



LS-DYNA keyword deck by LS-PrePost  
Contours of Effective Stress (v-m)

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Fringe Levels

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7.456e+00

5.592e+00

3.728e+00

1.854e+00

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LS-DYNA keyword deck by LS-PrePost

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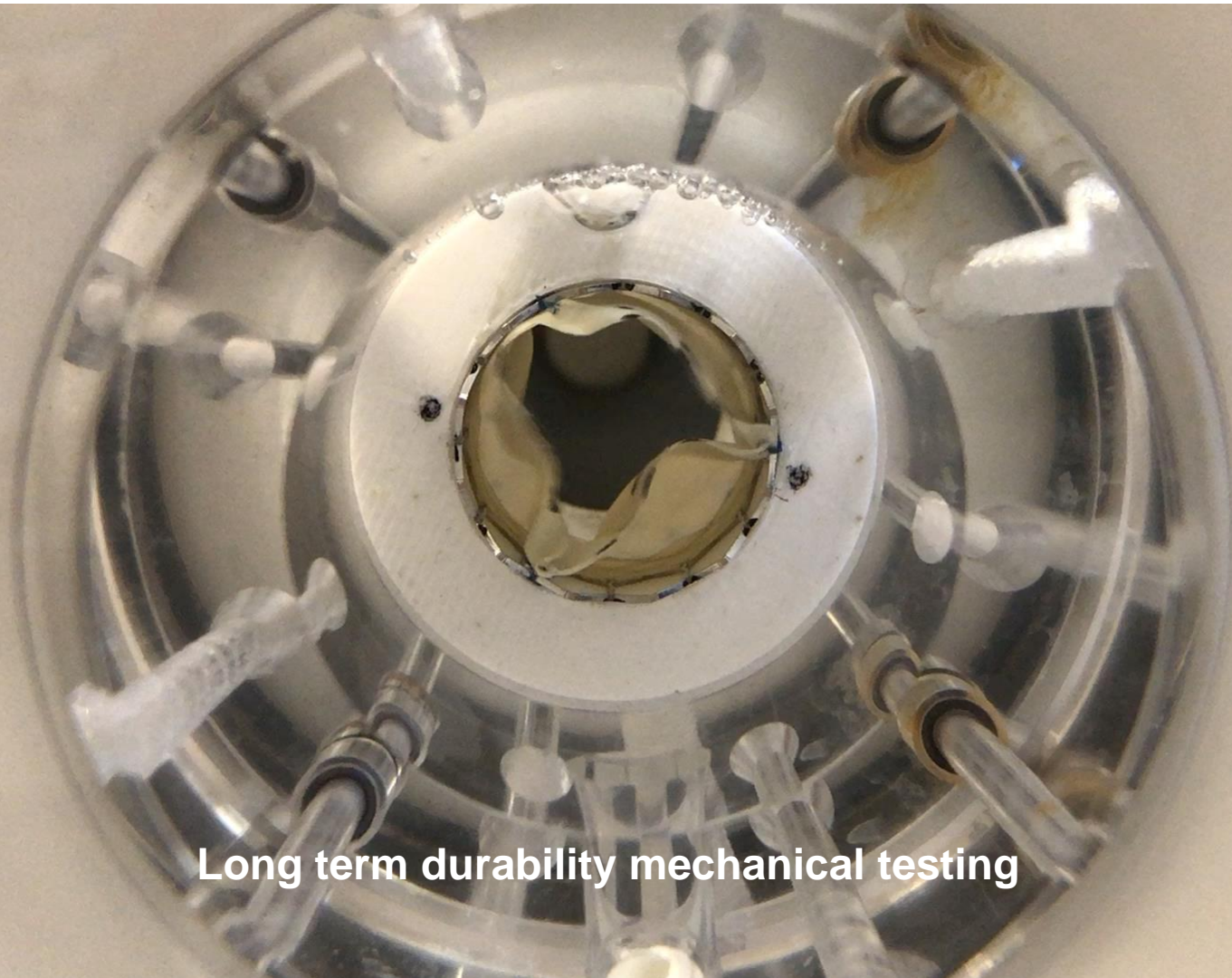
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# INTELLECTUAL PROPERTY PROTECTION – COMPANY’S AND CONSORTIUM PATENTS

In order to protect developed know-how and ensure transition from R&D to final product commercialization, Innovations for Heart and Vessels has registered a number of patents with an intention to obtain multi-regional approval

	PATENT DESCRIPTION	APPLICATION DATE	PL APPROVAL DATE	PATENT OWNERSHIP	PROTECTION RANGE
#1	Balloon, with specific use case for aortic and pulmonary valvuloplasty	28.11.2011	17.04.2014	I4HV 100%	Poland 
#2	Endovascular microcatheter for the delivery of active substances	15.10.2014	02.06.2016	I4HV 100%	Poland, EPD 
#3	Endovascular catheter for invasive diagnosis of peripheral vessels	25.02.2015	07.11.2019	I4HV 100%	Poland, EPD 
#4	Table for hemodynamic procedures and a modular system with a table	15.10.2015	09.02.2018	I4HV 100%	Poland 
#5	Device for pericardial access	17.12.2015	14.03.2018	I4HV 100%	Poland 
#6	Biological, low-profile, balloon-expanded specialized aortic heart valve, percutaneously implanted, and its method of production	24.07.2018	11.12.2020	INFLOW I consortium members	Poland, PCT 
#7	Artificial, low-profile, balloon-expanded specialized aortic heart valve, percutaneously implanted	24.07.2018	11.12.2020	INFLOW I consortium members	Poland, PCT 
#8	System for introducing implants used in structural heart diseases using a minimally invasive method	24.07.2018	25.03.2021	INFLOW I consortium members	Poland, PCT 
#9	The method of forming prefabricated elements used in the production of transcatheter aortic valve implantation systems	24.07.2018	17.06.2021	INFLOW I consortium members	Poland, PCT 
#10	A stent specialized for the aortic valve	24.07.2018	09.06.2021	INFLOW I consortium members	Poland 

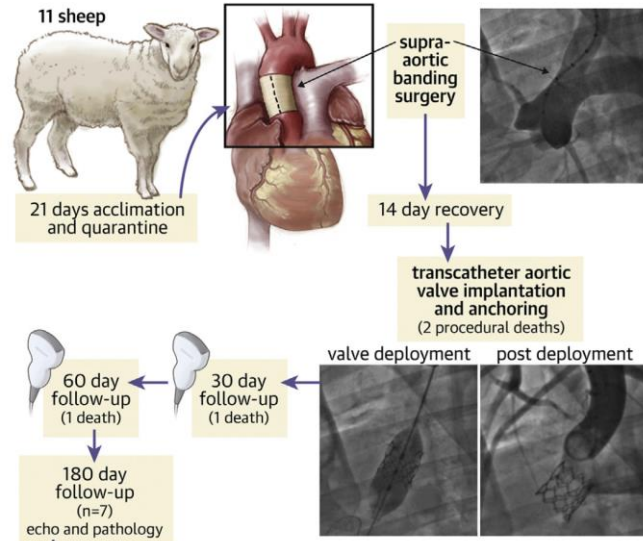


**Long term durability mechanical testing**



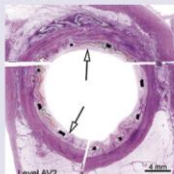
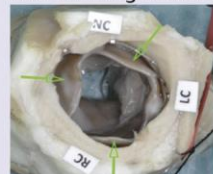
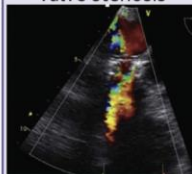
# Comprehensive Preclinical Testing up to 6 months

## Ovine Aortic Banding Model

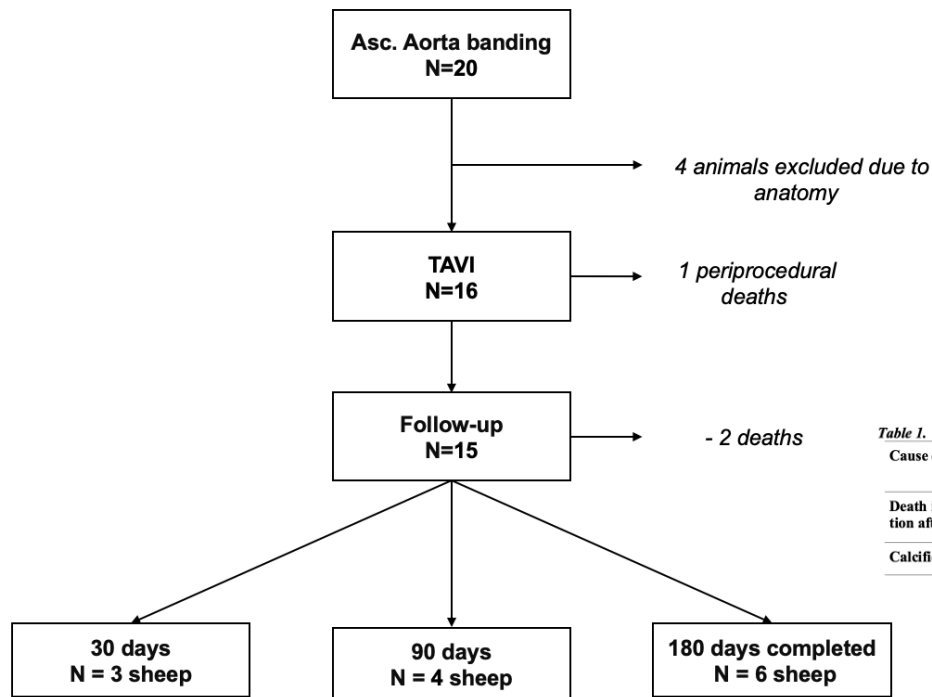


**Results**

- mild-moderate valve stenosis
- NO leaflet degeneration
- mature neointima



# Polymeric Inflow TAVI – Preclinical evaluation in the aortic banding model



*Table 1. Causes of pre-mature death.*

Cause of death	Number of animals
Death in post-operational care (inability to resume respiratory function after anesthesia) – day 0	1
Calcification and vegetations in banding site – day 18 and 62	2



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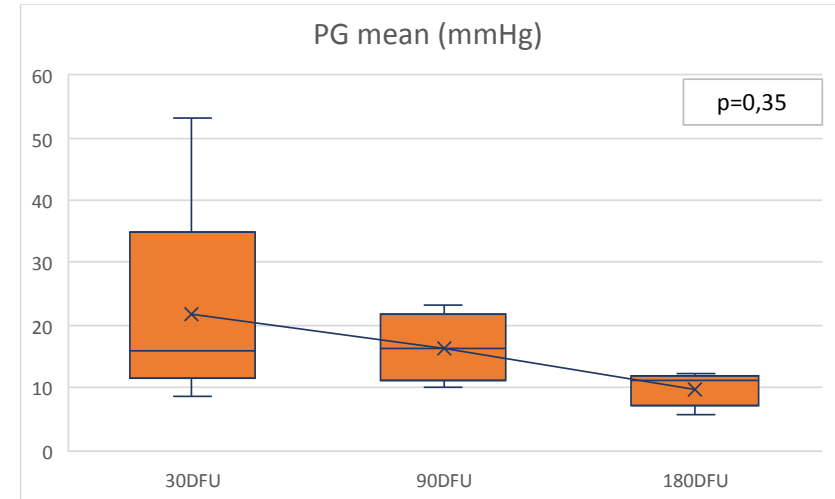
ACC 20  
WORLD CONGRESS  
OF CARDIOLOGY

1350  
JACC March 24, 2020  
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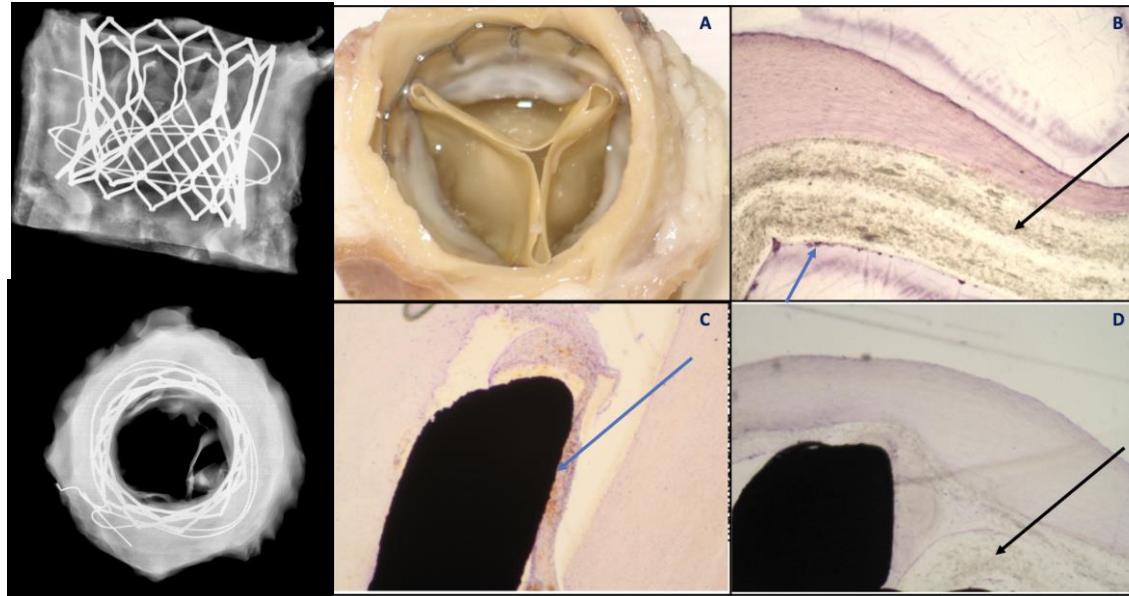
# Temporal and terminal echocardiographic evaluation

Doppler measurements	30 DFU		90 DFU		180 DFU	
	Mean	SD	Mean	SD	Mean	SD
<i>V max (m/s)</i>	2,70	0,68	2,81	0,55	2,30	0,24
<i>PG max (mmHg)</i>	30,75	17,34	32,57	13,07	21,34	4,22
<i>PG mean (mmHg)</i>	17,91	11,40	19,21	8,18	10,63	3,17

ECHO findings	n=14	%	n=10	%	n=6	%
<i>mild regurgitation</i>	2	14,29	2	20,0	2	33,3
<i>moderate regurgitation</i>	1	7,14	1	10,0	0	0
<i>possible calcification</i>	2	14,29	1	10,0	1	16,7
<i>present calcification</i>	2	14,29	0	0	1	16,7
<i>probable vegetation</i>	0	0	0	0	1	16,7
<i>mean pressure gradient &gt;30 mmHg</i>	1	7,14	1	10,0	0	0



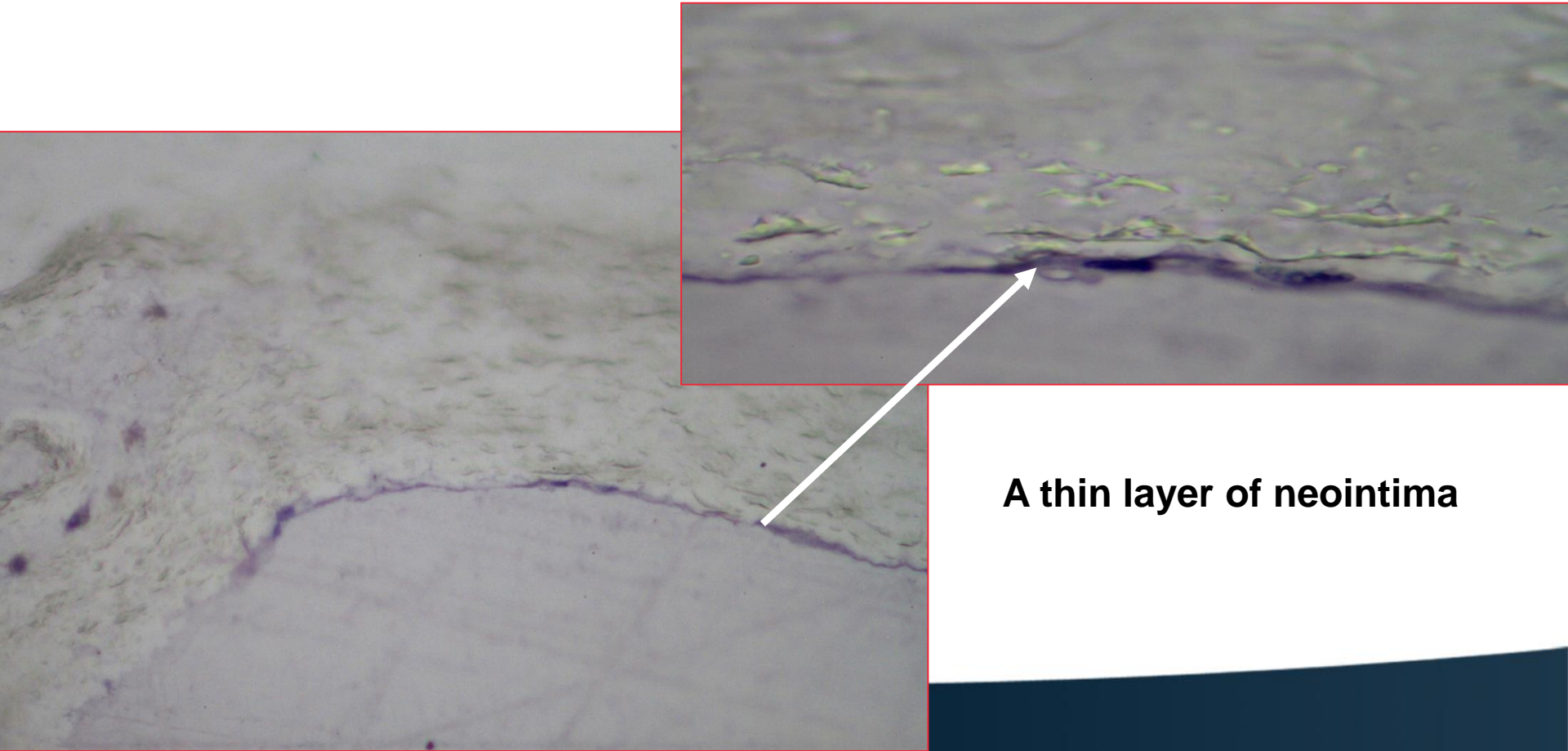
# ***Histopathologic analysis showed no valve degeneration and complete healing at terminal follow up in all cases.***



*- Leaflets remained free from thrombi in all cases*

- Micro-thrombi to the base of the leaflets, and between the aortic wall and the stent in most of the valves,*
- Scanty calcifications at the base of leaflets were reported in 3 animals evaluated 180 days after implantation.*

# Coverage and endothelialisation of polymer

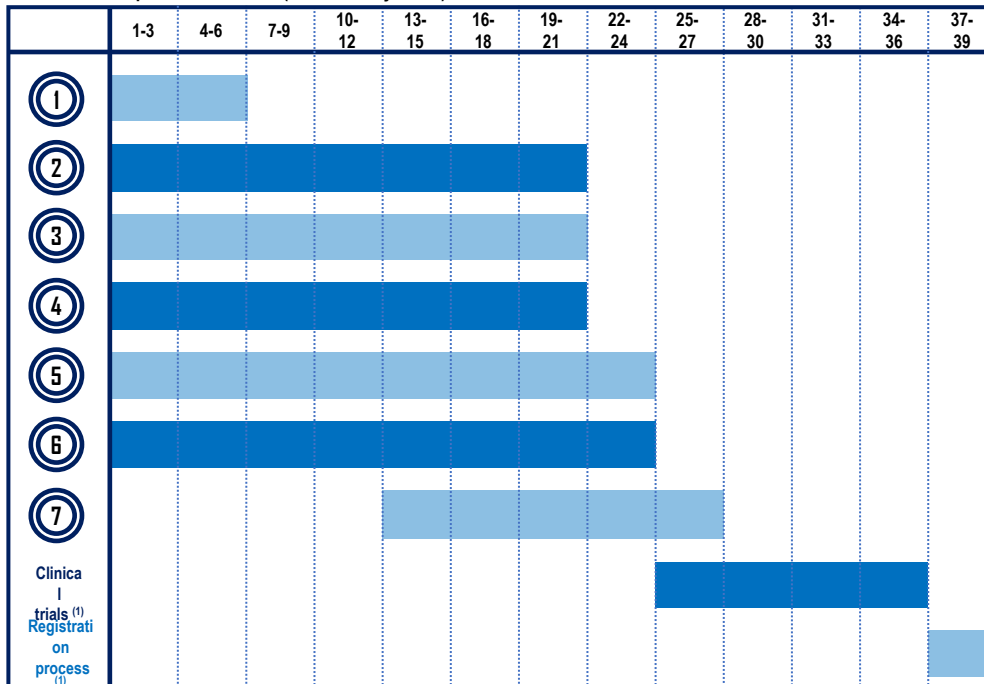


**A thin layer of neointima**

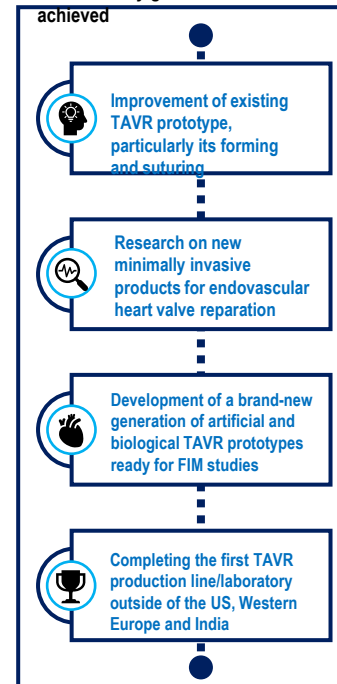
# PRODUCT COMMERCIALIZATION ROADMAP – INFLOW2 TIMELINE AND PROJECT GOALS

According to the detailed schedule, most of the R&D will be done simultaneously by separate scientific teams, significantly accelerating the whole process. Upon clinical trials completion, I4HV will proceed with the mandatory registration and subsequent commercialization of the medical devices

Planned R&D process schedule (on a monthly basis)



INFLOW2 key goals to be achieved



Source: the Company

(1) The last two stages involve the preparation of the ready-to-implant transcatheter aortic valves for potential commercialization, which will be the next chapter to be accomplished by the Company

# Conclusions

- The study showed a proper hemodynamic performance and acceptable biocompatibility of the novel artificial polymeric InFlow ATHV, similar to biological counterparts, as evaluated in the observation in the ovine 6 month banding model.
- As indication and demand increase with younger patients undergoing TAVR the presented prosthesis may be a viable alternative to the currently used biological technologies and add up to the widespread utilization of TAV procedures and long-term durability.