



Transcatheter Electrosurgery

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Generelle Bemerkungen

Elektrischer Strom: entsteht durch Bewegung von Elektronen

Volt: die Kraft, die diese Bewegung verursacht

Gleichstrom: die Elektronen bewegen sich in nur eine Richtung (z.B. Batterie)

Wechselstrom: die Elektronen bewegen sich periodisch hin und her (z.B. Steckdose)

Frequenz: Anzahl der Zyklen pro Sekunde (Hz)

Hochfrequenzgenerator: wandelt die Frequenz des «normalen» Stromes (50-60Hz) in viel höhere Frequenzen um (um Nerven bzw. Muskel Stimulation zu unterbinden (<5000-10.000Hz))

Gewebeeffekt: Fulguration, Desiccation/Coagulation und Vaporisation/Ablation

«Desiccation, Austrocknung»



Desiccation

- durch den Kontakt von Strom mit Gewebe entsteht Wärme
- Direkter Kontakt zwischen Instrument und Gewebe
- Niedrige Ströme führen zur Protein-Denaturierung > weisse Oberfläche
- Höhere Ströme führen zu Denaturierung und Dehydratation
- Gewebe mit völliger Desiccation haben hohen Widerstand und leiten schlecht
- Kontinuierliche Stromapplikation führt zur Carbonisierung

«Vaporisation»



Vaporization

- durch den Kontakt von Strom mit Gewebe entsteht Wärme
- Kontaktlose Anwendung (kleiner Abstand)
- Explosion von Zellen, daher keine Verkohlung



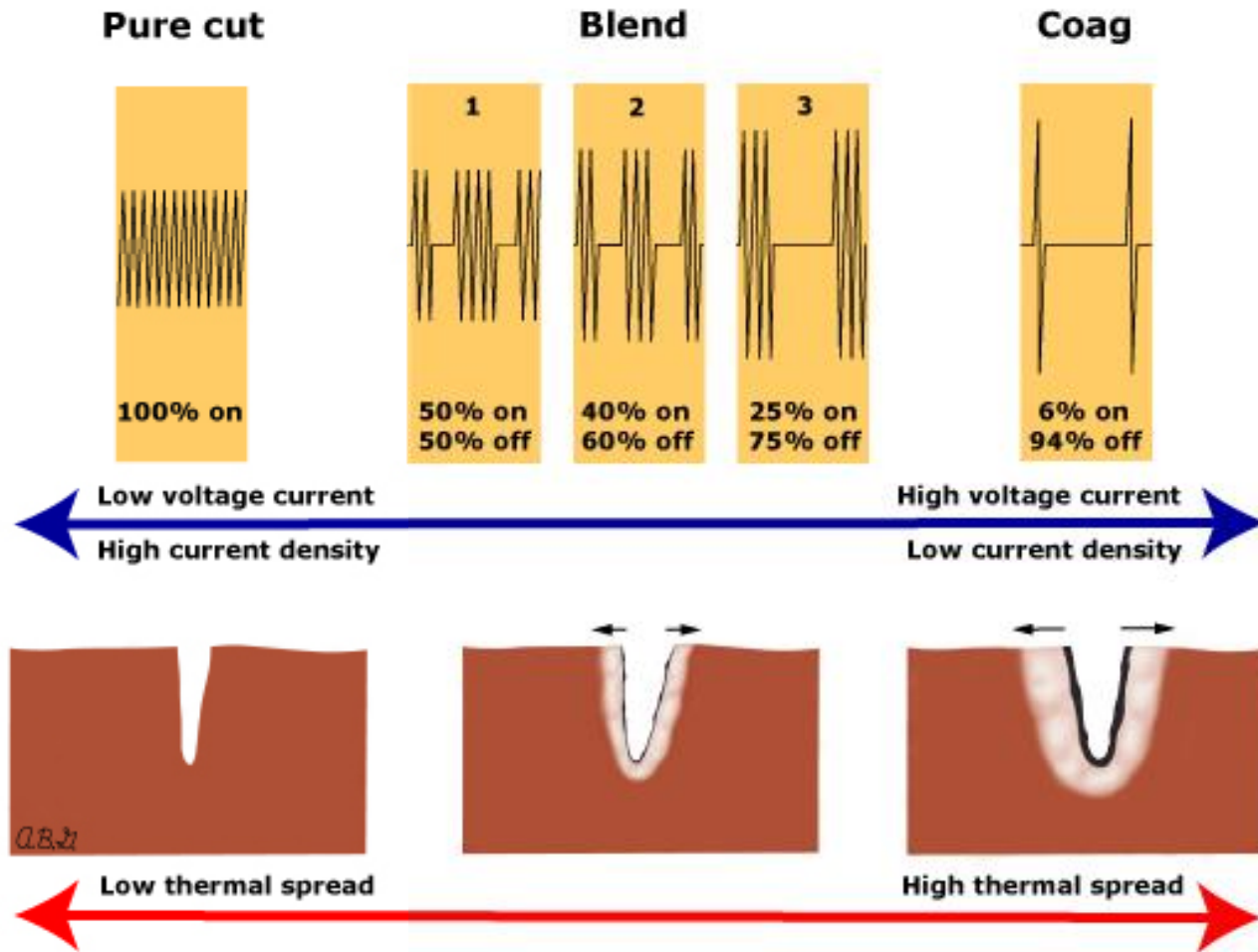
«Fulguration»



Fulguration

- durch den Kontakt von Strom mit Gewebe entsteht Wärme
- Kontaktlose Anwendung (grosser Abstand)
- Strom springt als Funken über (Lichtbogen)
- Erzeugt Verkohlung des Gewebes

Klinischer Einsatz



Klinischer Einsatz

Pure cut



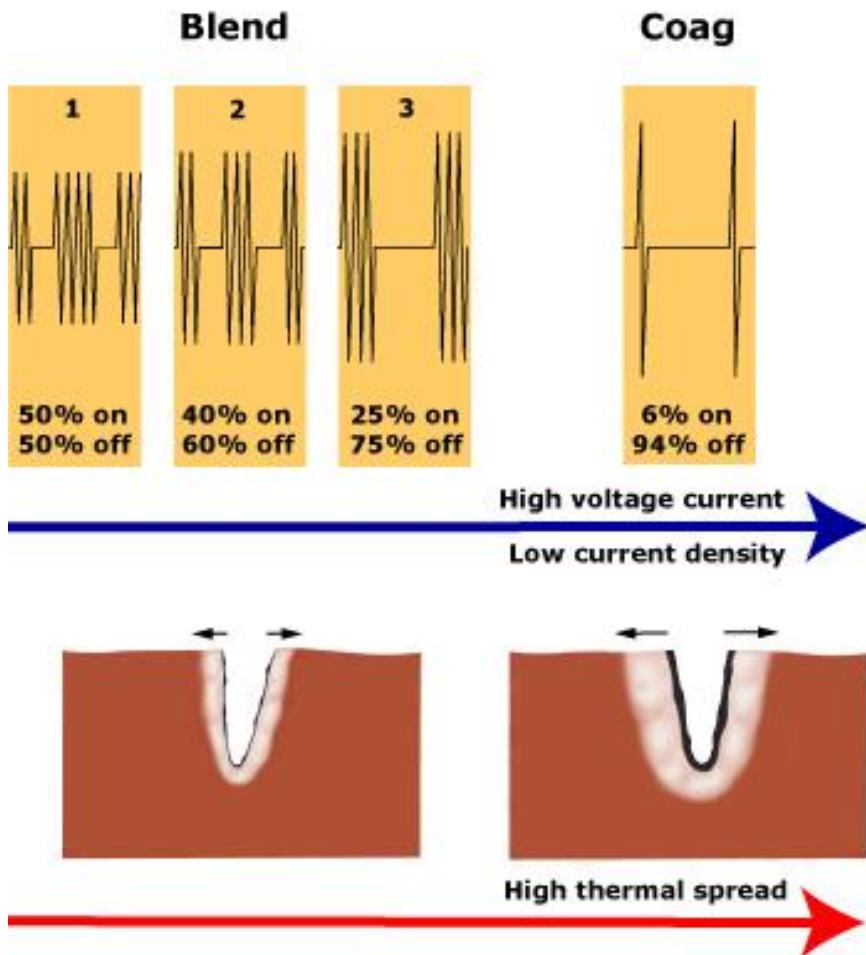
← Low voltage current
High current density



← Low thermal spread

- kontinuierliche, Niedervolt Spannung
- Konzentrierung des Stromes auf kleine Fläche, hohe Dichte
- Oszillierender Strom erzeugt Vibrationen des Gewebes
 - mit Friktion und Wärmeentstehung
 - mit konsekutiver Explosion und Rauchentwicklung
- «Vaporisation»
- Schneiden des Gewebes

Klinischer Einsatz



- Unterbrochene (modulierte) Hochvolt Spannung
- Modulation einstellbar
- Off-Phase: Abkühlung des Gewebes
 - führt zu Dehydration (weniger Explosion)
 - «Desiccation»
- Grösserer Gewebeschaden, grössere Wärmeausbreitung

Transcatheter Electrosurgery

Unterschiede zu der chirurgischen Hochfrequenz-Chirurgie:

- Einsatz langer Drähte
- Eingesetzt in leitendem Gewebe (Blut)
- unter fluoroscopischer oder echocardiographischer Führung
- wichtige technische Implikationen
 - Änderung der Spannungskonzentration um Effekte zu generieren
 - Ungewollte, nicht kontrollierbare Spannungsausbreitung
 - Ungewünschte Blutkoagulation (Schlaganfall, Thrombosen, hörbare pops)

Transcatheter Electrosurgery



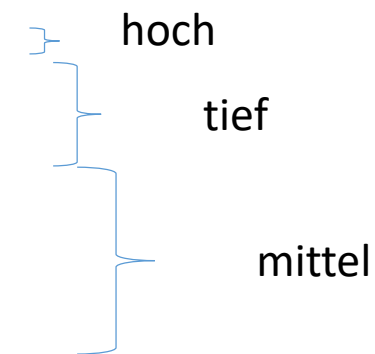
Temperature	Tissue Effect
49°C	Tissue coagulates
60°C	Protein denatures
70°C	Cells desiccate
100°C	Cells rupture from vaporization of intracellular water

Temperatureffekt auf Gewebe

Tissue	Electrical Permittivity (ϵ)	Electrical Conductivity (σ)
Blood	280	1.10
Bone cancellous	71	0.12
Bone cortical	37	0.04
Fat	14	0.03
Heart	293	0.50
Lung (inflated)	124	0.23
Muscle (parallel fiber)	149	0.67
Muscle (transverse fiber)	171	0.62
Skin (wet)	221	0.37

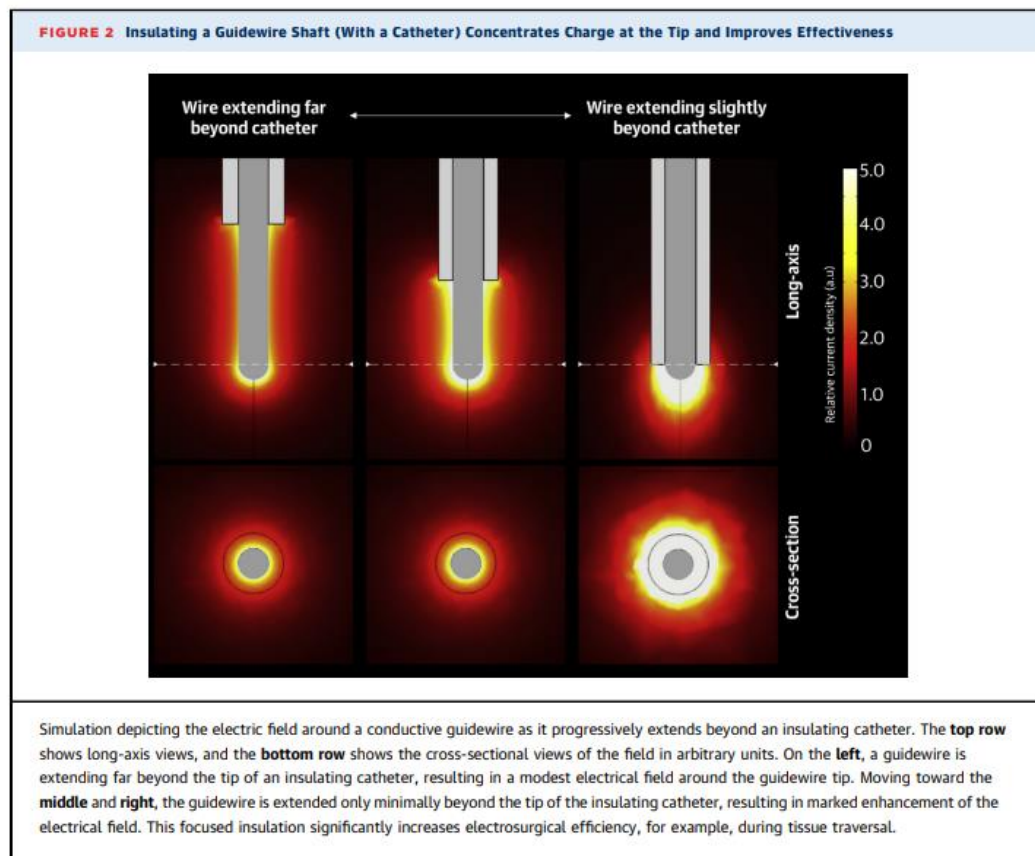
The tissue dielectric parameters are computed according to the 4-Cole-Cole Model (68) at frequency = 10.00 MHz.

Leitfähigkeit von Gewebe



Transcatheter Electrosurgery

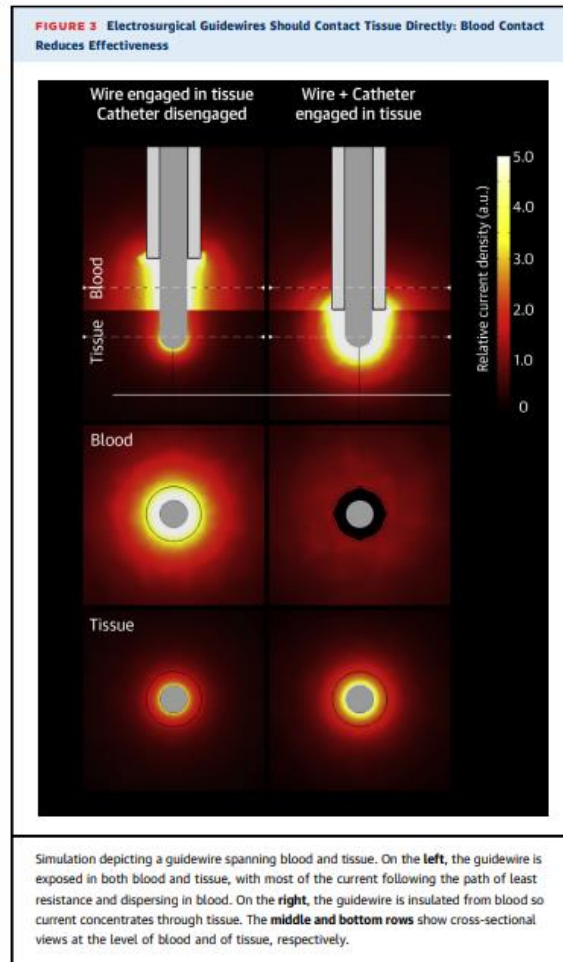
Einfluss unterschiedlicher Führungsdrähte Konfigurationen



- die Strom Dichte nimmt exponentiell ab, wenn die **Isolierung** zurückgezogen wird
- die Strom Dichte nimmt ebenfalls exponentiell ab, je weiter **entfernt** sich die Katheterspitze vom Gewebe befindet

Transcatheter Electrosurgery

Einfluss unterschiedlicher Führungsdrähte Konfigurationen



- A) Führungsdraht mit Katheter durch Blut ins Gewebe
- B) Führungsdraht/Katheter direkt im Gewebe

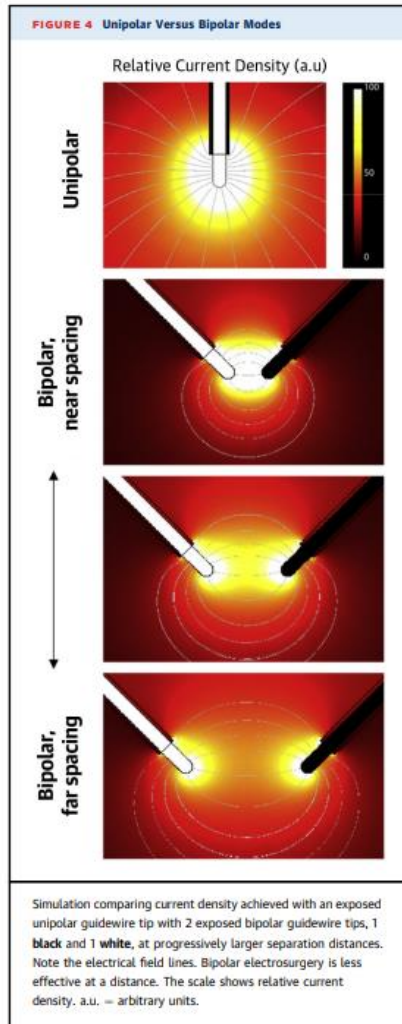
Strom nimmt Weg des geringsten Widerstandes

Kaum Stromdichte in A) im Gewebe, dadurch kaum Erhitzen des Gewebes, kaum Schnitt durch das Gewebe

Hohe Stromdichte in B), gutes Erhitzen, gutes Schneiden

Transcatheter Electrosurgery

Einfluss unterschiedlicher Führungsdrähte Konfigurationen

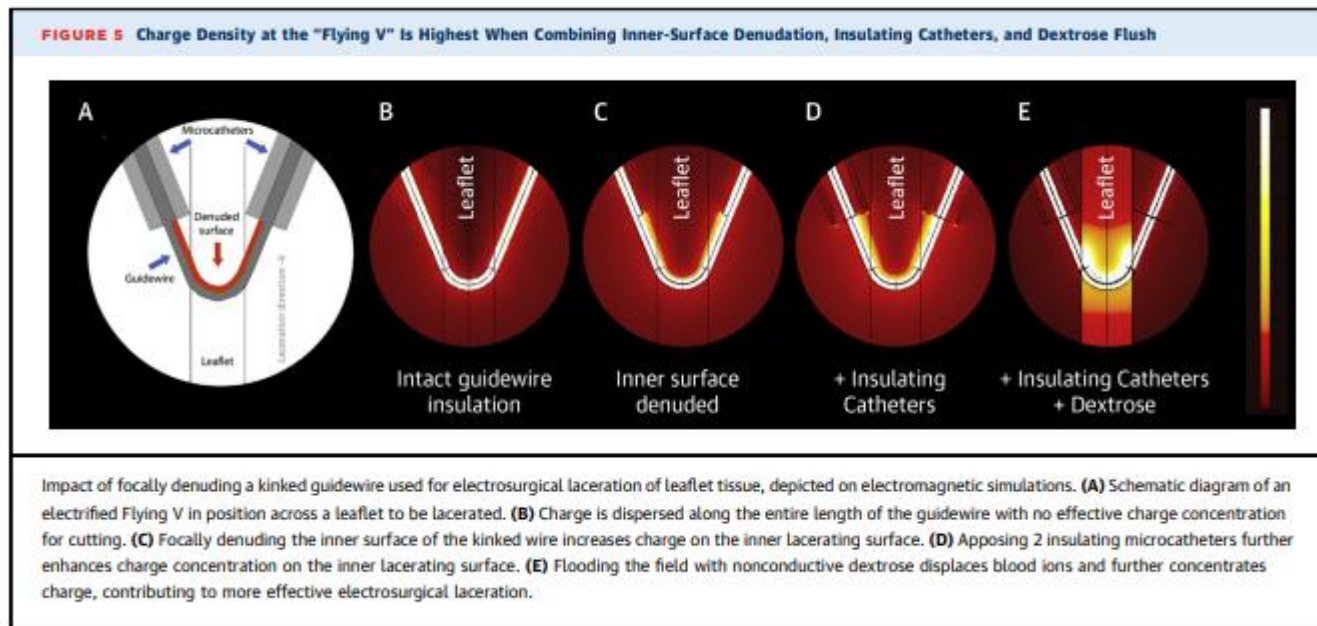


Bipolare Konfigurationen entwickeln grösseres elektrisches Feld

- Unipolarer Strom wird für das Schneiden häufiger genutzt
- Kaum Kollateralschäden im umliegenden Gewebe
- Heutzutage kaum bipolare Katheter im Bereich der transcatheter HF-Chirurgie

Transcatheter Electrosurgery

Einfluss unterschiedlicher Führungsdrähte Konfigurationen



Veränderung der Strom-Dichte bei Konfigurationsänderungen und Einsatz von 5% Dextrose

Transcatheter Electrosurgery

Klinische Anwendung:

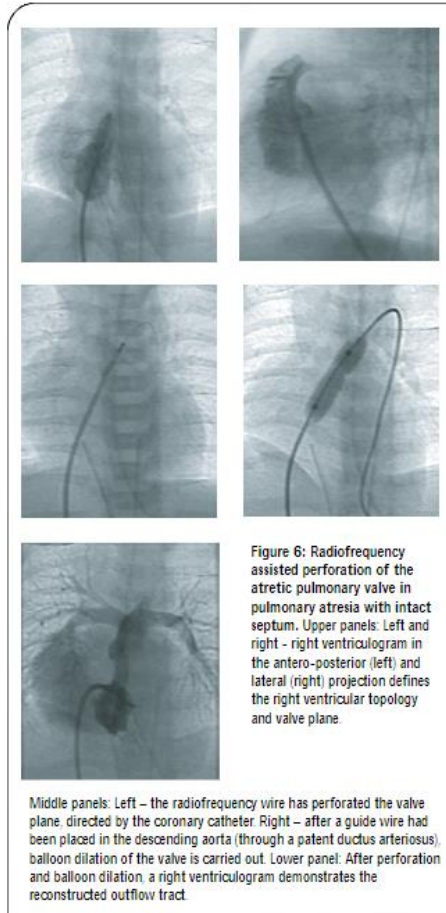
TABLE 4 Representative Clinical Applications of Transcatheter Electrosurgery

Application	First Author, Year (Ref. #)	Study Type	No. of Patients	Procedure Success	Complications
Pulmonary valve atresia traversal in newborns	Veldtman, 2004 (18)	Case series	136	87% successful in establishing antegrade flow	Procedural death (7%); arrhythmia, RVOT perforation (16%)
Central chronic total venous occlusion traversal (subclavian vein, SVC)	Baerlocher, 2006 (4); Iafrati, 2012 (20); Foerst, 2017 (21)	Case reports	6	100%	None reported
Coronary chronic total occlusion	Baim, 2004 (26)	Prospective multicenter registry	116	54%	Perforation and tamponade (2.6%)
Transseptal puncture	Hsu, 2013 (30)	Randomized control trial	36 RF; 36 conventional	100% RF; 72% conventional (with cross-over to RF and subsequent success)	Pericardial effusion (2.8%)
Interventricular septum puncture (for LV lead placement)	Gamble, 2018 (39)	Prospective single-center single-arm clinical trial	20	100% success in ventricular traversal	Disabling stroke (5%)
Transcaval for large-bore access for TAVR	Greenbaum, 2017 (45); Lederman, 2019 (46); Costa, 2020 (47)	Prospective multicenter single-arm clinical trial Retrospective registry	150	99%	Life-threatening or disabling bleeding (4% to 12%) No late complications
LAMPOON to lacerate the anterior mitral valve leaflet before TMVR	Khan, 2019 (57)	Prospective multicenter single-arm clinical trial	30	100%	More than mild paravalvular leak (23%); LVOT obstruction from valve skirt (10%)
BASILICA to lacerate aortic leaflets before TAVR	Khan, 2019 (65)	Prospective multicenter single-arm clinical trial	30	93%	Disabling stroke (3%)

LV = left ventricular; LVOT = left ventricular outflow tract; RF = radiofrequency; RVOT = right ventricular outflow tract; SVC = superior vena cava; TAVR = transcatheter aortic valve replacement; TMVR = transcatheter mitral valve replacement.

Transcatheter Electrosurgery

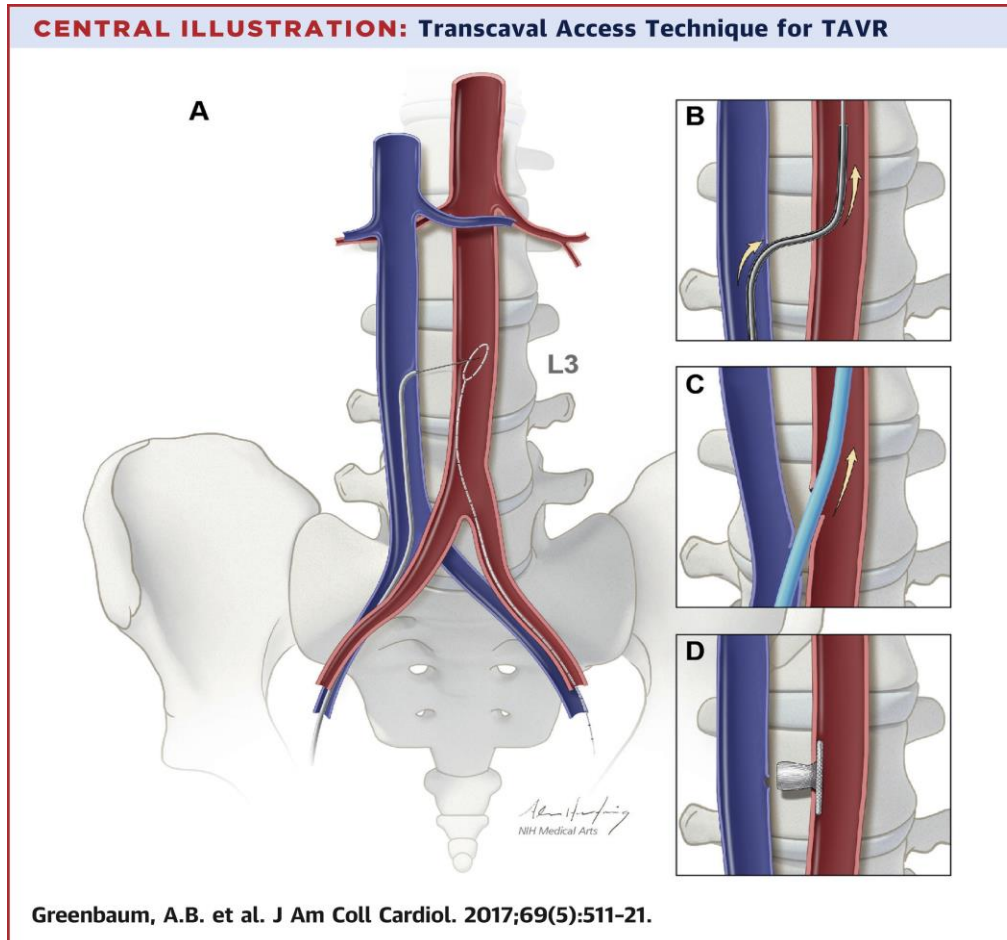
Klinische Anwendung:



Pulmonal Atresie

Transcatheter Electrosurgery

Klinische Anwendung:



Transcaval TAVI

Frau A. V., 30.06.1945

Valvuläre Herzkrankheit

Schwere Mitralklappeninsuffizienz Mitralklappe mit stark verdicktem anterioren Segel (besonders Segeirand A2) und Protaps der Segmente A3 und P3 ohne Vollbild eines M. Barlow. Schwere Mitralklappeninsuffizienz mit stark exzentrisch nach posterior gerichtetem Jet bis zum Vorhofdach, Sehnenfadenabriss sehr wahrscheinlich mit "flail leaflet" im medialen Anteil des Segments A2 vor. PISA Radius 12 mm, EROA nach PISA 0.75 cm². Carpentier 2

- Leichte Aortenstenose
- Linker Ventrikel schwer exzentrisch hypertrophiert, LVEF 40% wegen diffuser Hypokinesie. .
- Akute biventrikuläre Herzinsuffizienz NYHA III-IV in 11/2021

Koronare Herzkrankheit

- Koronarangiographie 29.11.2021: fokal hämodynamisch nicht relevante Stenosen RIVA proximal und Mit (FFR=0.86). Koronarsklerose RCx, signifikante Stenose RCA proximal langstreckige, fokal hochgradige Stenose RCA distal bis PLA ostial (abgeheilte Dissektion, DD: fibromuskuläre Dysplasie)

- kvRF: arterielle Hypertonie, sistierter Nikotinkonsum (50 py)

NSTEMI 1.11.2021 i.S. eines Myokardinfarkts Typ 2

- im Rahmen kardialer Dekompensation

Hypertensive Kardiopathie

Neu diagnostiziertes Vorhofflimmern 01.11.2021

- 01.11.2021 EKG: Tachykardes Vorhofflimmern ohne De- oder Repolarisationsstörungen
- 01.11.2021 Monitor: 10 Schläge dauernde, asymptomatische, nicht-anhaltende Kammertachykardie
- 05.11.2021: EKV

Hypokaliämie, a.e. medikamentös

- 29.11.2021: K⁺ 2.8mmol/l, nach Substitution p.o. und i.v. 4.2

Subakute Beinischämie rechts entsprechend PAVK in klinischem Stadium IIb -III rechts nach Fontaine

- 12.12.2018 Stent-PTA und DCB des Verschlusses der A. femoralis superficialis Mitte sowie hochgradige Stenosierung der A. femoralis superficialis distal und femoro-poplitealen Übergangsbereich und A. poplitea: im proximalen und mittleren Bereich
- 20.12.2018 Postinterventionelles intramuskuläres Hämatom im Bereich des Musculus gastrocnemius rechts unter Marcoumar, Clexane und Plavix
- 18.12.2019 Angiographie und aufwändige Sondierung des langstreckigen Verschlusses der A. femoralis superficialis ab dem proximalen Bereich nach distal sowie A. poplitea in-Stent. Rotarex-Thrombektomie, PTA und DCB des Verschlusssegmentes sowie lokale Lyse und Aspiration des iatrogenen thromboembolischen Material von Truncus tibiofibularis und A. fibularis rechts von links crossover
- 02.11.2021 verschlechterte kritische Beinischämie
- 02.11.2021 Duplexsonographisch zeigt sich ein langstreckiger Rezidiv-Abgangverschluss der A. femoralis superficialis mit Wiederauffüllung im distalen Bereich der A. poplitea

- 02.11.2021 komplikationslose PTA rechts

PAVK in klinischem Stadium I - IIa links nach Fontaine

- 20.12.2019 Duplexsonographisch unauffällige Punktionsstelle inguinal. Bekannter langstreckiger Abgangverschluss der A. femoralis superficialis
- 02.11.2021 gut kompensierte arterielle Perfusion bei bekannter langstreckiger nahezu Abgangverschluss der A. femoralis superficialis

Faktor-V-Leiden

- unter Therapie Apixaban und Clopidogrel

Chronisch venöse Insuffizienz C2 beidseits nach CEAP-Klassifikation

- Status nach Schaumsklerosierung der Varizen vor Jahren

Weitere Diagnosen

Gallengangsstauung unklarer Ursache

- 03.11.2021 Sonographie Abdomen: deutliche Erweiterung von DHC (8 mm) und Pankreaticus (7 mm) welche gemeinsam münden

- St. n. Zyst-Enterostomie nach Pankreasschwanz-Pseudozyste (Zeitpunkt unklar)

- MRCP geplant

Episodische Schmerzen, belastungs- und druckabhängig im rechten Fuss mit Ausstrahlung in den Unterschenkel unklarer Ätiologie

- 12/2018 Stent PTA femoralis superficialis rechts und PTA-Verschluss A. femoralis superficialis rechts

Status nach Splenektomie bei Milzthrombose 1999

Verdacht auf obstruktive Pneumopathie (bei Nikotinkonsum und chronischer Hypoxie)

Respiratorische Partialinsuffizienz unklarer Ätiologie

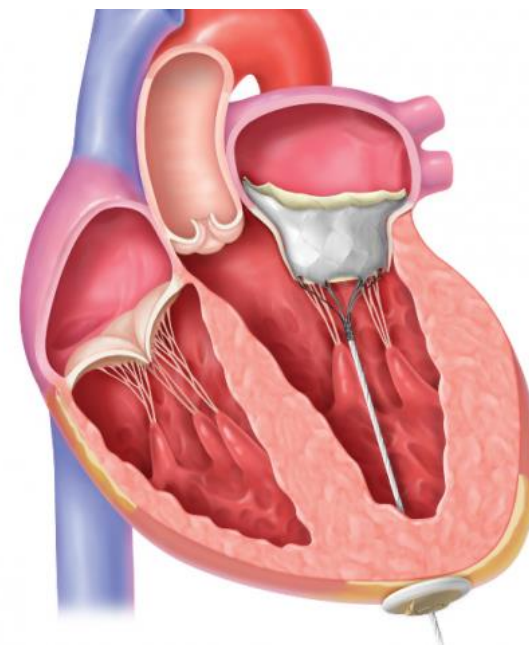
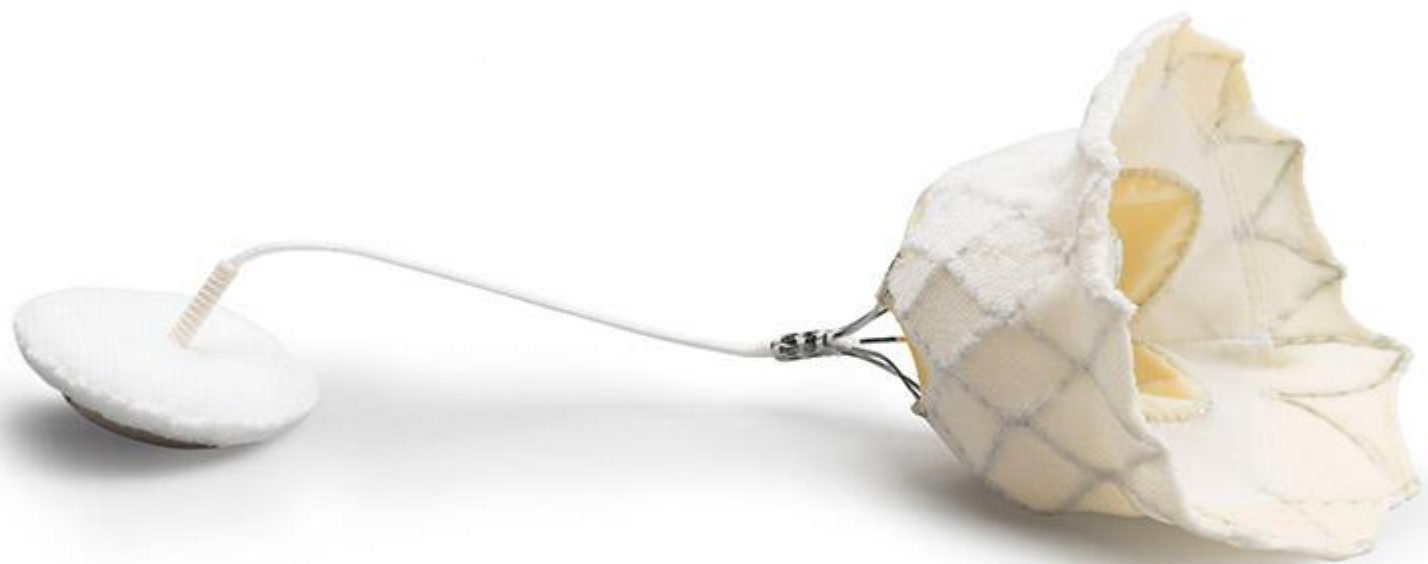
Indikation: schwere Mitralklappeninsuffizienz

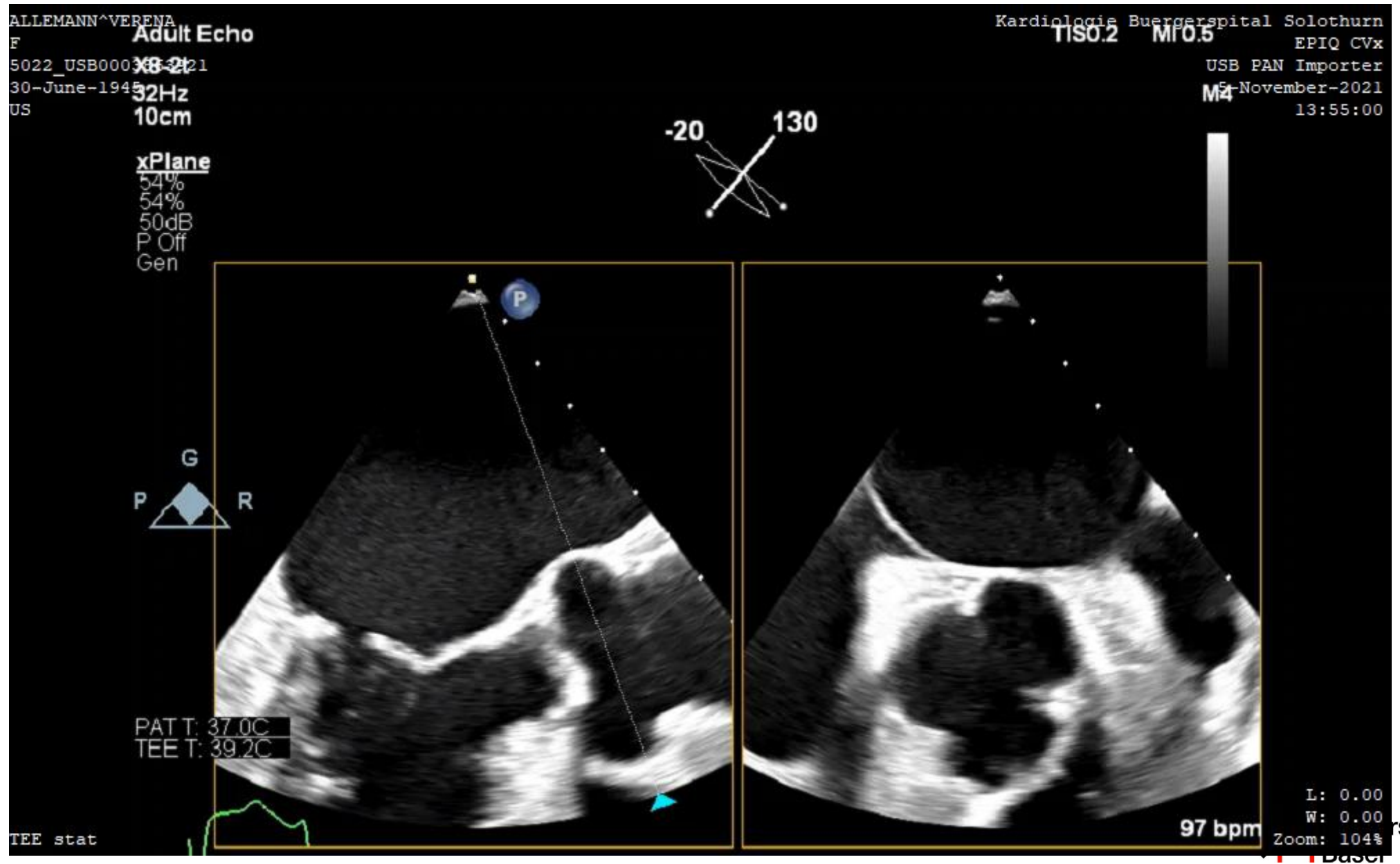
Klinik: keine AP, St.n. kardialer Dekompensation i.R. VHF in 11/2021

Zuweiser: Prof. Vogel, Dr. Schön

Alter: 76 Jahre, **Grösse:** 160 cm, **Gewicht:** 55 kg

TENDYNE





Universitätsspital

Basel



LVOT Obstruction?

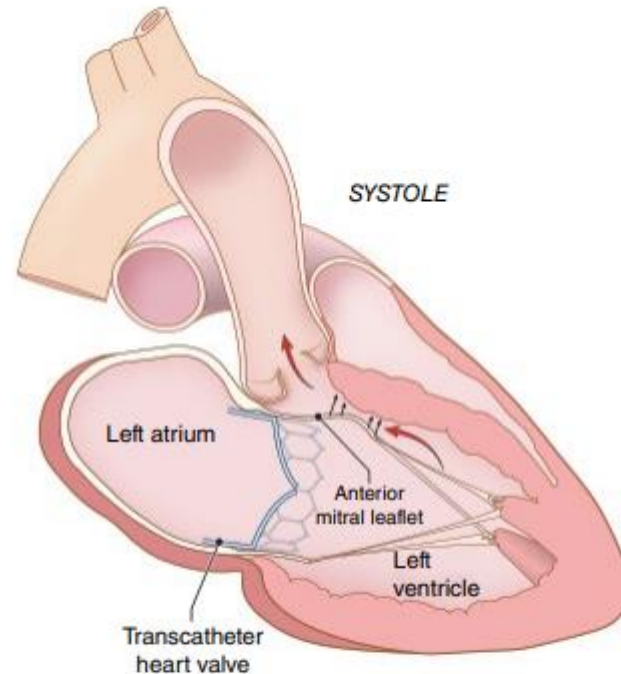
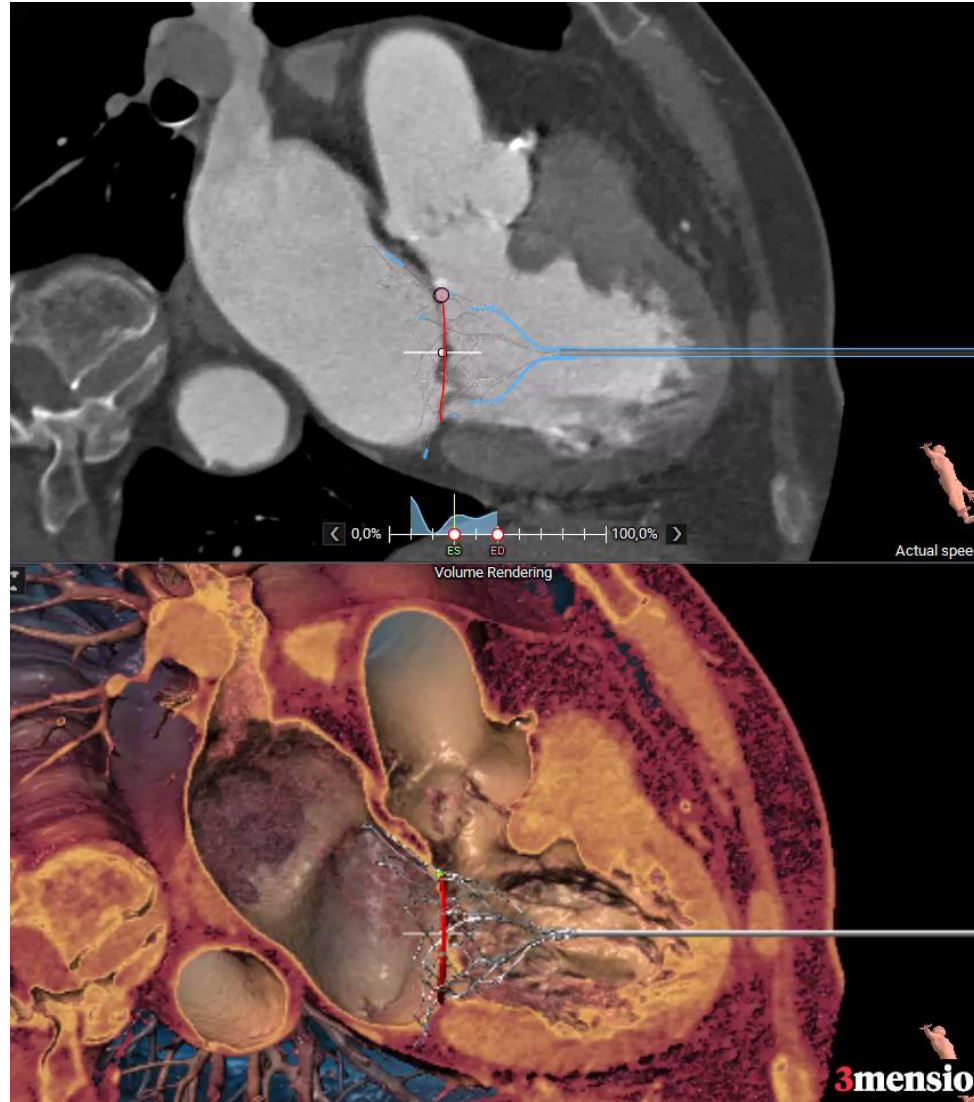


Figure 28.1 Mechanisms of LVOT obstruction from TMVR. The transcatheter heart valve displaces the anterior mitral leaflet toward the interventricular septum, narrowing and elongating the neo-LVOT, causing fixed LVOT obstruction. The narrowed LVOT generates Bernoulli forces that drag the anterior mitral leaflet toward the septum in systole, causing dynamic obstruction. LVOT = left ventricular outflow tract.

Mögliche Ursachen für LVOT Obstruktion:

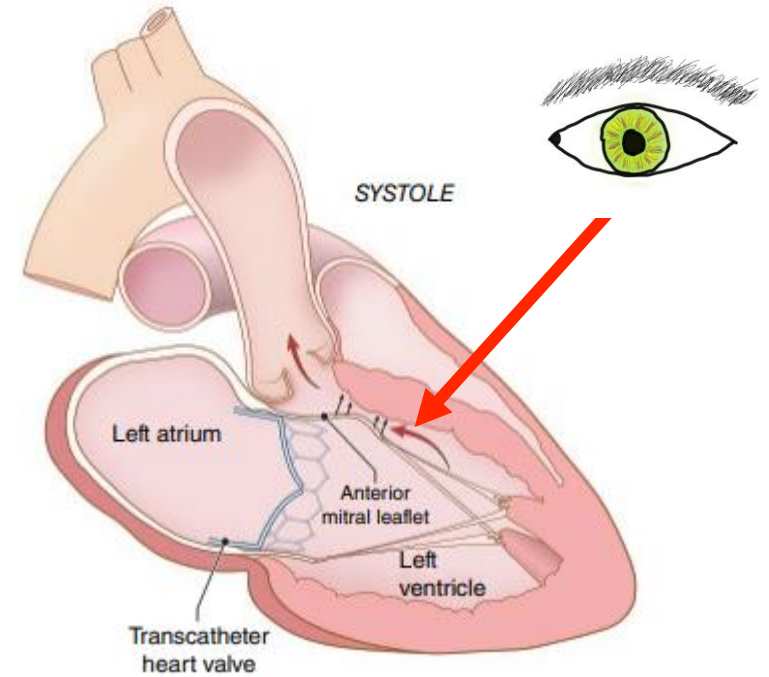
- 1) Die Tendyne Prothese drückt das anteriore Mitral-Segel in Richtung Septum: Verengung
- 2) Durch Bernoulli Kräfte (Sog im LVOT während Systole) wird das anteriore Mitralsegel noch weiter in den LVOT gezogen: Verengung



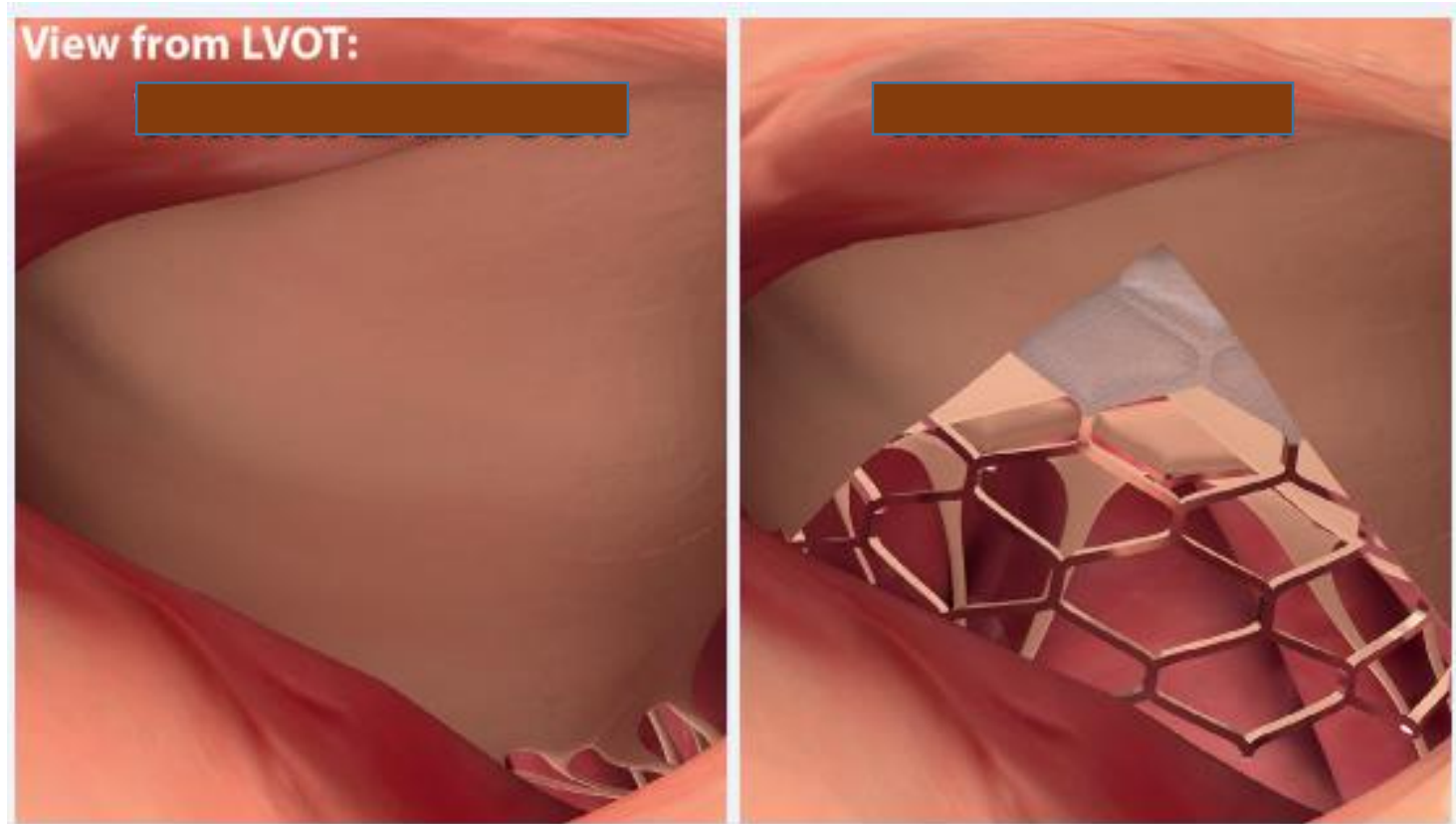
LVOT
Obstruction?



LVOT Obstruction?



LVOT Obstruction?



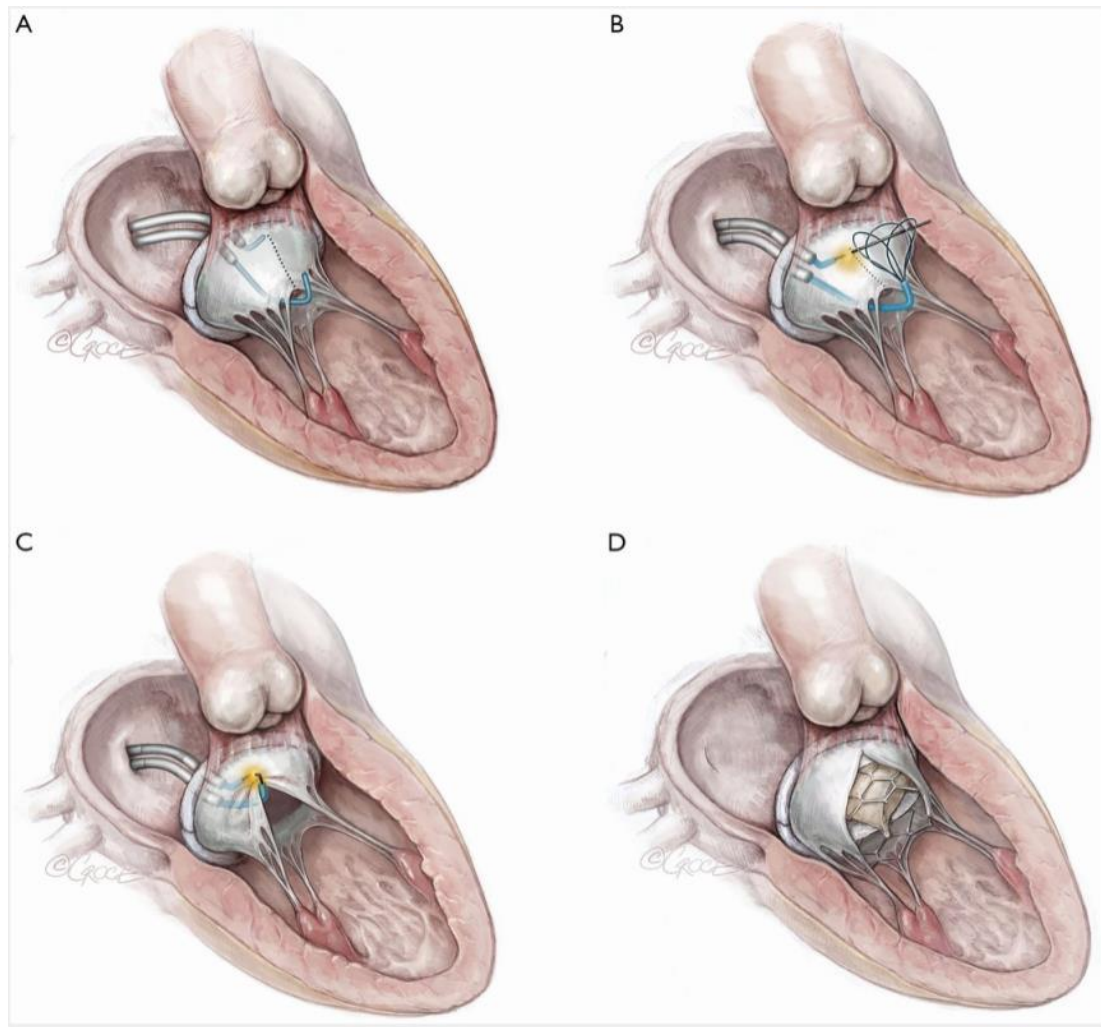
Schlitzten des anterioren Segels, damit Blut durch den offenen Käfig fließen kann

Transcatheter Electrosurgery

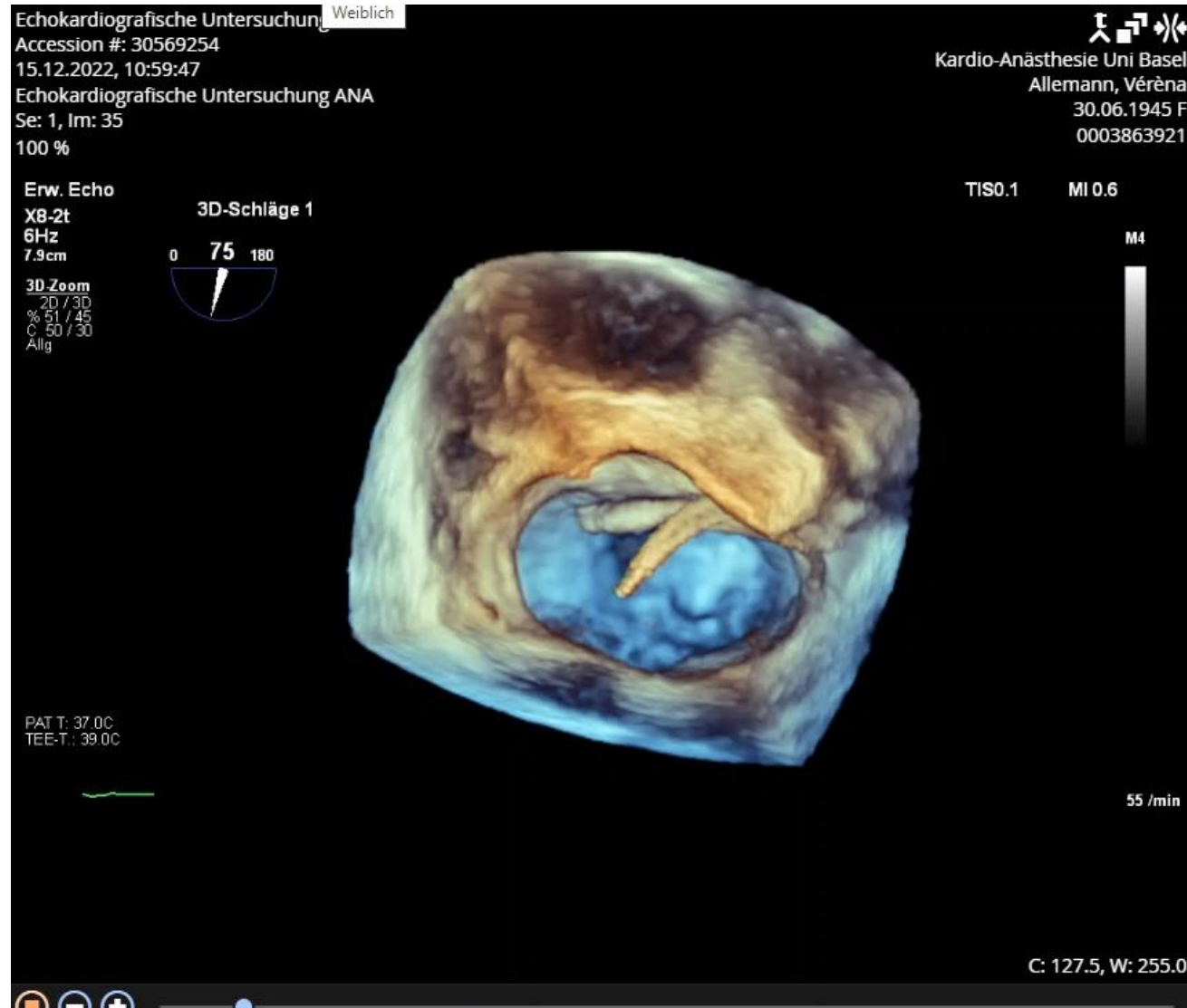
Laceration of the **anterior mitral valve leaflet** to **prevent outflow obstruction**



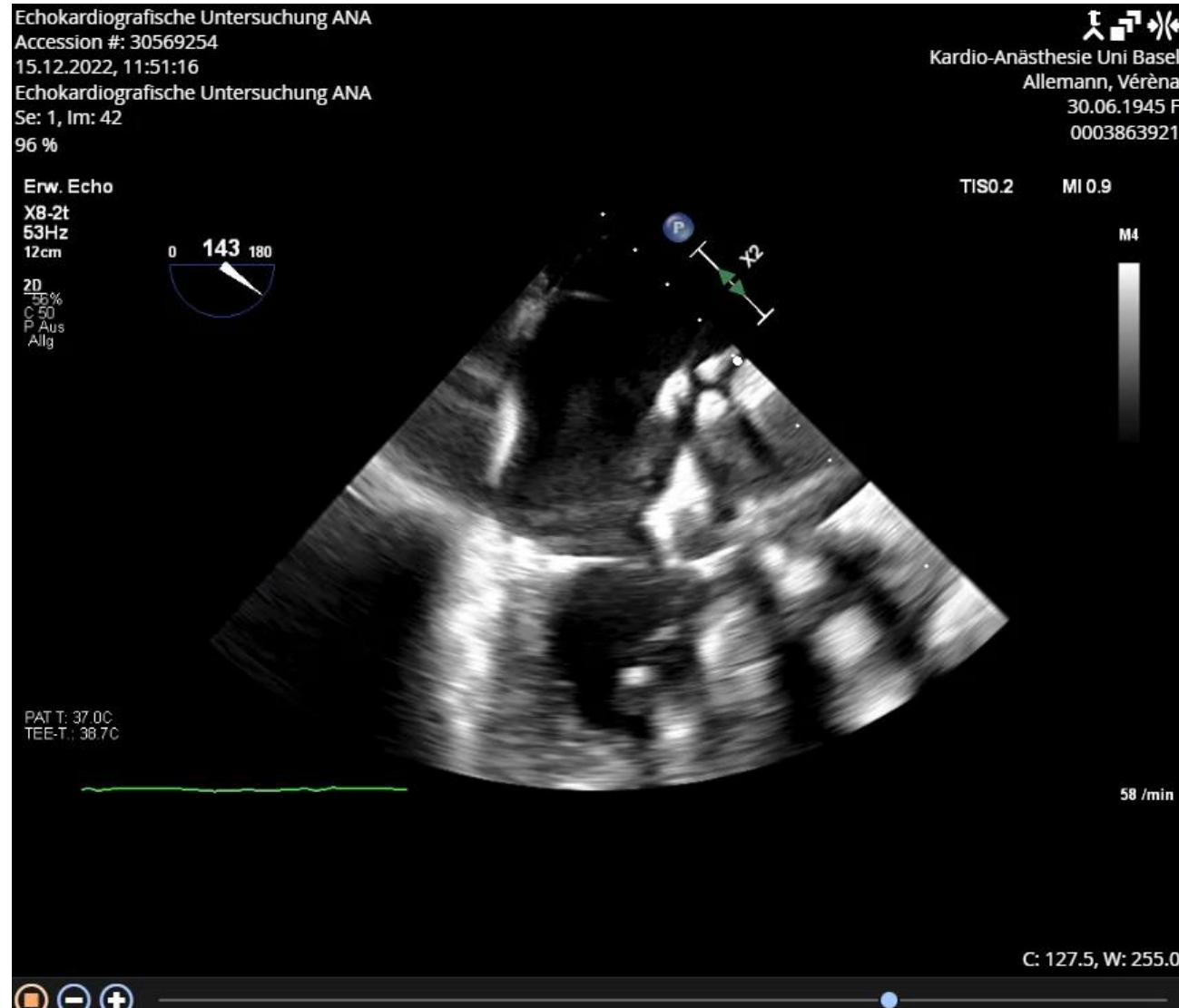
LAMPOON «antegrade»



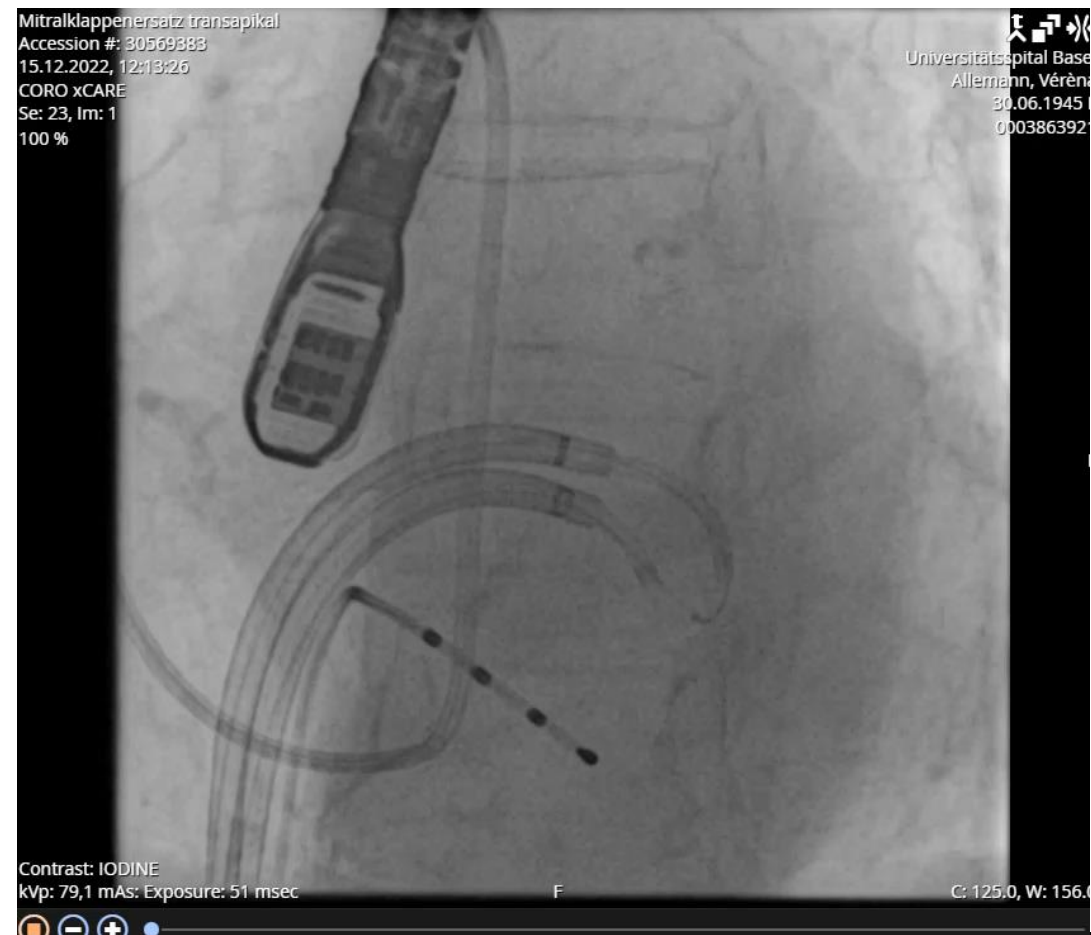
LAMPOON «antegrade», Basel



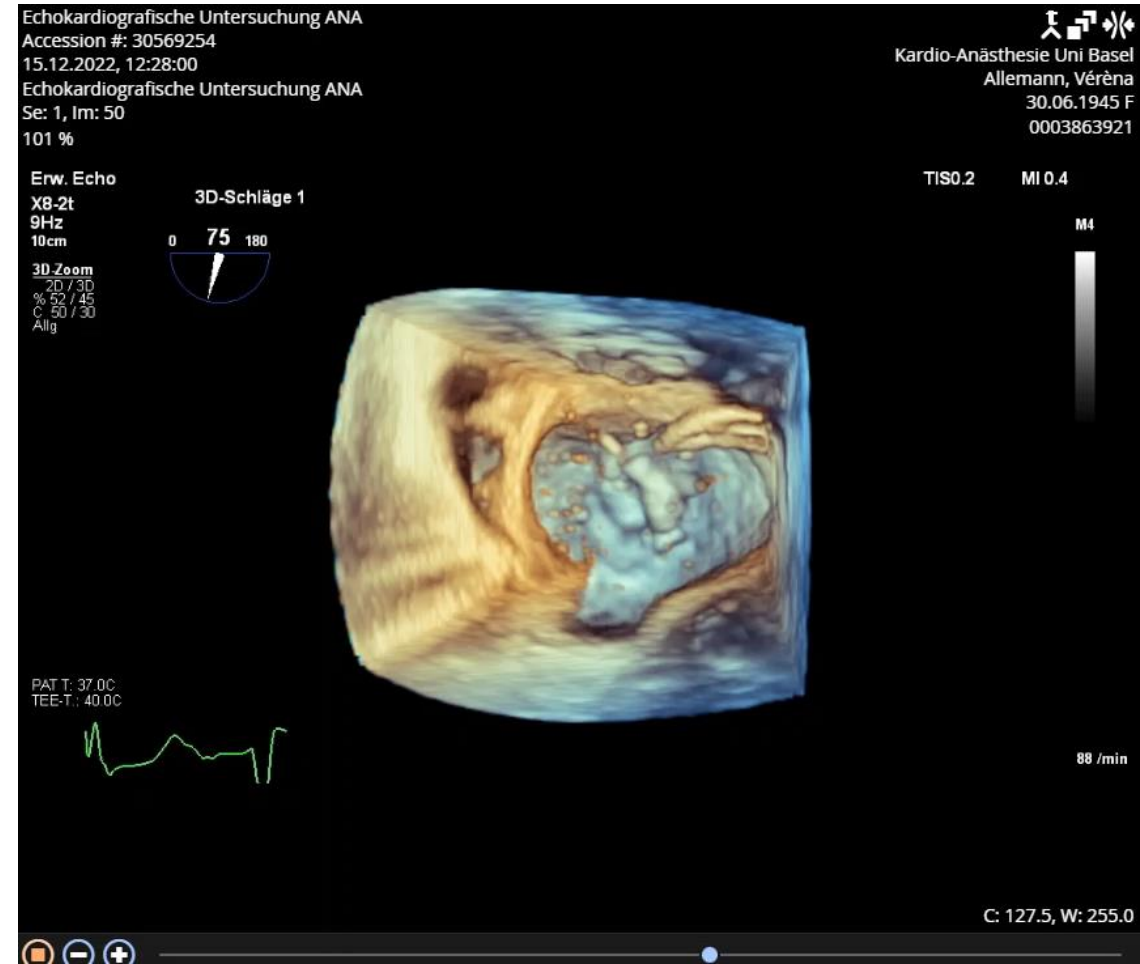
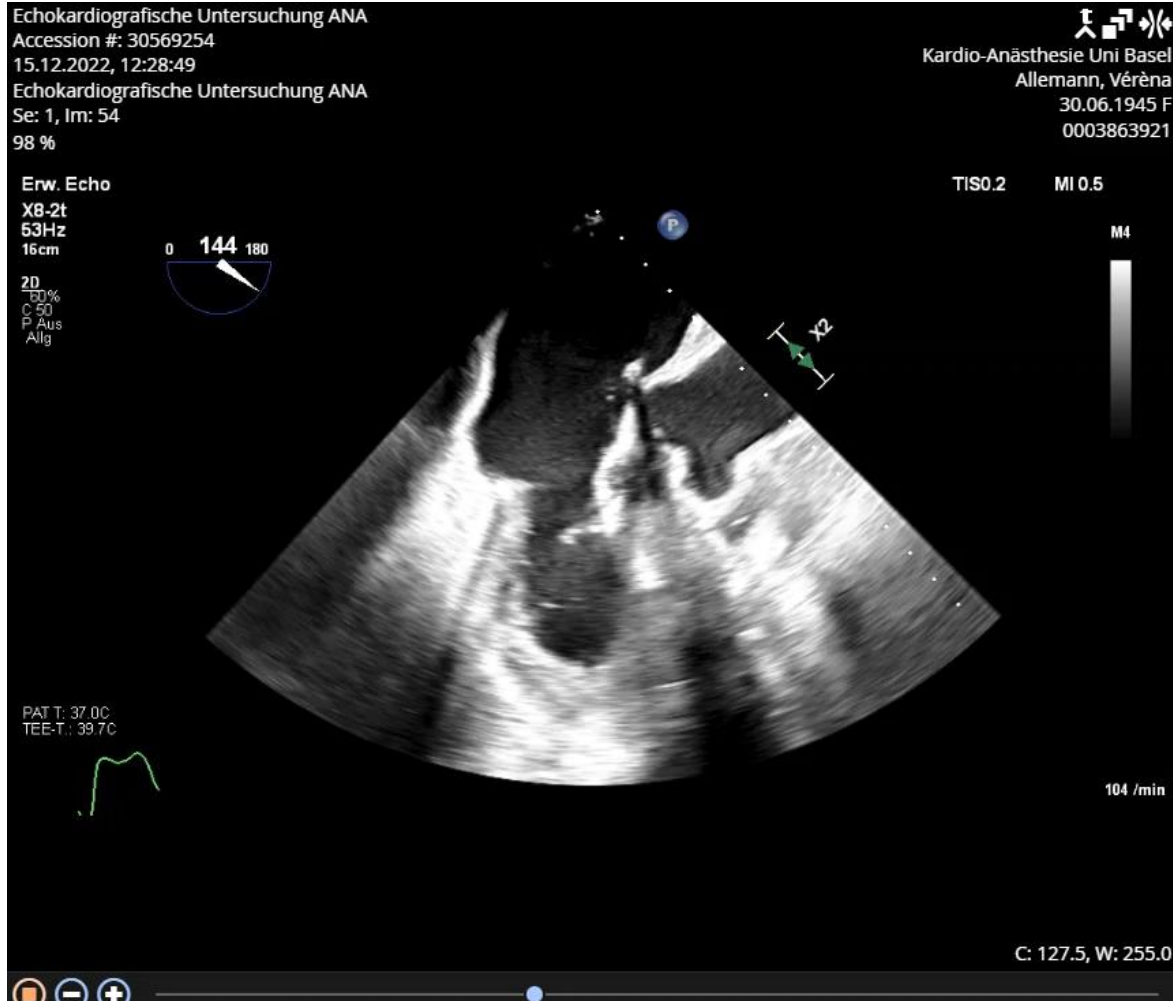
LAMPOON «antegrade», Basel



LAMPOON «antegrade», Basel



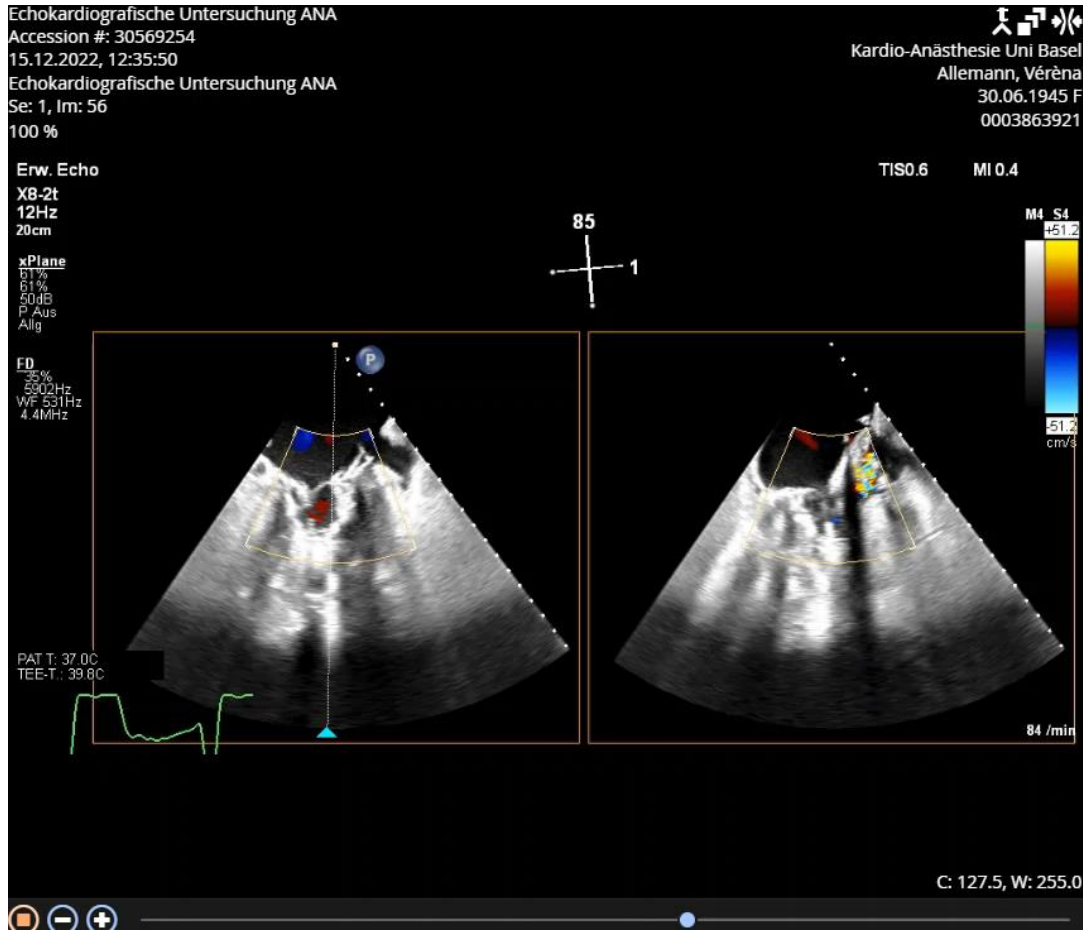
LAMPOON «antegrade», Basel



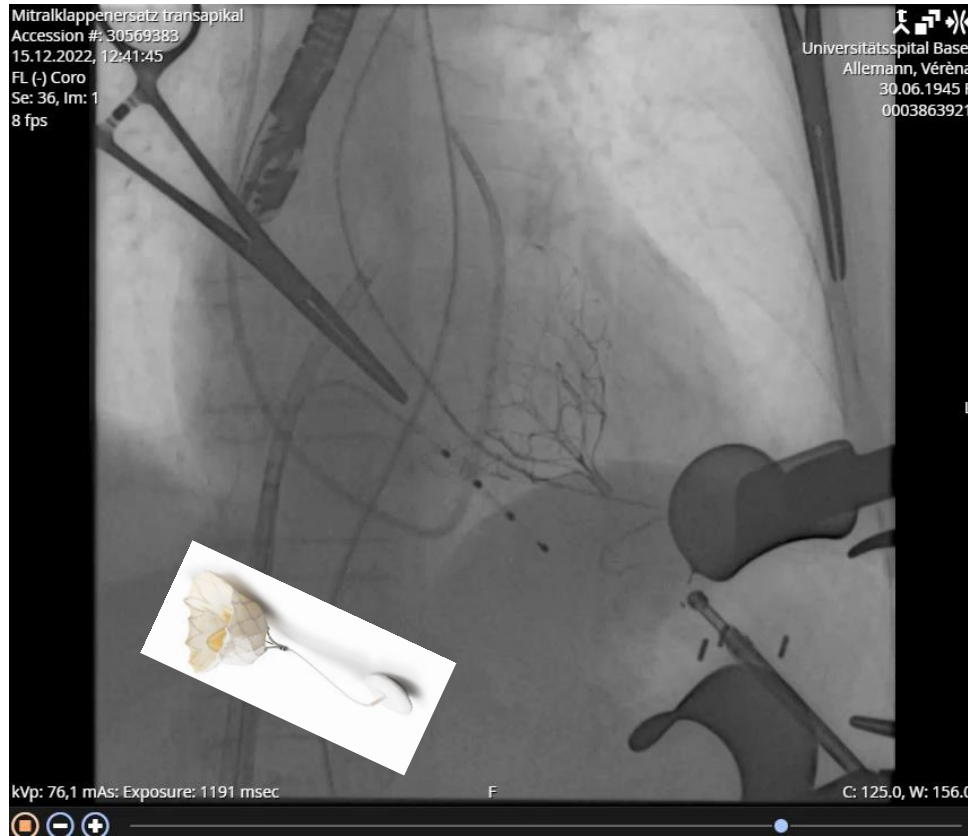
LAMPOON «antegrade», Basel



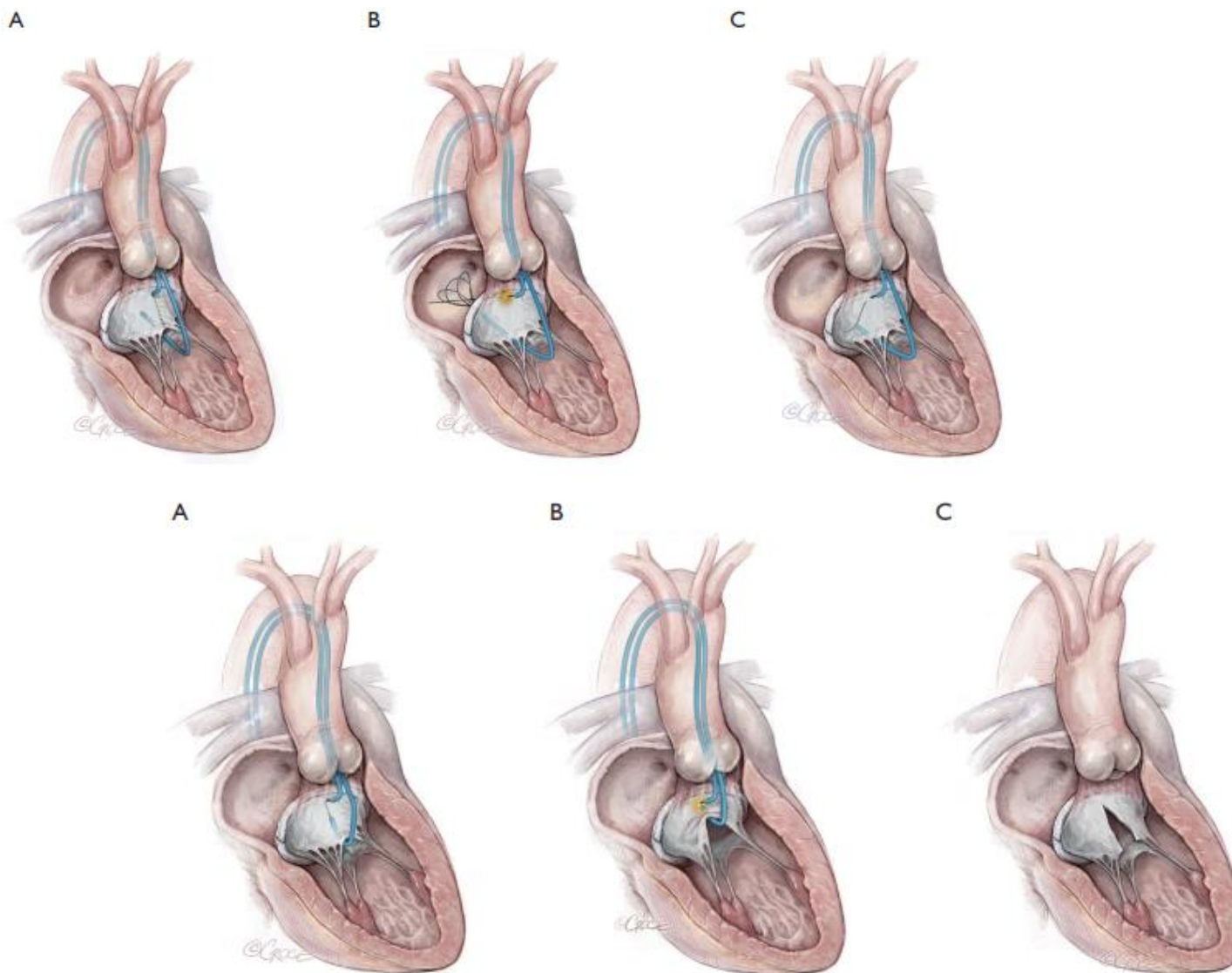
LAMPOON «antegrade», Basel



LAMPOON «antegrade», Basel



LAMPOON «retrograde»



LAMPOON «tip-to-base»

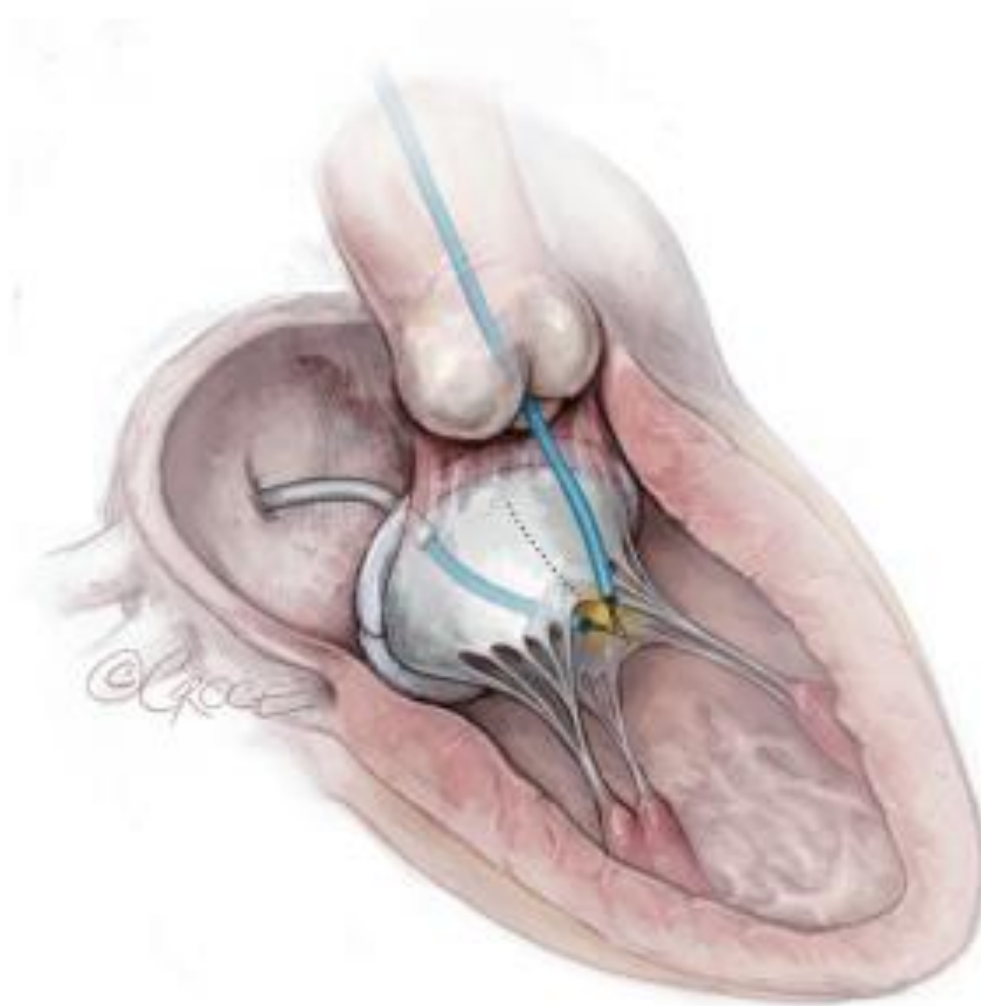


Figure 4 Tip-to-base LAMPOON. Access is via the right femoral vein for steerable sheath and subsequently TMVR. 6F arterial access is obtained for snaring. In this modified technique, after transseptal puncture the mitral prosthesis is crossed using a balloon wedge end-hole catheter. An Astato guidewire is advanced through the balloon-wedge catheter and snared in the ascending aorta. The guiding catheter used for snaring is advanced across the aortic valve. The balloon catheter is withdrawn and a guide catheter advanced. The mid-shaft of the Astato guidewire is kinked and positioned at the tip of the anterior bioprosthetic mitral leaflet. The final step is the laceration where the 5% Dextrose is infused, the wire is electrified at 70 W pure cut, and slowly pulled back to facilitate laceration. The “Flying V” will reach a hard stop at the valve sewing ring. The LAMPOON system is disassembled, and the deflectable sheath in the left atrium is used to guide a stiff pre-shaped 0.035” guidewire into the left ventricle for valve-in-valve TMVR. TMVR, transcatheter mitral valve replacement.

LAMPOON «Rescue»

A modified laceration technique from leaflet tip to base may be effective in patients with a prosthesis that protects the aortomitral curtain.

Lisko J. et al. JACC Cardiovasc Interv. 2021 Mar 8;14(5):541-550

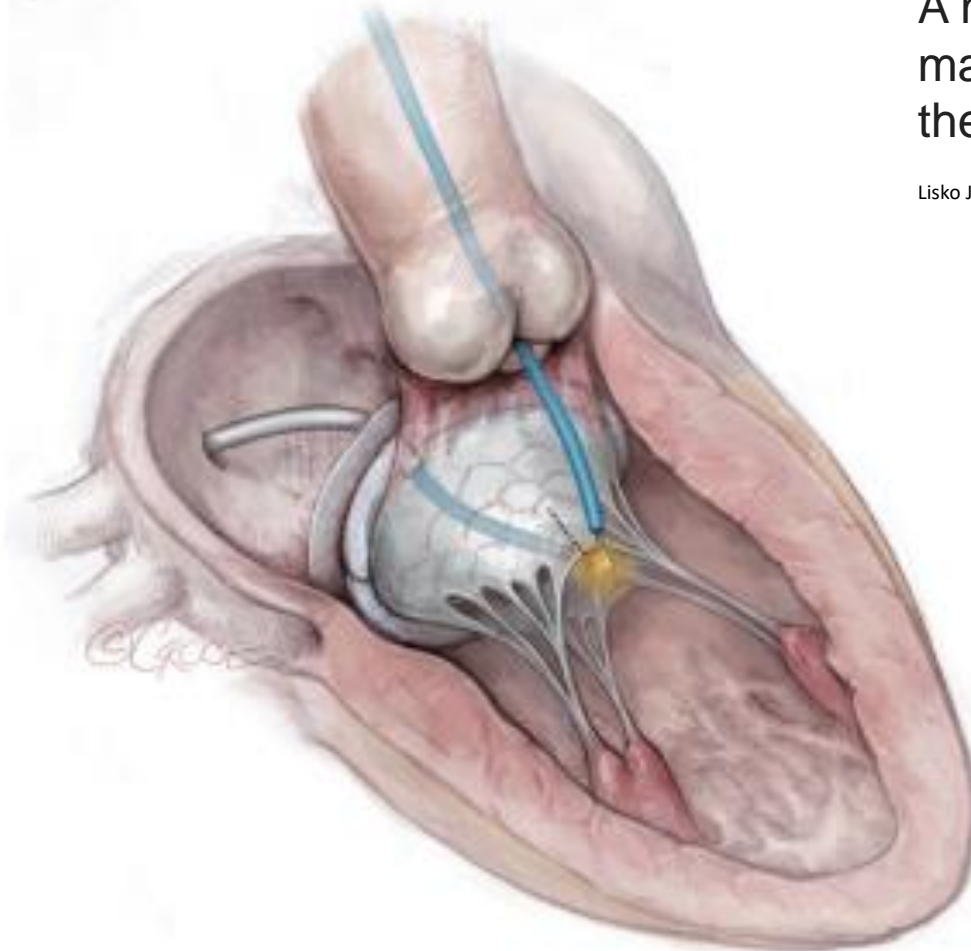
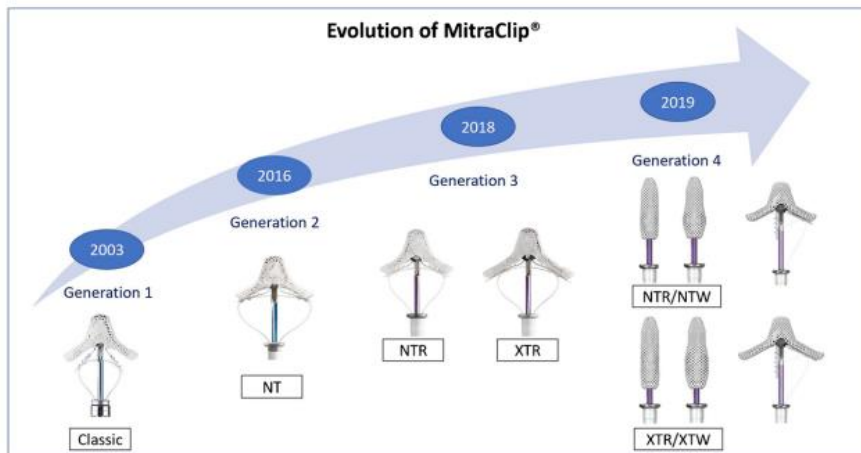


Figure 5 Rescue LAMPOON is an option when there is LVOT obstruction due to SAM after TMVR. Access is via the right femoral vein for an Agilis sheath and femoral artery for a 6Fr sheath. Following transseptal puncture, a balloon catheter is floated via an Agilis deflectable sheath through the THV. A 300 cm 0.014" Atrato XS 20 guidewire is advanced through the balloon catheter and snared in the ascending aorta. The balloon catheter is replaced with a JR guide and the "Flying V" is created on the Atrato mid-shaft. The Atrato guidewire tip is externalized and the "Flying V" is positioned at the tip of the anterior mitral leaflet between femoral and transseptal guiding catheters. The transseptal guiding catheter is positioned at A2 via a deflectable transseptal sheath under TEE guidance. Tension is applied to both catheters, electrified with 70 W radiofrequency energy and 5% dextrose flush and the lacerating edge is pulled upwards from the protruding tip of the anterior mitral leaflet towards the THV frame. The THV frame provides a barrier to prevent deleterious advancement of the laceration edge into the aortomitral curtain and aortic root. The catheters are relaxed and laceration is confirmed on TEE and LVOT gradients are assessed. Electrification can be repeated to achieve effective tip laceration. TMVR, transcatheter mitral valve replacement; LVOT, left ventricular outflow tract; SAM, systolic anterior motion; THV, transcatheter heart valve; TEE, transoesophageal echocardiogram.

Electrosurgical Laceration and STabilization of a MitraClip ELASTA-Clip



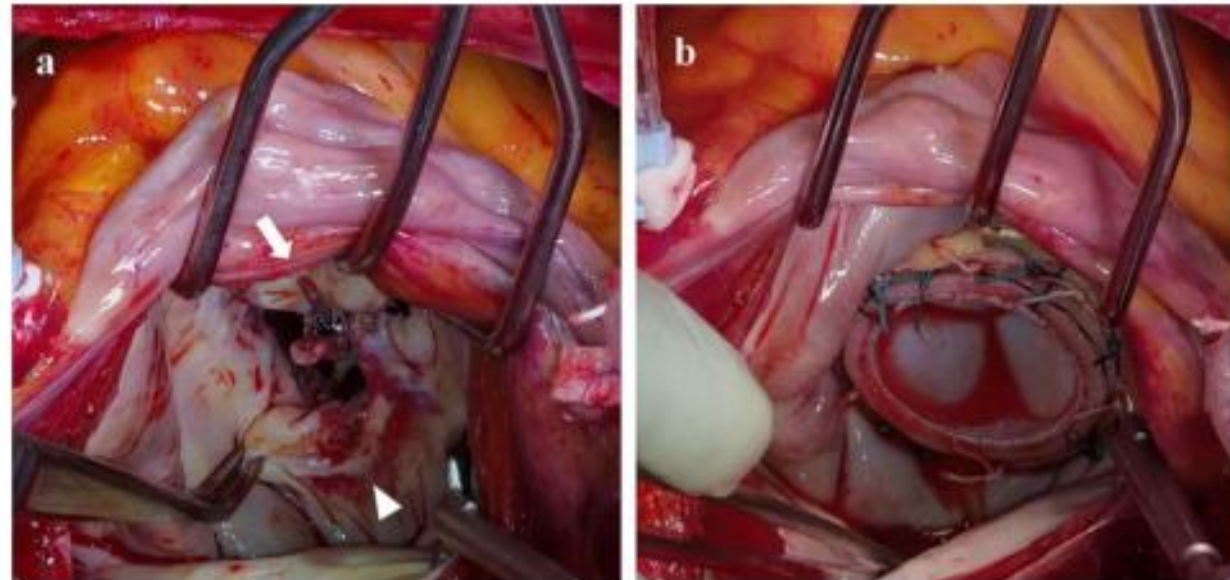
Complications following MitraClip®

Procedure-related			Device-related
Access-site	Bleeding	Ischemic	Functional
<ul style="list-style-type: none"> Vascular Dissection Stenosis Atrial/venous thrombosis Perforation Rupture AV-Fistula Pseudoaneurysm Hematoma 	<ul style="list-style-type: none"> Cardiac IASD Atrial/ventricle perforation Pericardial effusion Tamponade Pseudoaneurysm 	<ul style="list-style-type: none"> Access-site Gastrointestinal Urinary tract Pericardial effusion Central venous line Atrial line Obscure bleeding 	<ul style="list-style-type: none"> Myocardial Infarction Stroke Acute thrombus formation
Arrhythmia	Renal	Infectious	Structural
<ul style="list-style-type: none"> New-onset atrial fibrillation 	<ul style="list-style-type: none"> Acute Kidney Injury 	<ul style="list-style-type: none"> Endocarditis 	<ul style="list-style-type: none"> SLDA Leaflet Perforation Leaflet Tear Chordal Rupture Clip Embolization

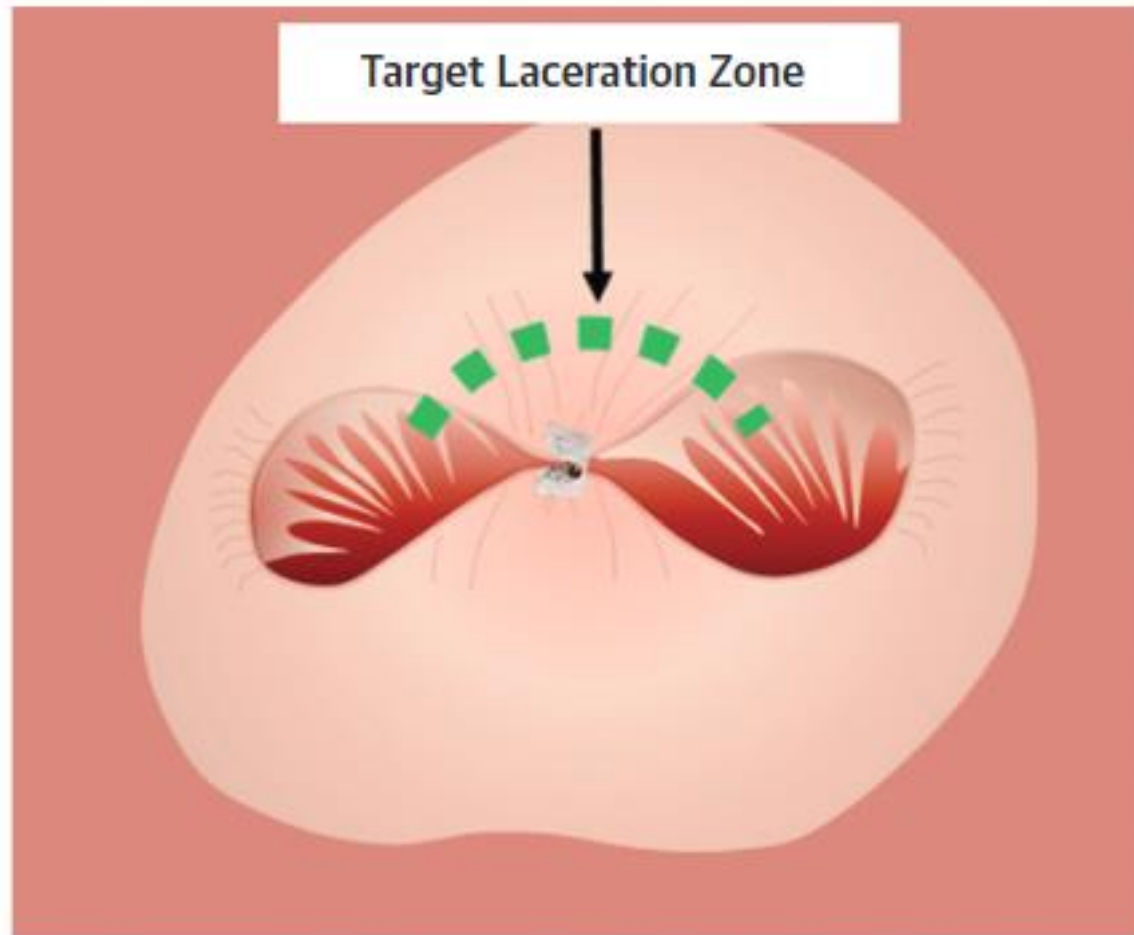
Elasta

- Kaum transkatheter Alternativen (Stenose)
- Implantation einer Transcatheter Klappe nicht möglich
- Operative Sanierung oft einzige Alternative
 - Meist nur Ersatz möglich
 - Mortalität nach operativer Sanierung bei ca. 47%

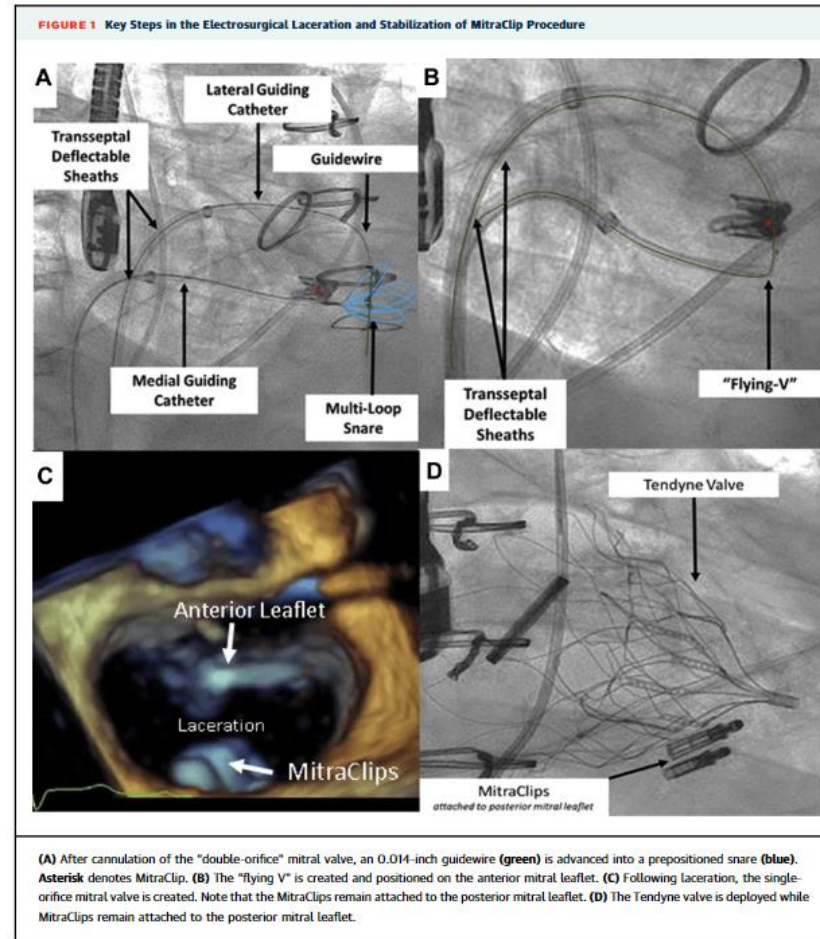
Fig. 4 Surgical view of the mitral valve. **a** Although the posterior medial side of the MitraClip was attached to the anterior and posterior leaflets, the anterolateral side of the MitraClip was detached (arrow) and the posterior leaflet was torn (arrowhead). **b** The mitral valve was replaced with a Magna Mitral valve



Elasta



Elasta



Elasta

TABLE 2 Case Planning

	Patient #1	Patient #2	Patient #3	Patient #4	Patient #5
Reason for surgical ineligibility	Frailty	Frailty	Pulmonary fibrosis	Third redo sternotomy	86 years of age
Septal-lateral diameter (mm)	33.4	36.9	29.3	27.9	31.9
Intercommissural diameter (mm)	41.5	47.7	42.3	43.2	45.4
Perimeter (mm)	126.4	141.3	122.9	116.7	128.9
Area (cm ²)	11.5	13	10.5	9.7	12.1
Implanted valve size	35M LP	37L SP	33M LP	33M LP	37M LP
Septal-lateral percentage oversizing	3.3	-1.1	10.8	12.1	14.4
Intercommissural percentage oversizing	16.9	10.1	10.0	8.1	9.0
Perimeter percentage oversizing	13.9	10.4	17.1	13.3	16.4
Predicted neo-LVOT (mm ²)	571	294	306	296	341
End-systolic aortomitral angle (deg)	32.2	NA	NA	52.1	54.2
End-diastolic aortomitral angle (deg)	33.7	NA	NA	53	49.3

Values were derived using contrast-enhanced gated cardiac computed tomography for the 5 patients undergoing electrosurgical laceration and stabilization of MitraClip.
LVOT – left ventricular outflow tract; NA – not applicable.

Elasta



TABLE 3 Procedural and In-Hospital Outcomes (N = 5)

Successful electrosurgical laceration	5 (100)
Number of clips lacerated (per patient)	2
Successful deployment and correct positioning of Tendyne valve	5 (100)
Need for valve retrieval	0
Procedure time (min)	205 (198.5–237.5)
Fluoroscopy duration (min)	59.5 (54.6–66.4)
Planned intra-aortic balloon pump	5 (100)
Hospital length of stay (days)	13 (11–37)
Procedural complications	
Death	0
Cardiac arrest	0
Tamponade	0
Cardiac perforation	0
LVOI obstruction	0
Required conversion to open surgery	0
Significant hemodynamic compromise	1 (20)
Laceration of nontarget structure	0
Valve embolization	0
Stroke	0
Major vascular complication	0
Life-threatening bleed	2 (40)
Hemothorax	2 (40)
Acute renal failure	1 (20)
Perivalvular leak greater than mild	2 (40)
Discharge echocardiographic outcomes	
Left ventricular ejection fraction (%)	55 (50.0–57.5)
Mean mitral gradient (mm Hg)	5.0 (4.3–5.5)
Central MR grade 0	5 (100)
Perivalvular leak greater than mild	2 (40)
Survival	
Survived immediate procedure	5 (100)
Survived to discharge	5 (100)

Values are n (%), n, or median (range).
Abbreviations as in Tables 1 and 2.

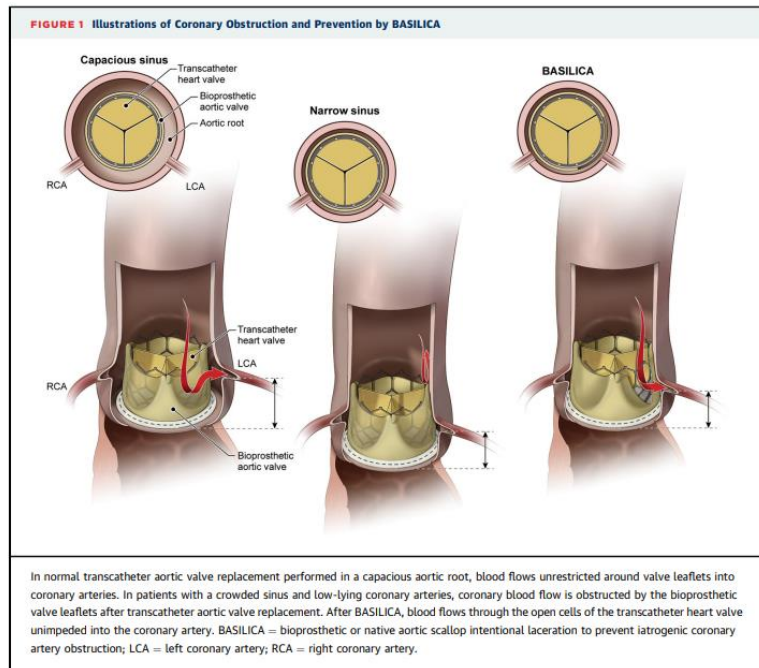
TABLE 4 30-Day Clinical Follow-Up (N = 5)

Clinical outcomes	
Any mortality	0
Cardiovascular mortality	0
Stroke or TIA	1 (20)
Reintervention for MV dysfunction	0
BARC 2, 3, or 5 bleeding	1 (20)
Bioprosthetic valve dysfunction	
Embolization	0
Thrombosis	0
Erosion, migration	0
Echocardiographic outcomes (n = 5)*	
Left ventricular ejection fraction (%)	55
Mean mitral gradient (mm Hg)	5.3 (4.5–6.5)
Central MR grade 0	5
PVL (moderate)	2

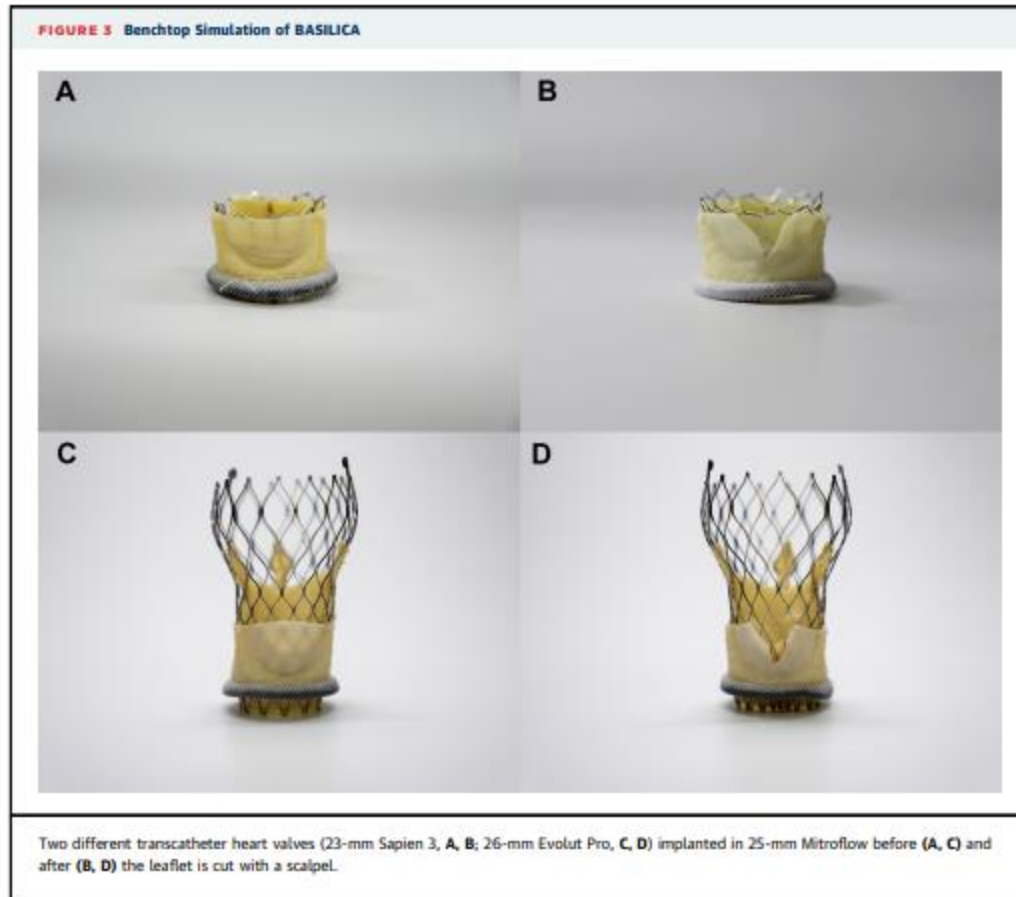
Values are n, n (%), or median (range). *One patient's 30-day echocardiographic study was completed to discharge.
BARC – Bleeding Academic Research Consortium; MR – mitral regurgitation; MV – mitral valve; PVL – paravalvular leak; TIA – transient ischemic attack.

Bioprosthetic Aortic Scallop Intentional Laceration to prevent Coronary Artery Occlusion

BASILICA



- Koronar Verschluss bei V-i-V mit 50% Mortalität
- Entsteht durch Verdrängung der nativen oder biologischen Klappensegel nach aussen durch die TAVI Prothese
 - durch Abdichten des STJ
 - durch Verschluss des Ostiums durch ein Segel
- Häufig wegen tiefliegender Ostien oder kleinem Sinus
- 4x häufiger bei V-i-V als bei nativer Klappe
- Besonders bei biologischen Klappen, deren Segel aussen am Stent montiert sind oder Stentless Klappen



Basilica

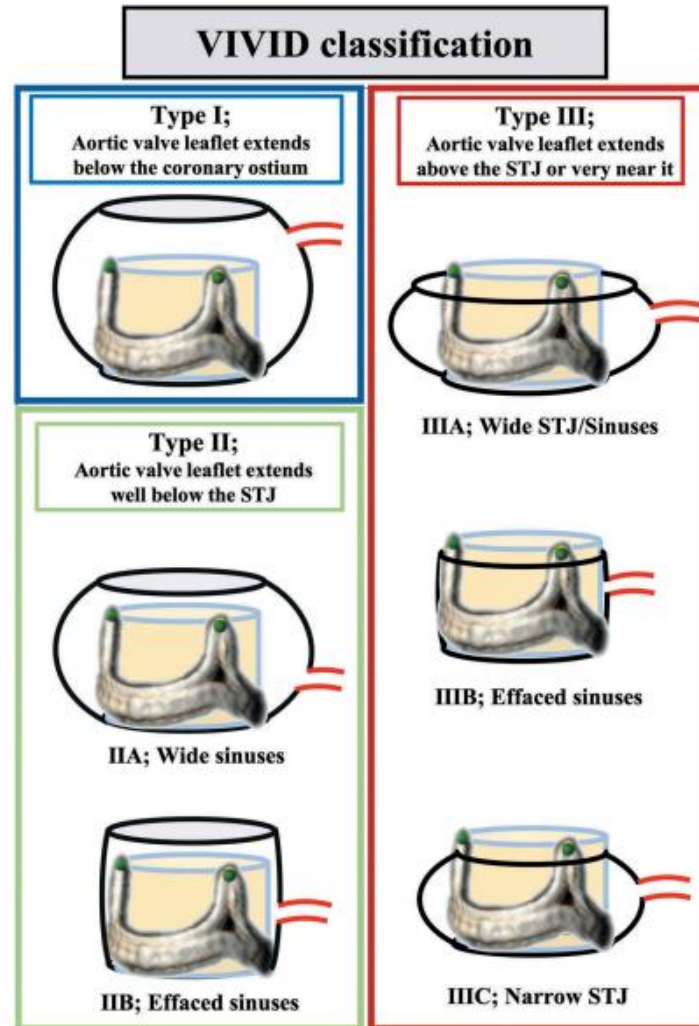
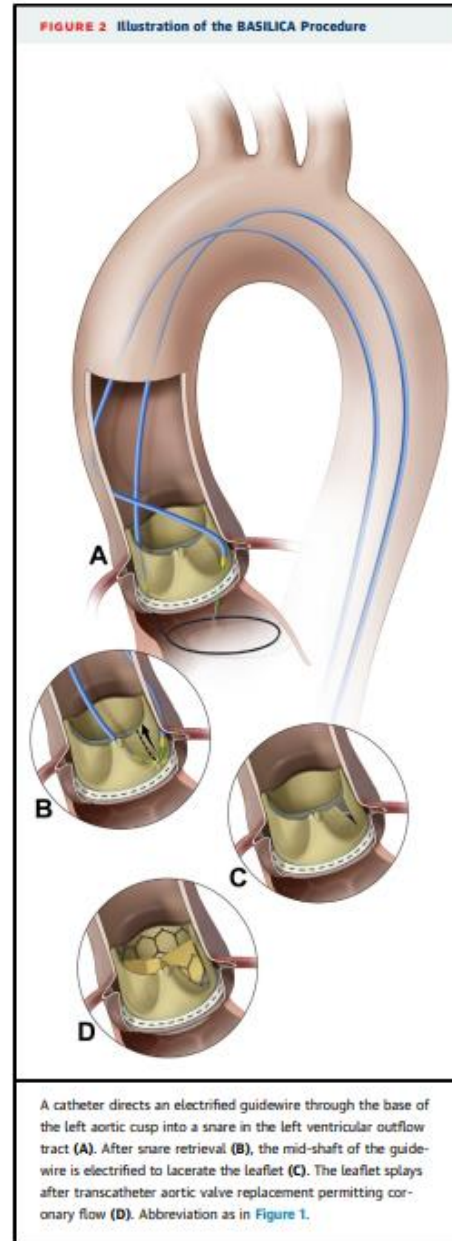


Figure 3. VIVID classification of a coronary ostium and aortic root morphologies influencing the risk for obstruction after TAVR. STJ, sinotubular junction.

Basilica



Basilica

Double Leaflet (Doppio) Basilica

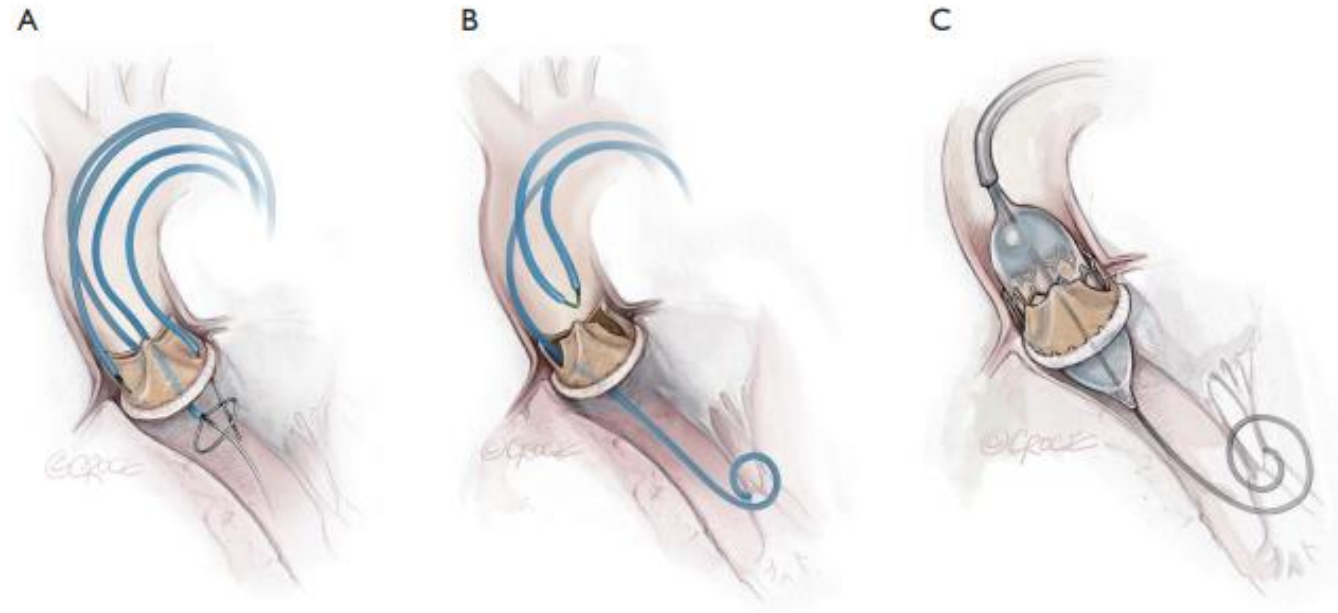


Figure 3 Double leaflet (Doppio) BASILICA. Access is with two 14-Fr femoral arterial sheaths (e.g., DrySeal Flex) that permit introduction of multiple parallel catheters whilst maintaining hemostasis. (A) One pair of BASILICA catheters (traversal and snare) are introduced through each access sheath. Leaflets are crossed and snared sequentially at the operator's discretion. Flying V kinks are formed on both wires as described above (Figure 1) and are delivered in turn to their target leaflets. Coaxial systems are aligned and torquers and dextrose syringes attached to the guiding catheters and hemostatic valves. (B) One leaflet is lacerated with application of 70 W 'pure' cut energy and continuous dextrose flush. Prior to laceration of the second leaflet a pigtail is placed in the left ventricle in preparation for TAVR and the 14-Fr sheath is exchanged for the TAVR delivery sheath. The second leaflet is lacerated and BASILICA catheters are removed from the body. (C) TAVR is performed in traditional fashion.

Basilica

BA (balloon augmented) Basilica

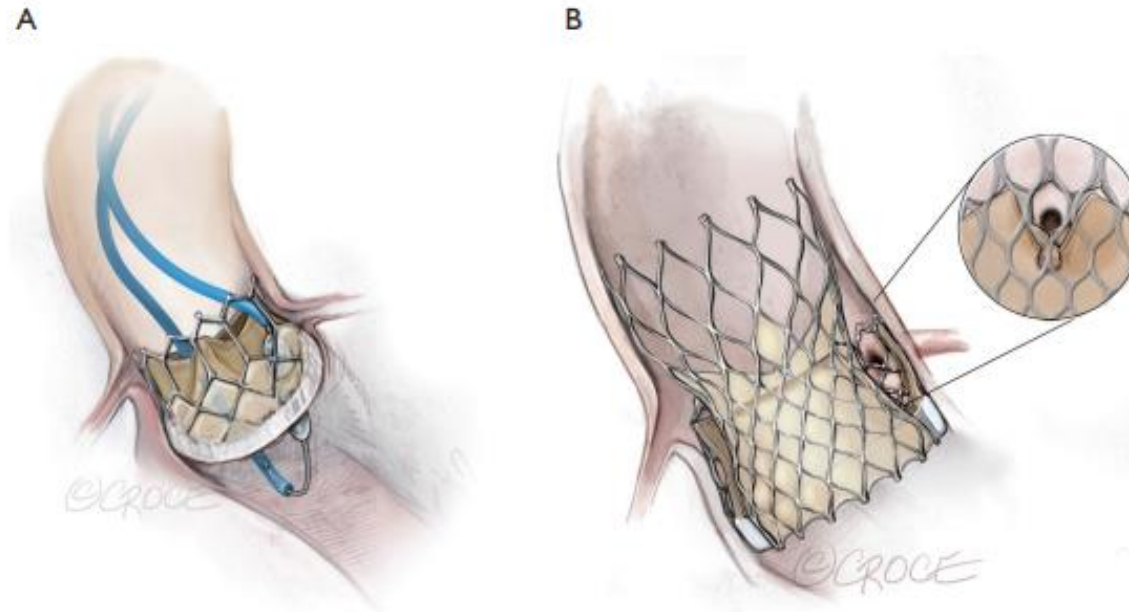


Figure 4 Balloon-augmented (BA) BASILICA. Access is identical to traditional BASILICA depending on whether a single or Doppio procedure is to be performed. (A) The coaxial system comprising 7-Fr traversal guiding catheter, Piggyback wire converter and Astato XS20 guidewire is advanced to and positioned on the base of the target leaflet. A single loop snare, sized to the LVOT, is positioned below the aortic annulus through a 6-Fr guiding catheter (JR4/Multipurpose). Leaflet traversal is performed during brief (<1 s) application of 30–50 W “pure” cut RF energy and the wire is snared and retained in the LVOT. The Piggyback is removed and replaced with a 4.5–5.0 mm non-compliant, rapid exchange (Rx) angioplasty balloon. The balloon is positioned to straddle the base of the target leaflet and inflated to dilate the leaflet crossing point. The balloon is subsequently removed, locking microcatheter re-inserted over the proximal shaft of the wire and flying V created. The flying V is positioned at the point of dilatation in the leaflet base and laceration performed. (B) A large leaflet splay is created, further reducing the likelihood of coronary artery obstruction in high risk cases e.g., TAV-in-TAV.

Transcatheter Electrosurgery

Klinische Anwendung:

PASTA

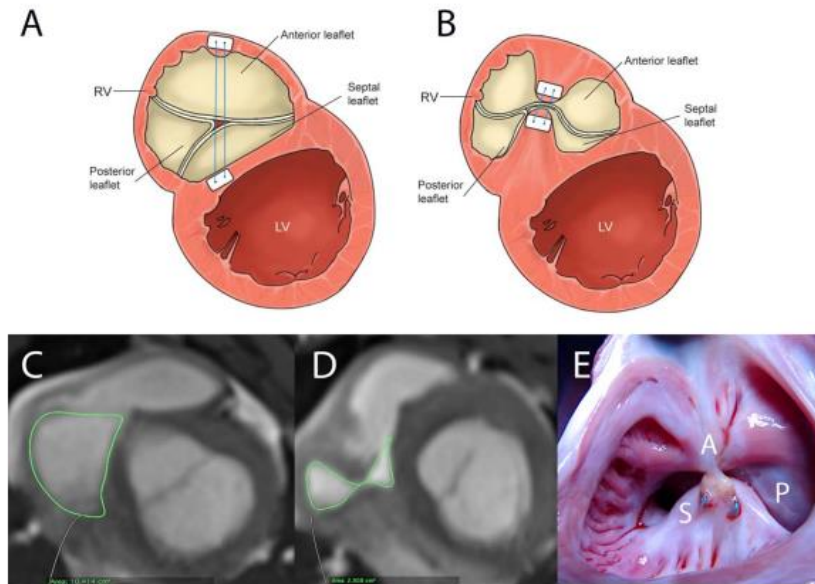


FIGURE 1 PASTA overview, viewed from the ventricles. (A) A dilated tricuspid valve annulus, and (B) a double orifice valve created by PASTA pledgeted sutures between the postero-septal and mid-anterior annulus. MRI images before (C) and after (D) PASTA demonstrating reduced annular dimension from 10.4 cm² to 2.9 cm². (E) Necropsy 30 days after PASTA, viewed from the atrium. S = septum; A = anterior annulus; P = posterior leaflet

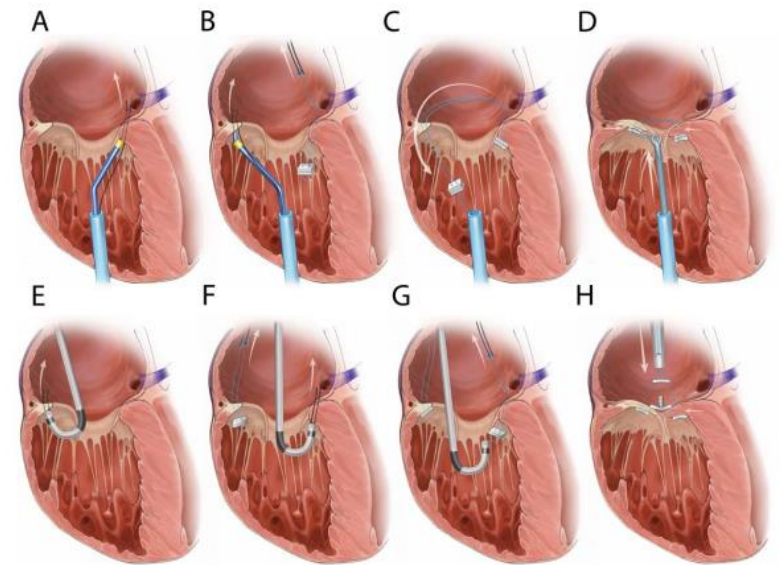
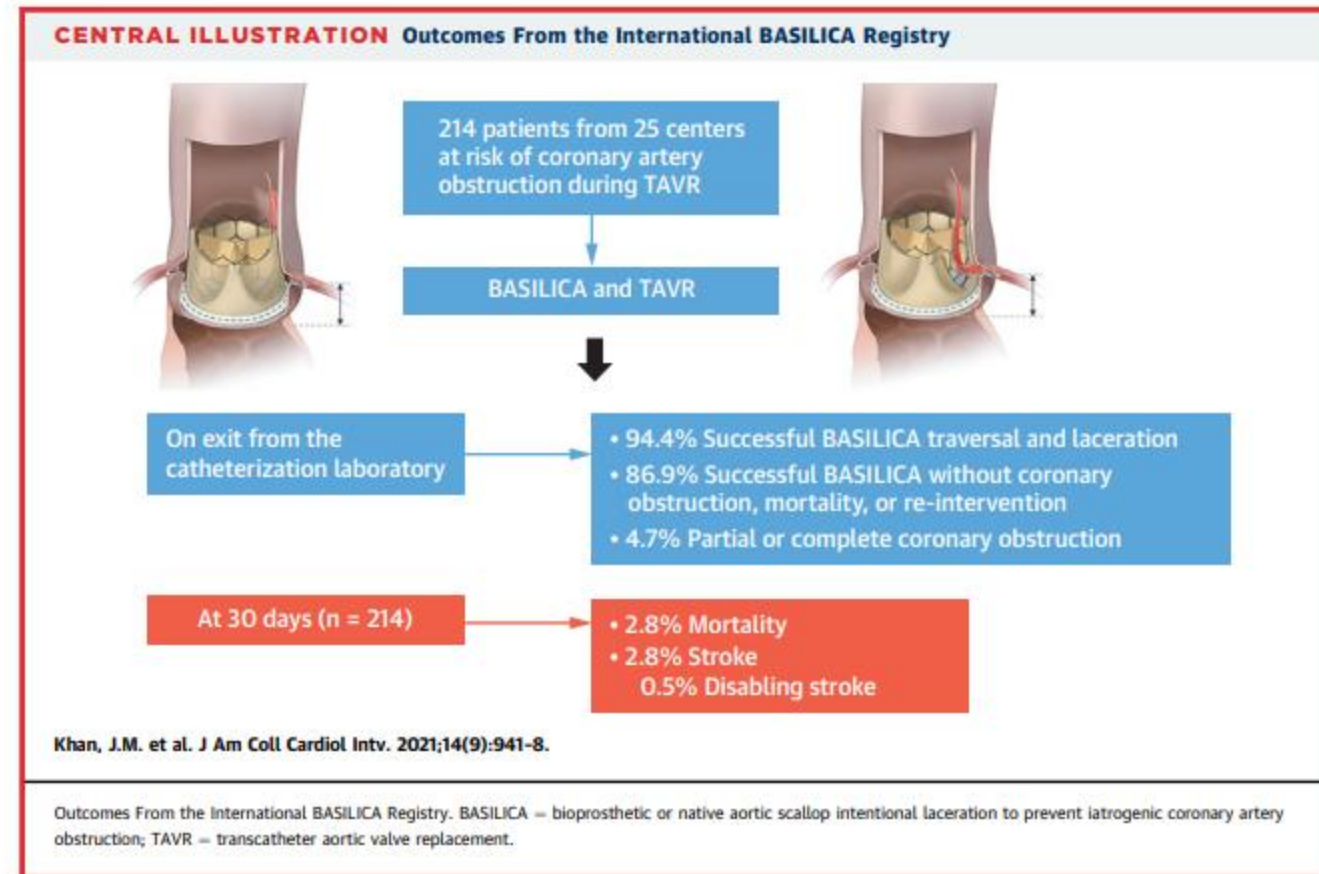


FIGURE 2 PASTA procedure steps. (A) In the transapical approach, two guidewire perforate the septal annulus and are snared and externalized through a jugular sheath. (B) The guidewires are connected to a pledgeted suture, which is then pulled into the annulus. A second pair of guidewire perforations are made at the anterior annulus. (C) The tips of these guidewires are connected to the suture previously externalized through the jugular sheath and are pulled back through the apex. (D) A knot pusher delivers a pledget and applies tension to appose the annular targets. (E) In the trans-jugular approach, a deflectable catheter delivers guidewires to anterior and septal (F) targets on the tricuspid annulus. (G) These are exchanged for pledgeted sutures. (H) A Cor-Knot ties opposing sutures, apposing annular targets

Basilica

International Basilica Registry



Zusammenfassung:

(Transcatheter) HF Chirurgie erlebt eine rasante technische Entwicklung

Neue Katheter

Bessere Steuerbarkeit wegen besserer Bildgebung

Weltweit bisher nur wenige Studien, eher Fallbeschreibungen

Hochkomplexe Eingriffe

Wird die Indikation für interventionelle Verfahren weiter ausdehnen





