Tendyne™

Transcatheter Mitral Valve System

Instructions for Use

CAUTION: Federal (USA) law restricts these devices to sale by or on the order of a physician.

WARNING: Read all instructions carefully. Failure to follow these instructions, warnings, and precautions may lead to device damage or patient injury.

CAUTION: Implantation of the Transcatheter Mitral Valve System should be performed only by physicians who have received training for the Abbott Tendyne™ Mitral Valve replacement system.

1. Device Description

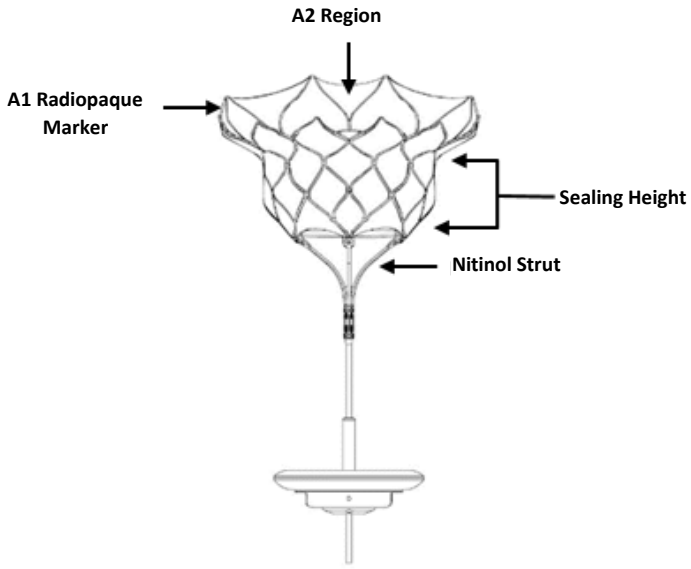
The Tendyne™ Transcatheter Mitral Valve System consists of a Tendyne™ Mitral Valve with an Apical Pad and a Tendyne™ Mitral Valve Delivery System that facilitates placement of the valve.

1.1. Tendyne™ Mitral Valve with Apical Pad

The Tendyne™ Mitral Valve is a bioprosthesis intended for transapical implantation within the native mitral valve. The valve includes two (2) parts; a porcine pericardial bioprosthetic valve and an Apical Pad (connected to a braided tether, Figure 1). The valve has three (3) porcine pericardial tissue leaflets sewn onto a nitinol inner frame that is attached to a self-expanding nitinol outer frame. The valve is designed for radial orientation such that the anterior aspect of the cuff rests upon the aortomitral continuity. This orientation aligns the cuff with the anterior portion of the native mitral valve.

The frame is covered with a fabric cuff that provides a sealing surface within the native annulus. The self-expanding prosthesis is connected to a braided tether intended to stabilize the valve by passing through the left ventricular myocardium near the apex, where it is fastened to an Apical Pad on the epicardium.

Figure 1. Tendyne™ Mitral Valve with Apical Pad



The valve is fully repositionable and retrievable intraoperatively. Repositioning allows optimization of the valve position following deployment, and retrieval allows use of an alternative valve in the event the valve implant is suboptimal.

The Tendyne™ valve is available in several sizes to accommodate differing cardiac anatomies. Two (2) sealing heights are available: Standard Profile designated by “SP” and Low Profile, designated by “LP”. The SP valve has an effective orifice area (EOA) of approximately 3.0 cm^2. The LP valve has an EOA of approximately 2.2 cm^2. Refer to Section 8 for Patient Selection and Treatment.

The Apical Pad is available in a large and a small size. It is comprised of a button covered by fabric.

Table 1. Tendyne™ Mitral Valve Models, Sizes and Native Valve Annulus Sizing

Model	Description	Valve Size		Native Valve Annulus Size			
				AP[1] (mm)		PER[2] (mm)	
TENDV-LP-29S	Tendyne™ Mitral Valve LP	LP	29S	26.4	29.5	101	110
TENDV-LP-29L	Tendyne™ Mitral Valve LP	LP	29L	26.4	29.5	110	120
TENDV-SP-33A	Tendyne™ Mitral Valve	SP	33A	29.5	33.2	96	104
TENDV-SP-33B	Tendyne™ Mitral Valve	SP	33B	29.5	33.2	100	108
TENDV-SP-33C	Tendyne™ Mitral Valve	SP	33C	29.5	33.2	105	114
TENDV-SP-33S	Tendyne™ Mitral Valve	SP	33S	29.5	33.2	111	121
TENDV-LP-33S	Tendyne™ Mitral Valve LP	LP	33S	29.5	33.2	111	121
TENDV-SP-33M	Tendyne™ Mitral Valve	SP	33M	29.5	33.2	116	125
TENDV-LP-33M	Tendyne™ Mitral Valve LP	LP	33M	29.5	33.2	116	125
TENDV-SP-33L	Tendyne™ Mitral Valve	SP	33L	29.5	33.2	121	132
TENDV-SP-35S	Tendyne™ Mitral Valve	SP	35S	31.4	35.2	117	127
TENDV-LP-35S	Tendyne™ Mitral Valve LP	LP	35S	31.4	35.2	117	127
TENDV-SP-35M	Tendyne™ Mitral Valve	SP	35M	31.4	35.2	122	132
TENDV-LP-35M	Tendyne™ Mitral Valve LP	LP	35M	31.4	35.2	122	132
TENDV-SP-35L	Tendyne™ Mitral Valve	SP	35L	31.4	35.2	127	138
TENDV-SP-37S	Tendyne™ Mitral Valve	SP	37S	33.2	37.2	122	133
TENDV-LP-37S	Tendyne™ Mitral Valve LP	LP	37S	33.2	37.2	122	133
TENDV-SP-37M	Tendyne™ Mitral Valve	SP	37M	33.2	37.2	127	138
TENDV-LP-37M	Tendyne™ Mitral Valve LP	LP	37M	33.2	37.2	127	138
TENDV-SP-37L	Tendyne™ Mitral Valve	SP	37L	33.2	37.2	133	143
TENDV-SP-39S	Tendyne™ Mitral Valve	SP	39S	35.0	39.3	127	138
TENDV-SP-39M	Tendyne™ Mitral Valve	SP	39M	35.0	39.3	133	143
TENDV-SP-41S	Tendyne™ Mitral Valve	SP	41S	36.8	41.3	131	141

[1] Anterior to Posterior
[2] Perimeter

Table 2. Tendyne™ Apical Pad Sizes

Model	Description	Pad Size
TENDV-SPAD	Tendyne Apical Pad - Small	Small
TENDV-LPAD	Tendyne Apical Pad - Large	Large

1.2. Tendyne™ Mitral Valve Delivery System

The Tendyne™ Mitral Valve Delivery System consists of a Tendyne™ Loading System, Tendyne™ Delivery System, Tendyne™ Pad Positioning System, Tendyne™ Stand Components and non-sterile, reusable Tendyne™ Loading Stand and Tendyne™ Weight. A Tendyne™ Retrieval System is available to retrieve the valve intraoperatively, in the event the valve implant is suboptimal.

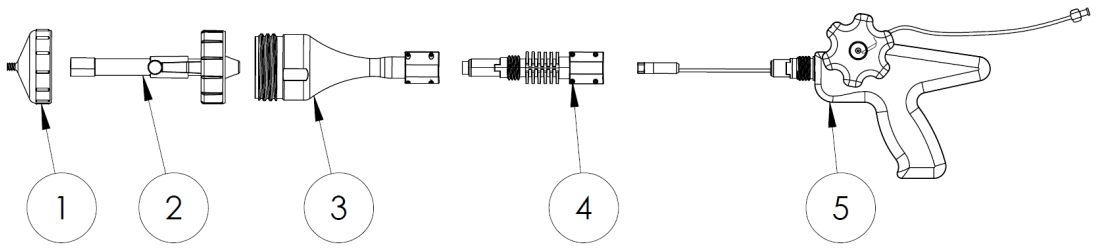
Table 3. Tendyne™ Mitral Valve Delivery System

Model	Description
TENDV-LS	Tendyne™ Loading System
TENDV-DS	Tendyne™ Delivery System
TENDV-PS	Tendyne™ Pad Positioning System
TENDV-SC	Tendyne™ Stand Components
TENDV-ST	Tendyne™ Loading Stand
TENDV-WT	Tendyne™ Weight
TENDV-RS2	Tendyne™ Retrieval System

1.2.1. Tendyne™ Loading System

The Tendyne™ Loading System (Figure 2) collapses the Tendyne™ Mitral Valve into a loading tube. The A2 portion of the Tendyne™ Mitral Valve (see Figure 1) aligns with black indicator marks on the Loading Tube. The System includes a Closed Cap, Centering Cap Assembly (Centering Cap, Centering Rod, Centering Cone, and Thumb Screw), loading funnel, loading tube, loading handle, and tether clip.

Figure 2. Tendyne™ Loading System

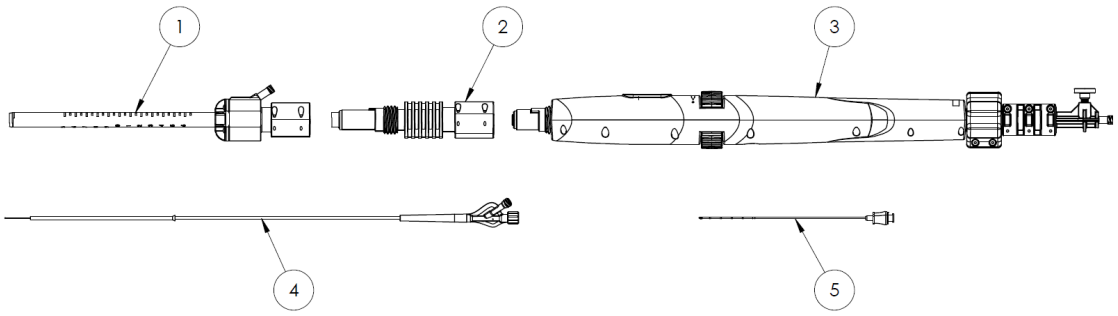


1. *Closed Cap*
2. *Centering Cap Assembly (Centering Cap, Centering Rod, Centering Cone, and Thumb Screw)*
3. *Loading Funnel*
4. *Loading Tube*
5. *Loading Handle*
6. *Tether Clip (not shown)*

1.2.2. Tendyne™ Delivery System

The Tendyne™ Delivery System (Figure 3) facilitates deployment of the valve. If necessary, the Delivery System can partially recapture and reposition the valve after full deployment. The Delivery System handle includes a Delivery Sheath, Loading Tube (packaged with the Loading System), Delivery Handle, Collapsible Dilator, and Introducer Needle.

Figure 3. Tendyne™ Delivery System

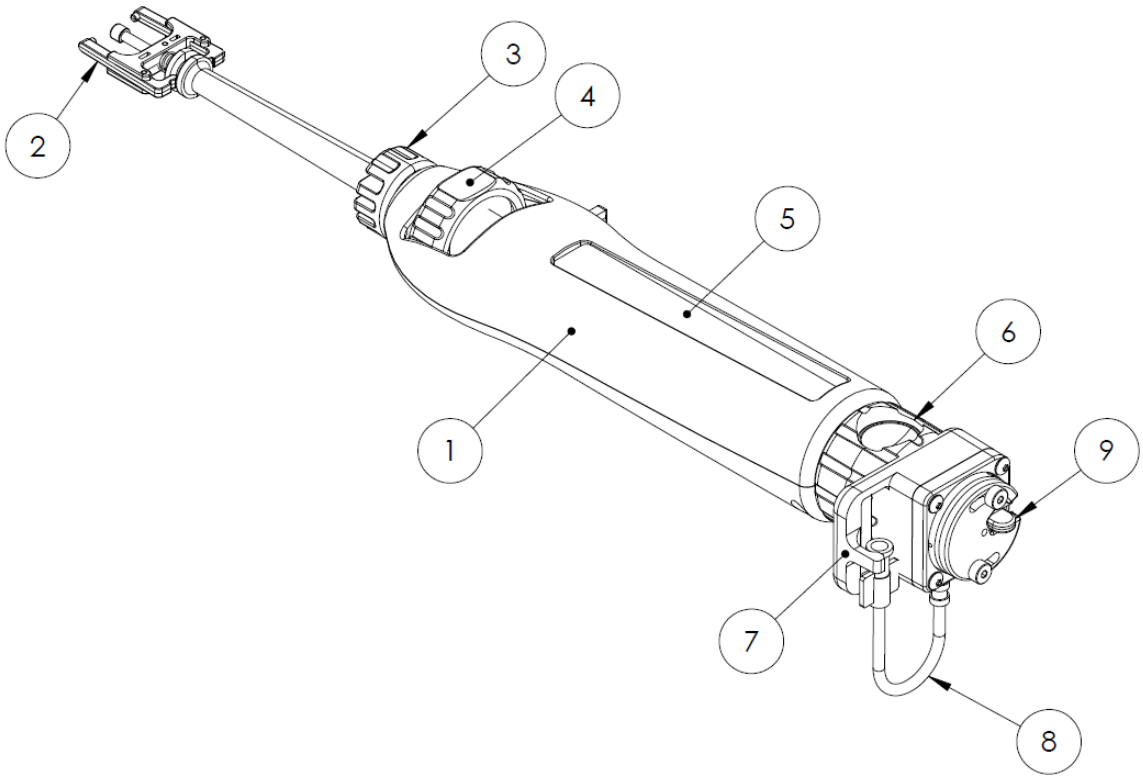


1. *Delivery Sheath*
2. *Loading Tube*
3. *Delivery Handle*
4. *Collapsible Dilator*
5. *Introducer Needle*

1.2.3. Tendyne™ Pad Positioning System

The Tendyne™ Pad Positioning System (Figure 4) fastens the Apical Pad to the braided tether at the epicardial surface. It employs a Tether Load System (TLS) that holds the tether securely with a pin while tension load is applied.

Figure 4. Tendyne™ Pad Positioning System

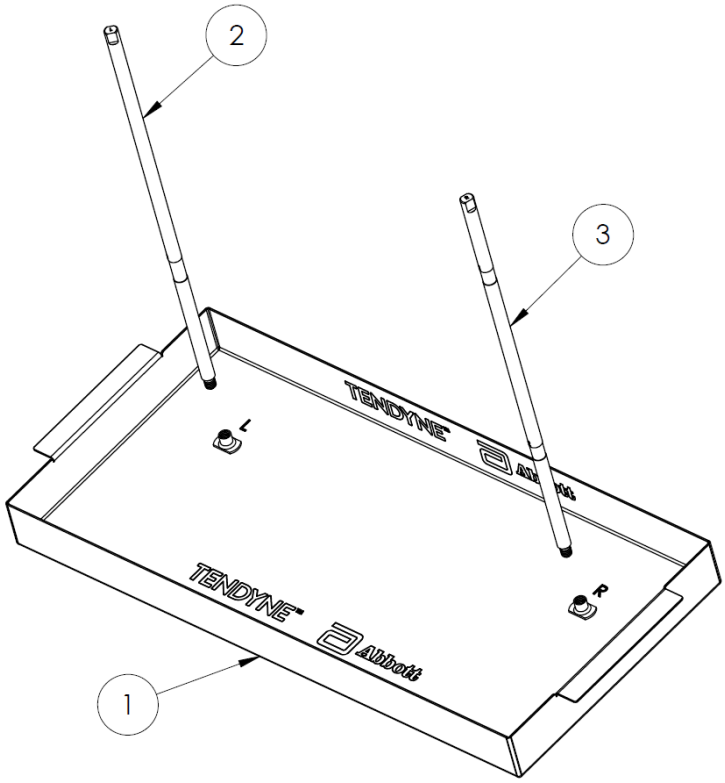


1. *Positioning Handle*
2. *Pad Arms*
3. *Pad Release Knob*
4. *Lock Wheel*
5. *Travel Indicator and Indicator Window*
6. *Lead Screw Release Knob and Button*
7. *Tether Load System (TLS)*
8. *Extension Tube*
9. *Pin*

1.2.4. Non-Sterile Reusable Components

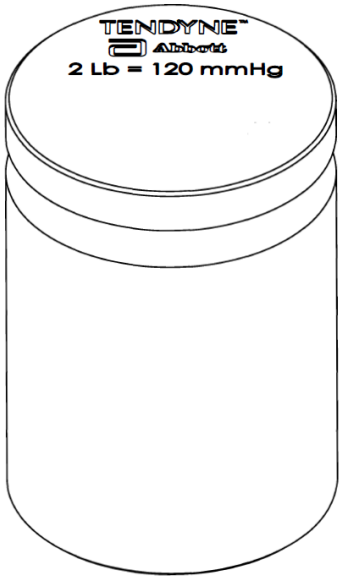
The Tendyne™ Stand and Tendyne™ Weight are provided non-sterile and are reusable. They must be cleaned and sterilized prior to each use. Follow the cleaning and sterilization instructions provided in Section 12.16.

Figure 5. Tendyne™ Loading Stand



1. *Loading Stand Base*
2. *Left Stand Post*
3. *Right Stand Post*

Figure 6. Tendyne™ Weight



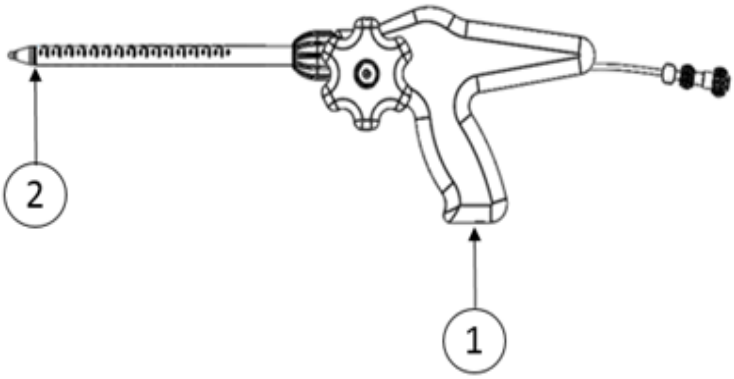
1.2.5. Tendyne™ Sterile Components

The following additional system components are provided sterile for use in conjunction with the Tendyne™ Transcatheter Mitral Valve System: Tendyne™ Stand Components (angled clip, rotating clip, rotating clip head, bottom loading clip, thumb screws), 1-way and 3-way stopcocks, hemostasis adapter, Tuohy-Borst valve, valve pocket air evacuation tube, tether flushing assembly, verification tether, tether clip, and pressure transducer.

1.3. Tendyne™ Retrieval System

The Tendyne™ Retrieval System (Figure 7) recaptures and collapses the valve for removal from the body during the procedure if the size or final position relative to the native annulus is suboptimal.

Figure 7. Tendyne™ Retrieval System



1. *Retrieval Handle*
2. *Dilator/Sheath*
3. *Tether Clip (not shown)*

2. Indications

The Tendyne™ Transcatheter Mitral Valve System (Tendyne™ System) is indicated for the treatment of symptomatic severe mitral valve dysfunction (moderate-to-severe or severe mitral regurgitation (MR), severe mitral stenosis (MS), or moderate MR with moderate or greater MS) associated with severe mitral annular calcification (MAC) in patients who are deemed unsuitable for mitral valve surgery or transcatheter edge-to-edge repair by a multidisciplinary heart team.

3. Contraindications

The Tendyne™ Transcatheter Mitral Valve System is contraindicated in patients with:

- anticoagulation/antiplatelet intolerance;
- sepsis or active endocarditis;
- evidence of left ventricular or left atrial thrombus at risk of embolization;
- a thin or fragile apex rendering the subject unsuitable for a transapical procedure; or
- untreatable hypersensitivity to nickel or titanium

4. Warnings

- The valve implant procedure should only be performed where emergency mitral valve surgery can be performed.
- All sterile supplied products are for single use only. Do not reuse, reprocess, or re-sterilize components that are provided sterile. Reuse, reprocessing, or re-sterilization of these components may compromise the structural integrity of the device and/or create a risk of contamination of the device, which could result in patient injury, illness, or death.
- Inspect all products prior to use. Do not use the valve or any component of the System if the seal or sterile barrier is compromised or if the product has been dropped, damaged, or mishandled in any way.
- Do not use if the 'Use By' date specified on the package has elapsed.
- Do not manipulate or handle the valve with sharp or pointed objects.
- If a valve is inserted into a patient and then retrieved, it may not be reused. Do not attempt to reload it on the same or any other Delivery System.

- Failure to properly clean and/or re-sterilize the reusable stand and reusable weight prior to use may result in infections, user injury, or patient injury (see instructions in Section 12.16).
- The Collapsible Dilator is coated with a hydrophilic coating at the distal end of the device for a length of 8.0 centimeters. Please refer to Section 12.6 for further information on how to prepare and use this device to ensure it performs as intended. Failure to abide by the warnings in this labeling might result in damage to the device coating, which may necessitate intervention or result in serious adverse events.
- Do not apply radial compression to the Retrieval System sheath within the 9 cm to 15 cm markings to prevent sheath damage during valve retrieval.
- Do not use or continue to use a Retrieval System with a damaged sheath.

5. Precautions

5.1. Pre-implantation Precautions

- Long-term durability has not been established for the Tendyne™ Mitral Valve. Regular medical follow-up is advised to evaluate valve performance.
- Safety and effectiveness of the Tendyne™ Mitral Valve has not been established for the following specific patient populations:
    - Patients with coronary artery disease requiring intervention
    - Patients with severe tricuspid regurgitation
    - Patients with tricuspid valve disease requiring surgery
    - Patients with severe right ventricular dysfunction
    - Patients with hypertrophic or restrictive cardiomyopathy
    - Patients who are pregnant or breastfeeding
    - Pediatric patients (less than 18 years of age)
- Pre-procedural planning, including transesophageal echocardiography and contrast-enhanced cardiac CT, should be performed to evaluate anatomic compatibility with the Tendyne™ prosthesis.
- Do not use the valve if there is any damage to the container (e.g., cracked jar or lid, leakage, broken or missing seals). Do not use the valve if the container is leaking or if the glutaraldehyde storage solution does not completely cover the valve.
- Do not freeze or expose to extreme heat. Check the temperature indicator prior to use. Do not use if the temperature indicator identifies exposure to a high or low temperature.
- The valve and the glutaraldehyde storage solution are sterile. The outside of the valve container is non-sterile and must not be placed in the sterile field.
- Exposure to glutaraldehyde may cause irritation of the skin, eyes, nose, and throat. Avoid prolonged or repeated exposure to the vapors. Use only with adequate ventilation. If skin contact occurs, immediately flush the affected area with water. In the event of eye contact, flush with water and seek medical attention immediately. For more information about glutaraldehyde exposure, request a Safety Data Sheet (SDS) from Abbott.
- Care should be exercised in patients with hypersensitivities or allergies to aldehyde, silicone, polymeric materials and/or contrast.
- Do not use the valve without thoroughly rinsing it, as directed. Adequate rinsing of the valve with sterile heparinized saline is mandatory before implantation (see instructions in Section 12.4).
- During rinsing, do not touch the leaflets or squeeze the valve.
- Do not expose the valve to solutions other than the storage and rinse solutions.
- Do not add antibiotics or any other substance (other than heparin) to either the storage or rinse solutions.
- Do not allow the valve to dry. Maintain tissue hydration with irrigation or immersion.
- If a valve is damaged during loading, do not use or attempt to repair it.

- Failure to properly clean and dry the reusable stand and reusable weight may lead to a reduction in device life. Do not use ultrasonic cleaning processes, steel wool, metallic wire brushes, pipe cleaners, or abrasive detergents. Do not use saline to clean or soak the device. Do not use chlorine bleach (see instructions in Section 12.16).

5.2. Implantation Precautions

- The valve is to be used in conjunction with the Tendyne™ Delivery and Retrieval Systems only.
- Do not introduce air into the System. Ensure that the components remain free of air by flushing with sterile saline.
- Do not deform the valve more than what is necessary for loading and implantation.
- Do not use Delivery System or Retrieval System components if they have been dropped, damaged, or mishandled in any way.
- Monitor valve position and performance if making induced volume or hemodynamic changes.

6. Magnetic Resonance (MR) Safety Information

6.1. MR Conditional

A patient with the Tendyne™ Mitral Valve may be safely scanned under the following conditions. Failure to follow these conditions may result in injury.

Device Name	Tendyne™ Mitral Valve
Static Magnetic Field Strength (B0)	1.5T or 3.0T
Maximum Spatial Field Gradient	≤40 T/m (4000 gauss/cm)
RF Excitation	Circularly Polarized (CP)
RF Transmit Coil Type	Body coil
Operating Mode	Normal Operating Mode
Maximum Whole Body SAR	2 W/kg (Normal Operating Mode)
Maximum Head SAR	N/A
Scan Duration	2 W/kg whole body average SAR for 15 minutes of continuous scanning
MR Image Artifact	The presence of this implant may produce image artifacts

7. Potential Adverse Events

Adverse events potentially associated with use of the Tendyne™ Transcatheter Mitral Valve System may include, but are not limited to, the following:

- Death
- Adverse foreign body response
- Adverse reaction to anesthesia
- Allergic reaction
- Anemia
- Annular dissection
- Aortic insufficiency
- Atrial or ventricular injury
- Atrial Septal Defect (resulting from transseptal mitral valvuloplasty, if performed)

- Bioprosthetic valve dysfunction
- Bleeding complications
- Blood loss which may require transfusion
- Cardiac arrest
- Cardiac perforation
- Conduction defect with or without need for pacemaker
- Cardiac arrhythmia, atrial or ventricular
- Damage to cardiac tissue and/or structures
- Decreased LV function and/or cardiac output
- Device embolism
- Device erosion, migration or malposition
- Device thrombosis
- Embolism (air, blood clot, calcium, tissue, etc.)
- Endocarditis
- Esophageal irritation, stricture, or perforation
- Fever
- Foreign body response
- Heart Failure, new or worsening
- Hematoma
- Hemolysis
- Hypotension
- Infection/Sepsis
- Leaflet, chordal, papillary or ventricular rupture (resulting from mitral valvuloplasty, if performed)
- Liver failure
- Mitral valve injury
- Mitral valve prolapse/stenosis
- Myocardial infarction
- Obstruction
- Pain
- Pleural effusion
- Pulmonary embolism
- Pulmonary hypertension
- Paravalvular leak
- Pericardial effusion/tamponade
- Renal insufficiency or failure
- Respiratory difficulty, insufficiency or failure
- Stroke or transient ischemic attack
- Tear or damage to device

- Vascular and access-related complications
- Worsening of mitral regurgitation

8. Patient Selection

Use standard imaging techniques such as Computed Tomography (CT) angiography and echocardiography to pre-operatively assess the patient's native mitral valve and left ventricular dimensions for valve sizing. Echocardiography imaging at the time of procedure should be compared with prior imaging for annular and left ventricular dimensions as a final confirmation for valve size selection. Once the patient's native mitral valve and left ventricular dimensions have been determined, refer to Table 1 for the list of available Tendyne™ valve sizes.

The assessment of patient suitability for the Tendyne™ Mitral Valve treatment and the determination of the valve model and size to implant shall be based on 3D modeling of the native mitral valve and the Left Ventricular Outflow Tract (LVOT) created by implant of the replacement valve.

NOTE: Pre-procedural imaging and evaluation of the patient's native mitral valve, underlying pathologic anatomy, and vessel locations at access site is essential. In addition, pre-operative CT reconstruction with appropriate valve size simulation for neo-LVOT area analysis is critical.

The assessment may determine that concomitant mitral annulus valvuloplasty be performed to ensure plaque mobility prior to valve implantation. In such cases, standard institutional techniques may be used.

Using the pre-operative imaging, it is recommended that the following conditions are met at both end-systole and end-diastole:

- A minimum neo-LVOT area of 250 mm^2,
- At least 5 mm distance from the Tendyne™ valve stem to the ventricular myocardium,
- The valve does not interfere with ventricular wall tissue,
- The ventricular access site does not approximate the coronary vessel anatomy or transverse the right ventricle,
- The native anterior mitral leaflet is not at risk for Systolic Anterior Motion (SAM) causing LVOT obstruction.

Additional evaluation may be required to confirm the following:

- For subjects with severely restricted or immobile leaflets, or MAC that may preclude full expansion off the Tendyne™ valve, confirm that balloon valvuloplasty can be performed to mobilize the leaflets or calcification and permit delivery sheath access through the mitral annulus.
- Pre-existing co-morbid conditions that increase the risk of poor initial results or the risk of emergency referral for surgery should be reviewed.

Carefully consider the risks and benefits for each patient before using the Tendyne™ Transcatheter Mitral Valve System.

9. Information to be Supplied To the Patient

9.1. Patient Registration

A medical device registration form and return envelope are included with each device. Complete the temporary identification card attached to the medical device registration form and provide it to the patient. After implantation, please complete all requested information and return the original form to Abbott Medical. A permanent implant card from Abbott will be mailed to the patient, encourage the patient to carry this card with them as much as possible.

9.2. Patient Counseling Information

Physicians should review the following information when counseling patients about the Tendyne™ Transcatheter Mitral Valve System:

- A detailed explanation of the procedure including the expected approach for medical management from the pre-procedure phase through to post-procedure care.[3]

[3] Duncan A, Dahle G, Conradi L, Dumonteil N, Wang J, Shah N, Sun B, Sorajja P, Ailawadi G, Rogers JH, Quarto C, and Bethea B. Multicenter Clinical Management Practice to Optimize Outcomes Following Tendyne Trancatheter Mitral Valve Replacement. Structural Heart 6 (2022); 1-4.

- The potential that if the patient's apical tissue is found not to be sufficiently robust for the procedure, or if an acceptable valve position cannot be achieved intra-procedurally, the valve may not be implanted, and the patient may be left untreated.
- The procedural risks associated with the Tendyne™ Transcatheter Mitral Valve System. Table 10lists the major events related to the device or procedure observed during the clinical study.
- The risks and benefits of long-term anticoagulant therapy or antiplatelet therapy. Long-term anticoagulation therapy, unless contraindicated, is recommended for all patients with bioprosthetic heart valves who have risk factors for thromboembolism.
- The recommendation for prophylaxis against infective endocarditis for patients with prosthetic heart valves. Patients with bioprostheses who undergo dental procedures that involve manipulation of gingival tissue or the periapical region of the teeth, or perforation of the oral mucosa should receive endocarditis prophylactic antibiotic therapy.
- Additional counseling information can be found in the patient brochure available through your Abbott Medical sales representative.

10. How Supplied

10.1. Sterile

The valve is supplied sterile and non-pyrogenic for single use only. The valve is sterilized with and stored in glutaraldehyde solution for preservation of porcine tissue components. The valve is supplied in a storage container with a screw cap closure and a tamper-evident seal.

The Apical Pad is supplied sterile and non-pyrogenic for single use only. The Apical Pad is sterilized with ethylene oxide gas.

The Tendyne™ Loading System, Tendyne™ Delivery System, Tendyne™ Pad Positioning System, and Tendyne™ Retrieval System are supplied sterile for single use only. They are sterilized with ethylene oxide gas.

System components provided sterile are single use only and include the Tendyne™ Stand Components (angled clip, rotating clip, rotating clip head, bottom loading clip, thumb screws), 1-way and 3-way stopcocks, hemostasis adapter, Tuohy- Borst valve, valve pocket de-air tube, tether flushing assembly, verification tether, tether clip, and pressure transducer. They are sterilized with ethylene oxide gas.

10.2. Non-Sterile

The Tendyne™ Stand and Tendyne™ Weight are provided non-sterile and are reusable. These components must be cleaned and sterilized prior to each use. Follow the cleaning and sterilization instructions provided in Section 12.16.

10.3. Storage

The Tendyne™ Mitral Valve, Apical Pad, Delivery System, Pad Positioning System, Retrieval System, Loading System, and Stand Components should be kept dry and away from sunlight.

Do not use the valve if the shipping temperature indicator has turned red or black, or if the valve has been improperly stored in temperature conditions outside of the 5°C (41°F) - 25°C (77°F) range.

CAUTION: Check the temperature indicator prior to use. Do not use if the temperature indicator identifies exposure to a high or low temperature.

Appropriate inventory control should be maintained so that Tendyne™ valves, Apical Pads, Delivery Systems and system components with earlier 'USE BY' dates are used preferentially.

11. Required Equipment (Not Provided)

- Standard cardiac catheterization lab equipment
- Transesophageal and transthoracic echocardiographic equipment
- Three (3) 1-Liter sterile rinsing basins
- Two (2) Liters heparinized saline
- Two (2) 1000 mL sterile saline bags with pressure infusion bag and IV pole
- Two (2) sterile IV tubing

- 20 – 35cc Luer-lock syringes
- 0.035 in. (0.89 mm) guidewire
- 8F introducer sheath, short length
- 7F or 8F single lumen balloon tip catheter compatible with 0.035 in. (0.89 mm) guidewire
- Hemodynamic system interface cable
- Long sterile probe cover
- Balloon inflation device
- Sterile towel
- Three (3) Serrated surgical clamp(s)
- 50 mL Contrast Dye

12. Operator's Instructions

12.1. Perform Visual Inspection

Prior to each use, perform the following inspection:

Ensure that the Stand Base and Stand Posts are free of damage. If damage is detected, do not use. Damage may include:

- Corrosion (rust)
- Stripped base or post threads
- Bent or misaligned posts
- Chips or cracks

Inspect the weight for evidence of damage or corrosion.

Check for missing components.

- Verify that both Left and Right Stand Post are present. Refer to Figure 5 - Tendyne™ Loading Stand

Verify that the Stand Base and Stand Posts are free of moisture. If moisture is found, do not use. Resterilize and use dry components.

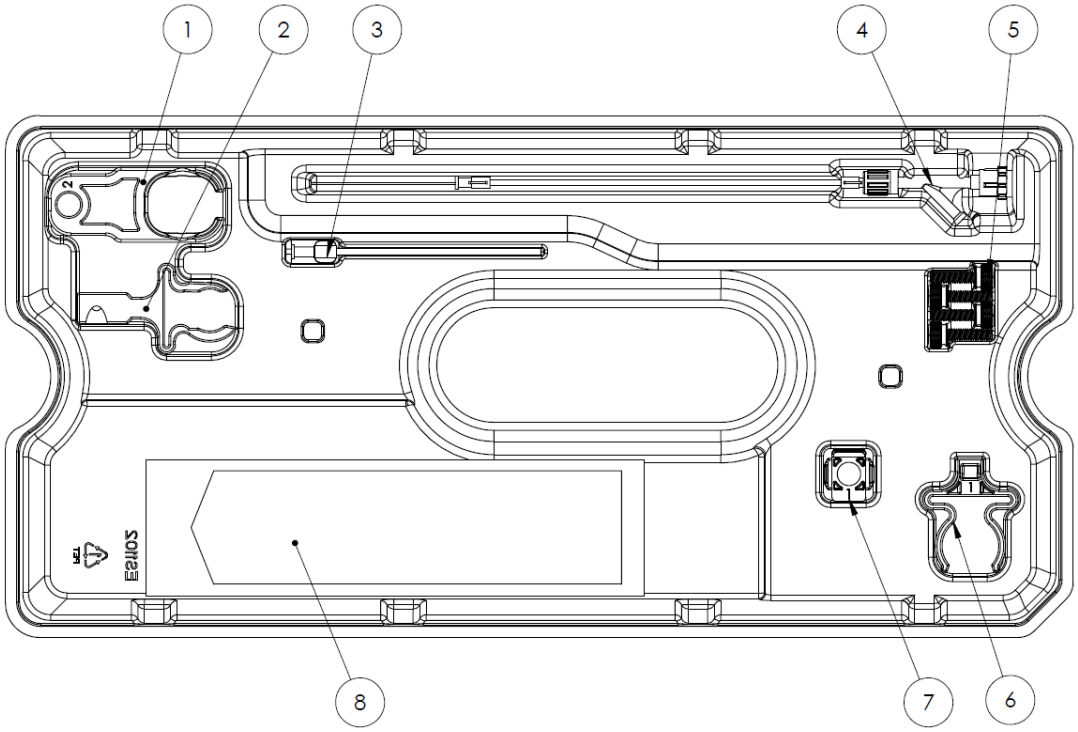
CAUTION: Do not use the valve if there is any sign of damage or deterioration.

12.2. Set up Loading Stand and Stand Components

Before use, clean and sterilize stand, posts and weight per step 9.16. Ensure that the Stand Base and Stand Posts are free of damage or corrosion. If damage or corrosion is detected, do not use.

1. Assemble the Stand by threading the Left Stand Post into the left post hole in the Stand Base and the Right Stand post into the right post hole.
2. Ensure that the Stand Posts are fully threaded into the post holes.
3. Remove sterile tray from Stand Components Package. Inspect components and remove from tray.

Figure 8. Tendyne™ Stand Components sterile tray component layout.



1. *Bottom Loading Clip – Clip 2*
2. *Angled Clip – Clip 3*
3. *De-air tube*
4. *Tether Flushing Assembly*
5. *Thumbscrews*
6. *Rotating Clip – Clip 1*
7. *Rotating Clip Head*
8. *Verification Tether*

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4. Attach the Rotating Clip – Clip 1 to the Rotating Clip Head using a thumb screw.
5. Attach remaining thumb screws to the Rotating Clip – Clip 1, Bottom Loading Clip – Clip 2 and the Angled Clip – Clip 3.
6. Attach Bottom Loading Clip – Clip 2 to the Right Stand Post and align with the lower groove marked 2. Attach the Rotating Clip – Clip 1 assembly to the Right Stand Post at the upper groove marked 1. Attach the Angled Clip – Clip 3 to the Left Stand Post at the groove marked 3.
   NOTE: Install the clips with the numbers and tether grooves facing upward.
7. Line the clips up with the respective numbering and circumferential grooves on the stand posts.

12.3. Removing the Valve from the Storage Container

Do not open the valve package until implantation and sizing are certain.

WARNING: Do not use the valve if the tamper-evident seal is damaged, broken, or missing, or if fluid is leaking from the jar.

1. Assure that the labeling on the valve container indicates the proper valve model selected for the case.

2. Using blunt-nosed sterile forceps, carefully remove the valve holder from the jar. Use the designated tab on the valve holder.

   CAUTION: Do not place the non-sterile exterior of the jar containing the valve in the sterile field.

3. Carefully cut the stay suture and grasp the valve at the cuff. Remove the valve from the holder.

   CAUTION: Manage tether and leader to assure they remain sterile.

4. Drain the valve completely.
5. Carefully inspect the valve.

   CAUTION: Do not use the valve if there is any sign of damage or deterioration.

12.4. Rinsing the Valve

Follow sterile technique during valve preparation and implantation.

1. On a table within the sterile field, prepare three (3) sterile basins for rinsing the valve, each with 600-800 mL of sterile heparinized saline (1000 units/L).

   CAUTION: Do not add any other solutions, drugs, chemicals, or antibiotics to the rinse solution, as irreparable damage to the leaflet tissue, which may not be apparent under visual inspection, may result.

2. Fully immerse the valve in the heparinized saline solution in the first basin and rinse the valve for two (2) minutes.
3. Use a 20-35 mL syringe to perform a 20 mL flush of each of the three (3) leaflet pockets to remove residual glutaraldehyde.

   CAUTION: Do not touch the leaflets or squeeze the valve during rinsing.

4. Transfer the valve to the second basin and rinse the valve for a second time for two minutes.
5. Perform another 20 mL flush of each of the three (3) leaflet pockets.
6. Transfer the valve to the third basin and rinse the valve for a third time for two minutes.
7. Perform another 20 mL flush of each of the three (3) leaflet pockets.
8. Flush the braided tether thoroughly to remove residual glutaraldehyde.
9. Insert the tether leader into the Tuohy-Borst valve on the tether flushing assembly until the end abuts the valve stem. Close the Tuohy-Borst valve.
10. Attach a 20-35 mL syringe to the Y-connector and aspirate the air from the tether.
11. Perform a forward and backward flush of the tether three (3) times or until no air bubbles are identified exiting the tether flushing assembly. Loosen Tuohy-Borst valve and remove tether and leader from tether flushing assembly.
12. After rinsing, leave the valve fully immersed in the third basin until it is ready to be loaded.

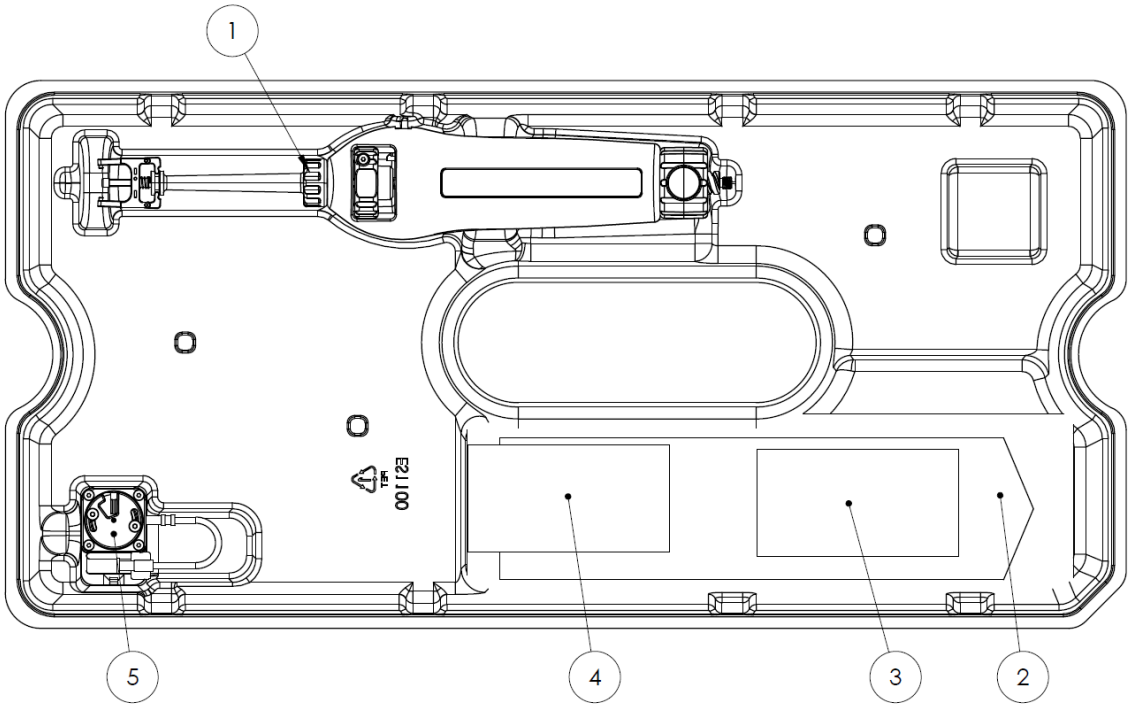
    CAUTION: The valve should be kept hydrated throughout the rest of the preparation procedure to prevent the tissue from drying.

    WARNING: Throughout preparation of the components, remove air using syringes, stopcocks, and flushing with positive pressure saline as needed. It is imperative that all components be purged of air to prevent introducing air emboli into the heart.

12.5. Preparing the Pad Positioning System

1. Place sterile weight on table. Inspect for evidence of damage or corrosion. If damage or corrosion is detected, do not use.
2. Assure that the labeling on the pouch indicates the Apical Pad model that is selected for the case. Remove jar containing Apical Pad from sterile pouch. Open jar and inspect Apical Pad. Do not use if damage is detected.
3. Remove sterile tray from Tendyne™ Pad Positioning System package. Assemble components on sterile table.

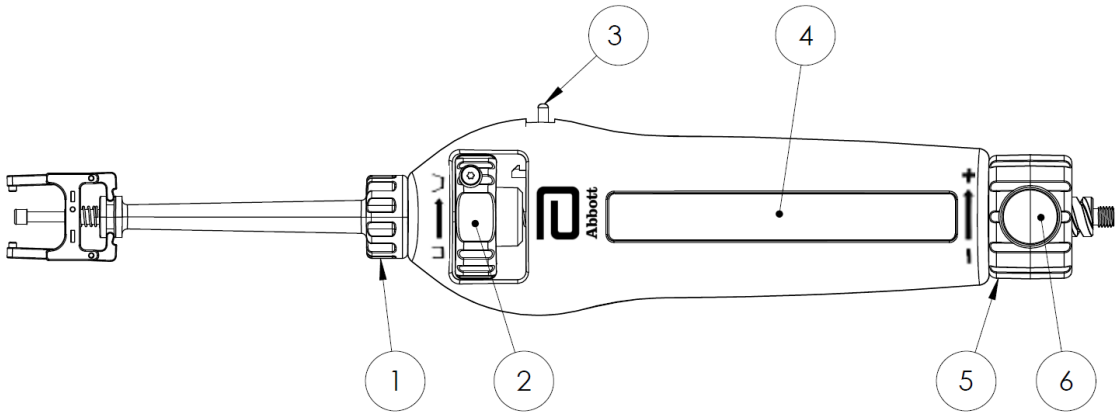
Figure 9. Tendyne™ Pad Positioning System sterile tray component layout



1. *Positioning Handle*
2. *Pressure Transducer*
3. *3-way Stopcock*
4. *1-way Stopcock*
5. *Tether Load System (TLS)*

4. With the Release Button on the Lead Screw Knob fully depressed, set the indicator to “15” relative to the printed scale on the Indicator Window.

Figure 10. Positioning Handle knobs and actuators.



1. *Pad Release Knob*
2. *Lock Wheel*
3. *Lock Wheel Release Button*
4. *Indicator Window*
5. *Lead Screw Knob*
6. *Lead Screw Release Button*

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5. Rotate the Pad Release Knob to open the arms.
6. Attach the Apical Pad with the hole in the outer ring of the Apical Pad facing up.
7. Rotate the Pad Release Knob in the opposite direction to close the arms and secure the Apical Pad onto the Positioning Handle.
8. Advance the pin cam to the opening on the Apical Pad by activating the Lock Wheel Release Button and ensuring that the "D" shaped pin cam engages with the opening.
9. Check pin cam movement by rotating the Lock Wheel to the full lock position and back to the full unlocked position.
10. Attach a 20-35mL syringe filled with 10 mL of sterile saline to the Tether Load System (TLS).
11. With the syringe positioned vertically above the TLS, pull vacuum to evacuate air, then push fluid into the System.
12. Repeat this process until minimal bubbles are observed. Remove syringe from TLS.
13. Attach the pressure transducer to the extension tube on the TLS. Align the Pressure Transducer to the holder without twisting the pressure tube. Do not clip into the holder.
14. Attach the 1-way stopcock onto the Pressure Transducer. Re-attach the syringe to the 1-way stopcock.
15. Hold the System vertically and repeat the air evacuation procedure.
16. Once air is evacuated, slightly pressurize the System, lock the 1-way stopcock, and then remove the syringe.

    CAUTION: Do not over pressurize the TLS. Very little pressure is needed.

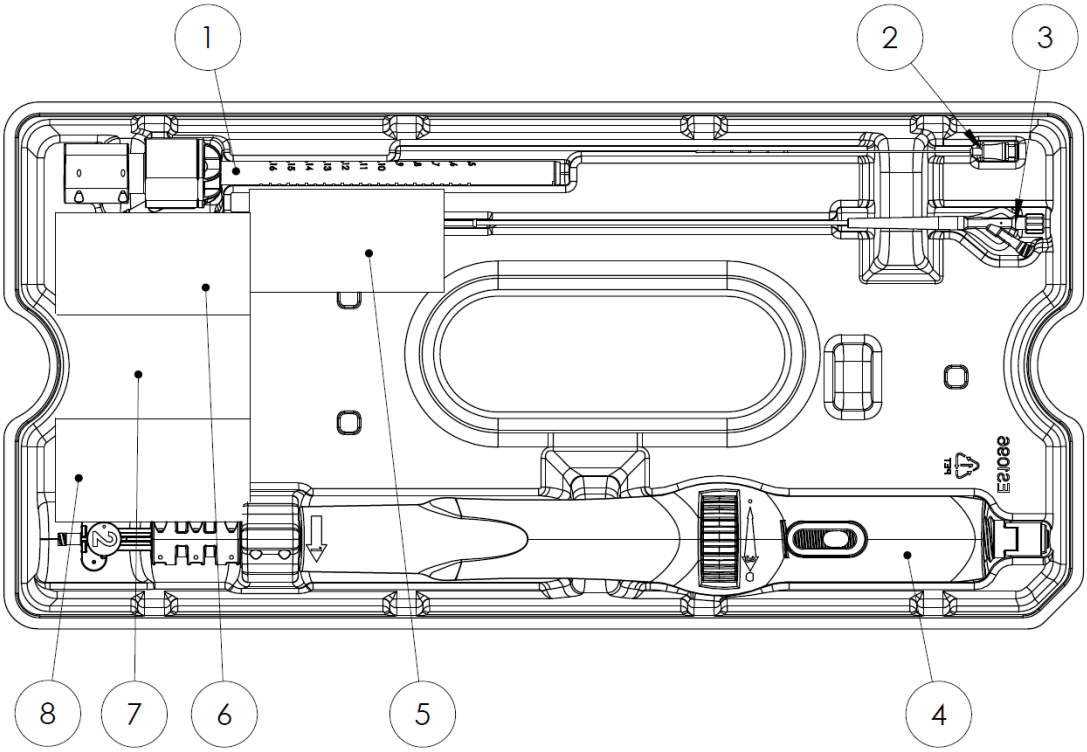
17. Clip the Pressure Transducer into the holder and place the System on a level surface. Connect Pressure Transducer cable to interconnect cable.
18. Open the 1-way stopcock to atmosphere and zero.
19. After the System is zeroed, close the 1-way stopcock.
20. Verify prep by attaching the weight to the TLS using the Verification Tether. Place loop of the Verification Tether around groove in the 2 lb. Weight and tighten. Insert the leader of the Verification Tether through the threaded hole on the bottom of the TLS until the tether braid is clear of the TLS. Slide tab on the TLS Pin to pin the tether braid. Holding the TLS from the bottom surface, lift until the weight is clear of the table.
    If weight does not verify an acceptable signal, repeat steps 7 to 12 once. If weight does not verify an acceptable signal after a second evacuation, discard unit start with a new System.
    2 lb. weight – pressure monitor 120 mmHg (±15 mmHg)
21. Remove the Verification Tether by retracting the slide tab to release the TLS Pin and pull the Verification Tether through the TLS, and attach the TLS to the Positioning Handle.

CAUTION: Ensure the TLS Pin is not engaged after the TLS has been attached to the Positioning Handle. If the TLS Pin is engaged, it may interfere with the nitinol leader joint and could result in damage to the Pin.

12.6. Preparing the Delivery System Handle and Collapsible Dilator

1. Remove sterile tray from Delivery System packaging. Inspect and remove contents to sterile table.

Figure 11. Tendyne™ Delivery sterile tray component layout



1. *Delivery Sheath*
2. *Introducer Needle*
3. *Collapsible Dilator*
4. *Delivery Handle*
5. *Hemostasis Valve Adapter*
6. *Tuohy-Borst with extension*
7. *1-way Stopcock*
8. *3-way Stopcock*

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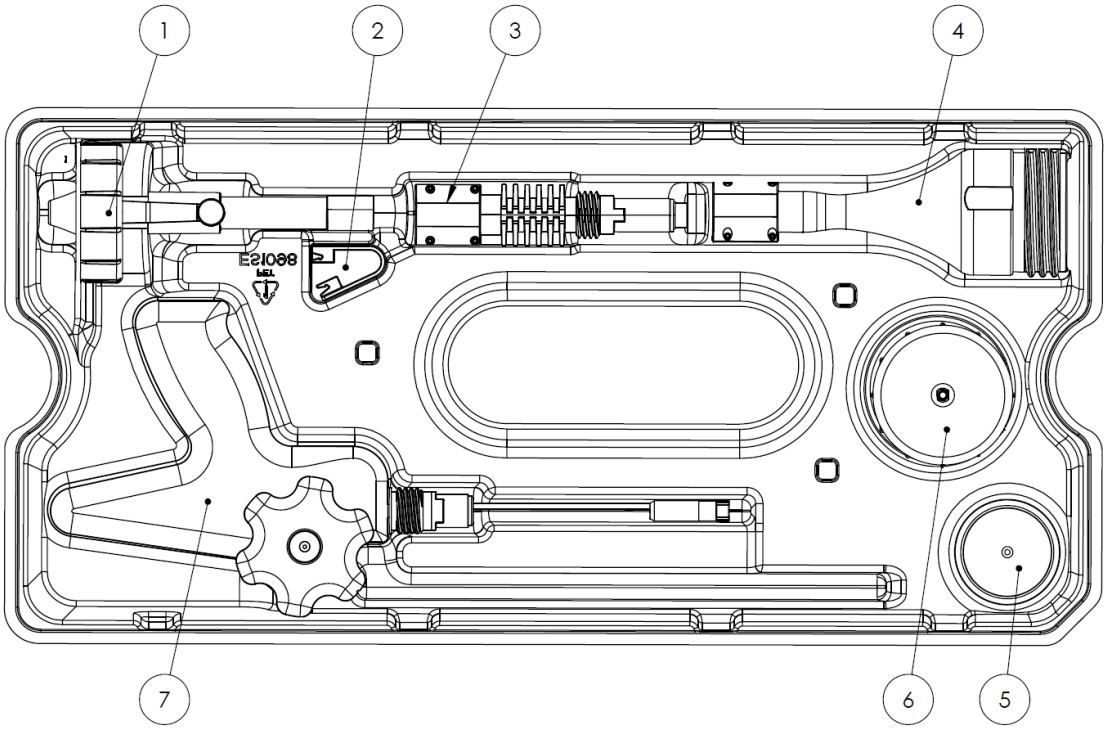
2. Attach the Hemostasis Valve to the Delivery Sheath side port.
3. Attach a 3-way stopcock to the Collapsible Dilator hub.
4. Carefully remove the protector from the Collapsible Dilator.
5. Prepare diluted contrast solution (30/70 contrast/saline).
6. Fill a balloon inflation device with at least 5-10 ml of the contrast solution.
7. Attach the balloon inflation device to the 3-way stopcock.
8. Using standard balloon preparation techniques, prepare the Collapsible Dilator to remove air and close the 3-way stopcock.
9. Refill the inflation device with 20 ml of contrast solution.
10. Insert the Collapsible Dilator into the Hemostasis Valve on the Delivery Sheath until the strain relief on the Collapsible Dilator hub abuts the Hemostasis Valve housing.

12.7. Preparing the Loading System

1. Remove sterile tray from Loading System Package. Inspect components and remove from tray.

Figure 12. Tendyne™ Loading System sterile tray component layout.



1. *Centering Cap Assembly*
2. *Tether Clip*
3. *Loading Tube*
4. *Loading Funnel*
5. *Small Centering Cone (for loading Tendyne™ Mitral Valve LP only)*
6. *Closed Cap*
7. *Loading Handle*
8. *1-way Stopcock (not shown)*
9. *3-way Stopcock (not shown)*
10. *Tuohy-Borst with extension (not shown)*

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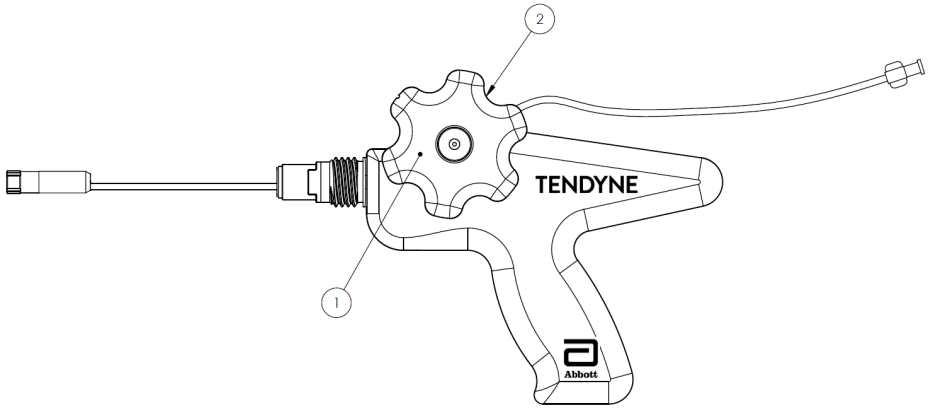
2. Attach the Loading Tube to the Loading Funnel. Ensure the Loading Tube black indicator and Funnel cutout indicator are aligned. Ensure the interfacing keys are aligned and the interfacing O-ring is fully seated.
3. Feed the tether through the Loading Funnel and Loading Tube until the valve is seated inside the Loading Funnel. Approximately align the anterior aspect of the valve cuff (raised portion) to the Loading Funnel cutout (Figure 13).
4. Attach the Closed Cap onto Loading Funnel.
5. Attach the Closed Cap to a 1-way stopcock.
6. Mount the Loading Funnel, Loading Tube, and Closed Cap into the stand clips oriented with the Closed Cap down (in Bottom Loading Clip – Clip 2) and the Loading Tube up (in Rotating Clip – Clip 1). Make sure that the black alignment indicators are visible.
7. Hang a 1000 mL saline bag pressurized to 150-250 mmHg and attach the fluid line to the Closed Cap/1-way stopcock assembly. Make sure that all luer connections are tight and secure.

8. Fill the assembly with saline up to a level even with the open end of the Loading Tube and shut the 1-way stopcock.
9. Tap the Loading Funnel and Loading Tube to remove any air bubbles behind the valve.
10. Attach a Tuohy-Borst with extension to the Loading Handle Extension Tube, then attach a 3-way stopcock to the side port tubing luer on the Tuohy-Borst valve.

Figure 13. Tendyne™ Loading Handle



1. *Loading Handle Knob*
2. *Knob Retention Thumb Screw (not shown, behind Loading Handle Knob)*

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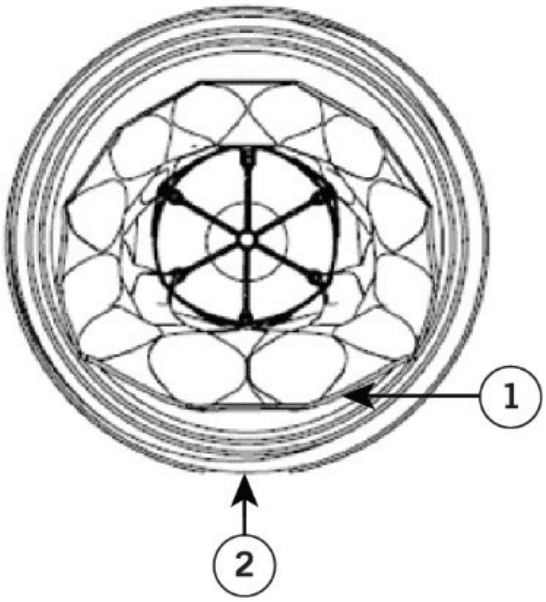
11. Verify that the line on the Loading Handle Knob and the line on the Loading Handle are aligned. The Loading Handle Knob can be rotated until the two (2) are aligned.
12. Assure that the Tuohy-Borst valve is open. If closed, turn the rotator in the counter-clockwise direction to open the valve.
13. Thread the tether through the Loading Handle, ensuring the side of the Loading Handle with the knob is aligned with the black indicator line on the Loading Tube.
14. Attach the Loading Handle to Loading Tube.
15. Use the saline bag to continue filling the remainder of the Loading System until saline exits the Loading Handle Extension Tube and fittings. If leaks are observed, reconfirm keying of Loading Handle.
16. Close the Tuohy-Borst valve and all stopcocks.
17. Turn off the flush and remove the saline line from the Closed Cap/1-way stopcock assembly.
18. Invert Loading System and secure to the stand by securing the Loading Tube into the Rotating Clip – Clip 1 and Loading Handle into the Bottom Loading Clip – Clip 2.
19. Remove Closed Cap from assembly.
20. Place the Tether Clip onto the tether leader at the end of the Tuohy-Borst valve.
21. Apply tension to the tether leader and slide the Tether Clip into contact with the Tuohy-Borst valve.
22. Use syringe with de-air (air evacuation) tube to remove air from the valve pockets.

CAUTION: Do not damage the pocket fabric or the leaflets.

23. Align the anterior aspect of the valve cuff (raised portion) to the Loading Funnel cutout (Figure 14).

Figure 14. Top down view of valve in Loading Funnel



1. *Raised portion of valve*
2. *Funnel Cutout*

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24. If a Tendyne™ Mitral Valve LP is being loaded, replace the Centering Cone and attach the Small Inner Centering Cone to the Centering Rod.
    If a standard Tendyne™ Mitral Valve is being loaded, do not replace the Centering Cone. Screw the Centering Cap assembly onto the Loading Funnel with the Centering Cone fully retracted, then, while holding the Centering Rod loosen the thumb screw and gently lower the Centering Cone in contact with the valve.

12.8. Loading the Valve

1. Rotate the Loading Handle Knob counterclockwise to compress the valve into the Loading Tube.
2. Ensure the Centering Cone supports the valve as it is compressed by gently applying force to the Centering Rod until the rod reaches its stop, and then tighten the thumb screw.
3. Continue rotating the Loading Handle Knob until the stop is reached and the valve is fully loaded.

   CAUTION: Note time upon completion of this step. Do not keep the valve loaded in the Loading Tube longer than 15 minutes. If the valve is in the Loading Tube longer than 15 minutes, discard the valve and prepare a new valve.

4. Confirm that the tether leader connection is still visible in the Loading Handle extension tube.

   CAUTION: If the tether leader is not visible in the Loading Handle extension tube when the valve is fully loaded, discard the valve and prepare a new valve.

5. Remove Centering Cap assembly. Place Closed Cap on Loading Funnel.

12.9. Moving the Loading Tube to the Delivery System Handle

1. Remove the Loading Funnel from the Loading Tube by unthreading the Loading Funnel collet connecting the Loading Funnel to the Loading Tube.
2. Turn the Loading Funnel to the side and keep the funnel over the Loading Stand Base to control saline spillage.
3. Ensure the Delivery Sheath side port aligns with the Loading Tube black mark and attach the sheath to the Loading Tube by tightening the collet.

4. Attach saline line to the Hemostasis Adapter on the Sheath Side Port.
5. Fill the sheath with saline.

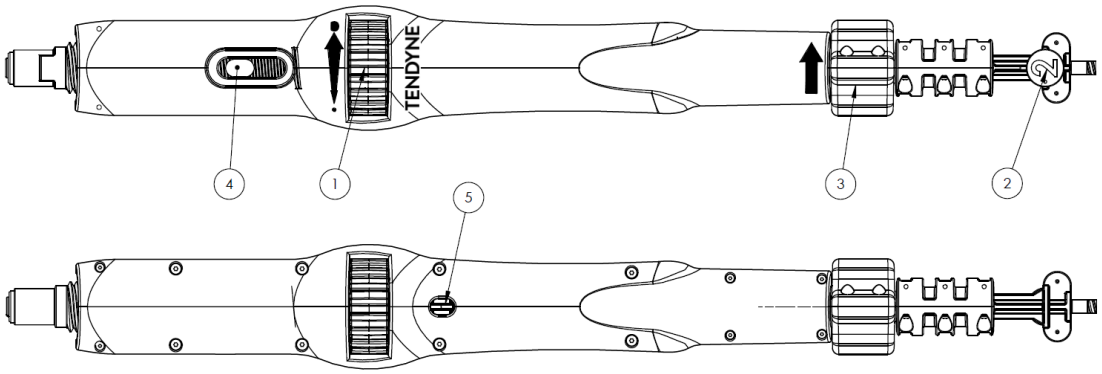
   NOTE: Do not turn off the saline flush to the sheath side port.

6. Inflate the collapsible dilator to 4-5 atm to seal off the end of the sheath, while continuing to flush through the sheath side port.
7. Close all stopcocks to turn off the flush.
8. Place the sheath and Loading Tube assembly into the Angled Clip – Clip 3.
9. Remove the tether clip and loosen the Tuohy-Borst valve.
10. Pull the Loading Handle Knob to disengage while turning the knob clockwise one complete rotation. Remove the Knob Retention Thumb Screw and remove the Loading Handle Knob from the Loading Handle.
11. Pull the tether until taut, loosen the Loading Tube collet, and then remove the Loading Handle.
12. Alternate pulling the leader and handle to fully remove tether and prevent entanglement.

    NOTE: Verify the tether is not tangled by looking through the opening where the knob was removed on the Loading Handle.

13. Tap the sheath and Loading Tube to remove any air bubbles that may reside behind the valve after loading. The flush may also be turned on and off during this step to replace any saline lost during Loading Handle removal.

Figure 15. Tendyne™ Delivery System. Upper image: top view. Lower image: bottom view



1. *Sheath Retraction Knob – Knob 3*
2. *Tether Retention Knob – Knob 2*
3. *Delivery Push Knob – Knob 1*
4. *Top Alignment Window*
5. *Bottom Alignment Window*

14. Confirm the sheath retraction mechanism of the Delivery Handle is properly positioned by checking the Bottom Alignment Window to assure that the tab is centered. Adjust travel using the Sheath Retraction Knob – Knob 3 if necessary.
15. Confirm the Delivery Push Knob – Knob 1 is fully rotated counterclockwise.

    NOTE: Do not over rotate and damage the mechanism.

16. Attach a Tuohy-Borst with side extension to the luer connector on the proximal end of the Delivery Handle and then attach a 1-way stopcock to the Extension Tube on the Tuohy-Borst valve.
17. Ensure that the Tuohy-Borst valve is open.
    Carefully inspect the valve assembly at the braided tether to nitinol leader joint and verify that there is no evidence of damage.

    CAUTION: Do not use the valve if there is any sign of damage or deterioration.

18. Feed the tether through the Delivery Handle until the tether leader exits the hub of the Delivery Handle and Tuohy-Borst valve.

19. Maintain tension on the tether and attach the Delivery Handle to the Loading Tube, ensuring the Delivery Handle is in proper alignment with the Loading Tube. Clip one end of the Delivery Handle into Rotating Clip – Clip 1.
    The black indicator on the Loading Tube should align with the Top Alignment Window.
20. Place the tether leader into the retention openings on the hub of the Delivery Handle.

    NOTE: Four (4) to six (6) inches (10 to 15 centimeters) of leader should be in the hub for retention.

21. Make sure that all luer connections are tight and secure. Flush the Delivery Handle with saline until saline exits the Tuohy-Borst valve and 1-way stopcock. Close the Tuohy-Borst valve and the 1-way stopcock.
22. Remove the shipping mandrel from the collapsible dilator and flush the dilator lumen with sterile saline
23. Verify the Tether Retention Knob – Knob 2 is not engaged with the tether leader.

12.10. Preparing for the Transapical Procedure

The valve should be implanted with sterile technique using primarily transesophageal echocardiographic guidance. In addition, transthoracic echocardiographic and fluoroscopic imaging modalities may be used.

CAUTION: Only physicians who have undergone training on use of the Tendyne™ Transcatheter Mitral Valve System should operate this product.

1. Prepare the thoracic access site using standard practice.
2. Determine the proper trajectory from the ventricular myocardium to the mitral valve using echocardiography guidance. Confirm the patient does not have a thin or fragile apex rendering the patient unsuitable for a transapical procedure.
3. Determine proper apical access site using transesophageal echocardiography. Puncture the myocardium with the introducer needle and insert a standard 0.035 in. (0.89 mm) guide wire. With wire in the left ventricle, remove introducer needle.

   WARNING: Do not attempt to re-insert a partially or completely withdrawn needle.

4. Insert an 8F sheath into the left ventricle and remove dilator. Insert a balloon tip catheter over the wire and through the sheath into the left ventricle. Using the inflated balloon, establish an entanglement free pathway from the ventricular access site to the left atrium leading with the inflated balloon tip catheter.
5. Advance the guide wire across the mitral valve and into the left atrium. Deflate the balloon and remove the balloon tipped catheter from the sheath off the wire. Remove the sheath from the heart and off the wire. Maintain wire position in the left atrium.

12.11. Deploying the Valve

1. Run a continuous saline flush through the Delivery Handle. Confirm that the pressure is between 150-250 mmHg.
2. Insert the collapsible dilator and sheath through the myocardium over the 0.035 in. (0.89 mm) guide wire.
3. Advance the Delivery Handle using echocardiography and fluoroscopy guidance to maintain proper trajectory and to confirm final sheath depth is above the mitral annulus.

   CAUTION: Maintain end of sheath approximately 1 centimeter (cm) above mitral annulus to ensure device does not interact with atrial wall.

4. Deflate the collapsible dilator for at least 5 seconds and remove. If resistance is encountered, confirm the dilator has fully deflated. Remove the 0.035 in. guidewire from the heart through the hemostasis valve.
5. Stop the flush and evacuate air from the sheath through the hemostasis adapter side port.
6. Restart flush.
7. Rotate the Delivery Push Knob – Knob 1 on the Delivery Handle in the direction indicated by the arrows to push the valve out of the Loading Tube into the sheath.
8. Continue rotating Delivery Push Knob – Knob 1 until the indicator line is seen in the Top Alignment Window, indicating that the valve is at the end of the sheath.
   Confirm on echo that the valve is at the end of the sheath.
9. Turn off the flush.
10. Pull the tether taut and tighten the Tether Retention Knob - Knob 2 at the end of the Delivery Handle to secure the tether leader. Use fingertips only. Do not overtighten.
11. Ensure the tip of the sheath is at the level of the mitral annular plane.
12. Rotate Sheath Retraction Knob – Knob 3 in the direction indicated by the arrows to retract the sheath and initiate valve deployment.

    CAUTION: Ensure that Delivery Push Knob – Knob 1 does not rotate.

12.12. Orienting the Valve

A radiopaque marker on the valve at A1 can be visualized under fluoroscopy to confirm orientation of the valve. The valve outer-frame cuff is raised along the anterior aspect and is referred to as the A2 region.

1. Ensure that the valve is at the level of the mitral annulus and that the cuff has been deployed a sufficient amount to correctly identify the orientation of the valve A2 cuff (see Figure 1).
2. Confirm with echocardiography that the valve is oriented correctly, ensuring that the raised anterior aspect (straight segment of the valve) is radially oriented toward the aortomitral continuity.
   Fluoroscopy may also be used to confirm orientation, using pre- determined projection angles from pre-operative CT scan and properly aligning the A1 (see Figure 1) radiopaque marker on the valve.
3. Continue to rotate Sheath Retraction Knob – Knob 3 in the direction of the arrow until a hard stop.
4. Rotate Delivery Push Knob – Knob 1 in the direction opposite the indicator arrow one-half turn to deploy the valve fully.
5. If the valve needs to be repositioned, use the Delivery Handle to recapture the valve stem and nitinol struts by rotating the Sheath Retraction Knob – Knob 3 in the direction of the indicator arrows.

   CAUTION: Confirm native leaflets are not captured between the sheath and valve.

6. Once recaptured, push the valve into the left atrium, reorient radially as needed, re-orient axially within the annulus and redeploy by rotating Retraction Knob – Knob 3 in the direction of the indicator arrows.

   CAUTION: Do not recapture and redeploy the valve more than five (5) times.

7. Remove tether leader from the holder. Manually grasp the tether leader, then loosen the Tuohy-Borst valve and Tether Retention Knob – Knob 2.
8. Remove Delivery Handle while maintaining tether tension.

   CAUTION: Maintain tether leader tension.

12.13. Securing the Tether

1. Confirm the Apical Pad is attached to the Positioning Handle.
2. Thread the Apical Pad and Positioning Handle over the tether and advance it until the Tether Marker exits the TLS.
3. Engage the pin on the TLS with the tether marker flush to the surface of the TLS.
4. Depress the Release Button (tensioning dial button) on the Lead Screw Knob (tensioning dial) to advance the Apical Pad to the myocardium while confirming the Apical Pad Stem enters the myocardium. Maintain tension on the System to keep the valve seated in the annulus.
5. Assure that no objects (i.e., suture lines) are trapped between the myocardium and the Pad before beginning the final tightening of the Apical Pad.
6. Use the Lead Screw Knob to adjust tether tension to attain proper seating of the valve.
   Refer to Appendix A for tether load tensions based on the patient's hemodynamic conditions.
7. Use echocardiography to evaluate valve performance and position, ensuring valve is well seated within the mitral annulus without paravalvular leak or central mitral regurgitation. Check the physiologic trans-mitral and LVOT gradients.
   If optimal performance is not achieved and valve retrieval or tension adjustment is desired, do not trim tether. Refer to Section 12.14 for retrieval procedures.
8. Fasten the Apical Pad using the Lock Wheel – Center Knob to pin the tether.
   Confirm the two (2) alignment holes on the Apical Pad are aligned as visual confirmation that the Apical Pad is secured to the tether.
9. Disengage the pin at the TLS to free the tether.
10. Turn the Pad Release Knob to release the arms and detach the Apical Pad.
11. Remove the Positioning Handle.
12. After optimal valve orientation and seating is confirmed, trim the tether to approximately 5 centimeters (cm). The Tendyne™ Valve cannot be repositioned or retrieved with the Tendyne™ System after trimming of the tether; therefore, careful assessment of valve orientation and seating prior to trimming the tether is advised to mitigate the risk of paravalvular leak or LVOT obstruction resulting from suboptimal valve position. If valve position is not optimal, the valve may be retrieved prior to cutting the tether per Section 12.14.
13. Close the surgical incision using standard practice.

12.14. Retrieving the Valve with the Retrieval System (if required)

NOTE: Retrieval can only be accomplished intraoperatively, prior to trimming the tether.

If the Apical Pad is present, first remove the Apical Pad using the pad positioning System.

Follow these steps if the Apical Pad has been pinned to the tether:

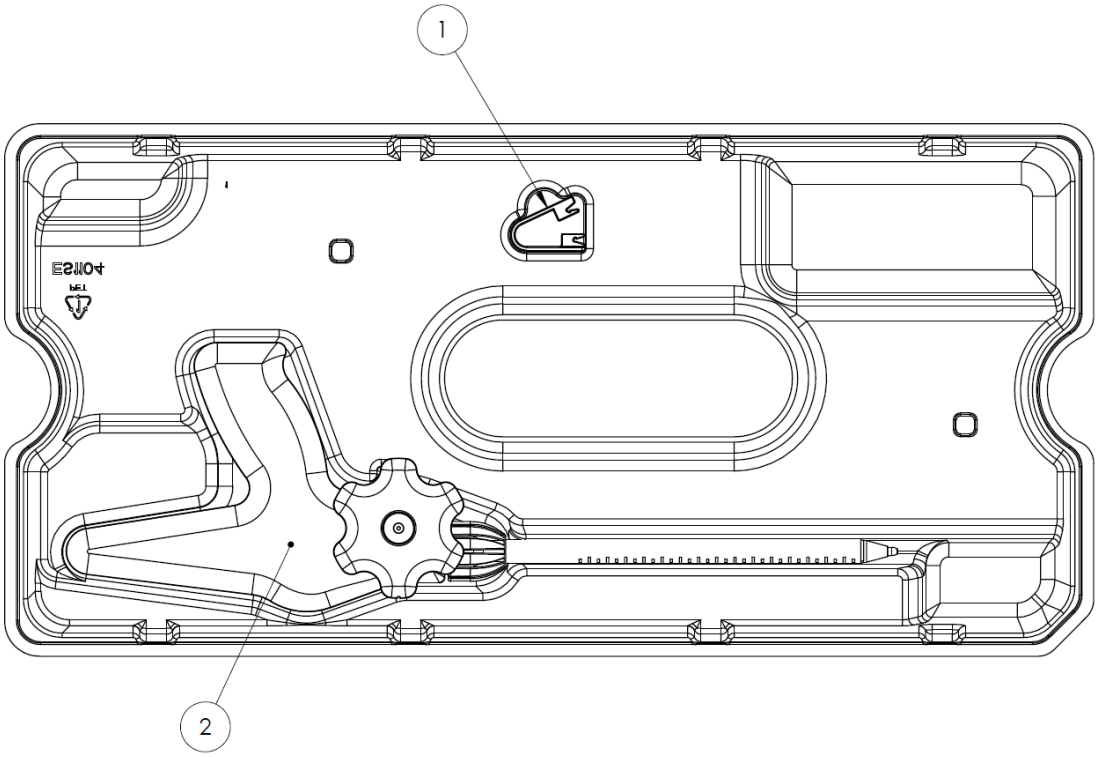
1. Load the Positioning Handle over the tether and advance it up to the Apical Pad.
2. Turn the Pad Release Knob to engage the arms with the Apical Pad. Ensure that the D-shaped drive feature is engaged with the D-shaped pocket on the Apical Pad.
3. Maintain tether tension and use the lock wheel to unpin the tether and remove the Apical Pad.

CAUTION: Do not lose tether tension.

12.14.1. Retrieval System Device Preparation

1. Inspect sterile tray for damage.
2. Using standard surgical aseptic (sterile) technique, remove sterile tray with device and transfer to the sterile field.
3. Remove device and device components from packaging.

Figure 16. Tendyne™ Retrieval System



1. *Tether Clip*
2. *Retrieval Handle*

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4. Inspect device for damage.
5. Verify that the indicator lines on the Retrieval Knob and Retrieval Handle are aligned.
6. Attach the Tuohy-Borst valve assembly to the luer connection of the Retrieval System.
7. Attach a three-way stopcock to the luer of the Tuohy-Borst valve assembly.
8. Place the Retrieval System within Stand Clips (1 and 2) of the Right Stand Post while positioning the tip of the Retrieval System in an upward/vertical orientation. Reposition the Stand Clips as needed.
9. Fill a basin with normal sterile saline to a minimum depth of approximately 5 cm (2 inches). Place the basin under Stand Clip 2.

10. Connect a de-aired positive pressure saline flush line to the three-way stopcock on the Retrieval System. Verify flush line pressure is between 150-250 mmHg.

12.14.2. Retrieval System De-Airing Procedure (System Lumen)

1. De-air the Tuohy-Borst valve. Upon closure of Tuohy-Borst valve, fluid will begin to flush from the tip of the Retrieval System. Adjust flow to generate and maintain an approximate 2-3 cm (1 inch) vertical stream (moderate flow). Allow the Retrieval System to flush until a smooth stream is observed from the tip of the Retrieval System.
   NOTE: Do NOT tap on the retrieval sheath or dilator tip while de-airing.
2. While maintaining positive pressure flush, remove the Retrieval System from the stand. While holding the Retrieval System tip at an upward angle, fully rotate the handle clockwise and counterclockwise.

12.14.3. Retrieval System De-Airing Procedure (System Dilator and Sheath)

1. While maintaining moderate flush, invert and immerse the tip of the Retrieval System into the saline filled basin. Ensure the tip of the Retrieval System does not rest on the bottom of the basin. Continually flush with saline until no air bubbles exit the tip.
   Retrieval System is prepared and is ready for use. If retrieval procedure is delayed, maintain flush to keep open (TKO) and maintain tip immersed in saline basin until use.
2. When ready for valve retrieval, verify flush line pressure is between 150-250 mmHg. Ensure flush rate is at moderate flow. A sterile towel (not supplied) can be used to support and capture flush fluid from tip during device transfer. Present Retrieval System with tip lower than the system handle. Continue to maintain positive pressure flush during device transfer.

12.14.4. Valve Retrieval Procedure

WARNING: Do not apply radial compression to the Retrieval System sheath within the 9 cm to 15 cm markings to prevent sheath damage during valve retrieval.

WARNING: Do not use or continue to use a Retrieval System with a damaged sheath.

3. Feed the tether leader into the tip of the Retrieval System. Maintain Retrieval System Handle higher than the tip of the Retrieval System. Advance the tether leader until the leader tip is visible at the Tuohy-Borst valve. Open the Tuohy-Borst valve, advance the tether leader through the Tuohy-Borst valve, and close the Tuohy-Borst valve.
4. While maintaining manual tether tension, advance the Retrieval System to the apex. Turn flush off. Insert retrieval system using fluoroscopic and echo guidance.
5. Using fluoroscopic guidance as the primary imaging modality, advance the Retrieval System until the metal tip is coaxial and in contact with the base of the metal valve stem. Maintain metal to metal contact using manual tether tension.
6. Place two Tether Clips onto the tether leader. Ensure the clips are in contact with the Tuohy--Borst valve. Maintain manual tether tension.
   CAUTION: Using fluoroscopic guidance, confirm that metal to metal contact and coaxial alignment between the valve and Retrieval System are maintained.
7. Using fluoroscopic and echo guidance, rotate the Knob in Direction A (counterclockwise), until the valve stem is captured within the tip. Continue to rotate the Knob in Direction A to the junction of the inner and outer frames.

CAUTION: Confirm native leaflets are not captured between the sheath and valve.

8. Before retrieving valve beyond the junction of the inner and outer frames, observe native leaflets and chordae to ensure they remain free and mobile using echo guidance throughout the retrieval process.
9. If necessary, the valve retrieval process can be reversed as follows:
   a. Pull the Knob away from the Retrieval Handle and rotate the Knob in Direction B (clockwise, indicated on the Retrieval Handle). Maintain manual tether tension.
   b. Continue to rotate Knob in Direction B (clockwise) as needed. Maintain contact between the metal tip and valve stem.
   c. Adjust tether clips and verify they are in contact with the Tuohy-Borst valve. Maintain manual tether tension.
   10. To continue valve retrieval, resume rotation of the Knob in Direction A (counterclockwise).
11. Using fluoroscopic and echo guidance, position the sheath to avoid capturing native anatomy and continue to rotate the Knob in Direction A (counterclockwise) until valve is fully retrieved within the Sheath.
12. Remove the entire Retrieval System. If desired, another valve can be loaded and deployed.

WARNING: If the retrieval sheath is damaged or the valve cannot be retrieved, attempt reversing the Retrieval System using Direction B rotation, remove the device and replace it with an alternate Retrieval System.

WARNING: Do not reuse a valve that has been retrieved.

12.15. Adjusting Tether Length Post Tether Cut (if required)

NOTE: If the tether has been cut, the Pad Positioning System cannot be used.

CAUTION: Post tether cut, TLS cannot be used for monitoring pressure readout.

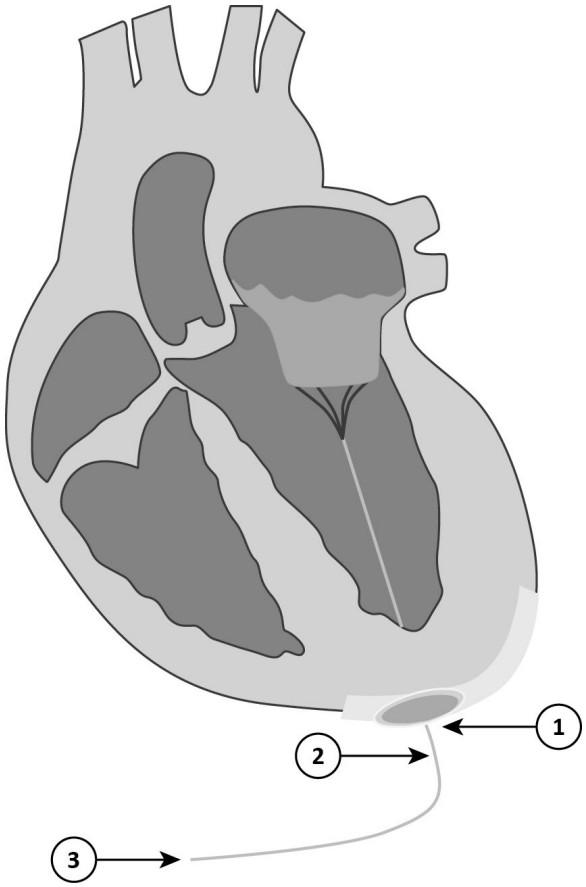
1. Use fluoroscopic guidance throughout tether length adjustment, to assess stem to apical pad distance for ability to shorten.
2. Use echocardiographic guidance throughout tether length adjustment, to evaluate valve performance and position.

   NOTE: Continuously monitor valve performance, function and position and cardiac function.

3. Place two serrated clamps on the tether adjacent to the Apical Pad (Position 1 and 2) and a third serrated clamp towards the end of the tether (Position 3) (Figure 17).

   NOTE: Monitor grip of clamp in Position 3, to ensure ability to pull tension.

Figure 17. Clamp positions for tether length adjustment



1. *Position 1*
2. *Position 2*
3. *Position 3*

4. Maintain manual tension using the clamp from Position 3 and unpin the Apical Pad using a clamp.
5. Adjust tether length by applying tether tension with the clamp in Position 3. Move the clamp from Position 2 to Position 1, adjacent to the apical pad.

WARNING: Do not make adjustments with the clamp in Position 1.

6. Continue adjusting tether length until desired valve position and performance is obtained.
7. Pin the Apical Pad to the tether using a clamp. Confirm the two (2) alignment holes on the Apical Pad are aligned as visual confirmation that the Apical Pad is secured to the tether.
8. Remove all clamps from the tether.

12.16. Cleaning and Sterilizing the Reusable Stand and Reusable Weight

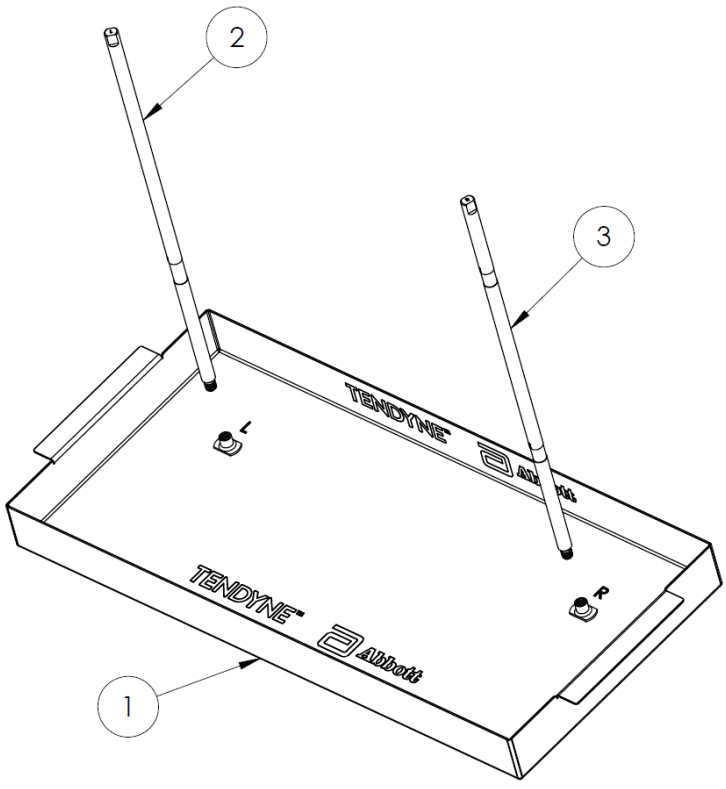
WARNING: Failure to properly clean and/or re-sterilize the stand and weight prior to use may result in infections, user injury, or patient injury.

CAUTION: Failure to properly clean and dry the reusable stand and reusable weight may lead to a reduction in device life. Do not use ultrasonic cleaning processes, steel wool, metallic wire brushes, pipe cleaners, or abrasive detergents. Do not use saline to clean or soak the device. Do not use chlorine bleach

Two (2) cleaning methods are provided: Manual Cleaning and Automated Cleaning. User may select either method.

1. Manually Cleaning the Reusable Stand and Reusable Weight
   a. Immediately after surgery (Point-of-Use), disassemble the stand by separating the two (2) posts from the base (Figure 18).

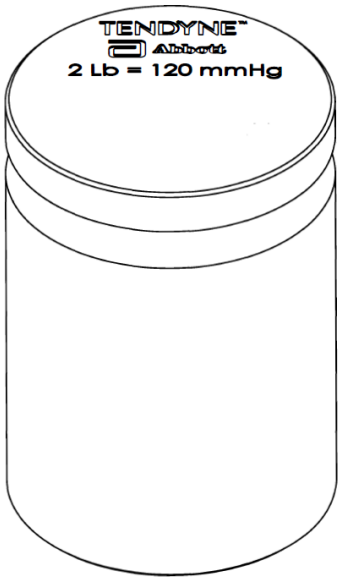
Figure 18. Tendyne™ Stand, disassembled



1. *Post Holes*
2. *Posts*
3. *Base*

b. Using a moistened low-lint wipe, clean all surfaces and edges of the stand (base, post holes, and posts [Figure 18]), and weight (Figure 19).

Figure 19. Tendyne™ Weight



c. Rinse each individual component of the stand and the weight under flowing, warm (20°C – 25°C) Utility Water for a minimum of 1 minute, using a low-lint wipe, gloved hands, or nylon brush to aid in the removal of visible residual soil. Focus on grooves, threads, crevices, or engraved areas.
d. Repeat until no soil is visible on the stand or weight.
e. Prepare a neutral (pH 7.0 – 8.5) enzymatic cleaning solution (Prolystica‡ 2X Concentrate or equivalent enzymatic detergent). Follow the cleaning solution manufacturers' instructions for recommended concentration and temperature.
f. Submerge the stand base, stand posts, and weight and allow the components to soak for a minimum of 5 minutes.
Adjust the position of components as necessary to ensure all component surfaces contact the enzymatic detergent solution for a minimum of 5 minutes.
g. Following the minimum 5-minute soak, use a soft nylon instrument brush to scrub the entire surface area of the stand base, stand posts, and weight for at least one minute. Pay special attention to the post holes and engraved surfaces. Scrub below the water line to prevent aerosolizing of contaminants for a minimum of 3 minutes. Use a soft nylon brush to clean the internal threads. Scrub each threaded hole for a minimum or 30 seconds each.
h. Repeat until no residue is visible on the stand or weight.
i. Rinse each individual component under flowing deionized (DI) water for a minimum of 2 minutes.
j. Dry stand base, stand posts, and weight using compressed air or a dry lint- free cloth until the device exterior surfaces are completely dry.

2. Automatic Washer Cleaning Instructions

a. Disassemble the stand by separating the two (2) posts from the base (Figure 18).
b. Using a moistened low-lint wipe, clean all surfaces and edges of the stand (base, post holes, and posts [Figure 18]), and weight (Figure 19).

c. Rinse each individual component of the stand and the weight under flowing, warm (20°C – 25°C) Utility Water for a minimum of 2 minutes, using a low-lint wipe, gloved hands, or nylon brush to aid in the removal of visible residual soil. Focus on grooves, threads, crevices, or engraved areas.
d. Repeat until no soil is visible on the stand or weight
e. Set the Pre-Wash washer cycle to use cold utility water for 2 minutes.
f. Set the following washer cycles:

Washer Cycle: Pre-Wash – Cold Utility Water for 2 minutes

Washer Cycle: Wash – Heated Utility Water at 55.0°C – 82.2°C for 2-10 minutes

Use Alkaline detergent (Prolystica‡ Ultra Alkaline or equivalent alkaline detergent): per detergent manufacturer's instructions

Washer Cycle: Neutralizing Rinse – Heated Utility Water at 25°C for 5 minutes

Washer Cycle Intermediate Rinse – Cold Utility Water for 4 minutes

Optional thermal rinse up to 95°C for up to 10 minutes

Washer Cycle: Dry – 100°C, for a minimum of 10 minutes

Optional manual air dry or wipe dry with clean, disposable, absorbent, non-shedding wipe

3. Sterilizing the stand and weight after cleaning.
Use Prevacuum Steam Sterilization to sterilize the stand and weight.
The minimum recommended exposure temperature and time to achieve a Sterility Assurance Level (SAL) of 10-6 using the Prevacuum method is indicated in Table 4.

CAUTION: Do not use other sterilization methods (e.g., ethylene oxide, or hydrogen peroxide gas plasma). Wrap all components individually.

Table 4. Stand and Weight Steam Sterilization Parameters

Cycle Parameters			
Method	**Temperature**	**Time**	**Drying Time**
Option 1: Prevacuum Steam Sterilization	134°C (273°F)	3 Minutes	75 Minutes
Option 2: Prevacuum Steam Sterilization	132°C (270°F)	4 Minutes	75 Minutes
Option 3: Prevacuum Steam Sterilization	121°C (250°F)	30 Minutes	75 Minutes

CAUTION: Do not use the stand or weight if damage is detected.

13. Summary of Primary Clinical Study

The SUMMIT trial was conducted to establish a reasonable assurance of safety and effectiveness of the Tendyne™ T System (TMVR) in patients with symptomatic severe mitral valve dysfunction associated with severe MAC who are not suitable for open mitral valve surgery.

The SUMMIT trial included three cohorts, namely, Randomized cohort (Tendyne vs. MitraClip), Non-repairable cohort (non-surgical and non-repairable patients), and Severe MAC cohort. A summary of the Severe MAC cohort clinical study is presented below.

13.1 SUMMIT Study Design

The SUMMIT trial Severe MAC cohort was a prospective, single-arm study. Patients were enrolled between October 2019 and March 2023. The database for this Panel Track PMA Supplement reflected data collected through May 20, 2024, and included 103 patients. There were 37 investigational sites in the US and Canada.

The SUMMIT trial utilized: a Subject Eligibility Committee (SEC), which confirmed study subject eligibility and the subject's intended treatment cohort; an Echocardiography Core Laboratory (ECL), which reviewed echocardiography images acquired at baseline and follow-up visits; a Computed Tomography (CT) Core Laboratory, which characterized the morphology, lateral-medial symmetry, and overall distribution shape of MAC; an independent Data Safety Monitoring Board (DSMB), which was instructed to notify the applicant of any safety or compliance issues; and a Clinical Events Committee (CEC), which was responsible for adjudicating endpoint-related events reported during the study.

13.1.1. Clinical Inclusion and Exclusion Criteria

Enrollment in the SUMMIT trial Severe MAC cohort was limited to patients who met the following inclusion criteria:

- Symptomatic mitral valve disease associated with MR ≥Grade III (per American Society of Echocardiography criteria), or severe mitral stenosis, or both moderate MR and moderate MS as assessed by the ECL. (Note: MR and MS severity must be determined by assessment of a qualifying transesophageal echocardiogram [TEE] or transthoracic echocardiogram (TTE) obtained within 120 days prior to subject consent.)
- New York Heart Association (NYHA) Functional Class ≥II (if Class IV, patient must be ambulatory).
- The site heart team determines that the subject has been adequately treated per applicable standards for coronary artery disease (e.g., revascularization), left ventricular dysfunction (e.g., cardiac resynchronization therapy [CRT]) and heart failure (e.g., guideline-directed medical therapy). The SEC must concur that the subject has been adequately treated.
- The site heart team deems the degree of MAC renders the subject unsuitable for mitral valve surgery.
- Age 18 years or older at time of consent.
- Subject has been informed of the nature of the study and agrees to its provisions, including complying with study required testing, medications, and follow-up visits, and has provided written informed consent.

Patients were <u>not</u> permitted to enroll in the study if they met any of the following exclusion criteria:

- Mitral valvular vegetation or mass.
- Left ventricle or left atrium thrombus.
- Chest condition that prevents transapical access.
- Left ventricular ejection fraction (LVEF) <25%, as assessed by the site based on a TTE obtained within 120 days prior to subject consent and confirmed by the ECL.
- Left ventricular end diastolic diameter (LVEDD) >7.0 cm, as assessed by the site based on a TTE obtained within 120 days prior to subject consent and confirmed by the ECL.
- Prior surgical or interventional treatment of mitral valve involving implantation of prosthetic material (e.g., valve repair or replacement, or MitraClip).
- Mitral pathoanatomy and left ventricular outflow tract (LVOT) anatomy deemed not suitable for Tendyne transcatheter mitral valve implantation.
- Aortic valve disease requiring surgery or transcatheter intervention.
- Tricuspid valve disease requiring surgery or transcatheter intervention.
- Severe tricuspid regurgitation or severe right ventricular dysfunction.
- Any surgical or interventional procedure within the period of 60 days prior to subject registration or planned procedure 60 days following subject registration.
- Implant or revision of CRT device within 90 days prior to intended subject registration.

- Myocardial Infarction (MI) within 30 days prior to intended subject registration.
- Symptomatic, unresolved multi-vessel or unprotected left main coronary artery disease (e.g., active ischemia) requiring stenting or coronary artery bypass grafting (CABG).
- Cerebrovascular accident (CVA) within 6 months prior to intended subject registration.
- Unresolved severe symptomatic carotid stenosis (>70% by ultrasound).
- Cardiogenic shock or hemodynamic instability requiring inotropes or mechanical support devices at the time of planned implant procedure.
- Hypertrophic or restrictive cardiomyopathy, or constrictive pericarditis.
- Any of the following: leukopenia, acute anemia, thrombocytopenia, history of bleeding diathesis, or coagulopathy if cannot be adequately treated.
- History of endocarditis within 6 months of planned implant procedure.
- Active systemic infection requiring antibiotic therapy.
- Known hypersensitivity or contraindication to procedural or post-procedural medications (e.g., contrast solution, anti-coagulation and antiplatelet therapy) that cannot be adequately managed medically.
- Subjects in whom TEE is contraindicated or high risk.
- Known hypersensitivity to nickel or titanium.
- Subject is undergoing hemodialysis due to chronic renal failure.
- Subject has pulmonary arterial hypertension (fixed pulmonary artery systolic [PAS] pressure >70 mmHg). (Note: If PAS pressure >70 mmHg, site must provide documentation that PAS pressure is not fixed in order to be eligible.)
- Subject has chronic obstructive pulmonary disease (COPD) requiring continuous home oxygen therapy or chronic outpatient oral steroid use.
- Subjects with non-cardiac comorbidities that are likely to result in a life expectancy of <12 months.
- Modified Rankin Scale ≥4 disability.
- Status 1 heart transplant or prior orthotopic heart transplantation.
- Pregnant, lactating, or planning pregnancy during the clinical investigation follow-up period. (Note: Female subjects of childbearing age should be instructed to use safe contraception [e.g. intrauterine devices, hormonal contraceptives: contraceptive pills, implants, transdermal patches hormonal vaginal devices, injections with prolonged release.)
- Currently participating in an investigational drug or another device trial that has not reached its primary endpoint. (Note: Trials requiring extended follow-up for products that were investigational, but have since become commercially available, are not considered investigational trials.)
- Presence of other anatomic or comorbid conditions, or other medical, social, or psychological conditions that, in the investigator's opinion, could limit the subject's ability to participate in the clinical investigation or to comply with follow-up requirements, or impact the scientific soundness of the clinical investigation results.

13.2. Follow-up Schedule

Follow-up time points included 1 month, 3 months (phone contact), 6 months, and annually through 5 years. Baseline and follow-up assessments included physical assessments, medical history, laboratory tests, imaging studies, and health status surveys. Adverse events and complications were recorded at all visits.

13.3. Study Endpoints

13.3.1. Primary Endpoint

The primary endpoint was freedom from all-cause mortality and heart failure hospitalization (HFH) at 12 months post index procedure.

The null and alternative hypotheses are:

H_0: $\pi_D \leq 43\%$

H_1: $\pi_D > 43\%$

where π_D was the true event rate and $_{43\%}$ was the performance goal (PG). Kaplan-Meier analysis was used to compute the rate ; the standard error and confidence limits were computed using Greenwood's method. A sample size of 103 patients was estimated to provide 90% power to reject the null hypothesis at a one-sided significance level of 2.5%.

13.3.2. Secondary Endpoints

Six (6) secondary endpoints were assessed hierarchically after the primary endpoint was met, as listed in Table 5.

Table 5. Ordered List of Secondary Endpoints for Hierarchical Testing

Order	Secondary Endpoint	Null and Alternative Hypotheses	Significance Level*
1	Freedom from MR >mild (1+) at 30 days post procedure	H_0: $P_{MR\leq 1+} \leq 75\%$ H_1: $P_{MR\leq 1+} > 75\%$	2.5%
2	Change in KCCQ overall summary score at 12 months over baseline	H_0: $D_{12M} \leq 0$ H_1: $D_{12M} > 0$	2.5%
3	Proportion of NYHA functional class I or II at 12 months compared to baseline	H_0: $P_{12M,\ NYHA\ I/II} \leq P_{B,\ NYHA\ I/II}$ H_1: $P_{12M,\ NYHA\ I/II} > P_{B,\ NYHA\ I/II}$	2.5%
4	Change in 6MWT distance at 12 months over baseline	H_0: $D_{12M} \leq 0$ H_1: $D_{12M} > 0$	2.5%
5	Change in KCCQ overall summary score at 6 months over baseline	H_0: $D_{6M} \leq 0$ H_1: $D_{6M} > 0$	2.5%
6	Change in 6MWT distance at 6 months over baseline	H_0: $D_{6M} \leq 0$ H_1: $D_{6M} > 0$	2.5%

MR: mitral regurgitation; KCCQ: Kansas City Cardiomyopathy Questionnaire; NYHA: New York Heart Association; 6MWT: 6-minute walk test; H0: null hypothesis; H1: alternative hypothesis

*One-sided significance level

13.3.3. Descriptive Endpoints

The key descriptive endpoints included the following:

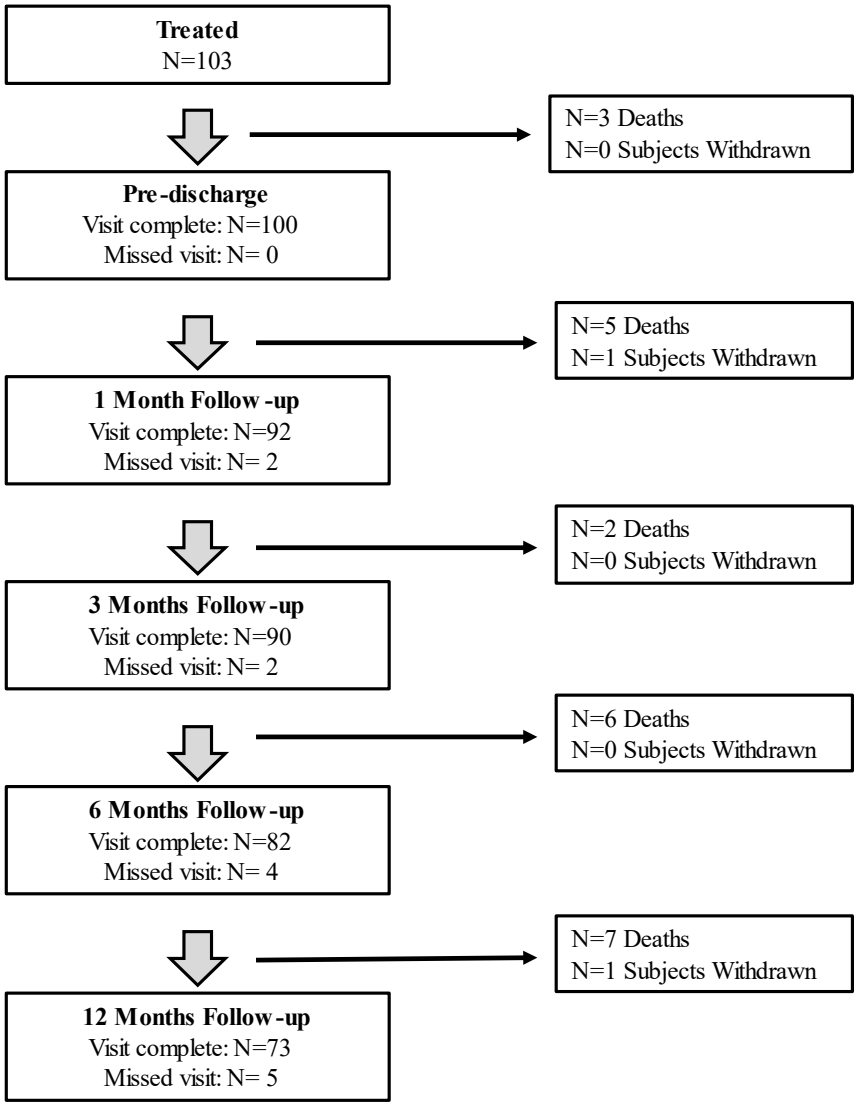
- Freedom from all-cause mortality
- Freedom from HFH
- Freedom from stroke
- Freedom from mitral valve reintervention or reoperation
- KCCQ score

- EQ-5D-5L visual analog score
- Short Form (SF)-12 physical and mental components scores
- NYHA functional class
- 6MWT distance
- MR severity

13.4. Accountability of the PMA Cohort

At the time of database extract, a total of 103 patients had an attempted procedure, which constituted the primary analysis population. Patient accountability through 12 months is summarized in Figure 20.

Figure 20. Patient Accountability Through 12 Months



13.5. Study Population Demographics and Baseline Characteristics

The demographics and baseline characteristics of the study population are typical for a transcatheter mitral valve replacement device study performed in the U.S. in patients with severe MAC, as summarized in Table 6.

Table 6. Demographics and Baseline Characteristics

Demographics and Baseline Characteristics	Summary Statistic* (N=103)
Age (years)	78.0 ± 6.5 (103)
Age ≥80 years	48.5% (50/103)
Sex	
Male	44.7% (46/103)
Female	55.3% (57/103)
Race[1]	
White	98.1% (101/103)
Black or African American	1.9% (2/103)
Native Hawaiian or Other Pacific Islander	0.0% (0/103)
Asian	0.0% (0/103)
American Indian or Alaskan Native	0.0% (0/103)
Other	0.0% (0/103)
Declined or Unknown	0.0% (0/103)
Ethnicity	
Hispanic or Latino	1.9% (2/103)
Not Hispanic or Latino	96.1% (99/103)
Declined or Unknown	1.9% (2/103)
Medical History and Comorbidities	
Diabetes	52.4% (54/103)

Demographics and Baseline Characteristics	Summary Statistic* (N=103)
Renal insufficiency (GFR <60 mL/min/1.73m^2)	55.3% (57/103)
Lung disease/COPD	28.2% (29/103)
Current or prior smoker	54.4% (56/103)
Liver disease	2.9% (3/103)
Malignant cancer	1.9% (2/103)
Peripheral artery disease	9.7% (10/103)
Carotid stenosis	20.4% (21/103)
Thoracic aortic disease	3.9% (4/103)
Pulmonary arterial hypertension	60.2% (62/103)
Prior stroke	11.7% (12/103)
Prior transient ischemic attack	13.6% (14/103)
Hypertension	89.3% (92/103)
Dyslipidemia	77.0% (77/100)
Coronary artery disease	62.1% (64/103)
Prior myocardial infarction	15.5% (16/103)
Infectious endocarditis	1.0% (1/103)
Hospitalization History	
Hospitalization for heart failure in the prior 12 months	29.1% (30/103)
Hospitalization for mitral valve insufficiency in the prior 12 months	15.5% (16/103)
Heart valve disease and conduction abnormalities	
Valvular heart disease other than mitral	94.2% (97/103)
Aortic	52.4% (54/103)

Demographics and Baseline Characteristics	Summary Statistic* (N=103)
Tricuspid	85.4% (88/103)
Cardiac arrhythmia or conduction abnormalities	78.6% (81/103)
Atrial fibrillation, chronic	32.0% (33/103)
Atrial fibrillation, paroxysmal	26.2% (27/103)
Cardiovascular intervention or device implantation	
Cardiac and vascular interventions	74.8% (77/103)
Aortic valve replacement	51.5% (53/103)
Cardiac rhythm and heart failure devices implanted	
PPM, ICD, CRT-P, or CRT-D	28.2% (29/103)
Risk Assessment	
Essential Frailty Toolset score	
0	14.6% (15/103)
1	31.1% (32/103)
2	36.9% (38/103)
3	13.6% (14/103)
4	3.9% (4/103)
5	0.0% (0/103)
STS score - mitral valve replacement (%)	7.13 ± 3.89 (103)
Echocardiography measurements	
MR grade	
None or Trivial	0.0% (0/101)
1+	3.0% (3/101)

Demographics and Baseline Characteristics	Summary Statistic* (N=103)
2+	9.9% (10/101)
3+	37.6% (38/101)
4+	49.5% (50/101)
MR etiology	
Primary or mixed MR	93.2% (96/103)
Secondary MR	6.8% (7/103)
Functional assessment or health status measure	
NYHA functional class	
Class I	0.0% (0/103)
Class II	26.2% (27/103)
Class III	72.8% (75/103)
Class IV	1.0% (1/103)
KCCQ overall summary score	49.2 ± 23.1 (103)
6-minute walk test (meter)	204.14 ± 111.03 (100)

GFR: glomerular filtration rate; COPD: chronic obstructive pulmonary disease; PPM: permanent pacemaker; ICD: implantable cardioverter defibrillator; CRT-P: cardiac resynchronization therapy with a pacemaker; CRT-D: cardiac resynchronization therapy with a defibrillator; STS: Society of Thoracic Surgeons; MR: mitral regurgitation; NYHA: New York Heart Association; KCCQ: Kansas City Cardiomyopathy Questionnaire.

*Continuous measures – mean ± SD (total no.); Categorical measures – % (no./total no.).

[1] Patients of mixed race are counted in all applicable categories.

The CT Core Laboratory conducted MAC-specific evaluations to characterize the MAC morphology at each of the six mitral segments (A1, A2 and A3 for the anterior annulus, and P1, P2, and P3 for the posterior annulus), the lateral-medial symmetry, and the overall shape of the MAC distribution. The characterization data were used by the SEC to determine patient eligibility, ensuring that only patients with severe MAC were enrolled in the study. The MAC characterization results for the Severe MAC cohort are summarized in Table 7.

Table 7. MAC Characterization by Computed Tomography Core Laboratory

MAC Characterization	Summary Statistic* (N=103)
MAC morphology†	
P1	
None	13.6% (14/103)
Homogenous	70.9% (73/103)
Spur	9.7% (10/103)
Gutter	5.8% (6/103)
P2	
None	2.9% (3/103)
Homogenous	72.8% (75/103)
Spur	11.7% (12/103)
Gutter	12.6% (13/103)
P3	
None	9.7% (10/103)
Homogenous	73.8% (76/103)
Spur	9.7% (10/103)
Gutter	6.8% (7/103)
A1	
None	43.7% (45/103)
Homogenous	20.4% (21/103)
Spur	35.9% (37/103)
Gutter	0.0% (0/103)
A2	
None	71.8% (74/103)
Homogenous	5.8% (6/103)
Spur	22.3% (23/103)
Gutter	0.0% (0/103)
A3	
None	50.5% (52/103)
Homogenous	12.6% (13/103)
Spur	36.9% (38/103)
Gutter	0.0% (0/103)
MAC distribution	
Circumferential	3.9% (4/103)
C-shape	51.5% (53/103)
J-shape	20.4% (21/103)

MAC Characterization	Summary Statistic* (N=103)
Other	24.3% (25/103)
MAC symmetry	
Symmetric	37.9% (39/103)
Asymmetric	62.1% (64/103)

*Categorical measures – % (no./total no.).

†Homogenous: MAC that did not deviate from the smooth, natural curvature of the mitral annulus was considered; spur: protrusions; gutter: indentations.

13.6. Safety and Effectiveness Results

13.6.1. Primary Endpoint

The primary endpoint results are presented in and Figure 21. The rate of freedom from all-cause mortality and HFH at 12 months was 60.4%, with a 97.5% lower confidence bound (LCB) of 50.2%, which is greater than the performance goal of 43.0% (p=0.0002); therefore, the primary endpoint was met**.**

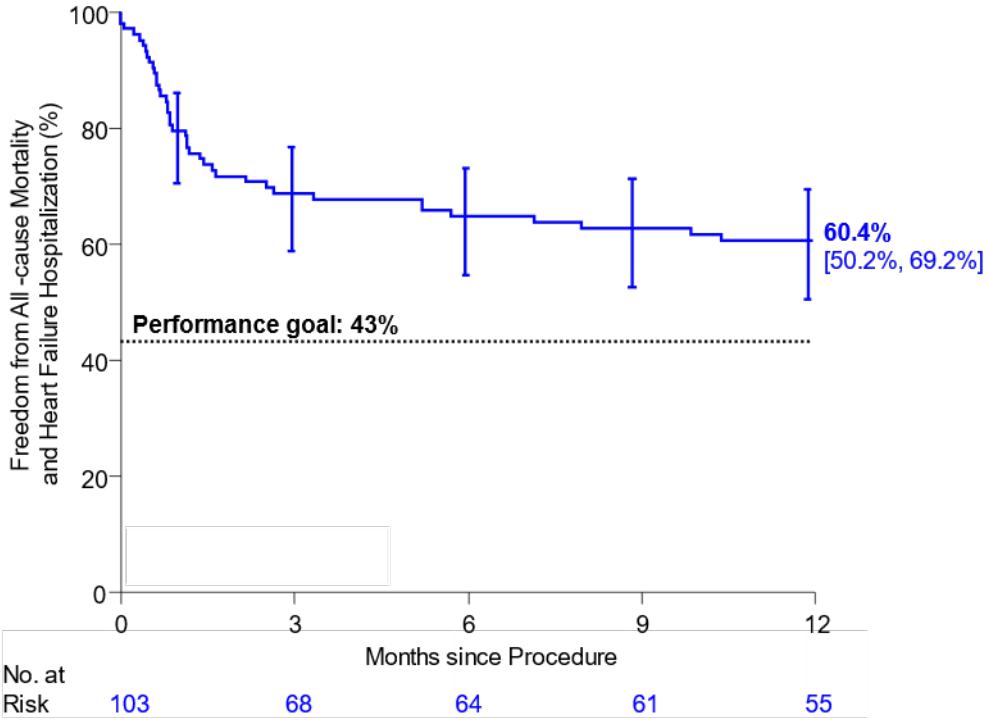
Table 8. Primary Endpoint Analysis

			Severe MAC (N=103)	
	Kaplan-Meier Estimate (SE[1])	**97.5% LCB[1]**	**Performance Goal**	**P-Value[1]**
Freedom from all-cause mortality and HFH[2]	60.4% (4.9%)	50.2%	43.0%	0.0002

HFH: heart failure hospitalization; SE: standard rrror; LCB: lower confidence bound

[1] Assumes asymptotic normal distribution for Kaplan-Meier estimate together with Greenwood method for estimated variance.
[2] Two patients who experienced death or hospitalization related to COVID-19 as adjudicated by the CEC had their follow-up information after the COVID-19 related hospitalization excluded.

Figure 21. Kaplan-Meier Curve of Freedom from All-Cause Mortality and Heart Failure Hospitalization Through 12 Months



Any patients experiencing a CEC-adjudicated COVID-19-related hospitalization or death had any and all follow-up clinical data censored beginning with the event. Confidence intervals are provided for information purpose only without multiplicity adjustment.

13.6.2. Secondary Endpoints

Since the primary endpoint was met, prespecified hypothesis testing was carried out on 6 secondary endpoints sequentially, as summarized in Table 9. The secondary endpoints of freedom from MR >mild (1+) at 30 days post procedure, change in KCCQ overall summary score at 12 months over baseline, proportion of NYHA functional class I or II at 12 months compared to baseline were met. However, there was no significant difference in the change in 6MWT distance at 12 months over baseline. Thus, hypothesis testing was not performed for the remaining endpoints on the hierarchical list.

Table 9. Summary of Secondary Endpoints in Pre-specified Sequential Order

No.	Endpoint	Summary Statistics*				
		Baseline	Follow-Up Visit	Change from Baseline	P-Value	Test Result
1	Freedom from MR >mild (1+) at 30 days post procedure¶	-	100.0% (98/98)	-	<0.0001 †	Endpoint met
2	Change in KCCQ overall summary score at 12 months over baseline (paired)**	51.2± 23.8 (74)	69.9 ± 23.2 (74)	18.7 ± 24.4	<0.0001 ‡	Endpoint met
3	Proportion of NYHA functional class I or II at 12 months compared to baseline**	30.6% (22/72)	87.5% (63/72)	56.9%§	<0.0001‖	Endpoint met
4	Change in 6MWT distance at 12 months over baseline (meter; paired)**,††	218.1 ± 112.2 (65)	238.7 ± 109.0 (65)	20.6 ± 89.3 (65)	0.0338‡	Endpoint not met
5	Change in KCCQ overall summary score at 6 months over baseline (paired)**	49.1 ± 23.9 (79)	67.8 ± 24.9 (79)	18.6 ± 27.1 (79)	-	Not Tested
6	Change in 6MWT distance at 6 months over baseline (meter; paired)**,††	216.1 ± 111.9 (71)	213.9 ± 115.4 (71)	-2.3 ± 88.6 (71)	-	Not Tested

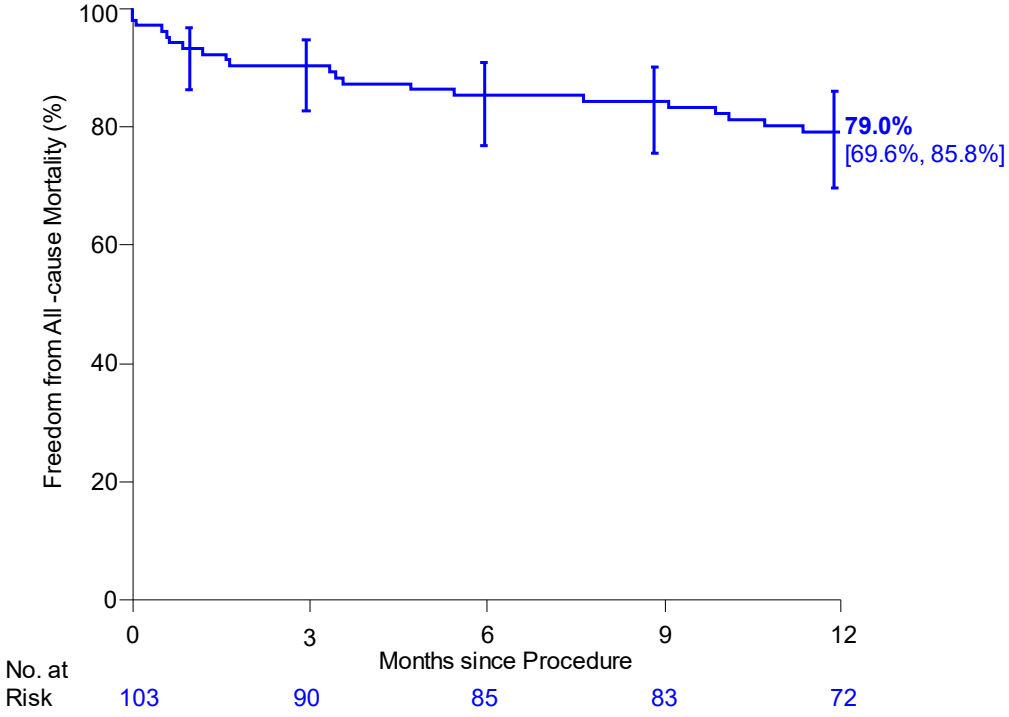
MR: mitral regurgitation; KCCQ: Kansas City Cardiomyopathy Questionnaire; NYHA: New York Heart Association; 6MWT: 6-minute walk test.

*Continuous measures – mean ± SD (total no.); Categorical measures – % (no./total no.).
†P-value calculated using Exact Binomial test, against a performance goal of 75% at a one-sided significance level of 2.5%.
‡P-value calculated using paired t-test at a one-sided significance level of 2.5%.
§Proportion defined as the proportion of patients who improved from NYHA Class III/IV at baseline to I/II at the 12-month visit, minus the proportion of patients who worsened from NYHA Class I/II at baseline to III/IV at the 12-month visit.
‖P-value calculated using McNemar's test at a one-sided significance level of 2.5%.
Missing 30-day MR measurement was imputed from the nearest post-procedure MR measurement obtained from the core laboratory, within 365 days of the scheduled 30-day follow-up visit, if applicable.
**Missing 12-month KCCQ score, 6MWT distance, and NYHA class was imputed from the nearest post 12-month value, within 365 days of the scheduled 12-month visit, if applicable.
††For patients whose 6MWT was not performed due to heart failure, the total distance walked was set to zero.Descriptive Endpoints

Freedom from All-Cause Mortality

The Kaplan-Meier curve for freedom from all-cause mortality is shown in Figure 22. Seventy-nine percent (79%) of the patients were estimated to be alive at 12 months post-procedure.

Figure 22. Kaplan-Meier Curve of Freedom from All-Cause Mortality Through 12 Months

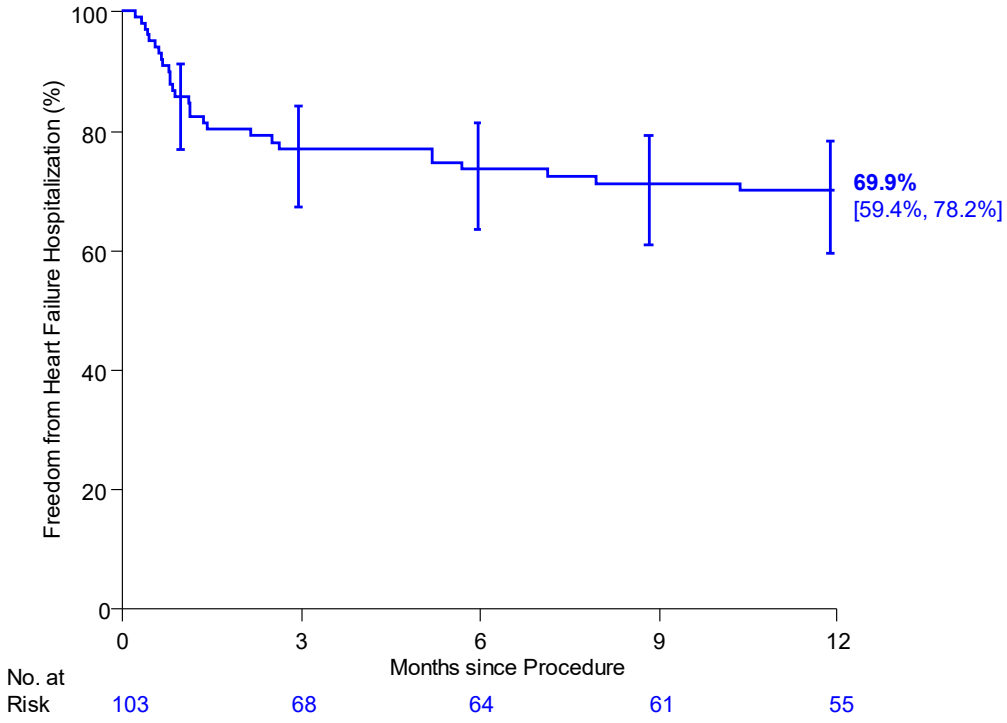


Any patients experiencing a CEC-adjudicated COVID-19-related hospitalization or death had any and all follow-up clinical data censored beginning with the event. Confidence intervals are provided for information purpose only without multiplicity adjustment.

Freedom from HFH

The Kaplan-Meier curve for freedom from HFH is shown in Figure 23. An estimated 69.9% of the patients did not experience any HFH at 12 months post-procedure.

Figure 23. Kaplan-Meier Curve of Freedom from Heart Failure Hospitalization Through 12 Months

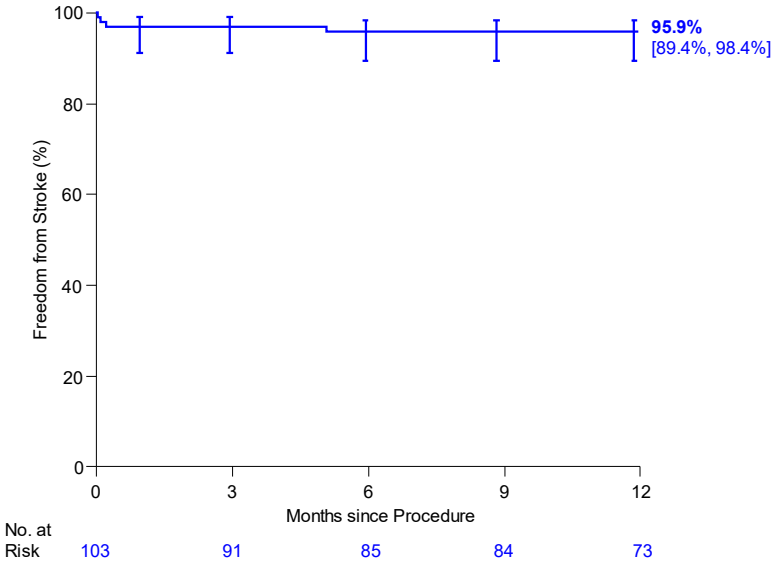


Any patients experiencing a CEC-adjudicated COVID-19-related hospitalization or death had any and all follow-up clinical data censored beginning with the event. Confidence intervals are provided for information purpose only without multiplicity adjustment.

Stroke

The Kaplan-Meier curve for freedom from stroke is shown in Figure 24. An estimated 95.9% of the patients were stroke free at 12 months post-procedure.

Figure 24. Kaplan-Meier Curve of Freedom from Stroke Through 12 Months

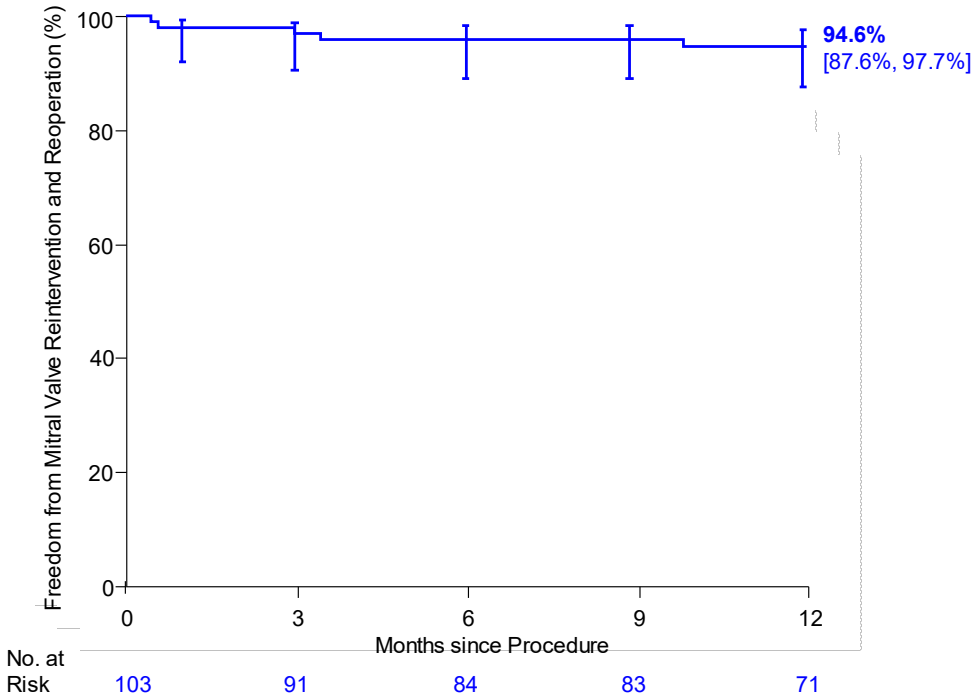


Confidence intervals are provided for information purpose only without multiplicity adjustment.

Freedom from Mitral Valve Reintervention or Reoperation

The Kaplan-Meier curve for freedom from mitral valve reintervention or reoperation is shown in Figure 25. An estimated 94.6% of the patients were free from mitral valve reintervention or reoperation at 12 months post-procedure.

Figure 25. Freedom From Mitral Valve Reintervention or Reoperation Through 12 Months

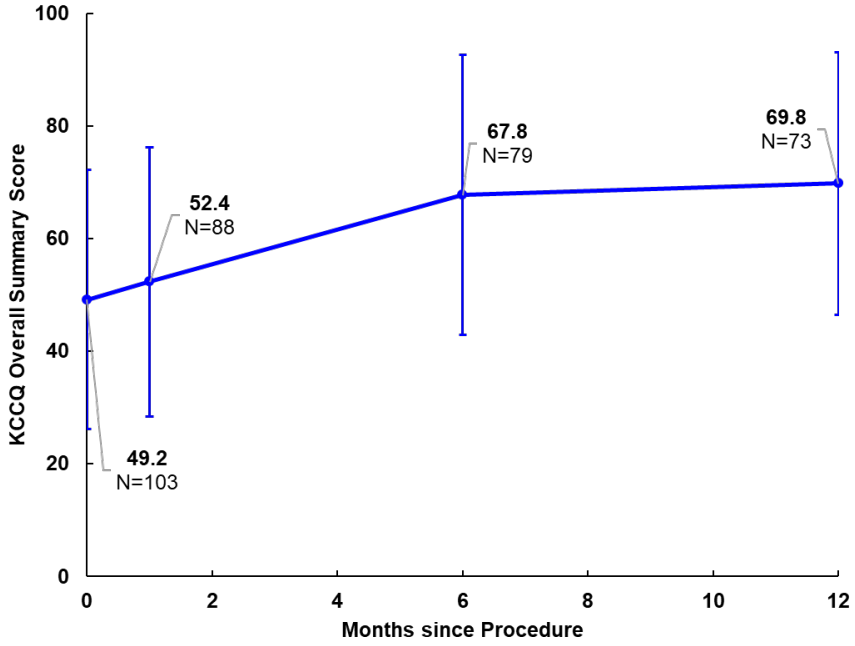


Confidence intervals are provided for information purpose only without multiplicity adjustment.

KCCQ

The results for the KCCQ overall summary score are shown in Figure 26 (all available data). The mean score increased from 49.2 at baseline to 69.8 at 12 months post-procedure.

Figure 26. KCCQ Overall Summary Score by Visit (All Available Data)

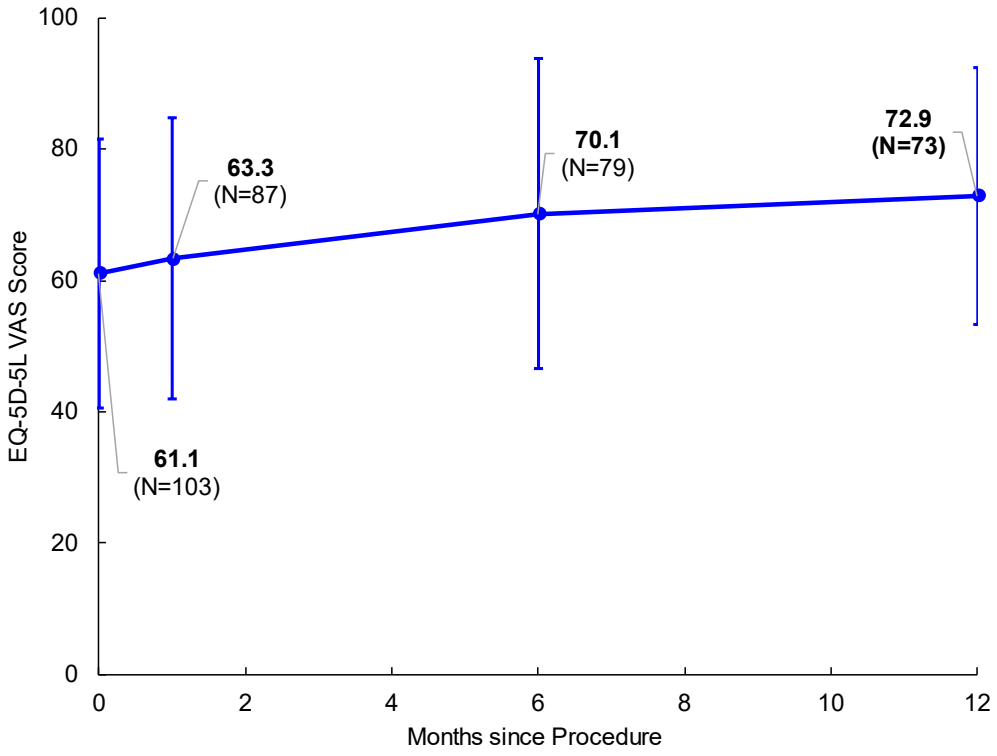


The error bars represent standard deviations.

EQ-5D-5L

The results for the EQ-5D-5L visual analog score (VAS) are presented in Figure 27 (all available data). The mean score was 61.1 at baseline and 72.9 at 12 months post-procedure.

Figure 27. EQ-5D-5L Visual Analog Score by Visit (All Available Data)



The error bars represent standard deviations.

SF-12

The results for the SF-12 physical component summary score and mental component summary score are presented in Figure 28 and Figure 29 (all available data). The physical component summary score and mental component summary score were 32.0 and 48.3 at baseline and 36.5 and 52.1 at 12 months post-procedure, respectively.

Figure 28. SF-12 Summary Score by Visit - Physical Component (All Available Data)

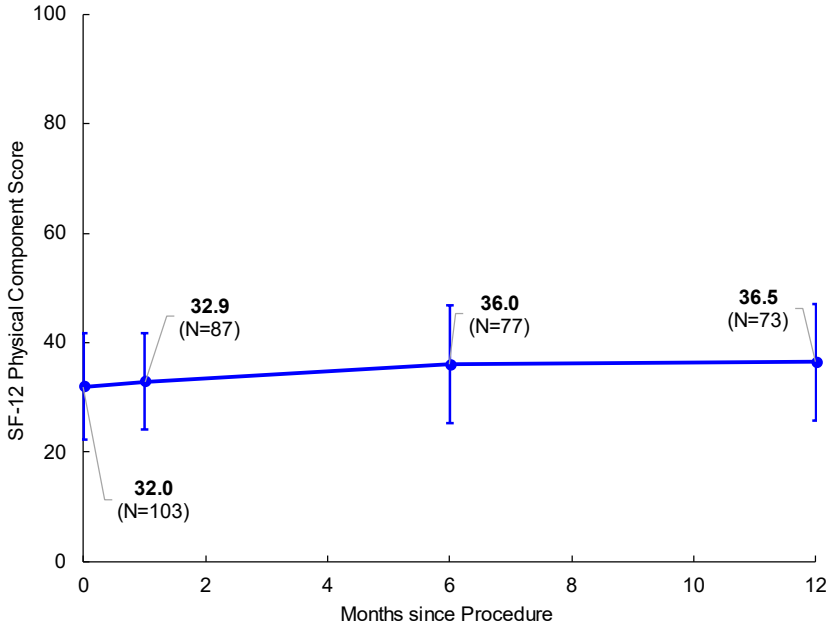
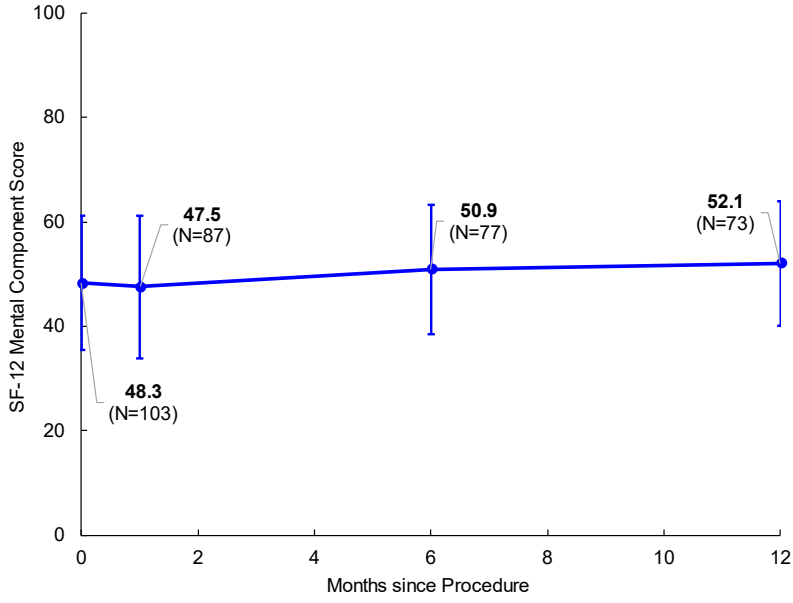


Figure 29. SF-12 Summary Score by Visit - Mental Component (All Available Data)

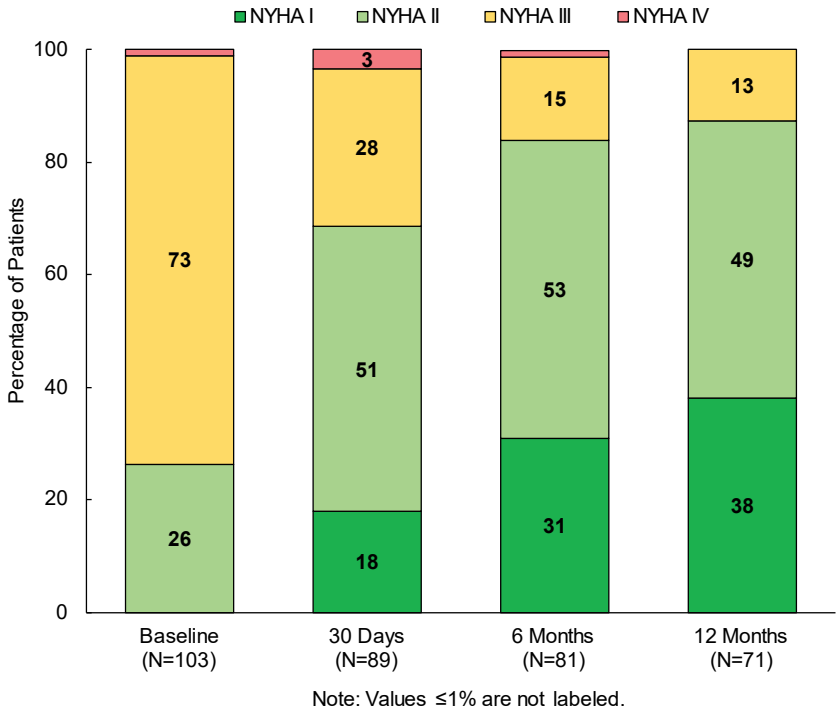


The error bars represent standard deviations.

NYHA Functional Class

The NYHA functional classes by visit are presented in Figure 30. The proportion of patients in NYHA class I/II increased from 26% at baseline to 87% at 12 months post-procedure.

Figure 30. NYHA Functional Class by Visit

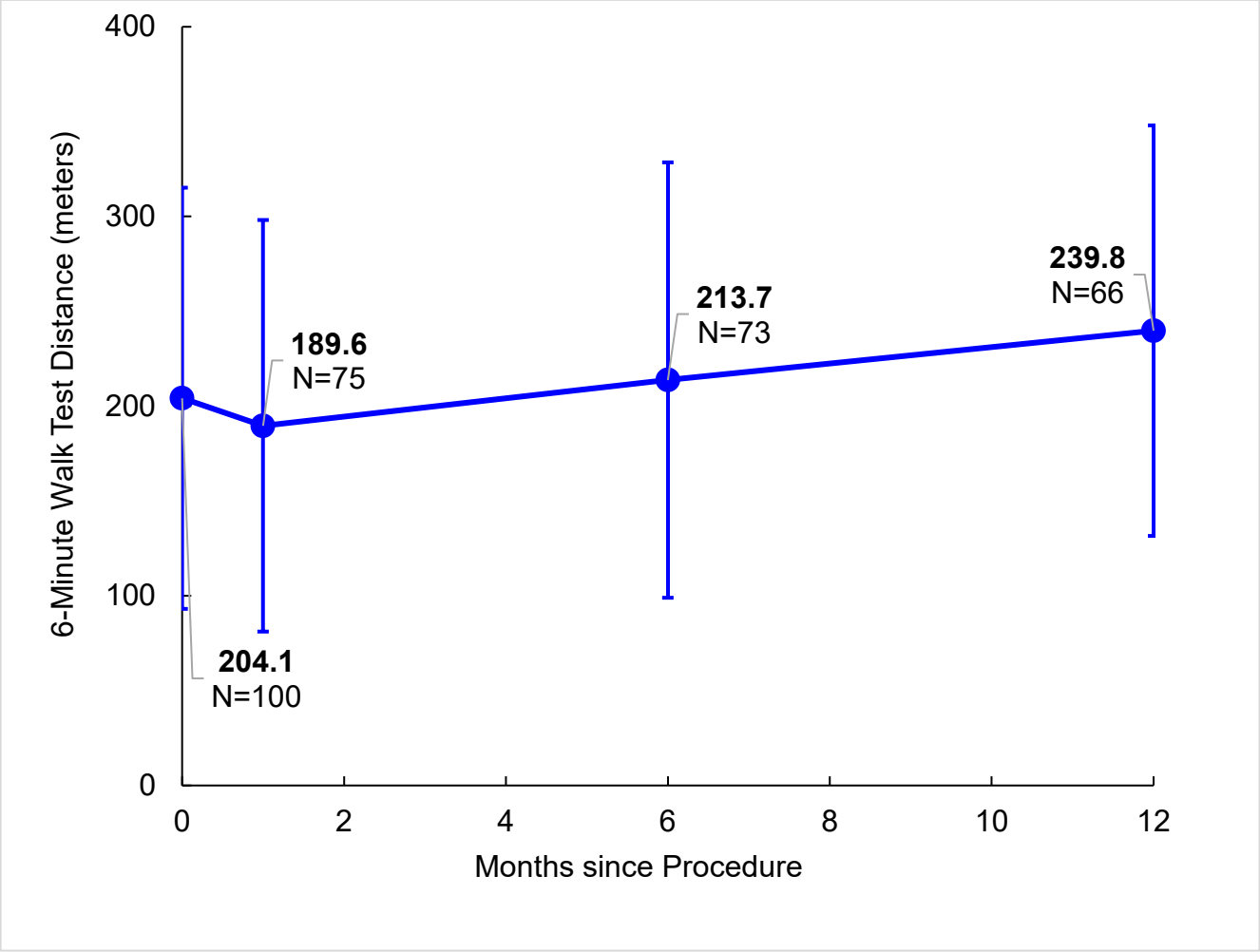


NOTE: Values ≤1% are not labeled.

6MWT distance

The results for the 6MWT distance are presented in Figure 31 (all available data). The mean walk distance increased from 204.1 meters at baseline to 239.8 meters.

Figure 31. 6MWT Distance by Visit (All Available Data)

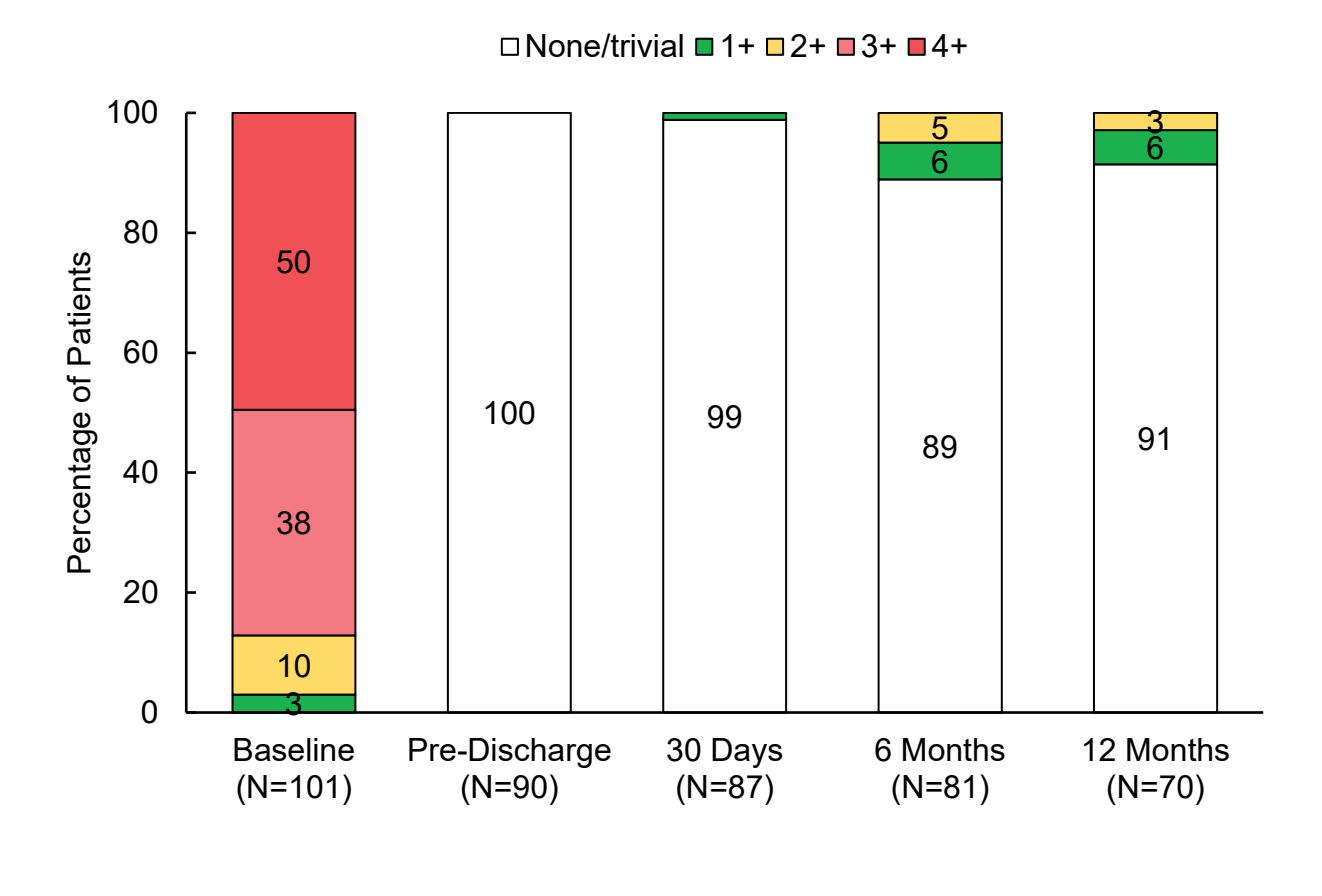


The error bars represent standard deviations.

MR Severity

MR severity by visit is shown in Figure 32. Ninety-one percent (91%) of patients had none/trivial MR at 12 months compared to no patients at baseline.

Figure 32. Mitral Regurgitation by Visit

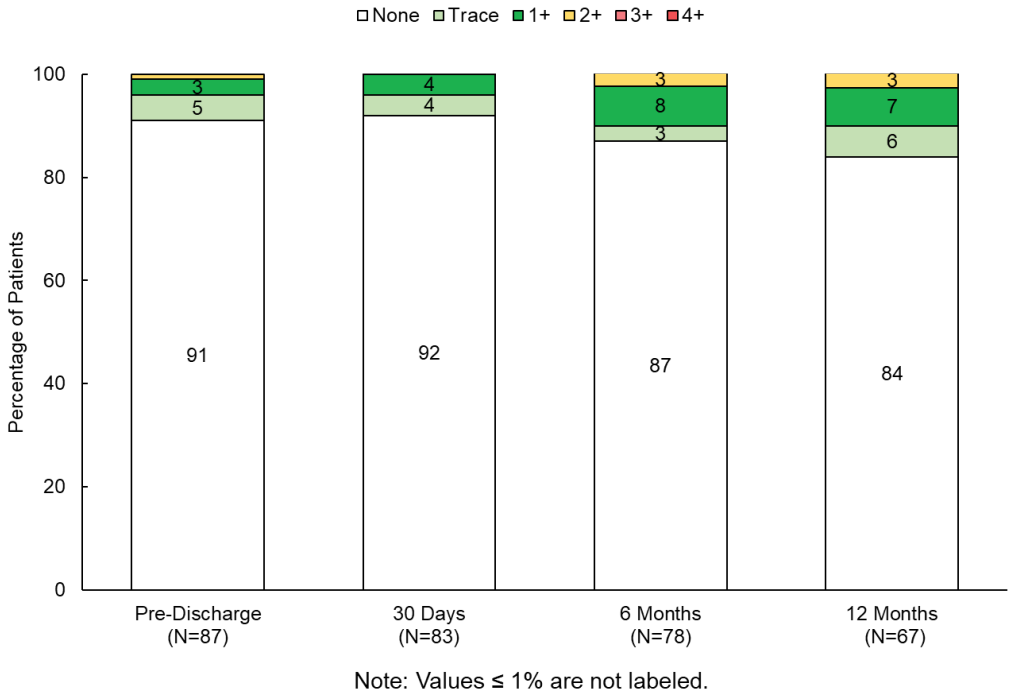


NOTE: Values ≤1% are not labeled.

Paravalvular Leak Grading

Paravalvular leak (PVL) by visit is shown in Figure 33. There were single instances of PVLs graded as 2+ at pre-discharge (1.1%) and 1-month (1.2%), and two instances each at the 6-month (2.6%) and 12-month visits (2.9%). There were no PVLs assessed by the ECL to be 3+ or greater severity during follow-up.

Figure 33. Paravalvular Leak by Visit



Note: Values ≤ 1% are not labeled.

Mitral Valve Hemodynamics

The mitral valve gradient and mitral valve area by visit are shown in Figure 34 and Figure 35.

Figure 34. Mitral Valve Mean Gradient by Visit

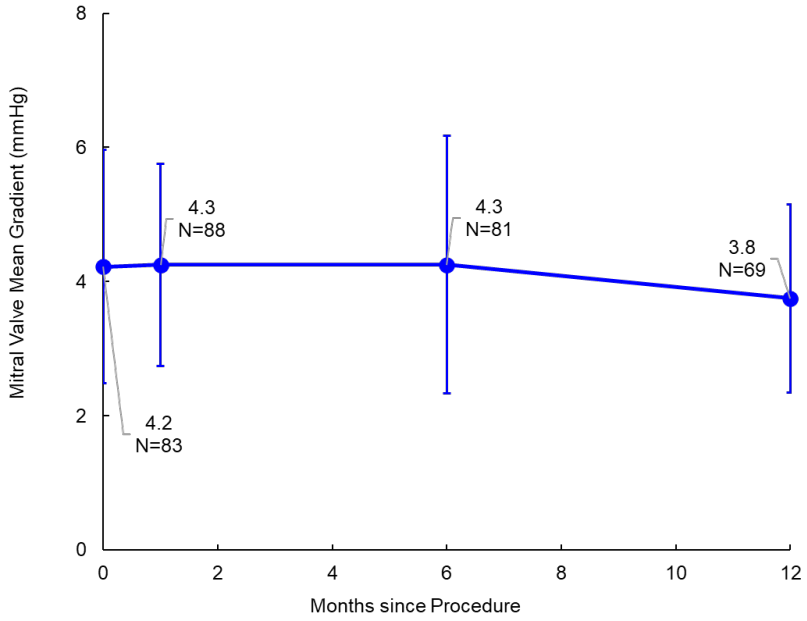
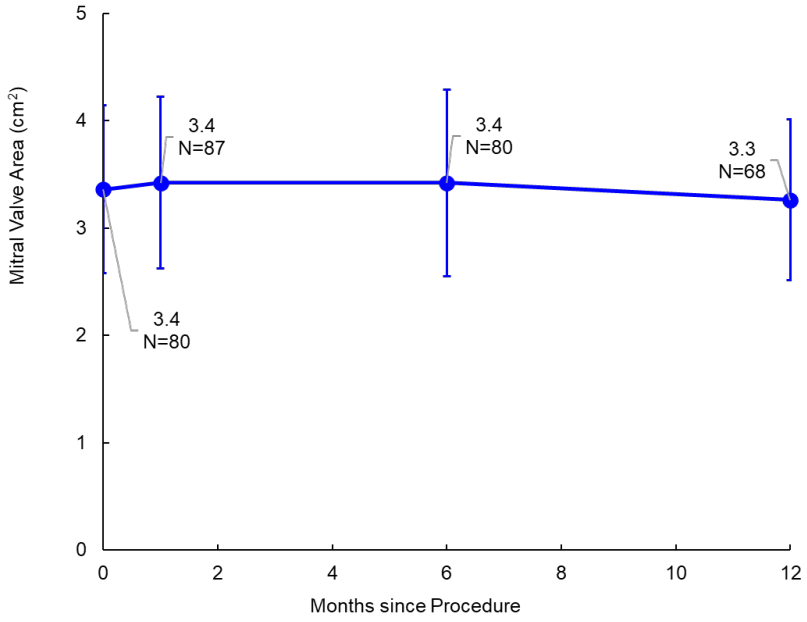


Figure 35. Mitral Valve Area by Visit



13.6.3. Adverse Events

CEC-adjudicated serious adverse events that occurred within the first 30 days and between 31 and 365 days post-procedure are summarized in Table 10.

Table 10. CEC-Adjudicated Serious Adverse Events Within 365 Days Post-Procedure

Event	Summary Statistics*							
	0 - 30 Days (N=103)				31 - 365 Days (N=95)			
	No. of Events	No. of Patients†	Device Related	Procedure Related	No. of Events	No. of Patients†	Device Related	Procedure Related
Death	7	7 (6.8%)	1	6	16	16 (16.8%)	1	3
HFH	14	14 (13.6%)	0	12	36	23 (24.2%)	2	0
Myocardial infarction	1	1 (1.0%)	0	1	0	0 (0.0%)	0	0
Bleeding	30	28 (27.2%)	2	27	21	16 (16.8%)	1	3
Fatal	3	3 (2.9%)	1	3	1	1 (1.1%)	0	0
Life threatening	7	7 (6.8%)	0	6	2	2 (2.1%)	1	1
Extensive	6	6 (5.8%)	0	6	3	3 (3.2%)	0	0
Major	6	6 (5.8%)	1	5	4	4 (4.2%)	0	1
Minor	8	8 (7.8%)	0	7	11	10 (10.5%)	0	1
Atrial fibrillation	28	27 (26.2%)	1	28	12	10 (10.5%)	0	2
New	14	14 (13.6%)	1	14	1	1 (1.1%)	0	1
Worsening	14	13 (12.6%)	0	14	11	9 (9.5%)	0	1
New PPM/ICD	5	5 (4.9%)	0	5	3	3 (3.2%)	0	0
Acute kidney injury	12	12 (11.7%)	2	12	0	0 (0.0%)	0	0
Device thrombosis	0	0 (0.0%)	0	0	3	3 (3.2%)	3	0
Major	0	0 (0.0%)	0	0	2	2 (2.1%)	2	0
Minor	0	0 (0.0%)	0	0	1	1 (1.1%)	1	0
Stroke or TIA	4	3 (2.9%)	1	4	1	1 (1.1%)	0	0
Disabling stroke	2	2 (1.9%)	1	2	1	1 (1.1%)	0	0
Non-disabling stroke	1	1 (1.0%)	0	1	0	0 (0.0%)	0	0

Event	Summary Statistics*							
	0 - 30 Days (N=103)				31 - 365 Days (N=95)			
	No. of Events	No. of Patients†	Device Related	Procedure Related	No. of Events	No. of Patients†	Device Related	Procedure Related
Undetermined	1	1 (1.0%)	0	1	0	0 (0.0%)	0	0
TIA	0	0 (0.0%)	0	0	0	0 (0.0%)	0	0
Endocarditis	0	0 (0.0%)	0	0	4	4 (4.2%)	3	0
Structural valve dysfunction	0	0 (0.0%)	0	0	0	0 (0.0%)	0	0
Emergency surgery or intervention during index procedure	6	5 (4.9%)	3	6	0	0 (0.0%)	0	0
Mitral valve reintervention	2	2 (1.9%)	2	2	3	3 (3.2%)	3	2

HFH: heart failure hospitalization; PPM: permanent pacemaker; ICD: implantable cardioverter defibrillator; TIA: transient ischemic attack.

*Patients who had at least one day of follow-up available during each period are included in the analysis.

†Number of events (percent of patients experienced at least one event during each period).

13.7. Subgroup Analysis

The primary endpoint result by race is shown in Table 11.

Table 11. Primary Endpoint Result by Race

Race	Freedom From All-Cause Mortality and Heart Failure Hospitalization* (N=103)
White or Caucasian	62/101
Black or African American	1/2
Native Hawaiian or Other Pacific Islander	0/0
Asian	0/0
American Indian or Alaskan Native	0/0
Other	0/0
Declined or unknown	0/0

*number of patients with events/total number of patients in the subgroup.

13.8. Procedural Information

The procedural data are summarized in Table 12. Successful valve implant was achieved in all attempted patients.

Table 12. Procedural Data

Procedural Characteristic	Summary Statistics* (N=103)
Total procedure time (min)†	120.9 ± 37.7 (102)
Device time (min)‡	45.6 ± 19.8 (99)
Total fluoroscopy time (min)	18.5 ± 12.3 (99)
Successful valve implant rate	100.0% (103/103)
First valve implanted	99.0% (102/103)
First valve implanted, retrieved, second valve implanted	1.0% (1/103)
Valve type implanted	
SP	18.4% (19/103)
LP	81.6% (84/103)

*Continuous measures – mean ± SD (total no.); categorical measures – % (no./total no.).
†The time elapsed from the start time of anesthesia to time of skin closure.
‡The time elapsed from the start of the apex penetration to the time the tether tensioning ends.

14. Disposal

Dispose of all packaging materials as appropriate. Dispose of Delivery Systems, Loading Systems, Pad Positioning Systems, Retrieval Systems, and other components per standard solid biohazard waste procedures. Dispose of the Glutaraldehyde storage solution following hospital standards/protocols for disposal of hazardous substances.

15. Explanted Valve

An explanted valve may be placed into a suitable histological fixative such as 10% neutral buffered formalin or 2% glutaraldehyde and returned for analysis. Contact Abbott to request an Explant Kit.

16. Incident Reporting

If, in the course of use of this device, you have reason to believe that a serious incident occurred, please report it to the manufacturer. For user facilities in the United States of America, report a medical device-related serious injury to the manufacturer, or to the FDA if the medical device manufacturer is unknown.

17. DISCLAIMER OF WARRANTY AND LIMITATION OF REMEDY

Abbott Medical has exercised reasonable care in the manufacture of this device; however, numerous factors beyond Abbott Medical's control can affect this device and the results obtained from its use. ABBOTT MEDICAL, THEREFORE, MAKES NO WARRANTIES REGARDING THIS DEVICE AND EXPRESSLY DISCLAIMS ALL WARRANTIES, WHETHER EXPRESS OR IMPLIED BY OPERATION OF LAW OR OTHERWISE, INCLUDING, BUT NOT LIMITED TO, ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. ABBOTT MEDICAL SHALL NOT BE LIABLE TO ANY PERSON OR ENTITY FOR ANY INCIDENTAL OR CONSEQUENTIAL LOSS, DAMAGE OR EXPENSE, DIRECTLY OR INDIRECTLY ARISING FROM THE USE OF THIS DEVICE. NO PERSON HAS ANY AUTHORITY TO ASSUME ANY LIABILITY ON BEHALF OF ABBOTT MEDICAL WITH RESPECT TO THE DEVICE OR TO MAKE ANY GUARANTEE, REPRESENTATION, OR WARRANTY WITH RESPECT TO THE DEVICE. The exclusions and limitations set forth above are not intended to and should not be construed so as to contravene mandatory provisions of applicable law. If any term of this Disclaimer of Warranty is held to be illegal, unenforceable or in conflict with applicable law by a court of competent jurisdiction, the validity of the remaining portions of this Disclaimer of Warranty shall not be affected.
Descriptions or specifications in any Abbott Medical printed material are intended solely to generally describe the device at the time of manufacture and do not constitute any express warranties.
ABBOTT MEDICAL WILL NOT BE RESPONSIBLE FOR ANY DIRECT, INCIDENTAL OR CONSEQUENTIAL LOSS, DAMAGE, OR EXPENSE RESULTING FROM REUSE, REPROCESSING, OR RE-STERILIZATION OF THIS DEVICE.

WARNING: This product can expose you to chemicals including ethylene oxide, which is known to the State of California to cause cancer and birth defects or other reproductive harm. For more information, go to www.P65Warnings.ca.gov.

Graphical Symbols for Medical Device Labeling

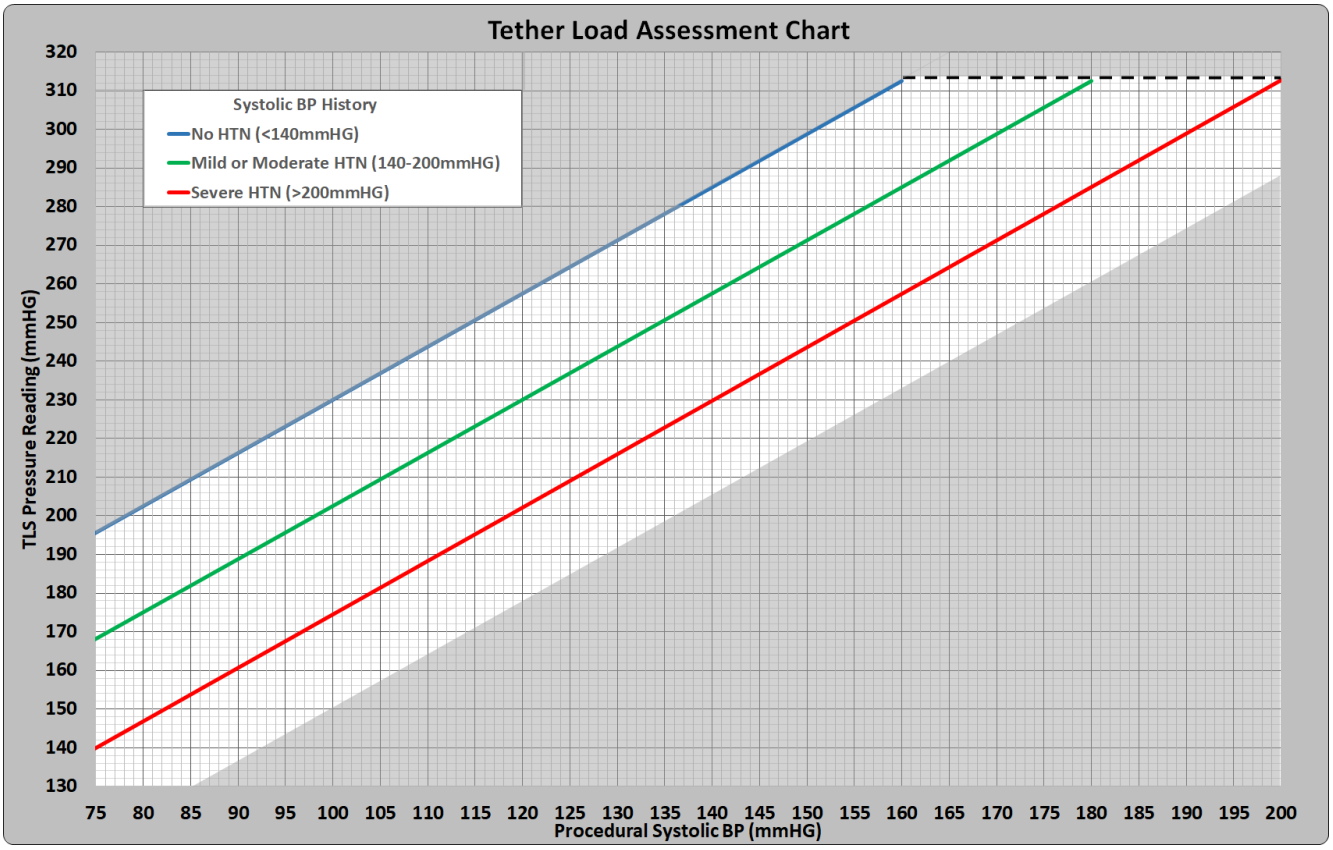
The symbols below and harmonized symbols may be found on the product or product label. For harmonized symbols, refer to the Universal Symbols Glossary at medical.abbott/manuals.

CONTENTS	Contents (component included with device)
STERILE LC	Sterilized using liquid chemical sterilants
Storage Solution: Glutaraldehyde	Storage solution: Glutaraldehyde
	Clean and sterilize prior to each use
EC REP	Authorized Representative in the European Community
CE 2797	European Conformity, affixed in accordance with European Council Regulation 2017/745 (NB 2797). Hereby, Abbott Medical declares that this device is in compliance with the relevant provisions of this regulation.
UDI	Unique Device Identifier
MD	Medical Device
	Importer
CC	Country of Manufacture
	Temperature Indicator: If red, do not use

UK CA 0086	United Kingdom Conformity Assessed
UKRP	Responsible person in the United Kingdom
℞ ONLY	USA only: Federal law restricts this device to sale by or on the order of a Physician
(7440-48-4) (117-81-7)	Contains hazardous substances (Cobalt CAS 7440-48-4) (DEHP CAS 117-81-7)
	Manufacturing facility
Mitral Valve	Mitral Valve
Apical Pad	Apical Pad
Delivery System	Delivery System
Loading System	Loading System
 medical.abbott/manuals	Follow instructions for use on this website
Pad Positioning System	Pad Positioning System
Retrieval System	Retrieval System
Stand Components	Stand Components
Stand	Stand

	2 lb Weight

APPENDIX A: Tether Load Chart



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