Myval™
Transcatheter Heart Valve System

INSTRUCTIONS FOR USE

1.0 Device Description

Myval™ Transcatheter Heart Valve System comprises of following components:

- A balloon expandable Myval™ Transcatheter Heart Valve consisting of a) a frame of Cobalt-Nickel-Chromium-Molybdenum Alloy, b) a tri-leaflet valve made from fixed bovine pericardium tissue and c) inner and outer fabric covers.
- Navigator™/ Navigator™ Inception/ Navigator Neo™/ Navigator Pro™ Transcatheter Heart Valve Delivery System is suitable for implantation of Transcatheter heart valve by balloon expansion. The distal portion of its shaft can be flexed to match anatomical curvatures to reach the implantation site. It includes an atraumatic tapered tip at its distal end. Radiopaque markers are provided within the balloon for guidance under fluoroscopy.
- Mammoth™/ Mammoth Neo™ Balloon Dilatation Catheter consists of a balloon (dilatation element). Dual lumens permit simultaneous movement of guide wire as well as balloon inflation fluid. The proximal end of the shaft has a 'Y' luer hub with two ports; one for introducing balloon inflation fluid and the second which acts as a guide wire exit port. Radiopaque markers are provided within the balloon for guidance under fluoroscopy and positioning the device across the treatment site.
- Python™ / Python™ Pro / Python™ Inception Introducer Set consists of a introducer tube with radiopaque distal tip and equipped with proximal hemostatic valve, two (2) size matched dilators, two (2) size matched loaders and an extension line with 3 way stopcock. Introducer Set is intended for insertion of THVR related hardware such as Guide wires, Balloon Dilatation Catheter, the THV pre-mounted on the balloon of transcatheter heart valve delivery system in and out of patient's vasculature.
- Val-de-Crimp™/ CrocoDial Compass™ Transcatheter Heart Valve Crimping Tool (Sterile) / CrocoDial™ Transcatheter Heart Valve Crimping Tool (Non-sterile) is a crimping tool used for Transcatheter Heart Valve (THV) on balloon of Transcatheter Heart Valve Delivery System.

1.1 Device Components Description

1.1.1 MyVal™ Transcatheter Heart Valve

Myval™ THV is offered in diameters – 20mm, 21.5mm, 23mm, 24.5mm, 26mm, 27.5mm, 29mm, 30.5mm & 32mm.

The parameters of these sizes are given in the table below:

Table 1

Reference/ Catalog Number	THV Size (mm)	Transesophageal Echocardiogram (TEE)* (mm)	Native Annulus Area (mm^2)	Area-derived diameter (mm)
MVL2200	20	16 –19	270 – 330	18.5 – 20.5
MVL2215	21.5	17.5 – 20.5	314 – 380	20 – 22
MVL2230	23	18 – 22	360 – 440	21.4 – 23.7
MVL2245	24.5	19.5 – 23.5	410 – 500	22.8 – 25.2
MVL2260	26	21 – 25	460 – 560	24.2 – 26.7
MVL2275	27.5	22.5 – 26.5	510 – 630	25.5 – 28.3
MVL2290	29	24 – 28	570 – 700	26.9 – 29.9
MVL2305	30.5	25.5 – 29.5	630 – 770	28.3 – 31.3
MVL2320	32	27 – 31	700 – 840	29.9 – 32.7

*THV size decisions are made using measurements based on multi-slice CT imaging undertaken in systolic phase of cardiac cycle. Essentially standard measurements incorporating annular, supra annular and sub annular anatomies may be considered.
The final selection of the size of THV is usually based on the anatomy of native valve annulus. Meril recommends use of 3mensio (Pie Medical, The Netherlands) and or similar imaging software to measure the appropriate dimensions of valve annulus of a particular patient.
Sizing decision of THV should be done by a qualified THVR heart team or an experienced THVR operator and is based in consultation with annulus measurements derived from patient's CT scan along with degree of calcification present at the site of implantation. Depending on the anatomical challenges and presence of calcium this may range from 5 –10% beyond the CT derived area & diameter at the valve annulus.

1.1.2 Navigator™ / Navigator™ Inception /Navigator Neo™ / Navigator Pro™ Transcatheter Heart Valve Delivery System

The Navigator™ / Navigator™ Inception / Navigator Neo™ / Navigator Pro™ Transcatheter Heart Valve Delivery System is an over-the-wire system available in usable length of 120 cm with balloon lengths of 30mm & 35mm in both models and various balloon diameters. This system is compatible with 0.035"guidewire having a minimum exchange length of 260 cm.

The details are given in the following table.

Table 2

Balloon Diameter (mm)	Balloon length (mm)	Navigator™	Navigator Neo™	Navigator Pro™	Navigator™ Inception
Model 01					
14F					
20	30	NVT20030	NVTN20030	NVTP20030	NVTI20030
21.5		NVT21530	NVTN21530	NVTP21530	NVTI21530
23		NVT23030	NVTN23030	NVTP23030	NVTI23030
24.5		NVT24530	NVTN24530	NVTP24530	NVTI24530
26		NVT26030	NVTN26030	NVTP26030	NVTI26030
27.5		NVT27530	NVTN27530	NVTP27530	NVTI27530
29		NVT29030	NVTN29030	NVTP29030	NVTI29030
27.5	35	NVT27535	NVTN27535	NVTP27535	NVTI27535
29		NVT29035	NVTN29035	NVTP29035	NVTI29035
30.5		NVT30535	NVTN30535	NVTP30535	NVTI30535
32		NVT32035	NVTN32035	NVTP32035	NVTI32035
16F					
20	30	NVS20030	NVNS20030	NVPS20030	NVIS20030
21.5		NVS21530	NVNS21530	NVPS21530	NVIS21530
23		NVS23030	NVNS23030	NVPS23030	NVIS23030
24.5		NVS24530	NVNS24530	NVPS24530	NVIS24530
26		NVS26030	NVNS26030	NVPS26030	NVIS26030
27.5	35	NVS27535	NVNS27535	NVPS27535	NVIS27535
29		NVS29035	NVNS29035	NVPS29035	NVIS29035
30.5		NVS30535	NVNS30535	NVPS30535	NVIS30535
32		NVS32035	NVNS32035	NVPS32035	NVIS32035
Model 1.1					
14F					
20	30	NVT120030	NVTN120030	NVTP120030	NVTI120030
21.5		NVT121530	NVTN121530	NVTP121530	NVTI121530
23		NVT123030	NVTN123030	NVTP123030	NVTI123030
24.5		NVT124530	NVTN124530	NVTP124530	NVTI124530
26		NVT126030	NVTN126030	NVTP126030	NVTI126030
27.5		NVT127530	NVTN127530	NVTP127530	NVTI127530
29		NVT129030	NVTN129030	NVTP129030	NVTI129030
27.5	35	NVT127535	NVTN127535	NVTP127535	NVTI127535
29		NVT129035	NVTN129035	NVTP129035	NVTI129035
30.5		NVT130535	NVTN130535	NVTP130535	NVTI130535
32		NVT132035	NVTN132035	NVTP132035	NVTI132035
16F					
20	30	NVS120030	NVNS120030	NVPS120030	NVIS120030
21.5		NVS121530	NVNS121530	NVPS121530	NVIS121530
23		NVS123030	NVNS123030	NVPS123030	NVIS123030
24.5		NVS124530	NVNS124530	NVPS124530	NVIS124530
26		NVS126030	NVNS126030	NVPS126030	NVIS126030
27.5	35	NVS127535	NVNS127535	NVPS127535	NVIS127535
29		NVS129035	NVNS129035	NVPS129035	NVIS129035
30.5		NVS130535	NVNS130535	NVPS130535	NVIS130535
32		NVS132035	NVNS132035	NVPS132035	NVIS132035
Model 02					
14F					
20	30	NVT220030	NVTN220030	NVTP220030	NVTI220030
21.5		NVT221530	NVTN221530	NVTP221530	NVTI221530
23		NVT223030	NVTN223030	NVTP223030	NVTI223030
24.5		NVT224530	NVTN224530	NVTP224530	NVTI224530
26		NVT226030	NVTN226030	NVTP226030	NVTI226030
27.5		NVT227530	NVTN227530	NVTP227530	NVTI227530
29		NVT229030	NVTN229030	NVTP229030	NVTI229030
27.5	35	NVT227535	NVTN227535	NVTP227535	NVTI227535
29		NVT229035	NVTN229035	NVTP229035	NVTI229035
30.5		NVT230535	NVTN230535	NVTP230535	NVTI230535
32		NVT232035	NVTN232035	NVTP232035	NVTI232035
16F					
20	30	NVS220030	NVNS220030	NVPS220030	NVIS220030

21.5		NVS221530	NVNS221530	NVPS221530	NVIS221530
23		NVS223030	NVNS223030	NVPS223030	NVIS223030
24.5		NVS224530	NVNS224530	NVPS224530	NVIS224530
26		NVS226030	NVNS226030	NVPS226030	NVIS226030
27.5	35	NVS227535	NVNS227535	NVPS227535	NVIS227535
29		NVS229035	NVNS229035	NVPS229035	NVIS229035
30.5		NVS230535	NVNS230535	NVPS230535	NVIS230535
32		NVS232035	NVNS232035	NVPS232035	NVIS232035

The Nominal Inflation Volume and Rated Burst Pressure are mentioned on product label.

Note: Navigator™ / Navigator™ Inception / Navigator Neo™ / Navigator Pro™ Transcatheter Heart Valve Delivery System should be used only with the Meril's Introducer Set provided by Meril Life Sciences.

Note: A separate IFU is provided for Navigator™ / Navigator™ Inception / Navigator Neo™ / Navigator Pro™ Transcatheter Heart Valve Delivery System.

1.1.3 Mammoth™ / Mammoth Neo™ Balloon Dilatation Catheter

Mammoth™ / Mammoth Neo™ Balloon Dilatation Catheter is an over-the-wire system available in usable length of 130 cm with balloon length of 40mm and various balloon diameters. This system is compatible with 0.035"guidewire having a minimum length of 260 cm.

The details are given in the following table.

Table 3

Reference/ Catalog Number	Balloon size (Diameter in mm)	Inflation volume for predilatation (ml)
MTV1440	14	8
MTVN1440		
MTV1640	16	10
MTVN1640		
MTV1840	18	13
MTVN1840		
MTV2040	20	16
MTVN2040		
MTV2340	23	23
MTVN2340		
MTV2540	25	25
MTVN2540		
MTV2840	28	34
MTVN2840		
MTV3040	30	42
MTVN3040		

The Balloon Rated Burst Pressure is mentioned on product label.

Note: A separate IFU is provided for Mammoth™ / Mammoth Neo™ Balloon Dilatation Catheter.

1.1.4 Python™ / Python™ Pro / Python™ Inception Introducer Set

The Python™ / Python™ Pro / Python™ Inception is available in 14F size, for which catalogue numbers are given in table below.

Table 4

Product Name	14F
Python™	PHT14
Python™ Pro	PHTPR14
Python™ Inception	PHTI14

Note: A separate IFU is provided for Python™ / Python™ Pro / Python™ Inception Introducer Set.

1.1.5 Crimping Tool

Meril has two alternate crimping tools as mentioned below.

1.1.5.1 Val-de-Crimp™ / CrocoDial Compass™ Transcatheter Heart Valve Crimping Tool (Sterile)

The Reference/Catalog Number is given in the following table.

Table 5

Reference/ Catalog Number
VLDC/ CCDC

1.1.5.2 CrocoDial™ Transcatheter Heart Valve Crimping Tool (Non-sterile)

The Reference/Catalog Number is given in the following table.

Table 6

Reference/ Catalog Number
CCD

Please refer to respective Instruction for Use for details of device preparation and handling.

Note: THV should be crimped using any one of the above crimping tools only.

The stopper size 8.0 is assembled in Transcatheter Heart Valve Crimping Tool, which is used for primary crimping of Transcatheter Heart Valve on Transcatheter Heart Valve Delivery System.
For the final crimping, additional 3 stoppers are provided for final crimping of different sizes of Transcatheter Heart valve as mentioned below.

Table 7

Stopper Size	Transcatheter Heart Valve Size
Stopper 8	Primary Crimping of all Transcatheter Heart Valve Size
Stopper 3.5	20mm & 21.5mm
Stopper 4.0	23mm, 24.5mm, 26mm & 27.5mm
Stopper 4.5	29mm, 30.5mm & 32mm

2.0 How Supplied

Transcatheter Heart Valve is sterilized by liquid chemical sterilization method and is non-pyrogenic. It is placed in a polypropylene container containing 0.625% glutaraldehyde solution. The container is sealed using a heat shrink by Poly-oly film seal. The polypropylene container is placed in a product box and Electronic temperature indicator is affixed on it, which is further enclosed in a polystyrene box and finally in E-Flute Box.

The Balloon Dilatation Catheter, Transcatheter Heart Valve Delivery System, Introducer Set and Transcatheter Heart Valve Crimping Tool are sterilized using Ethylene Oxide sterilization method.

Balloon Dilatation Catheter and Introducer Set are supplied in a separate Tyvek pouch placed in a product box and product box is placed in E-Flute Box.

Transcatheter Heart Valve Delivery System is supplied in a separate Tyvek pouch placed in a product box and B-Flute Box. Transcatheter Heart Valve Crimping Tool supplied in a separate Tyvek pouch, Header bag placed in a product box and product box is placed in E-Flute Box.

2.1 Contents

- One (1) Transcatheter Heart Valve with IFU
- One (1) Transcatheter Heart Valve Delivery System with IFU
- One (1) Balloon Dilatation Catheter with IFU
- One (1) Introducer Set with IFU
- One (1) Crimping tool with IFU
- Two (2) THV Implant card

2.2 Storage

Store Transcatheter Heart Valve between 10°C - 25°C (50°F - 77°F) temperature. The Transcatheter Heart Valve Delivery System, Balloon dilatation catheter, Introducer set, Crimping tool and other accessories should be stored in a cool and dry place in its original packaging.

2.3 Electronic temperature indicator

TagAlert® Indicator is provided on outer packaging of THV for shipping and storage temperature monitoring.

Use the Transcatheter Heart Valve only if the LCD displays "OK" (Figure 1). Do not use it if the LCD displays any other message (Figure 2 - 8).

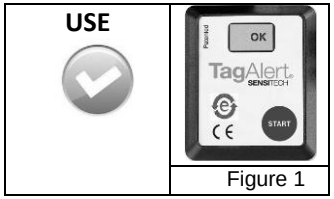

Figure 1

Do not USE

Figure 2

Figure 3

Figure 4

Figure 5

Figure 6

Figure 7

Figure 8

3.0 Indications

Transcatheter Heart Valve (THV) and accessories are indicated for relief of aortic stenosis in patients with symptomatic heart disease due to severe native calcific aortic stenosis as judged by a heart team (including a cardiac surgeon) and in patients who are at a risk for open heart surgical therapy (Society of Thoracic Surgeons operative risk score of ≥4% risk of mortality at 30 days).

4.0 Contraindications

Transcatheter Heart Valve is contraindicated under following conditions:

- Patients with hyper sensitivity or allergy to aspirin, heparin, clopidogrel, ticlopidine, cobalt, nickel, chromium, molybdenum or any contrast media.
- Patients in whom anti-platelet and/or anticoagulant therapy are contraindicated.
- In anatomical or clinical conditions which make THVR unfeasible.
- In clinical situations which would prohibit interventional procedures of the heart such as ongoing infective endocarditis or any similar infection.

5.0 Warnings

- Please note that Transcatheter Heart Valve contains animal tissue derivative viz. fixed bovine pericardium.
- Implantation of the Transcatheter Heart Valve should be performed only by Physicians who are trained in interventional and endovascular procedures especially qualified for performing transcatheter heart valve replacement procedure may include Interventional Cardiologist, Cardiothoracic surgeon etc. New THVR sites must undertake procedure under active guidance of a trained/qualified doctor till sufficient skills are acquired for an individual to perform cases alone.
- Transcatheter Heart Valve and accessory devices are supplied sterile (except CrocoDial™ THV crimping tool which is supplied non-sterile) and are for a single use only. Do not resterilize or reuse the devices.
- Follow the instructions given in this document for sizing of Transcatheter Heart Valve. Transcatheter Heart Valve sizing is a critical decision since this has an implication for acute procedural success and impacts long term valve performance. Incorrect sizing may result in mismatch with the implant site giving rise to probable risk of migration/embolization of the valve, para/peri-valvular leakage and/or overstretching of aorta and in extreme case an annular rupture.
- The physician must ensure correct orientation of the Transcatheter Heart Valve prior to its crimping; the inflow (outer skirt end) of the Transcatheter Heart Valve should be oriented towards the distal end of the balloon.
- Transcatheter Heart Valve may deteriorate faster in patients with hyper metabolic states where patient has a propensity of increased calcium deposition similar to other tissue valve technologies.
- Standard intra-procedural care with concomitant interventional devices must be maintained to avoid potential injury to patient's myocardium.
- Currently limited experience with Transcatheter Heart Valve exists in patients presenting with following clinical conditions:
  - Previously deployed surgical bioprosthetic valve in native aortic annulus.
  - Highly decompensated left ventricular function (less than 20%).
  - Severely thickened left ventricular wall, with/without severely reduced ventricular cavity that may prevent procedural success and limit clinical outcomes.
  - Severe aortic regurgitation without presence of aortic stenosis which would impair valve fixation.
- To prevent leaflet damage, the Transcatheter Heart Valve must remain in its supplied storage solution and/or sterile saline solution. It must not be exposed to any other solutions, antibiotics, chemicals etc. and should not be allowed to dry.
- Do not handle Transcatheter Heart Valve in a way that may result in any damage to the leaflets. Do not use Transcatheter Heart Valve if the leaflets are damaged during any part of the procedure.
- Do not use Transcatheter Heart Valve, delivery system, other components and accessory devices if the package seal is damaged or broken, as this may compromise the sterility.
- Do not use Transcatheter Heart Valve, delivery system, other components and accessory devices after expiry date, as either sterility or their function may be compromised.

6.0 Precautions

- Transcatheter Heart Valve is supplied in glutaraldehyde solution. Glutaraldehyde is toxic if swallowed or inhaled. Glutaraldehyde is known to cause skin burns and eye damage. It may cause an allergic skin reaction. It may cause allergy or asthma symptoms or breathing difficulties if inhaled. Do not breathe fume/vapours of glutaraldehyde. Wash the body parts which have come in contact with glutaraldehyde with water. Ensure sufficient ventilation.
- A proper antibacterial coverage as per guidelines should be practiced as a standard of care to prevent risk of infection at the valve implantation site.
- Individual THVR patient must receive standard dual-antiplatelet medication along with anticoagulation treatment as directed by THVR operator and treatment guidelines.
- Routine medical check-up at intervals must be considered by THVR operators depending on patient risk factors and hospital practices.
- The large sizing matrix of Transcatheter Heart Valve obviates the need for over or under expansion of the valve which results in preserving valve geometry and respecting patient's anatomy.
- Transcatheter Heart Valve in patients requiring mitral valve-in-valve replacement should be evaluated as per standard guidelines and practices.

7.0 Adverse Effects

Undesirable effects/adverse events (in alphabetical orders) that may be associated with the implantation of Valve in native valve includes but are not limited to:

- Allergic reactions
- Anemia
- Aneurysm
- Angina
- Arteriovenous fistula
- Arrhythmias including ventricular fibrillation (VF) and ventricular tachycardia (VT)
- Blockage of peripheral vasculature
- Cardiogenic shock
- Cardio tamponade
- Change in access size
- Conversion to open heart surgery
- Death
- Dissection
- Embolization
- Heart Failure
- Hematoma
- Hypotension/hypertension
- Myocardial infarction
- Pain
- Perforation or rupture
- Pericardial effusion
- Pulmonary edema
- Renal failure
- Respiratory failure
- Syncope
- Vasovagal response
- Vessel perforation
- Vessel spasm
- Vessel trauma requiring surgical repair or intervention
- Stroke

Potential risks specific to the THVR procedure:

- Bleeding requiring transfusion or intervention
- Cardiac arrest
- Cardiac failure or low cardiac output
- Central aortic regurgitation or paravalvular leaks
- Haemolysis
- Heterotopic valve deployment
- Infection, fever, septicemia, abscess, endocarditis
- Injury to mitral valve
- Left and / or right ventricular perforation
- Mechanical failure of delivery system, and/or accessories, including balloon rupture and tip separation
- New onset conduction system defect which may or may not necessitate a new permanent pacemaker implantation
- Occlusion of coronary arteries by native aortic valve leaflets
- Pericardial effusion

- Periprocedural cerebrovascular accident
- Structural valve deterioration (wear, fracture, calcification, stenosis)
- Thrombus formation on implanted valve
- Trauma to aortic root complex and neighbouring anatomical sites
- Valve explants
- Valve migration, malposition or embolization requiring intervention

8.0 Recommended drug regimen

Antiplatelet or anticoagulant therapy is recommended as per standard guidelines and hospital practices.

9.0 Individualization of treatment

As per standard guidelines and hospital practices.

10.0 Use in special population

As per standard guidelines and hospital practices.

11.0 Magnetic Resonance Imaging (MRI) Statement

Conditional

Non-clinical testing has demonstrated that the "Transcatheter Heart Valve" is MR conditional. A patient with this device can be safely scanned in an MR system meeting the following conditions:

- Static magnetic field of 7 Tesla, with
  - Maximum spatial field gradient of 4,700 G/cm (47 T/m)
  - Maximum force product of 243,000,000 G2/cm (243 T^2/m)
- Theoretically estimated maximum head averaged (HA) specific absorption rate (SAR) of 2 W/kg (Normal Operating Mode)
- Under the scan conditions defined above, the is " Transcatheter Heart valve" is expected to produce a maximum temperature rise of less than;
  - 0.3 °C (2 W/kg, 7 Tesla) RF-related temperature increase with a background temperature increase of ≈ 0.3 °C (2 W/kg, 7 Tesla) after 15 minutes of continuous scanning.
- In non-clinical testing, the image artefact caused by the device extends approximately 17.1 mm from the Transcatheter Heart Valve when imaged with a gradient echo pulse sequence and a 7 Tesla MR system.

12.0 Clinical use information

12.1 Inspection prior to use

- Carefully inspect the packages for physical damage before opening. Do not use if any package has been found damaged or open.
- The product should not be used after the "Use By" date specified on the label.
- If sterile package appears intact, carefully remove the system from the package and inspect for damage.
- Tear open the sterile pouch and carefully remove the products. Do not use in case if any damage is observed.
- Transfer to the sterile area using aseptic technique.

12.2 Materials required for the procedure

- THVR procedures have to be performed under active fluoroscopic guidance.
- Transesophageal echocardiography or transthoracic echocardiography equipment
- 0.89 mm (0.035 inch) stiff/ extra-stiff/superstiff guidewire, with appropriate exchange length
- Temporary Pacemaker (TPM) with accessories
- Meril's Transcatheter Heart Valve
- Meril's Transcatheter Heart Valve Delivery System
- Meril's balloon dilatation catheter
- Meril's Introducer Set
- Meril's THV crimping tool
- Inflation Device with sufficent volume for THV expansion
- Washing Tray with 500 ml bowls (sterile) for washing
- 2 Litres saline solution (sterile)
- Heparinized saline (sterile)
- Contrast medium diluted with saline solution (25% of contrast medium)
- Aseptic area for device preparation
- 10-30 ml syringe with luer lock
- 50-60 ml syringe with luer lock
- 3-way stopcock

12.3 Preparation

Device preparation, handling and implantation should be performed under aseptic conditions.

12.3.1 Transcatheter Heart Valve washing procedure

Transcatheter Heart Valve is supplied in a polypropylene container containing 0.625% glutaraldehyde solution. Transcatheter Heart Valve should be fully submerged in the storage solution when the package is opened.

Note: If the container is found damaged, seal broken, leaked and found without adequate storage solution, do not use Transcatheter Heart Valve.

- Take four (4) sterile bowls and fill each of them with at least 500 ml of sterile saline.
- Carefully remove Transcatheter Heart Valve with Cage from the container without touching the tissue. Ensure that there is no damage to the frame or tissue of Transcatheter Heart Valve during handling.
- Place Transcatheter Heart Valve in the first bowl of sterile saline. The saline solution should completely cover Transcatheter Heart Valve with Cage.
- With Transcatheter Heart Valve with Cage submerged, slowly agitate back and forth for at least 60 seconds.
- Transfer Transcatheter Heart Valve with Cage to the 2nd bowl of saline and gently agitate for at least 60 seconds.
- Transfer Transcatheter Heart Valve with Cage to the 3rd bowl of saline and gently agitate for at least 60 seconds.
- During agitation, ensure that Transcatheter Heart Valve does not come in contact with the bottom or sides of the bowl.
- Remove Transcatheter Heart Valve with Cage from the 3rd bowl.
- Carefully cut the suture to detach Transcatheter Heart Valve from the Cage.
- Transfer Transcatheter Heart Valve (without cage) to the 4th bowl of saline and leave it in this solution to keep the tissue wet.

Note: Do not implant Transcatheter Heart Valve without thoroughly washing as directed above.

12.3.2 Delivery system preparation

- Remove the packed Transcatheter Heart Valve Delivery System from the outer box.
- Ensure that the packing of the delivery system is not physically damaged.
- Remove the delivery system from the Tyvek pouch in aseptic condition.

Note: To prevent possible damage to the balloon shaft, ensure that the proximal end of the balloon shaft is not subjected to bending.

- The balloon is covered with a protective sheath. Carefully remove this sheath by gently sliding it taking care not to damage balloon.
- A stylet is provided in distal end of the catheter for its protection.
- Remove this stylet carefully and preserve it until the THV is crimped.
- Fill the syringe with sterile heparinized saline solution and connect it with the guidewire port of the hub. Pass this solution through the guidewire lumen such that the solution exits the distal tip of the catheter and remove the syringe thereafter.
- The next operation is filling the inflation lumen with diluted contrast medium and removing the air from the system.
- Insert the stylet into the distal end of the delivery catheter
- Attach a 50-60 ml syringe filled with 20-30 ml of diluted contrast medium to the balloon inflation port through a 3-way stopcock.
- Connect the inflation lumen of the catheter with the syringe by adjusting the stopcock and fill this medium in the inflation lumen by pushing the piston of the syringe.
- Apply vacuum in the lumen by pulling the piston of the syringe to remove the air.
- Push the plunger to fill the medium in the inflation lumen again.
- Repeat the operations of pulling vacuum and filling the lumen a few times to ensure removal of all the air from the system. After all the air is removed, fill the inflation lumen with the medium and close the 3-way stopcock.
- Fill the inflation device with diluted contrast medium with volume indicated in the table below.

12.3.3 Mounting Transcatheter Heart Valve on the balloon of the delivery system

Meril has two alternate crimping tools as mentioned below.

12.3.3.1 Val-de-Crimp™ / CrocoDial Compass™ Transcatheter Heart Valve Crimping Tool (Sterile)

- Remove the packed crimping tool from the outer box.
- Ensure that the packing of the crimping tool is not physically damaged.
- Remove the crimping tool from the Header bag and Tyvek pouch in aseptic condition and ensure that it is not physically damaged.
- Take Transcatheter Heart Valve from the fourth bowl and shake it gently to remove adhering liquid.
- Insert Transcatheter Heart Valve on the THV delivery system and move it across the balloon. The valve orientation is very important and depends on site of Implantation. For all retrograde approach procedures the external skirt must be towards the distal end of the THV delivery system.
- Move Transcatheter Heart Valve back on the balloon and position it between the two stoppers which is located on inner shaft of the balloon.
- With jaws of the crimping tool in open position, place Transcatheter Heart Valve (aligned between two stoppers) into the open crimping tool aperture such that it is located centrally within the aperture.

- Partially crimp Transcatheter Heart Valve with the help of Primary crimp stopper which is already attached with crimper such that its position can be adjusted by moving it across the balloon length.
- Remove the partially crimped Transcatheter Heart Valve from the crimping tool and position it accurately between the two stoppers of Balloon.
- Remove the Primary crimp stopper from the stopper base. Now select the desired stopper according to valve size and attached it with stopper base.
- Again place Transcatheter Heart Valve (aligned between two stoppers) into the crimping tool aperture such that it is located centrally within the aperture.
- Crimp Transcatheter Heart Valve until the handle stops at the stopper end and hold it in this position for at least 10-15 seconds.
- Open the aperture and repeat this crimping step two more times (total three crimps).
- Remove the stylet.
- Ensure that the leaflets remain wet throughout this operation.

12.3.3.2 CrocoDial™ Transcatheter Heart Valve Crimping Tool (Non-sterile)

- Remove the packed crimping tool from the outer box.
  Note: Sterilize Crocodial™ as per procedure specified in its IFU before use.
- Ensure that the packing of the crimping tool is not physically damaged.
- Remove the crimping tool from the Header bag in aseptic condition and ensure that it is not physically damaged.
- Take Transcatheter Heart Valve from the fourth bowl and shake it gently to remove adhering liquid.
- Insert Transcatheter Heart Valve from the distal end of the catheter such that the inflow end of Transcatheter Heart Valve (i.e. the end where the fabric cuff is located) faces the distal end of the delivery system and move it beyond the balloon. This orientation is very important.
- Move Transcatheter Heart Valve back on the balloon and position it between the two stoppers.
- With jaws of the crimping tool in open position, place Transcatheter Heart Valve (aligned between two stoppers) into the open crimping tool aperture such that it is located centrally within the aperture.
- Partially crimp Transcatheter Heart Valve such that its position can be adjusted by moving it across the balloon length.
- Remove the partially crimped Transcatheter Heart Valve from the crimping tool and position it accurately between the two stoppers.
- Again place Transcatheter Heart Valve (aligned between two stoppers) into the crimping tool aperture such that it is located centrally within the aperture.
- Crimp Transcatheter Heart Valve fully and hold it in this position for at least 20 seconds.
- Open the aperture and repeat this crimping step two more times (total three crimps).
- Remove the stylet.
- Ensure that the leaflets remain wet throughout this operation.

12.3.4 Preparation of Balloon Dilatation Catheter

- Remove the packed Balloon Dilatation Catheter from the outer box.
- Ensure that the packing of Balloon Dilatation Catheter is not physically damaged.
- Remove Balloon Dilatation Catheter from the Tyvek pouch and Tray in aseptic condition.
- The balloon is covered with a protective sheath. Carefully remove this sheath by gently sliding it taking care not to damage balloon.
- A stylet is provided in distal end of the catheter for its protection. Remove this stylet carefully.
- Fill the syringe with heparinized saline solution and connect it with the guidewire port of the hub. Pass this solution through the guidewire lumen such that the solution exits the distal tip of the catheter and remove the syringe thereafter.
- Fill the syringe with diluted contrast medium with volume as indicated on label.

12.4 Implantation procedure

12.4.1 Baseline parameters step

- Perform aortogram in standard views which allow for clear separation of all the coronary cusps and ensure co-planar view of the aortic root complex.
- Ascertain the aortic root complex and analyse the anatomical sites in conjunction with previously derived CT scan images
- A temporary pacemaker lead is usually placed in the right ventricle or in some cases procedural guidewire is used as a pacing lead. This may be done as per standard THVR center practices.
- Set the stimulation parameters to obtain 1:1 capture, and test pacing.
- THVR procedure is performed under standard fluoroscopic techniques and patient may or may not be sedated depending on patients condition and operators practice.

12.4.2 Preparing insertion site

- Prepare introducer set in accordance with the instructions for use for introducer set.
- Make incision in the femoro-illiac artery and dilate it if required.
- Insert introducer set along with dilator into the incision using normal clinical technique. During insertion the logo on the sheath should face upwards. Remove the dilator and close the sheath valve immediately.

12.4.3 Predilatation (Valvuloplasty)

- Predilatation procedure is generally considered to create a channel which allows smooth delivery of Transcatheter Heart Valve across the annulus. However, this may be considered from case to case basis by THVR Operator.
- Refer to Balloon Dilatation Catheter instructions for use (IFU) for information on device preparation and handling.
- Introduce Balloon Dilatation Catheter through introducer set and navigate it to the intended site i.e. to diseased native aortic valve of the patient under fluoroscopic guidance using contrast media.
- After placement of the balloon at the intended site, begin rapid ventricular pacing.
- Start balloon inflation when the systolic blood pressure has decreased to 50 mmHg or below.
- After achieving desired degree of pre-dilatation, deflate the balloon and withdraw Balloon Dilatation Catheter catheter from the body. Leave introducer set in place for implantation procedure.
- Activated Clotting Time must be maintained at $\geq$ 250 sec using standard anti-coagulation treatment

Note:

- Transcatheter Heart Valve implantation should not be carried out if the Balloon Dilatation Catheter cannot be fully inflated during Valvuloplasty.
- Measure the patient's creatinine level prior to the procedure. Contrast media usage should be monitored to minimise its adverse effects in renal compromised patients.
- Procedure may require an arterial cut-down with surgical closure of the puncture site due to the size of the arteriotomy.

12.4.4 THV implantation procedure

- Connect Inflation device to the inflation port of Transcatheter Heart Valve Delivery System.
- Take the size matched THV loader from Python Introducer Set tray and backload the loader to capture the distal end of crimped THV + Transcatheter Heart Valve Delivery System complex within its transparent distal end.
- Open introducer set valve and insert Transcatheter Heart Valve Delivery System mounted on Transcatheter Heart Valve Delivery System through it. Logo on the delivery system should face upwards during insertion.
- Advance the shaft of Transcatheter Heart Valve Delivery System through the vasculature under fluoroscopic guidance till THV crosses the native aortic valve. While manoeuvring the shaft through the aortic arch, flex the shaft using rotating wheel on the handle (refer to instructions for use of Transcatheter Heart Valve Delivery System).
- Adjust the position of Transcatheter heart valve under fluoroscopic guidance till second dark band from the distal end of Transcatheter heart valve is virtually bisected by aortic annular of aortic orifice. This ensures placement of Transcatheter heart valve at orthotropic position. (In case of Model 2 of Transcatheter Heart Valve Delivery System, four RO markers are placed. A proximal and a distal balloon marker; a mid balloon marker which are relatively less dense (passive) as compared to a prominent fourth marker known as the "THV Landing Zone" marker which is relatively denser. Once the Transcatheter Heart Valve has crossed the annulus, adjust the position of Transcatheter Heart Valve under fluoroscopic guidance till the "THV Landing Zone" radiopaque marker is virtually bisected by aortic annular plane of aortic orifice. This position allows the crimped THV to remain dominantly towards aortic end (70%) and marginally towards ventricular end (30%) and eventually facilitates orthotopic valve deployment Applicable for Transcatheter heart valve delivery system Model 2 only)
- Begin rapid pacing.
- Start inflation of Transcatheter Heart Valve Delivery System under rapid pacing once systolic blood pressures drop to less than 50 mmHg.

- Gradually and fully inflate the Transcatheter Heart Valve Delivery System and Transcatheter Heart Valve by injecting designated volume of saline: contrast mixture. Undertake a countdown of 3-4 seconds to ascertain that the balloon is fully inflated and proceed to deflate by retracting the inflation device.
- Stop temporary pacing.
- Ensure full deflation of the Transcatheter Heart Valve Delivery System and retract the Transcatheter Heart Valve Delivery System shaft. Take care to unflex the shaft while retracting through the aortic arch. Remove Transcatheter Heart Valve Delivery System through introducer set.
- Retract the pig tail catheter if placed in the coronary cusp (usually non-coronary) during valve deployment and undertake a fresh aortogram to ascertain valve placement and perfusion in coronary arteries.
- Using TTE or simultaneous pig tails in ascending aorta and left ventricle, measure the aortic gradients.
- Remove introducer set from the access site. Refer to the introducer set instructions for use for device removal.
- Vascular access closure must be performed after all therapeutic interventional devices have been retrieved and a DSA taken to ensure proper access site closure.

13.0 Patient implant card

Each Transcatheter Heart Valve contains duplicate implant cards which may be filled by cath-lab nursing staff for patient's medical history and company records.

14.0 Disposal of used devices

Dispose devices used during this procedure as per local regulatory requirements for medical device waste disposal.

15.0 Disclaimer of Warranty and Limitation of Remedy

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