Checking for the anatomical presence of left ventricular dilation and determining if the dilation is localized (aneurysmatic) or diffuse (dilated post-ischemic cardiomyopathy) is critical for proper pre-surgical planning and mannequin selection when considering a patient for the TRISVR procedure. It is optimal to perform the echocardiography diagnostic study pre-operatively rather than intra-operatively.

Two different types of left ventricular (LV) dilation should be considered for TRISVR Surgical Ventricular Restoration:

A) The first type is characterized by a localized or aneurysmatic dilation with the presence of a well-defined neck. The neck of the aneurysm is at the transitional zone between the normal and contractile muscle and the aneurysmatic scar. The dilation involves either the anterior or the inferolateral wall. Some areas of the LV have a preserved shortening fraction while others have a complete akinesia or dyskinesia and a more dilated and thin wall. Patients presenting with this type of disease may have either normal LV function or a decreased ejection fraction (EF). In either case, the surgical approach is very straightforward because the diseased area to be excised is clearly evident. Patients with localized dilation in the presence of a clearly defined neck are seen less frequently, due to the increasing availability of early intervention.

B) The second type of dilation is found commonly in post-ischemic cardiomyopathy patients where the infarctual necrosis involves the main part of the left ventricle. These types of patients are ideal candidates for the TRISVR procedure. By echo, the left ventricle shows a global dilation where more than 35% of the anterior wall is involved and the EF is very much reduced. Full functional echo assessment is crucial for surgical planning and for determination of potential surgical risk. It is not unusual to find, in this kind of patients, a mitral valve involvement with different degrees of functional mitral regurgitation (FMR). Patients with mitral valve disease in the presence of left ventricular dilation and low ejection fraction are considered to be at a higher surgical risk.
Echocardiography assessment

Perform a Full Functional Echo Assessment

1. Calculate the sphericity of the left ventricle measuring the long axis (from the apex toward the mitral plane), the short axis (at mid ventricle and at the level of the apex); all three axis at end-diastole and end –systole.

2. Continue the examination with the other anatomical assessments:
   a. Examine the ventricle for the presence of clots
   b. Assess the thickness of the akinetic wall
   c. Determine the wall motion score
   d. Assess for mitral valve involvement
   e. Assess the shape of the LV
   f. Perform full m-mode measurement of the LV and RV dimensions
   g. Assess for calcification of the dilation
   h. Document any other anatomical abnormalities
   i. Determine the presence of the neck

Perform the systolic functional analysis:

1. Measure the left ventricular end diastolic and end systolic volumes (both apical 4 and 2 chambers views).
   a. For end diastolic volume, start drawing the endocardial contour at end-diastole (EKG trace the last frame before the mitral valve closing)
   b. Trace a line from the apex to the mitral plane
   c. The echo machine will automatically calculate the volume (Simpson method)
   d. Repeat the same measurement for the end-systolic area (EKG trace of the frame before mitral opening)
   e. The measurements are body-surface correlates (body surface index.)

2. The echo machine automatically calculates the ejection fraction when the end diastolic and end systolic volumes (EDV-ESV/EDV) are entered.
3. Calculate the cardiac output by measuring the left ventricle outflow tract (LVOT) diameter and enter the measurement into the following formula- \( \text{LVOT radius}^2 \times \pi \times \text{LVOT VTI} \times \text{Heart rate} \). Certain echo machines will automatically calculate the CO when you enter LVOT diameter and calculate LVOT VTI.

4. Calculate the DP/DT. If Mitral valve regurgitation is present calculate the difference in msec between the regurgitate velocity at 1 m/sec and 3 m/sec then divide 32 mmHg (DP) and the obtained measurement (DT)
   a. normal values: >1200 mmHg/sec
   b. Moderate reduction of LV function >1000-<1200 mmHg/sec
   c. Severe reduction of LV function <1000 mmHg/sec).

Perform the diastolic functional assessment:
1. Assess the mitral valve pattern using the Mayo Clinic diastolic filling (normal E/A>1; abnormal relaxation E/A<1; pseudonormal E/A>1; restrictive E>>1)
2. TDI of the septal portion of the mitral annulus
3. Pulmonary vein flow reversal
4. Left atrial dimensions in parasternal long-axis view and apical 4 chamber view
5. Epatic vein collapse

Analyze the Right Ventricle (RV) dimensionally and the functionally:
1. If tricuspid regurgitation is present measure the pulmonary artery systolic pressure.
2. RV m-mode dimension
3. RV function-Tricuspid Annulus Plan Systolic Excursion (TAPSE):
   i. in the 4 chamber view put the cursor through the anterior tricuspid plane, then start the m-mode and measure the excursion of this plane starting from QRS of the EKG trace to the T wave
      a. normal values: > 20 mm
      b. abnormal values : < 15 mm
4. Tricuspid regurgitation degree and pulmonary artery systolic pressure

Assess for any other suspected cardiac pathologies.