

# Constraints - Excluding Extra-cardiac Activity

## OVERVIEW

If the dataset has significant extra-cardiac activity included in the LV surface contours (see Figure 1), then the functional and polar map estimates calculated by 4DM may be less accurate. Ideally, patient image data should be reacquired with minimal extra-cardiac activity present. However, if this is not possible, use the **Constraints** tool within 4DM to assist the application with finding the LV contours. The correct use of this tool allows the patient imaging data to be quantified more accurately by excluding extra-cardiac activity from the calculated estimates.

## HOW-TO GUIDE

The **Constraints** tool (Figure 2) can be accessed from the toolbar in the **MI Processing** screen. Within the **MI Processing** screen, the user can apply constraints while in the **Manual Processing** mode or the **Reset** mode. Use of the **Constraints** does not mask extra-cardiac space around the heart and remove it from the field of view. Instead, the calculations of the LV surfaces are confined within the constraints overlay.

### To apply Constraints, perform the following:

1. Click the **Constraints** tool. 4DM automatically positions a constraint border that overlays the SA, HLA, and VLA slice viewports for all datasets displayed. Adjustments to the constraint border are made with the resizing handles on the SA constraint overlay. (Figure 3).
2. Adjust the constraint border by clicking and dragging the resizing handles. Resize the constraint border so it does not clip any myocardium or leave additional space around the LV so extra-cardiac activity is included. See Figure 4 for examples of improperly sized constraints.
3. Visually confirm that the extra-cardiac activity is excluded in the SA, HLA, and VLA views and adjust if necessary (Figure 5).
4. Perform other necessary LV adjustments to the tilt, orientation, basal limit placement, and apical limit placement.

**i** For processing assistance, refer to the **MI Processing** screen Quick Reference Guide.

5. Click the **Process** tool (Figure 6) in the toolbar to apply 4DM LV surface generating calculations and return the screen to **QA** mode. The application displays updated contours, so the user can verify the new LV surface estimates after constraints are applied (Figure 7).

From the MI Processing screen's **QA** mode, ensure applied constraints are saved to the patient dataset by clicking **Save**.



Figure 6: Process tool

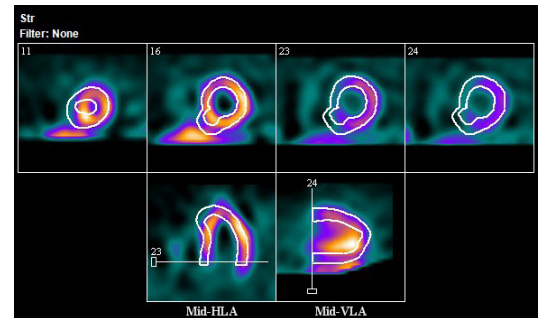


Figure 1: LV surface contours with extra-cardiac activity



Figure 2: Constraints tool

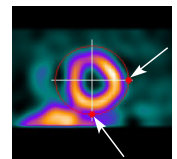


Figure 3: Constraints border overlay

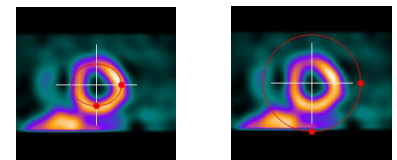


Figure 4: Improperly resized Constraints border

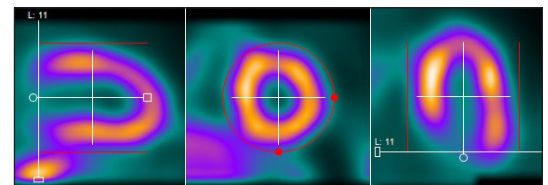


Figure 5: Properly resized Constraints border

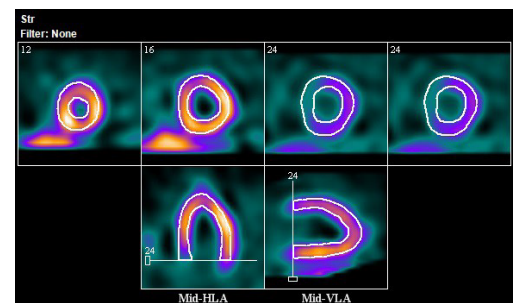


Figure 7: Accurate LV surface contours after Constraints are applied