

### **3D Geometric Relationship between the Mitral Annulus and the Coronaries from a Surgeon's Perspective**

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Background: Mitral annuloplasty involves sewing a rigid ring to support the mitral annulus. This involves a risk of damaging the surrounding structures in the left atrioventricular (AV) groove, especially the left circumflex artery (LCx) which may be inadvertently sutured, causing a coronary occlusion. We aimed to use cardiac CT scans to study the 3D relationship between the mitral valve annulus (MVA) and the neighbouring coronary arteries in the AV groove and to map the distance between the arteries and the circumference of the MVA.

Methods: We examined cardiac CT exams of two patient groups: 40 normal subjects (Group 1) and 20 patients with left ventricular dysfunction and/or mitral regurgitation (Group 2). The mitral annulus as well as the nearby coronaries were manually marked on a CT workstation and 3D coordinates saved in digital format. Dedicated software was developed to calculate the plane of the MVA and the smallest distance between each point on the mitral annulus and each of the LCx and right coronary arteries (RCA), called local minima. The global minimum for each heart is defined as the minimum of all local minima.

Results: The global minimum for the LCx averaged  $6.2 \pm 1.9$ mm usually occurring in the proximal LCx, just laterally to the left trigone; 30% of patients had a global minimum of less than 5mm. The latter was more common in patients with left dominance and in group 1 subjects. The major component of the line vector is in-planar while the through plane component is usually in an atrial direction. For the RCA the global minimum distance to the MVA is  $14.3 \pm 5.6$ mm, occurring at an angle of  $92 \pm 47$  degrees from the right trigone. No RCA approaches closer than 5mm with respect to the MVA, however 18% were closer than 10mm.

In conclusion, a significant percentage of LCx are situated in very close proximity to the MVA. Knowledge of the precise 3D relations between the structures would be expected to minimize iatrogenic complications.