

C22. Papillary Displacement: Specific Effects On Anterior And Posterior Leaflet Function

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OBJECTIVES: To clarify differential effects of papillary displacement on anterior and posterior mitral leaflets.

METHODS: Observations of live or postmortem mitral/ventricular complexes in more than 1500 human and other mammalian hearts, a lesser number of 2D echocardiograms and experiments on the effects on coaptation of varying papillary/annular positions and dimensions in dead hearts.

RESULTS: Essential facts: 1) Diastolic movement of the papillary muscles is apical, posterior and apart. The largest movement is apart. 2) The straight base of the anterior leaflet moves minimally between systole and diastole. The semicircular base of the multiscalloped posterior leaflet lengthens substantially in diastole. All radii centered at the middle of the base of the anterior leaflet increase so that the annulus change separates the scallops and moves the whole leaflet base posteriorly and outwards. 3) Papillary pull on the loadbearing chordae opens the basal noncoapting part of the anterior leaflet, while the coapting portion remains free to respond to fluid forces, such that at the end of diastole it is close to contact with the posterior leaflet. 4) Papillary pull on the posterior leaflet chordae opens the interscallop clefts and pulls the coapting area away from the anterior leaflet. 5) Pathology that fixes the papillary muscles in a permanent diastolic position has significantly more effect on the posterior than the anterior leaflet.

CONCLUSIONS: The different anatomy of anterior and posterior papillary , chordal and leaflet anatomy determines that optimal restoration of systolic coaptation demands restoration of papillary position in addition to the partial compensation provided by tight annuloplasty.