Apexcardiographic-Echocardiographic Correlation in Mitral Valve Prolapse*

Kenneth B. Desser, M.D., F.C.C.P.; Alberto Benchimol, M.D., F.C.C.P.; and Connie Sheasby

In 1972, we described simultaneously recorded phonocardiograms and apexcardiograms in two patients with angiographically documented mitral valve prolapse. Such study demonstrated the occurrence of an apical midsystolic retraction in conjunction with a midsystolic click on the phonocardiogram. Subsequent investigation indicated that both nonejection systolic clicks and apexcardiographic retractions correlated well with the demonstration of mitral valvular prolapse on left ventricular angiograms.

Echocardiography provides a new noninvasive technique for the diagnosis of mitral valve prolapse and has been independently applied for confirmation of characteristic auscultatory and apexcardiographic findings in the presence of ballooning mitral valves. We describe here the recording of the phonocardiogram, apexcardiogram, and echocardiogram in a patient with an apical midsystolic click and late systolic murmur.

Figure 1 shows the simultaneously recorded electrocardiogram, mitral-area phonocardiogram, apexcardiogram, external carotid-pulse tracing, and echocardiogram in a subject with angiographically proven prolapse of the anterior and posterior mitral valve leaflets. The echocardiogram demonstrates pansystolic bowing of the posterior mitral valve. Inscription of the midsystolic click occurs precisely at the time of midsystolic apexcardiographic retraction and maximal posterior midsystolic prolapse of the anterior mitral leaflet on the echocardiogram.

Nutter et al recently presented the most comprehensive analysis of the pathophysiologic findings of idiopathic mitral valve prolapse. They suggested that an unusually prominent or malpositioned papillary muscle, along with excessive chordal “pull” from the tense prolapsed leaflets, accounted for the posteroinferior and anterior contractile abnormalities associated with this disease. The abnormal graphic

*From the Institute for Cardiovascular Diseases, Good Samaritan Hospital, Phoenix. Supported in part by the E. Nichols and Kim Sigs worth Memorial Funds. Reprint requests: Dr. Benchimol, 1033 East McDowell Road, Phoenix 85006

68 DESSER, BENCHIMOL, SHEASBY

CHEST, 70: 1, JULY, 1976
findings described here are in accord with this thesis. Maximal posterior displacement of the anterior mitral valve and the resulting retraction of the myocardium at the insertion of the anterior papillary muscle would account for the observed abnormal midsystolic apical retraction.

Since anterior and posterior mitral valve leaflets may prolapse together, independently, or in different degree, it is possible that the recording of multiple systolic clicks, varying abnormalities of left ventricular wall motion, and changing apexcardiographic findings are expressions of an interplay between tensing of different chordae. This would account for the varied apexcardiographic manifestations seen in association with mitral valvular prolapse.

REFERENCES

Anterior Chest Pain

Currently, in medical and lay circles as well as in the news media, a great deal of justifiable attention is being given to the pronounced incidence of cardiovascular diseases and to their rather high rate of disability and mortality. The increasing awareness of their possible serious sequels has brought about frequent detection of noncardiac conditions the symptoms of some of which appeared to be suggestive of heart disease to respective individuals as well as to their physicians. Listing of these conditions related to various organs and structures is available in publications on differential diagnosis. In a text on coronary heart disease by Bean, WB (in Myers, J.A.: Diseases of the Heart—Including the Heart, Springfield, Illinois, Thomas, CC, 1959) the analysis of chest pain is discussed. Bean found in personally observed cases, in which the diagnosis of angina pectoris or myocardial infarction was considered, 20 various instances of other diseases of the heart and aorta; 15 varieties of pulmonary and/or pleural diseases; 12 different forms of diseases of the esophagus and those related to the diaphragm; there were 13 different involvements of the mediastinum and the chest wall; 16 pathologic conditions were attributed to neurologic and skeletal changes; 17 to diseases in the abdomen; and 23 to other miscellaneous diseases. Some entities of the entire group are rare in recognition rather than rare in occurrence. Also, among others, Master, AM (JAMA 187:894, 1964) emphasized the importance of differentiating chest pain originating from organic or functional noncardiac conditions, such as arthritis, ankylosing spondylitis (Marie-Struempell-Bechterew syndrome), myositis, fibrositis, neuritis, chronic pulmonary disease, neurocirculatory asthenia (functional cardiovascular disease, effort syndrome, Da Costa's syndrome), and others. He recorded substernal location of chest pain in 55 out of 200 patients with pain of functional origin, and asserted that emotion was almost as common precipitating cause of chest pain in the functional as in the angina group of patients. Horack, HM (Med Clin N America 51:1027, 1967) found that about 50 percent of patients who reported having myocardial infarction or angina pectoris had actually cardiac-like pain attributable to severe mental and/or emotional tension and to changes in the lower intervertebral disks with osteoarthritis spurs encroaching on the foramina. Rawlings, MS (geriatrics 18:139, 1963) mentions that occasionally respiratory alkalosis will produce precordial pain. Also, he states that rib syndrome is the most common of all causes of chest pain and most frequently misdiagnosed. Wolf, E et al (Arch Int Med 136:189, 1976) observed that in a series of 320 consecutive patients with precordial pain 6.5 percent were diagnosed as having costosternal syndrome; the latter coexisted with coronary heart disease in 9 additional cases. McBeath, AA et al (J Bone and Joint Surg 57A:795, 1975) reported 3 instances of rib-tip syndrome (slipping rib syndrome, slipping rib-cartilage syndrome, clicking rib) resulting from direct or indirect trauma and associated with severe chest pain suggestive of coronary thrombosis. Patients with noncardiac chest pain describe it as of various types, such as dull, vague discomfort, soreness, pressure, squeezing, vise-like constriction; it may be associated with choking sensation. The pain may be exaggerated by deep inspiration, coughing, sneezing, bending or stretching. It may be diurnal or nocturnal. In the latter instance it may suggest angina of decubitus. The pain may be constant or intermittent. Its duration varies from few seconds to two hours or longer. There may be repeated daily attacks. Residual dull soreness may persist after an acute episode. The multiplicity of causes of noncardiac chest pain demands commensurate differential diagnostic efforts. Treating chest pain without exact etiologic identification may entail serious organic and/or psychologic harm and dire economic consequences to the patient.

Andrew L. Banyai, M.D.