LAPW alone, and that it may be in fact the LAPW as well as parietal pericardium or other mediastinal structures.

I. A. D'Cruz, M.D.
H. C. Cohen, M.D.
R. Prabhu, M.D.
G. Glick, M.D.
Michael Reese Medical Center
Chicago, Illinois 60616

References

Echo Evaluation of Tamponade

To the Editor:

I have read with interest the recent report by D'Cruz and coworkers entitled Diagnosis of cardiac tamponade by echocardiography (Circulation 52: 460, 1975). The identification of parameters for the echocardiographic evaluation of the hemodynamic consequences of pericardial effusion carries with it significant clinical and patho-
genetic implications as the authors have discussed. Whereas I feel their observations are of great interest, I cannot agree that their conclusions are justified.

From the data presented, it appears that during phases of the cardiac cycle there is mechanical alternation of the heart causing septal and posterior walls to move essentially parallel after ventricular activation. In figures 1, 2 and 7 the posterior left ventricular wall (PWLV) is seen to move posteriorly after the QRS complex. If this is indeed the posterior left ventricular wall, a consistent pattern of superimposed posterior displacement of the entire heart must be present which remains in phase with the normal anterior posterior wall contraction. Thus, net posterior motion of that structure results as recorded externally. Alternatively, this structure (PWLV) may actually be the posterior left atrial wall. In this case, its motion would not be remarkable. The interventricular septum appears to move posteriorly as well after the QRS complex, but clearly in figure 2, following the fourth labeled QRS complex, is already moving posteriorly prior to ventricular activation. In addition, it is evident that the anterior right ventricular wall seems to be displaced anteriorly with inspiration, although its contraction is associated with posterior motion.

In the presence of gross cardiac displacement within the pericardial space during cardiac contraction, measurements of valve motion patterns and chamber sizes are not comparable from cycle to cycle. Cardiac displacement, which is clearly shown to be affected by respiratory movements, will invalidate comparative echocardiographic measurements by (a) superimposing internal cardiac motions upon gross cardiac oscillations and (b) altering the intra-
cardiac echo beam axis as it traverses the heart from cycle to cycle even as the external transducer is held in fixed position. Consistent changes may be recorded which, however, may merely represent the presence of a constant phase angle. The E-F slope and mitral D-E diastolic excursions, for example, represent the net sum of mitral leaflet, mitral annulus, and total cardiac motions. If the heart is grossly displaced posteriorly during diastole, the net amplitude of excursion will appear to be reduced and the E-F slope will be enhanced. The net effects are dependent upon the phase relations and geometry of the instantaneous vectors of motion. When varying left ventricular transverse axes are assessed, cavity dimensions are not comparable.

I have no doubt that the authors have clearly demonstrated that respiratory movements affect cardiac oscillation during pericardial tamponade. It remains to be determined whether this is specific for tamponade or whether it may also occur in the presence of significant effusion. Unfortunately, the conclusion that ventricular cavity dimensions and valve motion patterns have been shown to alter, such as to support the hypothesis of decreased right to left blood flow during inspiration, seems unwarranted from the data presented.

Andrew L. Morris, M.D.
St. Boniface-General Hospital
Winnipeg, Manitoba, Canada

The authors reply:

To the Editor:

Dr. Morris has drawn attention to the abnormal motion of the ventricular walls in our patients with large pericardial effusions and cardiac tamponade. Abnormal posterior systolic motion of the left ventricular posterior wall (Horowitz et al., fig. 7; Kleid and Schiller, case #40; Popp and Harrison, figs. 3–34) and other types of abnormal cardiac motion (Feigenbaum et al., fig. 4; Kleid and Segal, fig. 8; Gabor et al., fig. 4; Popp and Harrison, figs. 3–35) are evident in published echocardiograms of patients with large pericardial effusions.

Evidence against Dr. Morris's suggestion that the echo labeled left ventricular posterior wall in our figures 1, 2, and 7 may be that of the left atrial posterior wall includes (a) the fact that the echo is thicker and has too large an amplitude of movement, (b) an echo-free pericardial space posterior to it, (c) the fact that repeated scans from left ventricle to left atrium and vice versa confirmed the identity of these structures. We did not dwell at length on these and other echocardiographic features of pericardial effusions because the main topic of our paper was the abnormality of mitral valve motion in patients with cardiac tamponade.

We agree with Dr. Morris that the apparent motion of various cardiac structures in the echocardiograms of patients with peri-
cardial effusions is the resultant or net effect of (1) intrinsic motion of ventricular or valvular structures, and (2) undue mobility of the heart as a whole during each cardiac cycle and with respiration, within the fluid-containing pericardial sac. However, the echocardio-
graphic abnormalities of mitral valve motion reported by us were seen only in patients with cardiac tamponade and promptly disappeared after relief of tamponade, whereas echocardiographic examinations in over fifty other patients with pericardial effusions (but no cardiac tamponade by clinical evaluation) did not demonstrate such abnormalities of mitral valve motion.

Our discussion of the pathophysiologic basis of our echocardi-
ographic observations was an attempt to explain the latter in terms of known experimental and hemodynamic data. We did not, by any means, completely reject other possible explanations, one of which is that advanced by Dr. Morris in his letter. In clinical medicine it often happens that physical, radiologic, biochemical or elec-
trocardiographic signs have proved valuable in clinical practice for decades or even centuries, even though their precise genesis was (or has remained until now) controversial. This is true, for example, of the detection of pulsus paradoxus in alerting the clinician to the development of cardiac tamponade in patients with pericardial effusions. We suggest that the same situation may apply to echo-
cardiographic signs. Thus, we hope that the abnormal patterns of mitral motion described in our paper will be of practical clinical use to physicians managing patients with pericardial effusions in sus-
pecting or confirming cardiac tamponade, even though the final word on the pathophysiology of tamponade and the paradoxical pulse is yet to be written.

I. A. D'Cruz, M.D.
H. C. Cohen, M.D.
R. Prabhu, M.D.
G. Glick, M.D.
Michael Reese Medical Center
Chicago, Illinois 60616
Letter: Echo evaluation of tamponade.
A L Morris

_Circulation_. 1976;53:746-747
doi: 10.1161/01.CIR.53.4.746
_Circulation_ is published by the American Heart Association, 7272 Greenville Avenue, Dallas, TX 75231
Copyright © 1976 American Heart Association, Inc. All rights reserved.
Print ISSN: 0009-7322. Online ISSN: 1524-4539

The online version of this article, along with updated information and services, is located on the World Wide Web at:
http://circ.ahajournals.org/content/53/4/746.citation

Permissions: Requests for permissions to reproduce figures, tables, or portions of articles originally published in _Circulation_ can be obtained via RightsLink, a service of the Copyright Clearance Center, not the Editorial Office. Once the online version of the published article for which permission is being requested is located, click Request Permissions in the middle column of the Web page under Services. Further information about this process is available in the Permissions and Rights Question and Answer document.

Reprints: Information about reprints can be found online at: http://www.lww.com/reprints

Subscriptions: Information about subscribing to _Circulation_ is online at: http://circ.ahajournals.org//subscriptions/