Echocardiography and the Insurance Medical Director

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Echocardiography has been described as: “The most important non-surgical tool for heart diagnosis since the development of the electrocardiogram”. (The 1977 Lasker Foundation Award to Dr. I. Elder and Dr. H. Hertz).

This summary is taken in part from my presentations at the March 8, 1978 meeting of the Society of Insurance Medical Directors of Massachusetts, Boston, and the September 27, 1978 meeting of the Regional Insurance Medical Directors Association of Greater New York, New York City.

I shall describe and illustrate those anatomic considerations and measurements that have proven to be useful in echocardiography. No attempt will be made to discuss the applications of ultrasonography to pericardial and cardiac disorders.

Echocardiography allows the visualization of much of the internal structure of the heart and considerable functional assessment of the heart, thus yielding information that previously was either inaccessible or obtainable only with some degree of risk. From all that can be determined, the procedure is harmless to the patient.

The Transducer is directed toward the heart to visualize the various structures diagrammed below:

1. **Anatomy**

![Diagram of the heart](image)

2. **Echogram of Right Ventricle**

   Right Ventricle Internal Dimension at End Diastole (measured at the level of the Mitral valve leaflets) = 5-25mm.

3. **Echogram of Tricuspid Valve and Pulmonic Valve**

   The motion characteristics of these two valves will not be developed in this discussion. However, the following points may be made:
   - The characteristics of Tricuspid motion are similar to the Mitral valve pattern.
   - Usually only one leaflet of the Pulmonic valve is identified on the conventional echogram.
   - The echoes of both valves are recorded within the Right Ventricular Cavity.
4. Echogram of Ventricular Septum and Posterior Left Ventricular Wall

Ventricular systole: the ventricular septum and the posterior left ventricular wall converge (i.e.) the Ventricular septum moves posteriorly and the Posterior left ventricular wall moves anteriorly.

Ventricular diastole: the ventricular septum and the posterior left ventricular wall diverge (i.e.) the ventricular septum moves anteriorly, (bulging into the right ventricular cavity) and the posterior left ventricular wall moves posteriorly.

![Diagram of Ventricular Septum and Posterior Left Ventricular Wall]

LVIds: End systolic left ventricular internal dimension = 25-30 mm.

LVId: End diastolic left ventricular internal dimension = 35-55 mm.

Excursion: range between Diastolic and Systolic positions:

<table>
<thead>
<tr>
<th>Part</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>ventricular septum</td>
<td>3-8mm</td>
</tr>
<tr>
<td>posterior left ventricular wall</td>
<td>9-14mm</td>
</tr>
</tbody>
</table>

Ventricular septum thickness at End Diastole = 8-11 mm.

Posterior left ventricular wall thickness at End Diastole = 8-11 mm.

5. Echogram of Mitral Valve:

Anterior leaflet motion characteristics: an upward movement of the Mitral leaflet represents anterior displacement.

Posterior leaflet motion characteristics: the course mirrors that of the Anterior leaflet in DIASTOLE, but in the opposite direction, inscribing a W-shaped motion.

A. As a result of Atrial Systole, the Anterior leaflet moves anteriorly. Thickness of Mitral valve leaflet: 1-3 mm.

B. The Mitral valve then closes, producing a notched appearance.

C. The Mitral valve is closed. This is Final End Diastolic Position. (Coincides with downstroke of the S complex).

C-D. The anterior and posterior leaflets remain closed during systole. (Marked by the ECG Q-T interval). The leaflets move anteriorly slightly during systole.

D. Closed position of Mitral valve just before Ventricular Diastole.

D-E. Opening movement of Anterior Mitral leaflet.

E. Most anterior position of Anterior Mitral Leaflet, and marks start of Ventricular Diastole.

E-F. Mitral Diastolic Downstroke, during the period of rapid ventricular filling = 80-200 mm/sec.
F.  Furthermost posterior movement in mid-diastole of anterior leaflet.
Ee.  Height in millimeters = Mitral valve mobility = 25-35 mm.

6.  Echogram of Aortic Valve

E S D = END SYSTOLIC DIMENSIONS 20-37 mm
E D D = END DIASTOLIC DIMENSIONS 17-33 mm
O D E S = OUTSIDE DIMENSION END SYSTOLE 27-43 mm
A V O = AORTIC VALVE OPENING 16-26 mm  (This is the maximum systolic separation of leaflets.)
A A W = ANTERIOR AORTIC WALL
P A W = POSTERIOR AORTIC WALL
AV: = AORTIC VALVE LEAFLETS

Walls of the Aortic Root move in the same direction.

SYSTOLE: A box-like configuration is produced by the simultaneous recording of the Anterior (right coronary) cusp and the Posterior (non-coronary) cusp. (The left coronary cusp is recorded incompletely during systole, producing short mid-aortic echo pattern. The third aortic cusp is parallel to the echocardiographic beam; it is usually not identified.)

Anterior
Posterior

C and E = anterior leaflet opening and closing slopes, respectively.
D and F = posterior leaflet opening and closing slopes, respectively.

DIASTOLE: leaflets appear as a solid line midway between AAW and PAW.

7. Echogram of Left Atrial Chamber

The AORTA and the LEFT ATRIUM are visualized as the transducer is directed towards the base of the heart.

Left Atrial Chamber Dimension: Measured between Posterior (internal) aortic wall and Posterior left atrial wall at End Systole = 19-40 mm = A., or

Left atrial anterior wall and left atrial posterior wall at End Systole = 16-40 mm = B.

The AORTA and the LEFT ATRIUM are visualized as the transducer is directed towards the base of the heart.

Left Atrial Chamber Dimension: Measured between Posterior (internal) aortic wall and Posterior left atrial wall at End Systole = 19-40 mm = A., or

Left atrial anterior wall and left atrial posterior wall at End Systole = 16-40 mm = B.

Echocardiography is an established, highly sophisticated and reliable diagnostic modality, and serves an important role in the evaluation of many pericardial and cardiac disorders.