

# A Study on Echocardiographic Evaluation of Pericardial Diseases

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## ABSTRACT

**Introduction:** Pericardial effusion was a diagnostic enigma before the advent of echocardiography, both in developed and developing countries, more so in poorer countries. Advent of M-Mode and 2D-Echocardiography has revolutionized the diagnosis and management of pericardial diseases. The ECG and x-ray chest may be non-diagnostic in early cases. Echocardiography helps to overcome this difficulty. Objective of the present study was to study is taken up to evaluate role of Echocardiography in early detection of pericardial effusion and also to quantitate the pericardial fluid by measuring the amount of fluid drained during surgery.

**Material and Methods:** The present study was carried out at Osmania General Hospital, Hyderabad. About 15 patients were studied in a tertiary care set up. The age group of the study was in the range of 8-43 years. The selected patients underwent routine blood investigations, x-ray, ECG and Echo M mode and 2 Dimensional (ADL).

**Results:** There were 11 males and 1 female patients. There were 2 cases of effusive-constrictive pericarditis, 1 case of constrictive pericarditis and the remaining (9) were of pericardial effusion.

**Conclusion:** Echocardiography was extremely useful not only in demonstrating pericardial effusion but also showed various abnormalities of mitral valve, septal motion and cardiac motion.

**Keywords:** Pericardial effusion, Pericarditis, ECG, Echocardiography

## INTRODUCTION

In healthy states the two serous membranes of the pericardium are closely opposed to each other and contain 10-15 ml of fluid. During infections and inflammation, the amount of fluid increases abnormally. Persistent elevation of systemic venous pressure, Kussmaul sign (inspiratory increase in jugular venous pressure) and its absence in cardiac tamponade has been emphasized by Spodick and others<sup>1</sup> Pulsus Paradoxus is also observed in cardiac tamponade. Pericardial knock may be heard in case of constrictive pericarditis.<sup>2</sup> Elevated diastolic pressure is observed in both the ventricles.<sup>3</sup> Increased venous pressure and decreased arterial pressures are also seen.

Pericardial effusion is not identified in the initial stages but in such cases echocardiography has proved invaluable. In evaluating patients with pericardial effusion,<sup>4</sup> constrictive pericarditis, effusive constrictive pericarditis and metastatic

depositions causing effusion echocardiography has been very helpful.

The advantage of 2D echocardiography over M-mode echocardiography 1) that it gives clear anatomical definition of pericardial space and permits identification of pericardial effusion. 2) Localized pericardial effusion can be easily seen in 2D echocardiography. 3) Medial and lateral extent of pericardial effusion and apical location of pericardial effusion can be determined by 2D echocardiography.

2D echocardiography can be done in different planes. 1) Parasternal a) Long-axis b) Short-axis view, 2) Apical view shows all four chambers of heart, 3) Subcostal, 4) Suprasternal.

## MATERIAL AND METHOD

A hospital based cross sectional study was carried out. Institutional Ethics Committee permission was obtained. Informed consent was taken from each and every case. A sample size of 15 cases was taken in a tertiary care set up. Due to lack of data 3 cases were excluded from the study. The cases were chosen irrespective of their duration of disease. The following investigations were done for all the cases.

1. ESR
2. Hemogram
3. CUE
4. Blood sugar and urea
5. Chest X ray PA view
6. ECG
7. Echo M mode and 2 Dimensional (It was done on Advanced Technology Lab [ADL])

## RESULTS

Table 1 shows anterior and posterior echo free space was absent in the case of constrictive pericarditis. A posterior echo free space ranging from 1-4 cm was present in all cases and an anterior echo free space was present in all, but three cases

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of pericardial effusion. A larger echo free space was associated with large pericardial effusion.

With 2D Echo, echo free space was observed anteriorly, posteriorly, apically, medially and laterally depending on the amount of fluid. Pericardial effusion was observed in all the cases. A small echo free space is also observed in effusive constrictive pericarditis cases which was constant both in systole and diastolic phases. The cases which were identified with 2D Echo as large pericardial effusion were confirmed at surgery. The amount of fluid ranged from 400 ml to 1000ml. Table 3 shows flat motion of posterior left ventricular wall was associated with constriction. Abnormal anterior motion during diastole in two cases was associated with large effusions.

## DISCUSSION

In the study group, 12 cases were taken. Only one (8.3%) was female amongst the 12 cases. The age of the study subjects varied from 8 to 43 years. Ten patients (83.3%) cases had raised ESR and leukocytosis. Eleven patients (91.7%) were found to have cardiomegaly on x-ray chest PA view. In two thirds (66.67%) of the cases, ECG changes were not seen. In the rest (33.3%) of the cases, low voltage complexes and non specific ST-T changes were observed.

In M-Mode echocardiography<sup>5</sup> anterior echo free space was observed in 25% of cases and in another 25% of the cases this was not properly visualized. Half (50%) of the cases had 1-5 cm echo free space posteriorly. In constrictive pericarditis, echo free space was not observed. With 2D Echo, echo free space was observed anteriorly, posteriorly, apically, medially and laterally depending on the amount of fluid.

Paradoxical movement of septum was observed in both systole and diastole in 5/12 cases. Left ventricular posterior wall abnormality was observed in 2/12 cases and in one case flat motion was observed. Flat motion was observed in constrictive pericarditis cases. In anterior wall motion abnormality large amount of fluid was seen.<sup>6</sup>

Inability to diagnose pericardial effusion with only clinical findings, X-ray chest and ECG in early stages, may lead to development of cardiac tamponade. With the advent of Echocardiography the diagnosis of pericardial effusion in early stages is possible.<sup>7</sup> There are definitive signs of cardiac tamponade by echocardiography, like right ventricular compression and swinging movements of heart.<sup>8</sup>

It is possible to do pericardiocentesis with the help of Echocardiography.<sup>9</sup> The quantity of fluid can be estimated with the help of Echocardiography. In mild effusion fluid accumulation is seen only posteriorly. In moderate effusion the accumulation of fluid is limited to posterior, anterior and lateral areas.<sup>10</sup> In large effusion there is accumulation of fluid anteriorly, posteriorly and apically.<sup>10</sup>

Right ventricular compression by pericardial effusion was shown to be reliable sign of cardiac tamponade.<sup>11</sup> M mode Echo is much less sensitive compared to 2D Echo. Twelve

Case No	ECHO Free space -anterior	ECHO free space-posterior
1	1 cm	1.5 cm
2	Not visualized	2 cm
3	2.5 cm	2 cm
4	5cm	2 cm
5	Absent	Absent
6	Not visualized	4 cm
7	1cm	3cm
8	Present	1.5cm
9	Not visualized	1.5cm
10	5cm	2cm
11	Present	1.5cm
12	Present	1 cm

**Table-1:** Distribution of pericardial fluid in M-Mode echocardiography

Case No	Echocardiographic quantification	At surgery
2	Large	400ml
3	Large	500ml
4	Large	3000ml
6	Large	500ml
8	Large	1000ml
10	Large	1000ml

**Table-2:** Shows large effusions have 400 ml or more of pericardial fluid.

Case No	LVPW Abnormality
1	Nil
2	Nil
3	Nil
4	Nil
5	Not clearly visualized
6	Flat motion
7	Abnormal anterior motion during diastole
8	Abnormal anterior motion during diastole
9	Nil
10	Nil
11	Nil
12	Flat motion

**Table-3:** Left ventricular posterior wall (LVPW) abnormality

cases with pericardial disease whose age ranged from 8 to 43 years were studied. There were 11 males and 1 female patient. There were 2 cases of effusive –constrictive pericarditis, 1 case of constrictive pericarditis and the remaining were of pericardial effusion. The diagnosis was confirmed in 6 of the cases at surgery. Remaining patients showed good response to medical treatment.

Two of the cases had pyogenic pericardial effusion. Both were children, one of whom had Bronchopneumonia. One patient had thymoma invading pericardium and producing hemorrhagic effusion.

Most of the patients showed raised ESR. One patient showed leucocytosis who had pyogenic effusion. All the patients had increase in size of cardiac silhouette on chest X-ray (except one case of constrictive pericarditis). Four of the cases were

associated with pleural effusion. Low complexes were present in ECG of four patients and all these patients had large pericardial effusion.

Echocardiography was extremely useful not only in demonstrating pericardial effusion but also showed various abnormalities of mitral valve, septal motion<sup>12</sup> and cardiac motion. Swinging motion of heart<sup>13</sup> was diagnostic of cardiac tamponade. Highly specific signs of constrictive pericarditis such as diastolic paradoxical movement of septum were noted which were useful in detecting an element of constriction in effusive-constrictive pericarditis.

## CONCLUSION

Echocardiography is a well accepted diagnostic tool in the evaluation of patients with suspected cardiovascular disease. It is totally non-invasive, can be used at the bedside for serial evaluation and supplies anatomic and functional information not available by any other technique, and has led to its rapid acceptance over the past decade.

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