Chronic Idiopathic Pericardial Effusion without Tamponade

By Daniel C. Connolly, M.B., M.R.C.P., M.D., Ph.D., Thomas J. Dry, M.B., Ch.B., M.S., C. Allen Good, M.D., M.S., O. Theron Clagett, M.D., M.S., and Howard B. Burchell, M.D., Ph.D.

Persistent pericardial effusion in the absence of obvious preceding or concurrent disease presents a baffling problem. In such cases chylopericardium, cholesterol pericarditis, lupus erythematosus, malignant disease, myxedema, severe anemia, and scleroderma, must be considered. Six cases are reported with large effusions present for from 1 to 11 years. The diagnostic measures to be used, the results of histologic examination, and the effects of surgery on the clinical course are discussed.

PERICARDITIS with effusion is a relatively common form of acute pericardial inflammation that has been found in association with rheumatic fever,1 serious infections of the respiratory tract with and without demonstrable etiologic agents,2, 3 myocardial infarction,4 and myocardial contusion.5 In addition, pericardial effusion has been described in association with myxedema,6–8 severe anemia,9 tumors,10 uremia,11 and scleroderma,12 and it is believed to occur at some time in more than 50 per cent of cases of systemic lupus erythematosus.13 Chylopericardium14 and cholesterol pericarditis15–18 are rare entities. Rarely, pericardial effusion of considerable degree may follow a chronic course, usually with the late development of symptoms and signs of cardiac tamponade.19–22

The findings in 6 patients who had gross chronic pericardial effusion of unknown cause without the development of cardiac tamponade are described.

Case Reports

Case 1

A 40-year-old white married woman had a hysterectomy at the Mayo Clinic in 1951 because of endometriosis. A thoracic roentgenogram did not reveal any abnormalities in the lungs or the cardiac shadow at that time.

At her second examination, in July 1952, she had many symptoms believed psychogenic in origin. Results of physical examination and laboratory studies revealed no abnormality other than in the thoracic roentgenogram, which disclosed moderate globular enlargement of the cardiac shadow (fig. 1 a). Specific questioning elicited a history of mild precordial distress on leaning forward, with occasional consciousness of the heart beat. Heart murmurs were not detected. The blood pressure was 110 mm. Hg systolic and 80 diastolic; the pulse rate was 80 beats per minute, with a regular rhythm. There was no clinical evidence of hypothyroidism. In view of the absence of objective signs of cardiac disease, treatment was not considered necessary but follow-up was advised.

The patient returned in November 1954, because of progressive enlargement of the cardiac shadow. She now complained of severe palpitation, tachycardia on exertion, and a dull lower substernal ache that extended toward the left axilla with inspiration. She had not noticed any significant exertional dyspnea, orthopnea, or peripheral edema. Neither digitalization nor a period of rest in bed for 3 months prior to this admission had produced any diminution in the size of the cardiac shadow.

Results of physical examination in 1954 were essentially unchanged as compared with those in 1952. However, roentgenologic studies revealed considerable increase in the size of the cardiac shadow (fig. 1 b). Hematologic studies gave normal results. Fluoroscopy showed slightly diminished cardiac pulsations. An electrocardiogram showed no significant abnormality. The venous pressure was 12 mm. Hg, corrected to the midlevel of the

From the Mayo Clinic and the Mayo Foundation, Rochester, Minn.
The Mayo Foundation, Rochester, Minnesota, is a part of the Graduate School of the University of Minnesota.
right atrium. The presence of pericardial effusion was suspected, and angiocardiography demonstrated that the increased size of the cardiac shadow was not caused by enlargement of the cardiac chambers but was the result of pericardial effusion or thickening (fig. 1c).

Diagnostic paracentesis, with removal of 80 ml of clear yellow fluid and replacement by air, was performed prior to operation (fig. 1d and e). More than 1,000 ml of clear yellow fluid were removed at operation, and a large opening was made between the pericardium and the left pleural space. Cultures of the pericardial fluid did not produce any growth of Mycobacterium tuberculosis, brucellar organisms, fungi, or other pathogens. Histologic examination of the pericardium showed no abnormality. The size of the cardiac shadow became normal shortly after operation (fig. 1f).

Comment. A large pericardial effusion was present in this patient for at least 2 years without the development of cardiac tamponade. No history of an episode suggesting acute pericarditis was obtained, and the cause of the effusion was not evident. Six months after operation, examination revealed no abnormality, and the size of the cardiac shadow was normal. The only postoperative change in the electrocardiogram was a moderate increase in the amplitude of the QRS complexes and T waves in most leads (fig. 2). This was the usual pattern in all 6 cases.

**Fig. 1.** Case 1. a. Enlargement of cardiac shadow in 1952. b. Further increase in size of cardiac shadow 2 years later. c. Angiocardiogram showing normal right atrial contour and demonstrating that enlargement of the cardiac shadow is caused by pericardial effusion or thickened pericardium. d and e. Roentgenograms taken in erect and lateral decubitus positions after removal of 80 ml of pericardial fluid and replacement by air. f. Postoperative appearance, showing normal size of cardiac shadow.
IDIOPATHIC PERICARDIAL EFFUSION

Case 2

A 42-year-old white married woman came for examination in January 1955. She had a history of chorea at the age of 15 years and of pulmonary embolism following a pelvic operation at age 28. Cardiac enlargement had been diagnosed in 1947 following mass miniature radiography, and progressive enlargement of the cardiac shadow had been observed in thoracic roentgenograms made at yearly intervals. She had taken digitalis continuously since 1948, when she complained of exertional dyspnea and fatigue.

The patient came to the clinic in January 1955 because of the progressive enlargement of the cardiac shadow. At this time, she complained of occasional pain in the anterior aspect of the thorax on the left side, with extension to the left shoulder and arm. She also complained of mild dyspnea on exertion, but she had not experienced orthopnea or paroxysmal nocturnal dyspnea.

Examination failed to reveal any cardiac murmurs, peripheral edema, or clinical evidence of increased venous pressure. The blood pressure and the cardiac rate and rhythm were normal. Hematologic studies gave normal results. Thoracic roentgenography showed considerable enlargement of the cardiac shadow, and this enlargement had increased steadily since 1947, judging by the yearly roentgenograms that were available (fig. 3a and b). The electrocardiogram was interpreted as normal. The lupus erythematosus clot test on peripheral blood gave normal results. The value for plasma cholesterol was 169 mg. per 100 ml. The basal metabolic rate was 5 per cent, and she was clinically euthyroid.

The suspected presence of pericardial effusion was confirmed by angiocardiology (fig. 3c). At operation, approximately 1,200 ml. of clear yellow fluid were removed from the pericardial sac. A “window” was made between the pericardium and left pleural space. Cultures of the pericardial fluid did not give growth of any pathogenic organisms. Biopsy of the pericardium gave normal results.

The patient was seen again in February 1956, at which time she was well. The cardiac shadow returned to normal size, and it was still normal in November 1957 (fig. 3d).

Comment. Pericardial effusion was present in this patient for at least 8 years. Despite the history of chorea at age 15, evidence of rheumatic heart disease was absent, as was any evidence to suggest that the pericardial effusion was on a rheumatic basis.

Case 3

A 64-year-old white married woman came to the clinic in February 1955 because of a hard mass in the region of her thyroid gland. She gave a history of exploration of her neck for substernal goiter in 1921, and partial removal of a thymic tumor (reported as a thymoma) in 1928. At the time of the latter operation, she had complained of dyspnea, and there was increased prominence of the superficial venous pattern over the neck and thorax that persisted after operation. Narrowing of the trachea also had been found in 1928. She had noted difficulty in taking a deep breath at that time but had not experienced orthopnea or paroxysmal nocturnal dyspnea. An “abnormal” thoracic roentgenogram had been noted in 1933, and she had been told of cardiac enlargement detected roentgenographically in 1953, although these films were not available for study. Subtotal hysterectomy had been done in 1945.

Examination in 1955 disclosed dilated superficial veins over the neck and upper part of the thorax. The thyroid gland was moderately enlarged, the left lobe being larger than the right, and a hard nodule was palpable in the right lobe. Cardiac murmurs were absent, and the cardiac rate and rhythm were normal. The blood pressure was 170/100, and mild hypertensive changes were present in the retinal vessels. Peripheral edema was absent, and exercise tolerance was normal for her age. The value for hemoglobin was 11.9...
Fig. 3. Case 2. a and b. Note increase in size of cardiac shadow between 1947 and 1955. c. Angiocardiography demonstrates that the cardiac enlargement does not involve the cardiac chambers. d. Postoperative cardiac shadow of normal size.

Gm. per 100 ml. of blood; erythrocytes numbered 3,900,000 per mm. and the leukocyte count was 4,600. The erythrocytic sedimentation rate was 36 mm. during the first hour (Westergren technie). The thoracic roentgenogram showed globular enlargement of the cardiac shadow that was thought to indicate pericardial effusion (fig. 4 a). Other roentgenologic studies disclosed a calcified thyoidal adenoma on the right side and bilateral compression of the esophagus above the level of the clavicles. A partially calcified mediastinal mass also was present. The venous pressure was 20 mm. Hg in the arms and 19 mm. in the legs, corrected to the midlevel of the right atrium. The electrocardiogram showed decreased amplitude of the QRS complexes. Thyroidal uptake of radioiodine
IDIOPATHIC PERICARDIAL EFFUSION

was maximal in the region of the nodule in the right lobe. The value for protein-bound iodine was 5.8 μg. per 100 ml. of serum. Other laboratory studies were noncontributory. Angiocardiography was not attempted in view of the evidence of obstruction of the superior vena cava. The lesion in the thyroid gland was considered benign, and pericardial exploration was advised.

At operation, approximately 700 ml. of reddish-brown fluid were released from the pericardial sac. A diffuse calcified mass, thought to be scar tissue, was present in the mediastinum, involving the superior vena cava. There was no gross or microscopic evidence of recurrent thymoma. Malignant cells were not present in the fluid. Cultures of the pericardial fluid did not produce any growth of pathogenic organisms. Histologic examination of pericardial tissue revealed fibrous pericarditis with zones of infiltration by lymphocytes and plasma cells. Following operation, the patient stated that she could breathe more easily. The cardiac shadow became normal in size, although the evidence of superior vena caval obstruction was unchanged (fig. 4 b).

The patient was reexamined 9 months after operation, at which time she felt better and had no evidence of cardiac disease. The electrocardiogram showed some increase in amplitude of the QRS complexes as compared with the preoperative tracing. The evidence for superior vena caval obstruction remained, and the other findings were unchanged.

Comment. The chronicity of the effusion in this patient was assumed from the reported roentgenologic finding of cardiac enlargement 2 years before her initial examination at the clinic. Good historical evidence existed that superior vena caval obstruction had been present prior to the thoracotomy in 1928; at that time, a diagnosis of thymoma was made, and the tumor was partially removed, but the surgical record and tissue were not available. The thoracotomy in 1955 did not reveal evidence of recurrence of a thymic tumor, and examination of the pericardium and the pericardial fluid did not disclose malignant cells. It is thought justifiable to include this case as an example of chronic idiopathic pericardial effusion, although the possibility is recognized that the previous intrathoracic lesion and mediastinal scarring, with venous and lymphatic blockage, played an etiologic role.

Case 4

A 43-year-old white married woman came to the clinic in August 1955 because of loss of energy and weight. The menopause had occurred in 1954.

Examination disclosed a plethoric appearance. The blood pressure was 160/120. The retinal
arteries showed the changes of group 1 hypertension. The value for hemoglobin was 17.6 Gm. per cent, and the erythrocytes numbered 6,040,000 per mm. The volume of packed cells (hematocrit) was 62 per cent. Exercise tolerance was normal. Cardiac murmurs were absent, and the venous pressure was normal. A thoracic roentgenogram revealed pronounced increase in the size of the cardiac shadow as compared with a film taken in May 1954 (fig. 5 a and b). The cardiac pulsations were slightly diminished on fluoroscopy. The electrocardiogram showed a decreased QRS voltage, with inverted T waves in lead V₃. The presence of pericardial effusion was suspected, and angiocardiography substantiated this (fig. 5 c). The right atrium appeared to be slightly compressed by pericardial fluid or thickening. Results of tests of pulmonary function were normal. The possibility of a cardiac tumor was considered, and thoracotomy was advised.

The patient declined operation and returned home. In view of the polycythemia, she was advised to discontinue use of the cobalt-containing preparation of iron that she had been taking for several months for supposed anemia. Her home physician followed her progress with serial roentgenograms, which revealed diminution in size of her cardiac shadow, with a return to normal size by February 1956 (fig. 5 d and e). She was reexamined at the clinic in January 1958, at which time the roentgenogram (fig. 5 f) and blood counts were normal.

**Comment.** The subsequent clinical course of this patient appeared to eliminate the possibility of a pericardial tumor. It is possible that the polycythemia was caused by administration of the

**Fig. 5.** Case 4. a and b. Note great increase in size of cardiac shadow over a period of 15 months. c. Angiocardiography demonstrates pericardial effusion with invagination of right atrium. d-f. Note spontaneous disappearance of effusion, with return of cardiac silhouette to normal.
Case 5

A 54-year-old white woman came to the clinic in June 1957 because of concern over the gradual increase in cardiac size revealed by thoracic roentgenograms over a period of 11 years (fig. 6 a–d). Her chief complaint was chronic fatigue for many years. She did not give any history of exertional dyspnea, paroxysmal nocturnal dyspnea or orthopnea, and she had not been taking digitalis.

Examination did not reveal any significant abnormalities other than a retroverted uterus with small myomas. The blood pressure was 122/80. The heart sounds were normal, and there were no murmurs. Roentgenologic studies showed enlargement of the cardiac shadow, with normal pulmonary vascular markings (fig. 6 d). She appeared euthyroid, but she had been taking 0.5 gr. of desiccated thyroid daily for 11 years. Her history did not support the thesis that she had had myxedema. There was no evidence of pituitary insufficiency, although her menses had ceased at age 41 without the occurrence of hot flushes. The basal metabolic rate was —19 per cent, and the value for protein-bound iodine was 4.7 μg. The plasma cholesterol measured 190 mg. All other laboratory studies gave normal results. The venous pressure was 8 mm. Hg, corrected to the midlevel of the right atrium.

The patient was considered to be euthyroid, and pericardial effusion was thought to be the cause of the enlargement of her cardiac shadow. Angioardiography confirmed this diagnosis (fig. 6 e).

At pericardial exploration, approximately 1,000 ml. of clear yellow fluid was removed from the pericardial sac. A “window” was made between...
the pericardium and the left pleura. Malignant cells were not found, and cultures of the fluid were negative for pathogenic organisms. The fluid did not contain any lupus erythematosus cells. Histologic examination of the pericardial tissue disclosed mild fibrous pericarditis. Postoperative roentgenograms showed the size of the cardiac shadow to be normal (fig. 6f).

Case 6

A 52-year-old white married woman came to the clinic in October 1958. She was referred because of the roentgenologic finding of cardiac enlargement in 1952, with progressive increase in the size of the cardiac shadow since then (fig. 7 a-c). A thoracic roentgenogram in 1930 was alleged to have shown cardiac enlargement. She had not experienced exertional dyspnea or paroxysmal nocturnal dyspnea. She had had a mild degree of sternal depression since childhood. She complained of occasional aching pain in the left anterolateral aspect of the thorax that was not related to exertion. Hysterectomy and salpingo-oophorectomy had been done in 1948.

Examination disclosed normal heart sounds. The blood pressure was 140/70. The venous pressure was 7 mm. Hg, corrected to the midlevel of the right atrium. The retinal vessels were normal. Results of urinalysis and the values for blood sugar, blood urea, and plasma cholesterol were normal. The basal metabolic rate was +11 per cent. The value for protein-bound iodine was 4.7 μg. Results of the lupus erythematosus clot test on peripheral blood were normal. Considerable enlargement of the cardiac shadow was apparent on the thoracic roentgenogram; the pulmonary vascular shadows appeared normal (fig. 7 c). A slight funnel-chest deformity was present. The enlargement of the cardiac shadow was ascribed to pericardial effusion, and angiocardiography substantiated this impression (fig. 7 d and e).

Operation disclosed approximately 1,100 ml. of clear yellow fluid in the pericardial sac. A “window” was made between the pericardium and the
left pleural cavity. The fluid did not contain malignant cells or lupus erythematosus cells. Cultures failed to disclose any pathogens. Histologic study of the pericardial tissue showed practically normal pericardium apart from a mild increase in fibrous tissue. A postoperative roentgenogram showed the cardiac shadow to be normal (fig. 7 f).

Comment. Enlargement of the cardiac shadow in this patient had been evident roentgenologically since 1952. A roentgenogram in 1930 was reported to have shown cardiac enlargement, but this film was not available for examination. There has been no long-term follow-up on this patient, since the operation was done in February 1959.

**Discussion**

Three cases of chronic pericarditis with effusion were reported by Barker and Johnston. The effusion in their 3 male patients persisted from 7 months to 4 years. There was no evidence of tuberculosis or rheumatic disease, but a possible etiologic factor was present in 2 of the patients in the form of previous pneumonia and injury to the thorax, respectively. Two of the patients presented evidence of constrictive pericarditis after the effusion had lasted 4 and 2 years, respectively; a case somewhat similar to these 2 of Barker and Johnston has been reported by one of us.

Soloff and Bello reported 2 cases of pericardial effusion in association with severe anemia; the effusion had been present for at least 4 years in one case. Contro and co-workers reported 2 cases of chronic symptomless pericardial effusion lasting 4 years after pneumonia occurring at the age of 7 years. Guidotti and Puddu reported 2 cases of chronic pericardial effusion in 2 patients, a 46-year-old man and a 39-year-old woman, who were otherwise in apparently good health.

Genecin recently described chronic pericardial effusion in 2 brothers. Polycythemia was present in the younger patient and the effusion had the characteristics of "cholesterol pericarditis." A vascular anomaly of the skin and eyegrounds was noted in the older patient.

All of our 6 patients were women, and 5 were menopausal. There was no evidence of active tuberculosis or rheumatic disease at the time of examination, and none had myxedema or signs of systemic lupus erythematosus. Evidence of cardiac tamponade was not present in any of these patients, but the venous pressure was grossly increased in 1 (case 3) because of superior vena caval obstruction some 25 years previously. The duration of the pericardial effusion ranged from 1 to 11 years; fluid may have been present as long as 29 years in case 6, although the reported "cardiac enlargement" in 1930 in this instance could not be verified. In case 3, the chronicity of the effusion was assumed from the reported roentgenologic findings of cardiac enlargement at another institution 2 years before. In case 4, the pericardial effusion was possibly present for only a short period before the initial abnormal roentgenogram (fig. 5). None of the 6 patients gave a history suggesting an episode of acute pericarditis. Examination of the pericardial fluid gave no clue to the etiologic factor, and histologic study of pericardial tissue was uniformly nonrevealing. Case 4 is of interest in view of the coincidence of pericardial effusion and polycythemia, which almost certainly was induced by ingestion of a cobalt-containing preparation of iron.

The diagnosis of pericardial effusion has been made during cardiac catheterization by demonstrating that the tip of the catheter touched the lateral wall of the right atrium but did not reach the limit of the cardiac shadow. Pericardial effusion also has been diagnosed by the characteristic configuration of the right ventricular pressure pulse, with its early diastolic dip and the increased end-diastolic pressure. However, it appears that this diagnostic configuration of the right ventricular pressure pulse is the result of restriction of diastolic relaxation of the ventricles, and it should not be found in patients with pericardial effusion in whom cardiac constriction has not occurred.

The value of angiocardiography as an aid to the diagnosis of pericardial effusion has been described previously and is again demonstrated in our 6 patients. Carbon dioxide also has been used as a contrast medium to demonstrate the extraluminal density produced by pericardial effusion. The obtaining of fluid by pericardial puncture estab-
lishes the diagnosis, and replacement of the fluid by air gives information as to cardiac size and the degree of thickening of the parietal pericardium, as well as showing the limits of pericardial reflection on the great vessels. Clinical examination, fluoroscopy, and electrocardiography were not of significant discriminatory value in our cases. The lack of evidence of a lesion capable of producing cardiac hypertrophy or dilatation served as a clue to the possible existence of pericardial effusion, and this also should be considered when thoracic roentgenography shows an enlarged cardiac shadow without abnormality of the pulmonary vascular shadows.

It is appreciated that pericardial effusion may represent a stage in the development of chronic constrictive pericarditis. It is remarkable that none of these 6 patients gave any evidence of constriction after persistence of the effusion for periods up to 11 years.

None of our patients exhibited the prominent third heart sound in early diastole described by Barker and Johnston in 2 of their cases and occurring commonly in chronic constrictive pericarditis. This sound is related to the early decrease in diastolic pressure in the ventricular pulse of patients who have cardiac constriction; this mechanism is not present in pericardial effusion unless the fluid is under sufficient pressure to cause restriction of diastolic relaxation of the ventricles.20

Angiocardiography revealed some invagination of the right atrium in 1 patient (case 4), but there was no evidence of a large organized thrombus in the right atrium, such as was found in 2 of the cases of Barker and Johnston.

The operation performed on 4 of our patients, namely creation of a “pleuropericardial window,” previously has been found satisfactory in patients with pericardial effusion.20, 21

Follow-up for variable periods has not revealed any evidence of recurrence of pericardial effusion in these 6 patients, all of whom noted subjective improvement.

Summary
Six cases of chronic pericardial effusion of unknown cause are reported. The effusion in 1 patient followed an old thoracotomy and evidence of obstruction of the superior vena cava. The remaining 5 patients had not experienced any significant preceding illnesses, operations, or trauma. The appearance of the pericardial effusion in 1 patient appeared to be coincident with the onset of polycythemia, and disappearance of the effusion followed correction of the polycythemia.

No evidence of cardiac tamponade was found in any of the patients despite the persistence of effusion for periods up to 11 years. In 5 of the patients, the pericardial fluid measured from 700 to 1,200 ml at the time of operation.

The importance of angiocardiography as an aid to the diagnosis of pericardial effusion again is emphasized.

Summario in Interlingua
Es reportate 6 casos de chronic effusion pericardial de etiologia obscur. In 1 del patientes, le effusion sequave un ancian thoracotomia e indicios de obstruction del vena cave superior. Le altere 5 patientes habeva experientiata nulle previe morbo, operation, o trauma de signification. Le apparition del effusion pericardial in 1 patiente coincideva apparentemente con le declaration de polycythemia. Correction del polycythemia esseva sequite per disparition del effusion.

Nulle indicios de tamponage cardiac esseva constatate in ulle del casos, in despecto del persistentia del effusion durante periodos de usque a 11 annos. In 5 del patientes, le liquido pericardial amontava a inter 700 e 1.200 ml al tempore del operation.

Le importantia de angiocardiographia como adjuta in le diagnose de effusion pericardial es sublineate de novo.

REFERENCES
IDIOPATHIC PERICARDIAL EFFUSION


23. Hargraves, M. M.: Personal communication to the authors.


Chronic Idiopathic Pericardial Effusion without Tamponade
DANIEL C. CONNOLLY, THOMAS J. DRY, C. ALLEN GOOD, O. THERON CLAGETT and HOWARD B. BURCHELL

_Circulation_. 1959;20:1095-1105
doi: 10.1161/01.CIR.20.6.1095
_Circulation_ is published by the American Heart Association, 7272 Greenville Avenue, Dallas, TX 75231
Copyright © 1959 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/20/6/1095

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/