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POST-MYOCARDIAL-INFARCTION SYNDROME

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The post-myocardial-infarction syndrome is characterized by prolonged pericardial friction, persistent chest pain, continuing fever, and, in many instances, by pericardial and pleural effusion. These features develop during the first few weeks after myocardial infarction. The whole illness may pursue a relapsing course for months.

The syndrome was first described by Dressler (1956), and in 1959 he reported its occurrence in 44 patients. He estimated that the syndrome complicates from 3 to 4% of cases of myocardial infarction, and it is therefore remarkable that it has escaped recognition until recent years. Weiser, Kantor, and Russell (1959) have described four similar cases, but, so far as we are aware, no series has been reported in the British literature. Two of the five cases described in this paper were seen early in 1960, and within six months two others were diagnosed. The remaining one was identified from a review of patients classified as having pericarditis complicating myocardial infarction; in this patient, the significance of the pericarditis and other features of the syndrome had not been appreciated at the time. A review of 500 consecutive patients admitted to the Edinburgh Royal Infirmary on account of acute myocardial infarction revealed only three who developed the features of the post-myocardial-infarction syndrome—an incidence of less than 1%.

Case 1

A man aged 53 had increasing effort angina for two weeks. An acute myocardial infarct, with classical and severe precordial pain lasting for two hours, occurred immediately before admission. There was no history of previous vascular or other disease. On arrival in hospital he was shocked, with a blood-pressure of 100/80. With morphine, oxygen, and the relief of pain, the clinical features of shock disappeared but hypotension remained; on the fourth day after admission his blood-pressure fell to 80/50 and was subsequently in the region of 115/70. The first electrocardiogram taken on the morning of admission showed an acute transmural posterior myocardial infarct with widespread myocardial ischaemia, and a further record taken later on the same day showed the development of atrial fibrillation with a ventricular rate of approximately 120 a minute; on the next day sinus rhythm returned with a prolonged P–R interval at 0.26 second. Subsequent electrocardiograms continued to show transmural posterior myocardial infarction with the expected changes of healing.

During the first two days after admission he experienced several transient episodes of precordial pain suggestive of myocardial ischaemia, but subsequently this pain became dull and intermittent, and was mostly associated with inspiration. This different type of pain continued from the first to the twenty-fourth day. From the third to the tenth day coarse pericardial friction could be heard in systole and diastole. During the first four days the expected febrile response to myocardial infarction occurred, but subsequently a pyrexia continued for the next eight weeks (Fig. 1). The E.S.R. rose from 10 mm./hour to 102 mm./hour seven days after admission, and remained between 56 and 110 mm./hour for the next nine weeks (Fig. 1). On admission the haemoglobin level was 90%, at the beginning of the second week it was 80%, and at the beginning of the fifth week it was 65%. During the third week the heart sounds became progressively softer, and on the 22nd day a pericardial effusion was suspected clinically and confirmed radiologically (Fig. 2).

During the third week it was suspected that the patient might have the post-myocardial-infarction syndrome, and 15 mg. of prednisolone was given daily. This was continued for 19 days and then stopped, since it seemed that the pyrexia, the elevation of the E.S.R., and the pericardial effusion were not responding. From the second day of admission 1 mg. of digoxin was given orally every day for 30 days, and when the pericardial effusion was recognized 2 ml. of mersalyl was given on four occasions. After the withdrawal of prednisolone the pyrexia returned until a daily dose of 15 mg. of prednisolone was given once more (Fig. 1); this was continued for 30 days. During this period the pyrexia decreased, the E.S.R. fell from the region of 100 mm./hour to 21 mm./hour, the pericardial effusion gradually began to decrease, and the tendency to develop congestive failure no longer occurred.

Phenindione was administered orally throughout this period, and has been continued on a long-term out-patient basis. After his discharge from hospital this man made good progress, and returned to his work as a caretaker seven months after the myocardial infarct. All radiological evidence of the pericardial effusion had disappeared 14 weeks after its recognition.

Case 2

A man aged 56 had an occasional sharp pain in the right side of his anterior chest, partly in relation to exertion, for four weeks. An acute myocardial infarct, with severe but sharp pain deep to the sternum, marked breathlessness, sweating, paraesthesiae in the hands, and vomiting, occurred during the day before his admission to hospital. The pain occurred intermittently in severe form for 24 hours. There was no history of previous vascular or other disease. On admission he had orthopnoea, cyanosis, and engorgement of the neck veins. There was no tachycardia. Bilateral basal crepitations were heard, but there was no oedema. He was not shocked; his blood-pressure was 160/110; it fell to the region of 116/80 and remained at this level throughout the rest of his five-weeks stay in hospital. The first electrocardiogram indicated a recent transmural anterior myocardial infarct and probably also a recent transmural posterior myocardial infarct. Subsequent electrocardiograms confirmed that transmural myocardial infarction had occurred in both the anterior and the posterior walls of the left ventricle. No arrhythmia or conduction defects occurred. Only one estimation of the serum glutamic oxalo-acetic transaminase (S.G.O.T.) level was recorded; this was obtained 24 hours after the myocardial infarct and was elevated at 97 units.

The expected febrile response to myocardial infarction developed and subsequently settled, but at the beginning of the third week a pyrexia in the region of 101° F. (38.3° C.) occurred for four days. At that time, pericardial friction was heard; it remained throughout his stay in hospital and persisted for three months after his discharge. It was not associated with pain, although for some weeks he complained of a vague sense of heaviness and discomfort in the chest. The E.S.R. rose from 2 mm./hour on the day of admission and remained at a level of 36 to 68 mm./hour

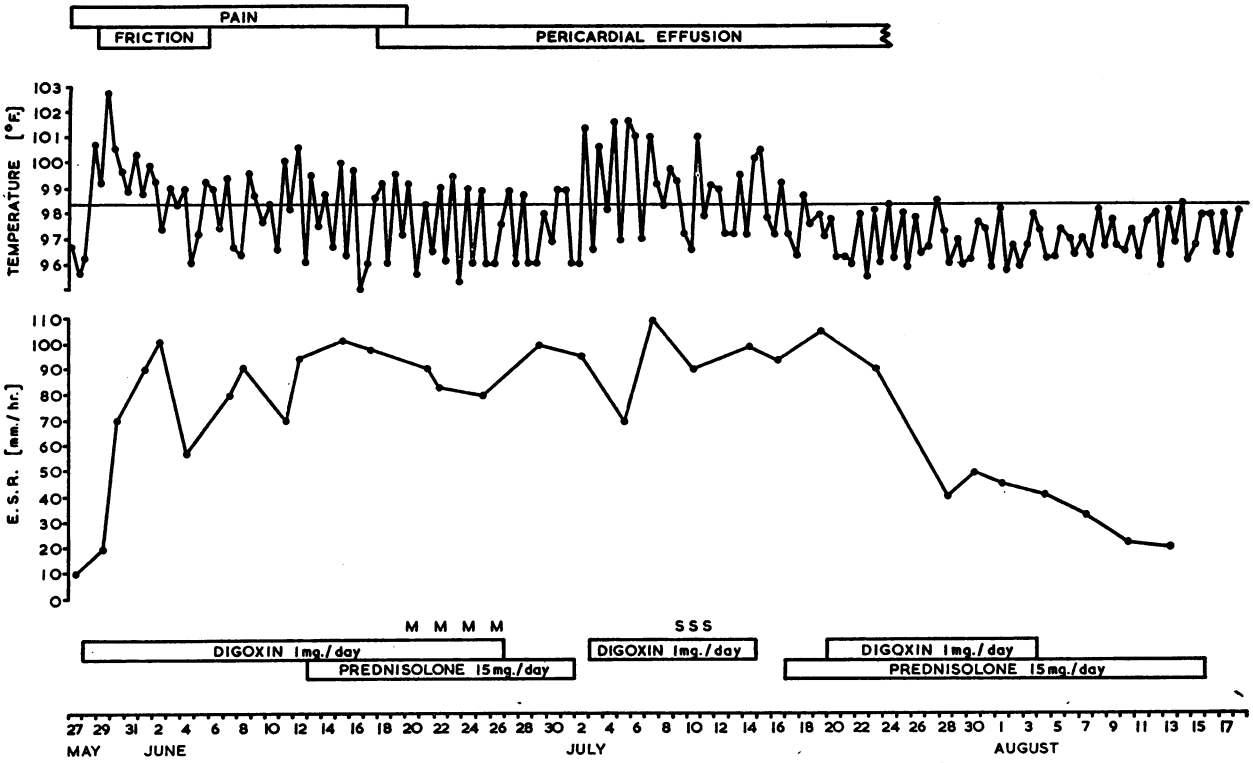

FIG. 1.—Details of Case 1. M=Mersalyl. S="Saluric" (chlorothiazide).

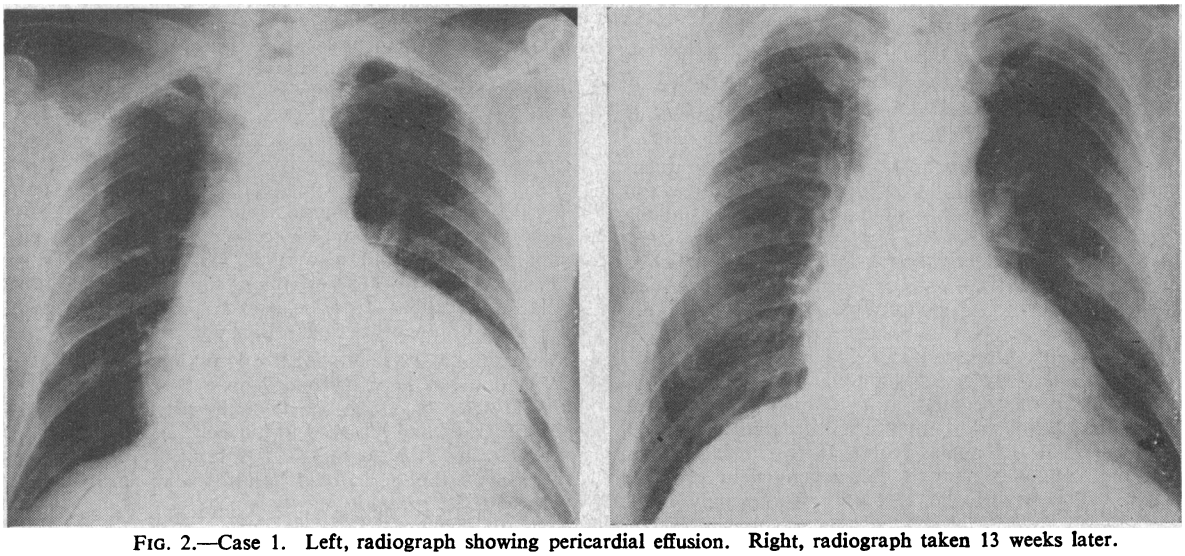

FIG. 2.—Case 1. Left, radiograph showing pericardial effusion. Right, radiograph taken 13 weeks later.

during the five-weeks stay in hospital; on discharge it was 46 mm./hour. At the time of the pyrexia at the beginning of the third week, there were radiological signs of patchy congestion at both bases associated with a transient right-sided pleural effusion. Slight generalized cardiac enlargement was observed radiologically during the fourth and fifth weeks, and it is possible that a small pericardial effusion may have developed.

Phenindione was administered throughout his stay in hospital, and continued on a long-term basis after his discharge. During the three years since his myocardial infarct he has remained reasonably well and has been able to return to his work as a crane-driver.

Case 3

A man aged 59 experienced effort angina for four days. An acute myocardial infarct, with very severe crushing chest pain for 15 minutes, occurred immediately before his admission to hospital. There was no history of previous vascular or other disease. On arrival in hospital he was in good condition and not shocked; blood-pressure 170/110 and subsequently 114/70. The first electrocardiogram indicated transmural anteroseptal myocardial infarction, which subsequently showed the expected signs of healing. The S.G.O.T. level reached 90 units 28 hours after the myocardial infarct.

On the second day a loud pericardial friction rub was heard, lasting for 16 days. At the same time he complained of a heavy pain made worse by inspiration. This discomfort continued intermittently during the next four or five days, but thereafter did not recur. A low-grade pyrexia and elevation of the E.S.R. persisted during his six weeks in hospital. On the fifth day after admission bronchial breath sounds were heard at the right base, where a moderately large pleural effusion subsequently developed. This persisted for two weeks and resolved spontaneously. Soon after he developed engorgement of the neck veins and sacral oedema, for which he was given bendrofluazide 7.5 mg. on eight occasions in association with 3 g. of potassium chloride daily. Phenindione was given only while he was in hospital.

When seen as an out-patient two months after the myocardial infarct a pericardial friction rub was again audible, particularly in diastole. His E.C.G. showed upward bowing of the ST segments in the standard and chest leads, indicating either some pericardial inflammatory reaction or continued ischaemia. On this occasion his E.S.R. was 41 mm./hour and radiologically there was some generalized cardiac enlargement, which may have been due to a small pericardial effusion. Screening examination showed diminished pulsation. During the five days prior to his out-patient visit, he had been aware of a dull pain in the left side of the lower part of the chest. This dull pain was aggravated by inspiration, and occasionally occurred over the front of the chest. It was not particularly severe, and was not associated with breathlessness, but remained for three weeks. During the next two months his E.S.R. remained elevated between 25 and 40 mm./hour, the ST elevation in the chest leads gradually decreased, and radiologically his cardiac enlargement disappeared.

Case 4

A man aged 78 had two attacks of anginal pain 10 days and four days before admission. An acute myocardial infarct with severe precordial pain lasting for four hours occurred on the day of admission. There was no history of previous vascular or other disease. On arrival in hospital he was pale and sweating, with a blood-pressure of 110/80. There was no evidence of cardiac failure. Within a few hours he ceased to complain of precordial pain, and his blood-pressure rose to 124/86. The first electrocardiogram taken on the day of admission showed an acute transmural posterior myocardial infarct with additional widespread myocardial ischaemia. Subsequent electrocardiograms showed the expected changes of healing with multiple supraventricular extrasystoles.

On the fourth day, coarse pericardial friction was heard both in systole and in diastole; this friction continued with only minor changes in character for 10 weeks. At no time during this period did the patient complain of precordial or pleuritic pain. Prior to the development of pericardial friction, there was a slight pyrexia which had almost settled but recurred with the friction and persisted (varying from 99 to 101° F.; 37.2 to 38.3° C.) for the same period as the friction. The E.S.R. was initially 48 mm./hour, and reached a maximum of 80 mm./hour during the eighth week of the illness. The haemoglobin level was 90% on admission, and subsequently fell to 80%. The white-cell count varied from 4,400 to 7,800/c.mm. The S.G.O.T. was not recorded. During the second week there was radiological evidence of pericardial effusion. Serial *x*-ray films during the subsequent 11 weeks showed some increase in this effusion followed by gradual resolution. At one stage there was evidence of inflammatory change in the right lower lobe with a small right basal effusion extending into the greater fissure. Despite the radiological appearances, there was no clinical evidence of an embarrassingly large pericardial effusion, and hence aspiration of the pericardial sac was not attempted. Furthermore, the pericardial friction was undiminished and the heart sounds remained loud.

On admission the usual treatment with phenindione was begun. During the fourth week numerous supraventricular extrasystoles were recorded, and quinidine sulphate was added to the regime. During the sixth week, because of radiological evidence of an inflammatory lesion in the right lower lobe, penicillin was given. By the seventh week it was clear that the patient had the post-myocardial-infarction syndrome, and it was therefore decided to give prednisolone 20 mg. daily. Unfortunately this appeared to precipitate mild congestive cardiac failure, and the pericarditis persisted; prednisolone was therefore stopped after seven days. Thereafter the failure was easily controlled with injections of mersalyl. During the ninth week phenindione was also stopped, on the grounds that it might be contributing to the post-myocardial-infarction syndrome.

After 12 weeks in hospital the patient was discharged in good health. All treatment had been stopped. He has since been seen on several occasions as an out-patient, and satisfactory progress has been maintained.

Case 5

A married woman aged 59, with a history of acute rheumatism in childhood and eclampsia during her only pregnancy, was admitted to hospital complaining of severe precordial pain which had been present for six hours. There was a moderate degree of shock with early signs of cardiac failure. An electrocardiogram showed transmural anterior myocardial infarction. The pain required morphine on the day of admission and pethidine on the following day, after which it did not recur. Treatment included rest, anticoagulants, diuretics, and a low-calorie diet as the patient was obese. Progress was uneventful apart from a small haemoptysis on the third day. There was a slight pyrexia during the first week in hospital. The E.S.R. was raised throughout the acute phase and was 83 mm./hour when the patient was discharged after five weeks in hospital.

Four weeks later she was readmitted with pain behind the lower sternum; it was burning in character, radiated to the right axilla, and was different from the pain of the original attack. Examination showed a pyrexia of 102° F. (38.9° C.) and signs of cardiac failure. On the day after admission a pericardial rub was heard. An electrocardiogram showed no sign of extension of infarction or of pericarditis. During the next two weeks the patient was extremely ill with a high fever uninfluenced by antibiotics. Repeated blood cultures were negative, the E.S.R. remained high (80 mm./hour), but the W.B.C. was not raised. During this time the right chest was aspirated and 200 ml. of blood-stained fluid was removed. The pericardial rub remained for three weeks. On the fifteenth day after admission the temperature fell to

normal, remained so for two weeks, then a low-grade pyrexia 98–100° F. (36.7–37.8° C.) continued for the next six weeks. On one occasion during this time a sharp attack of precordial pain occurred, depression of ST segment in the chest leads was seen, and anticoagulants were given for two weeks. Throughout her illness the blood-pressure varied from 120/70 to 150/95. Serial *x*-ray films from the time of admission showed the appearances of pericardial effusion and pleural effusions, which gradually improved during her stay in hospital.

At the beginning of the tenth week treatment with prednisolone 40 mg. daily was started. Temperature became normal and the patient remained afebrile until discharge three weeks later, when the dose had been reduced to 10 mg. daily. She continued to take 10 mg. of prednisolone as an out-patient. This was stopped six weeks after discharge, when *x*-ray examination showed a further decrease in heart size and disappearance of the pleural effusions. During the eight months since she left hospital the patient has kept well, apart from slight breathlessness on exertion.

Main Features of the Syndrome

The five patients described above presented with a clear diagnosis of myocardial infarction. In all of them the course of the illness was unusual and was characterized by features of the post-myocardial-infarction syndrome (see Table).

Pericardial Friction.—This is the clinical feature of greatest significance. Whereas the pericardial friction of myocardial infarction is early in onset and brief in duration, the friction of the syndrome usually occurs later and can hardly fail to attract attention by its extraordinary duration—120 days in Case 2 and 66 days in Case 4. In Case 3 friction persisted for only 16 days, but was heard again two months after the patient had been discharged from hospital. In Cases 1 and 5 the shorter duration—8 and 24 days respectively—may have been determined by the development of pericardial effusion.

Chest Pain.—The pain is variable in type, and the main feature is its difference in quality from the original infarction pain; it usually consists of a heavy dull discomfort confined to the anterior chest, and is often aggravated by inspiration. Furthermore, it arises when the pain of myocardial ischaemia has subsided or is subsiding. Dressler (1959) attributes it to the presence of pleuro-pericarditis, and stated that it is "absent only in exceptional cases." In our otherwise typical series chest pain was absent in one.

Pericardial Effusion.—In three of the five patients the *x*-ray appearances were typical of pericardial effusion; in the other two the appearances were only suggestive, but there was no other evidence of cardiac failure and both had prolonged pericardial friction. Dressler (1959) stated that he had observed intensely haemorrhagic pericardial exudate in the post-infarction syndrome, and adds that this may occur both with and without anticoagulant therapy. Nevertheless, the possibility of haemorrhagic cardiac tamponade in patients receiving anticoagulants in the presence of the syndrome must be considered by the physician, and in one of our patients anticoagulant therapy was stopped for this reason.

Pyrexia.—In this series irregular pyrexia persisted for periods up to 102 days, in contrast to the brief pyrexia of uncomplicated myocardial infarction. Prolonged pyrexia is therefore a striking component of the syndrome.

Erythrocyte Sedimentation Rate.—All five patients showed persistent and marked elevation of the E.S.R. during the active phase of the syndrome, which may last for many weeks.

Pleurisy.—Four of the patients developed small pleural effusions which were not preceded by detectable pleural friction. While pleurisy with or without effusion is a common feature of the syndrome, its diagnostic significance is limited, since the alternative causes of cardiac failure and pulmonary infarction are not easily excluded.

Pneumonitis.—Dressler (1959) reports that 10 of his 35 patients of whom adequate radiological study was made showed patchy or linear pulmonary infiltration which was commonly basal in situation; 3 of these 10 produced haemorrhagic sputum. Such features were not thought to be due to pulmonary infarction. Although the lungs of our patients showed minor radiological changes, we were reluctant to use the term "pneumonitis," which therefore does not appear in the Table. It is doubtful if this feature is specific enough to justify its inclusion in the syndrome.

Periostitis.—Roesler (1960) describes two cases with chest-wall pain after myocardial infarction. He attributes the pain to "periosteal involvement of chest-wall structures" and suggests that this might be added to the features of the post-myocardial-infarction syndrome. In other respects, however, his patients do not resemble the typical Dressler syndrome, being more akin to the "anterior chest wall syndrome" described by Prinzmetal and Massumi (1955). None of our patients had features of periostitis.

Discussion

Diagnosis.—The diagnosis of the post-myocardial-infarction syndrome should present little difficulty, provided that the physician is aware of its existence. The clinical features of prolonged pericardial friction with pyrexia and persistent elevation of the E.S.R. in a patient who has presented with obvious myocardial infarction form the basis of the diagnosis. Other and less constant features are non-ischaemic chest pain, pericardial effusion, and pleurisy with or without effusion. As Dressler (1959) points out, the clinical picture closely mimics the post-commissurotomy syndrome. Difficulty in diagnosis may occur when the clinical and electrocardiographic evidence of the original myocardial infarction is inconclusive; in these circumstances other causes of pericarditis and pyrexia, such as tuberculosis

Clinical Features of Five Patients with Post-myocardial-infarction Syndrome

Case No.	Sex and Age	Pericardial Friction (in Days)	Chest Pain or Discomfort (in Days)	Pericardial Effusion (in Days)	Pyrexia and Elevated E.S.R. (in Days)	Pleural Effusion (in Days)	Treatment	
							Anticoagulants	Steroids
1	M 53	3rd–10th	1st–24th	From 22nd	1st–63rd	None	Yes	On two occasions (relapse)
2	M 56	15th–135th	1st–42nd	Not definite	1st–24th	From 21st	,,	No
3	M 59	2nd–17th	1st–7th 51st–77th	,, ,,	1st–102nd	,, 5th	,,	,,
4	M 78	4th–70th	None	From 10th	1st–70th	,, 35th	,,	Yes
5	F 59	60th–84th	50th–80th	,, 60th	63rd–140th	,, 63rd	,,	,,

and systemic lupus erythematosus, would have to be considered. Recurrence of myocardial infarction and the onset of pulmonary infarction are other possible causes of confusion, but in our patients there was no difficulty in excluding these conditions. Congestive cardiac failure may reproduce two radiological features of the syndrome —namely, enlargement of the cardiac shadow and pleural effusion—but the syndrome should be suspected and diagnosed on the other more specific manifestations. The electrocardiogram is often unhelpful, since features of pericarditis may be overshadowed by those of extensive myocardial infarction; delay in disappearance of ST shifts was noted in three of our cases.

Aetiology.—The cause of the syndrome is unknown. Dressler (1959) argues that anticoagulant therapy, by causing leakage of blood into the serous cavities, might produce irritant pericarditis and pleuritis; but he notes that 11 patients in his series of 44 did not receive anticoagulants prior to the onset of the complication. Gery, Davies, and Ehrenfeld (1960) have found anti-heart antibodies in the serum of one patient suffering from the syndrome, thus supporting the suggestion of Dressler (1956) that it may be the result of an autoimmune reaction. Probably it should be regarded as a pericardial and pleural reaction to non-specific myocardial damage, and, as such, has the same aetiology as the post-commissurotomy syndrome.

Treatment.—In these days it is probable that most patients developing the syndrome will be receiving anticoagulant therapy. Even if it is agreed that anticoagulants do not cause the syndrome, the question of stopping them still arises because of the risk of precipitating haemorrhagic cardiac tamponade in the presence of pericarditis; Dressler (1959) reports a death from this cause, although it might be noted that the patient also had haemothorax, haemoperitoneum, and red blood cells in the urine, suggesting that there was an excessive bleeding tendency. The risk of precipitating haemorrhagic cardiac tamponade with anticoagulants must be weighed against the risk of recurrent infarction and thrombo-embolic complications without anticoagulants. If the autoimmune hypothesis of aetiology is correct it would clearly be desirable to give steroids. Three of our five patients received prednisolone; two showed a satisfactory response, but in the third prednisolone had to be stopped after seven days because of the onset of congestive cardiac failure. Dressler (1959) reported some success with prednisolone, although relapse was common when the drug was stopped; such a relapse occurred in one of our patients; this suggests suppression rather than elimination of the pathological process. Dressler (1959) also mentions that relief of pain with prednisolone is an important form of symptomatic treatment. As with anticoagulants, the benefit of steroid therapy is uncertain in the post-myocardial-infarction syndrome.

Prognosis.—All five patients eventually made a satisfactory recovery. Dressler (1959) also comments on the good prognosis. If the increased risk of cardiac tamponade is excluded the prognosis becomes that of the original myocardial infarction. The syndrome, however, prolongs the stay of the patient in hospital and increases discomfort during that time.

Summary

The clinical features are described of five patients who developed the post-myocardial-infarction syndrome. It closely resembles the post-commissurotomy syndrome, and is characterized by continued pericardial friction, prolonged pyrexia, persistently raised E.S.R., and chest pain of pleuro-pericardial type. Less constant features are pericardial effusion and pleurisy with or without effusion.

The post-myocardial-infarction syndrome probably complicates less than 1% of all cases of acute myocardial infarction. Although the prognosis is good, the patient's recovery is delayed for months.

Aetiology and the problems of treatment with anticoagulants and steroids are discussed.

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SEQUELAE OF URINARY INFECTION IN PREGNANCY

A FIVE-YEAR FOLLOW-UP

BY

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Infection of the urinary tract is relatively common during pregnancy and might be expected to lead, in some cases at least, to recurrent urinary infection or chronic pyelonephritis; it thus seemed worth while to review a number of patients five years after an attack of urinary infection during pregnancy to determine how many showed evidence of recurrent infection or chronic pyelonephritis at this time.

Material and Methods

Of 80 consecutive patients with definite evidence of urinary infection in pregnancy, diagnosed and treated in Queen Charlotte's Maternity Hospital at least five years previously, 50 were available for study. The other 30 either could not be traced (19) or were unwilling to come back to hospital for reassessment (11); no details of their present health or the number of deaths, if any, in the group are known. The investigations included: (1) full clinical examination, including blood-pressure readings, protein estimation, microscopy, and culture of the urine; (2) intravenous pyelography; and (3) a modification of the "pyrexal" test described by Pears and Houghton (1959). This was performed in 22 of the patients who had recurrent urinary infection or