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Diagnosis of tuberculous pericarditis and treatment without corticosteroids at a tertiary teaching hospital in Taiwan: a 14-year experience

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Tuberculous (TB) pericarditis is a rare but life-threatening form of extrapulmonary tuberculosis. The diagnostic strategy and optimal therapy for TB pericarditis are not well established. We retrospectively analyzed the diagnostic data, clinical characteristics, treatment and outcome in a total of 19 patients with TB pericarditis treated from January 1988 to July 2002. Based on the finding of echocardiography, 8 of these patients were classified as having early stage and 11 as having advanced-stage disease. There were 15 men and 4 women, with a mean age of 65 years (range, 34 to 80 years). All patients received antituberculosis chemotherapy, and all but 2 underwent at least 1 of the following procedures: pericardiocentesis and biopsy, pericardial window placement, and pericardiectomy. None of the patients received corticosteroids concurrently. Of the 8 patients with early-stage TB pericarditis, 3 (37.5%) developed constrictive pericarditis, while of the 7 patients with advanced-stage disease (excluding 4 who had already developed TB constrictive pericarditis at diagnosis), 6 (85.7%) subsequently developed constriction. These findings underscore the importance of pericardiectomy in patients with advanced-stage TB pericarditis. To avoid potentially lethal cardiac tamponade and constrictive cardiomyopathy, clinicians should have a high index of suspicion of TB pericarditis when encountering a patient with pericardial effusion. Histopathologic study of pericardial tissue sample is the key to timely diagnosis of TB pericarditis. The favorable outcomes of patients in this series suggest that a combination of antituberculosis chemotherapy and timely pericardiectomy may be the optimal therapy for patients with TB pericarditis.

Key words: Corticosteroid, pericardiectomy, pericardiocentesis, tuberculous pericarditis, tuberculosis drug therapy

Tuberculous (TB) pericarditis is a rare manifestation among other forms of extrapulmonary tuberculosis. The reported mortality rate of TB pericarditis has varied widely, ranging from 3% to 40% [1-3]. The diagnosis of TB pericarditis is made mainly based on the demonstration of tubercle bacilli in pericardial material, or granulomatous inflammation with or without caseous necrosis in the pericardium. Alternatively, the diagnosis of TB pericarditis may be made in a patient with unexplained pericardial effusion and concurrently confirmed tuberculosis involving a different side [1,2]. Cardiac tamponade and constrictive pericarditis are 2 major lethal complications of TB pericarditis [1]. All patients with TB pericarditis should be hospitalized and closely monitored for the development of cardiac tamponade because it is an immediately life-threatening complication [1,2]. In addition to mandatory antituberculosis chemotherapy, pericardiocentesis is often a life-saving procedure for cardiac tamponade and subxyphoid pericardial window placement is recommended in patients with large effusion [1,2,4]. Pericardiectomy is indicated if pericardial thickening is found during the window procedure [1,5]. Apart from open surgical interventions (pericardial window placement and/or pericardiectomy) [3,4,6], adjuvant corticosteroid treatment of TB pericarditis has been reported to be capable of minimizing the pericardial inflammatory reaction [7]. The use of corticosteroid remains controversial in that it does not lessen the need for the subsequent operation for constrictive pericarditis [3,7,8], but rather will further aggravate the already compromised immunity of the host. Data are needed on the clinical characteristics and response to antituberculosis chemotherapy for TB pericarditis when given in conjunction with surgical procedures

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without the use of corticosteroids. This retrospective study evaluated the demographic characteristics, clinical features, management and outcomes of patients with TB pericarditis at a tertiary teaching hospital over a 14-year period.

Materials and Methods

Patients admitted to Chang Gung Memorial Hospital-Linkou (CGMH-LK) between January 1988 and July 2002 with the diagnosis of TB pericarditis were included. The diagnosis of TB pericarditis was made if at least 1 of the following criteria was met: (1) culture of pericardial tissue and fluid positive for *Mycobacterium tuberculosis*; (2) biopsied pericardial specimen histopathologically demonstrating typically granulomatous necrosis or fibrin with positive acid-fast bacilli (AFB); and (3) presence of extrapericardial bacteriologic or histologic evidence of active tuberculosis in conjunction with pericardial effusion or thickened pericardium shown by echocardiography.

Based on the echocardiographic findings, TB pericarditis were categorized into: (1) early stage, when only pericardial effusion was found; and (2) advanced stage, when fibrin strand formation or fibrosis with thickening of pericardium reflecting constrictive pericarditis was detected [1]. Cardiac tamponade was defined as the presence of pericardial effusion that located anteriorly or posteriorly, rendering decrease in right ventricular dimensions at inspiration [1].

The medical charts of patients were retrospectively reviewed to collect information regarding demographic characteristics, clinical features, laboratory findings, echocardiograms, treatment modalities, clinical course and outcomes. Comparison of dichotomous variables was performed using Mann-Whitney *U* test, and $p<0.005$ was considered significant.

Results

A total of 19 patients (15 men and 4 women) with a diagnosis of TB pericarditis during the study period were identified. The demographic, clinical and laboratory characteristics of these patients are summarized in Table 1. The mean age was 65 years (range, 34 to 80 years). Ten patients had comorbidities as follows: chronic obstructive lung disease in 4 patients, diabetes mellitus in 2, chronic renal disease in 2, hypertension in 1 and pneumoconiosis in the remaining patient. One patient had received an 8-month course of chemotherapy for pulmonary tuberculosis 1 year before the diagnosis of TB pericarditis. The mean duration of symptoms and signs before diagnosis of TB pericarditis was 28.6 ± 37.7 days, and the mean duration of hospitalization for TB pericarditis was 22.0 ± 7.8 days.

Table 1. Characteristics of patients (n = 19) with tuberculous pericariditis

Clinical characteristic	Value[a]
Mean age ± SD (years)	65.0 ± 10.2 (34-80)
Gender (male/female)	15/4
Mean duration of symptoms ± SD before diagnosis (days)	28.6 ± 37.7
Mean duration of hospitalization ± SD (days)	22.0 ± 7.8
Clinical symptoms/signs [n (%)]	
Dyspnea	16 (84.2)
Jugular vein distension	13 (68.4)
Fever	11 (57.9)
Cough	9 (47.4)
Tachycardia	9 (47.4)
Leg edema	8 (42.1)
Chest tightness or pain	7 (36.8)
Friction rubs	6 (31.6)
Body weight loss	6 (31.6)
Ascites or abdominal fullness	5 (26.3)
Distant heart sound	5 (26.3)
Hepatomegaly	5 (26.3)
Paradoxical pulse	2 (10.5)
Electrocardiogram [n (%)]	
Lower voltages	10 (52.6)
Nonspecific ST-T change	4 (21.1)
Atrial fibrillation	2 (10.5)
Chest radiograph [n (%)]	
Cardiomegaly	15 (78.9)
Lung infiltration	8 (42.1)
Bilateral CP angle blunting	8 (42.1)
Unilateral CP angle blunting	4 (21.1)
Two-dimensional echocardiogram [n (%)]	
Pericardial effusion	8 (42.1)
Pericardial effusion with fibrin strands	5 (26.3)
Constriction	4 (21.1)
Pericardial fibrosis/thickening	2 (10.6)

Abbreviations: SD = standard deviation; CP = constrictive pericarditis

[a]Values are number (%) unless otherwise specified.

As for the clinical manifestations in these 19 patients with TB pericarditis (some might have more than 1 sign or symptom), dyspnea was found in 16 (84.2%), cough in 9 (47.4%), leg edema in 8 (42.1%), chest pain in 7 (36.8%), body weight loss in 6 (31.6%), abdominal fullness or ascites in 5 (26.3%), orthopnea in 4 (21.1%), jugular vein engorgement in 13 (68.4%), fever in 11 (57.9%), pericardial friction rubs in 6 (31.6%), distant

heart sound and hepatomagaly each in 5 (26.3%), and paradoxical pulse in 2 (10.5%).

Concerning electrocardiograms, with the exception of normal finding in 3 (15.8%) patients, low amplitude was found in 10 (52.6%), nonspecific ST-segment changes in 4 (21.1%), and atrial fibrillation in 2 (10.5%). None of the patients had ST-segment elevation. Regarding chest radiographic presentations, cardiomegaly was found in 15 patients (78.9%), lung infiltrations in 8 (42.1%), bilateral and unilateral blunt costophrenic angle in 8 (42.1%) and 4 (21.1%), respectively. Among 8 patients who had lung infiltrations, 5 patients had typical pulmonary apical fibroproductive changes indicating pulmonary tuberculosis.

Among patients with specimens available for culture, positive culture for *M. tuberculosis* was found in sputum in 4 (21.1%) of 19 patients, pleural fluid in 8 (44.4%) of 18, and pericardial fluid in 6 (35.3%) of 17. The average duration from specimen sampling for cultures to the growth of *M. tuberculosis* was 41.6 days. Of 17 pericardial specimens (each from an individual patient obtained during operation or from biopsy), 12 showed necrotizing granulomatous inflammation; 3 of these 12 specimens showed AFB additionally, 3 showed chronic granulomatous inflammation, and the remaining 2 showed chronic inflammation with the presence of Langhans giant cells. Two patients (1 with early stage and 1 with advanced stage disease) underwent neither pericardiocentesis nor surgical intervention; 1 of them had a sputum culture and the other had a pleural effusion culture, both of which were positive for *M. tuberculosis*.

All of the 19 patients underwent 2-dimensional echocardiographic study, which led to classification of early stage in 8 (42%), and advanced stage in 11 patients with TB pericarditis (58%) [Table 2]. Of the 8 patients in the early stage, 3 experienced cardiac tamponade later. Echographically, of the 11 patients in the advanced stage of TB pericarditis, 5 (26%) showed multiple fibrin strands (3 additionally had cardiac tamponade), and 6 showed pericardial thickening with or without constriction of heart chambers. All of these patients received antituberculosis chemotherapeutic treatment including isoniazid (INH) [5 mg/kg/day], rifampicin (RIF) [10 mg/kg/day], and ethambutol (EMB) [25 mg/kg/day] with or without pyrazinamide (PZA) [30 mg/kg/day]. Seventeen patients underwent invasive procedures (pericardiocentesis in 6, pericardial window placement in 7 and pericardiectomy in 4) in the first week of hospitalization. Among the 6 patients who underwent pericardiocentesis, 2 underwent repeat pericardiocentesis and pericardial biopsy 1 week later, and 4 underwent total pericardiectomy 14 to 40 days later because of adhesive constrictive pericarditis. Five patients with initial pericardial window placement in the first week of hospitalization subsequently underwent total pericardiectomy due to development of constrictive pericarditis 5 to 30 days later. There was no morbidity and mortality in the 17 patients undergoing additional invasive intervention during their hospital stay; among them, 15 showed marked improvement on outpatient evaluation and 2 were lost to follow-up. Two patients (1 early-stage and 1 advanced-stage with little fibrin in pericardial fluid) received antituberculosis chemotherapy alone for 2 years leading to pericardial effusion both radiographically and echocardiographically. These 2 patients had neither cardiac tamponade nor constrictive pericarditis during observation at the 16-day hospital stays. Excluding patients who were lost to follow-up, the mean duration of treatment was 10.7 months (range, 6 to 24 months). The treatment modalities and clinical courses of the 19 patients with TB pericarditis are summarized in Fig. 1.

All patients who developed constrictive pericarditis underwent total pericardiectomy when constrictive

Table 2. Comparison of clinical characteristics between patients with early- and advanced-stage tuberculous pericarditis classified based on the findings of echocardiography

	Early stage[a] (n = 8)	Advanced stage[b] (n = 11)	*p* value
Age (years) [male:female]	69 (6:2)	62 (9:2)	0.310
Duration of symptoms (days)	6.8	44.5	0.002
Hospital stay (days)	21.4	22.5	0.778
Duration of medical treatment (months)	8.1	10.6	0.657
Average white blood cell count (/mm^3)	7963	6182	0.657
Total number of pericardiectomy procedures	3	10	0.041

[a]Early stage: only pericardial effusion.

[b]Advanced stage: pericardial effusion with fibrin strand formation or fibrosis with thickening of pericardium reflecting constrictive pericarditis.

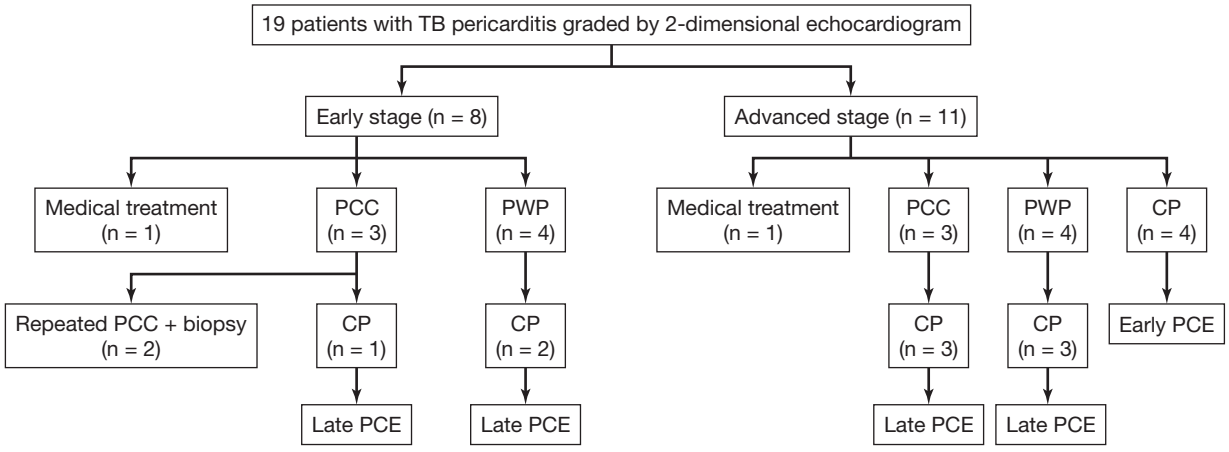

Fig. 1. Summary of treatment modalities and clinical course of 19 patients with tuberculous (TB) pericarditis. All patients who developed subacute constrictive pericarditis during the treatment course eventually underwent pericardiectomy. PCC = pericardiocentesis; PWP = pericardial window placement; PCE = pericardiectomy; CP = constrictive pericarditis.

pericarditis developed. Of the 8 patients with early-stage TB pericarditis, 3 (37.5%) subsequently developed constrictive pericarditis, while of 7 patients with advanced-stage TB pericarditis (excluding 4 who had already developed constrictive TB pericarditis at diagnosis), 6 (85.7%) subsequently developed constriction. Of the 4 patients with advanced-stage TB pericarditis, 3 who initially underwent pericardiocentesis and 1 who underwent pericardial window placement at the beginning subsequently had to undergo total pericardiectomy. Three of these 4 patients recovered at the completion of antituberculosis chemotherapy; however, persistent leg edema was found at a 10-year follow-up in the patient who underwent an initial pericardiocentesis and subsequently pericardiectomy because of progressive pericardial constriction, eventually leading to myocardial damage.

The duration of long-term follow-up after antituberculosis chemotherapy ranged from 9 months to 10 years. One patient who developed hepatitis associated with 2 months of antituberculosis chemotherapy recovered after cessation of the antituberculosis agents, and was treated with streptomycin (SM), ciprofloxacin and EMB due to the lack of other available second-line antituberculosis regimens at our hospital. After 7 months of treatment, this patient had improvement of symptoms but developed irreversible renal insufficiency. Only 1 patient with advanced-stage TB pericarditis developed active pulmonary tuberculosis as evidenced by sputum culture yielding *M. tuberculosis* 8 years after completing 2 years of chemotherapy.

Discussion

In this series, the ratio of men to women with TB pericarditis was 15:4. This supports previous reports of a male predominance in TB pericarditis [2,8-10]. Cardiomegaly and pericardial effusion have been universally found in patients with TB pericarditis [1,2, 11]. In contrast to other series, fever and tachycardia were present in more than 80% of patients with TB pericarditis [1]. This study revealed that dyspnea and jugular vein engorgement were the 2 leading clinical manifestations of patients suffering from this disease entity.

Fowler reported that low-voltage QRS and inverted T waves were the characteristic findings of electrocardiogram in TB pericarditis and presented only in a minority of patients [1]. However, these electrocardiographic features were found in 10 (52.6%) of our patients. The manifestations of TB pericarditis often clinically overlap with those of pericarditis due to other causes, such as viral or bacterial infections, lupus, neoplasms, uremia, myxedema, or sarcoidosis. Therefore, differential diagnosis in patients with pericardial disease is important, and any clue potentially suggestive of TB pericarditis should be lead to a high index of suspicion [11-13]. Extrapericardial tuberculosis may be clinically silent but its identification is helpful to make the diagnosis of TB pericarditis. Patients with TB pericarditis always have coexistent tuberculosis elsewhere, although the incidence of extrapericardial tuberculosis coexisting with TB pericarditis varies in different sides and ranges [1,8]. Sixty three percent and

42% of our patients had pleural effusion and pulmonary infiltration on their chest X-rays, respectively, suggestive of tuberculosis. Fowler and Manitsas reported that of patients with TB pericarditis, 58% had pleural effusion and 32% had pulmonary infiltration on their chest X-ray films [11]. The presence of accompanying infiltrative lung disease or pleural effusion in patients with pericardial effusion should alert clinicians to the potential for TB pericarditis until proven otherwise [2,8,11,13].

Before the introduction of antituberculosis chemotherapy in 1945, the mortality rate in patients with TB pericarditis was as high as 85% [9]. With the advent of SM in the 1940s, mortality was decreased to about 40% [1,2]. Early reports indicated that cardiac tamponade was the leading cause of death in patients with TB pericarditis, which developed in approximately 50% of the patients who did not receive adequate treatment in the first 3 months after the diagnosis of TB pericarditis [2,14,15]. In a retrospective study of 100 patients with TB pericarditis by Desai [15], 82 had pericardial effusion and 18 had constrictive pericarditis found at the time of diagnosis. The overall mortality rate was 17%. Among the 82 patients with pericardial effusion, 15 developed constrictive pericarditis within 4 months, and 12 of these 15 patients subsequently required pericardiectomy; 16 of the 82 patients with pericardial effusion eventually died of cardiac tamponade, and 1 of the 18 patients with early constrictive pericarditis died [15]. This report emphasized the need for early pericardiocentesis and repeat procedure, when required, in patients with TB pericarditis.

Strang et al reported a series of 143 patients with active TB constrictive pericarditis lacking significant pericardial effusion who received a 6-month anti-tuberculosis chemotherapy (INH, RIF, PZA and SM for the first 2 months; INH and RIF for the subsequent 4 months). At the beginning of antituberculosis therapy, these patients were randomly allocated to concurrently receive either additional prednisolone 60 mg per day or placebo for the 11-week treatment period [16]. Among the total of 114 patients who were assessable up to 24 months, improvement was found to be significantly more rapid in the prednisolone group, as indicated by the higher rate of decrease in the mean pulse rate, as well as jugular vein pressure level, and the higher rate of normalization of physical activities; during follow-up, 2 (3%) of the 53 patients in the prednisolone group and 7 (11%) of the 61 patients in the placebo group died from pericarditis, and 11 (21%) in the prednisolone group and 18 (30%) in the placebo group subsequently required pericardiectomy.

Although corticosteroids are capable of suppressing inflammatory reaction in TB pericarditis, the use of corticosteroids will inevitably further compromise the immunity in vulnerable elderly hosts suffering from TB pericarditis [3,5,7,8,13]. As a result, the benefit of use of corticosteroids as adjuvant therapy for patients with TB pericarditis remains uncertain.

Larrieu et al treated 12 patients with TB pericarditis without using corticosteroid as adjuvant therapy [6]; 8 patients received antituberculosis chemotherapy alone, and 4 underwent surgical treatment in addition to corticosteroids. All 4 patients who underwent operation survived without major complications, whereas all patients who received antituberculosis chemotherapy alone developed long-term complications including superimposing anaerobic empyema and respiratory distress in each of them, with 1 having a fatal outcome. The average hospital stay in the additional surgery group was 33 days less than that of patients who received antituberculous chemotherapy alone. The authors concluded that in the absence of rapid clinical response to antituberculosis chemotherapy, surgical intervention should be carried out in patients with TB pericarditis [6].

This present series of 19 patients with TB pericarditis spanning a 14-year period indicates that this potentially lethal disease remains a continuing threat. The determinants of the need for surgical intervention in the early stage were difficult to determine conclusively in our series and the decision largely depends on the clinical symptoms of cardiac tamponade, heart failure progression and constriction that led to jugular vein engrossment. Among 11 cases in the advanced stage, 4 developed early constriction and 6 (85.7%) developed subacute constrictive pericarditis in an average of 19 days (range, 15 to 28 days).

One patient in the advanced stage group eventually developed the long-term complication of exertional dypnea and legs edema, while another patient in the advanced group who received medical treatment was found to have a positive sputum culture for *M. tuberculosis* 8 years later, and occult *M. tuberculosis* infection was suspected. This series highlights the importance of pursuing early pericardiectomy, rather than pericardiocentesis and window placement, to achieve sustained relief of symptoms in patients with advanced stage disease.

The progression of TB pericarditis will inevitably lead to constrictive pericardiopathy because of the thickening of the pericardium due to granulomatous inflammation and subsequent deposition of fibrous strands. Previous studies underscore the importance of early diagnosis and initiation of appropriate treatment of TB pericarditis [1,2,4]. In view of the suboptimal culture rate of *M. tuberculosis* from pericardial fluid and/or tissue, invasive procedures should be carried out to obtain a pericardial tissue sample to enable early diagnosis of TB pericarditis on a histopathologic basis.

The dark-color appearance of the pericardial effusion makes it difficult to distinguish TB pericarditis from pericarditis due to other causes such as malignancy, myxedema, autoimmune diseases, drug therapy, and trauma [17]. Therefore, the role of histopathology in making the diagnosis cannot be overemphasized [17]. Although recent advances in molecular biology techniques may help expedite the diagnosis of TB pericarditis [18], further studies are needed to verify their clinical applicability. Echocardiogram is an extremely useful and noninvasive tool in the diagnosis and management of patients with TB pericarditis. It plays a critical role in identifying high-risk patients and expediting a therapeutic strategy based on the echocardiographic findings.

In conclusion, dyspnea and jugular vein engorgement were the 2 leading clinical manifestations of TB pericarditis in this series. To avoid the potentially serious complications of TB pericarditis, clinicians should maintain a high index of suspicion for this disease entity upon facing a patient with unexplained pericardial effusion. It is extremely important to perform early pericardiocentesis with biopsy or surgical intervention to obtain pericardial fluid and/or tissue for mycobacterial cultures and histopathological study for the differential diagnosis of TB pericarditis.

Echocardiography appears to a useful tool in making the early diagnosis and management of TB pericarditis. It is not only helpful in performing pericardiocentesis with pericardial biopsy and identifying the stages of pericarditis, but is also useful for the management-based repetitive staging of TB pericarditis. The combination of antituberculosis chemotherapy with timely pericardiectomy may be the optimal therapy for patients with TB pericarditis.

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