Echocardiographically Guided Pericardiocentesis for Treatment of Clinically Significant Pericardial Effusion in Rheumatoid Arthritis

SANDERSON A. CAUDURO, KEVIN G. MODER, HARVINDER S. LUTHRA, and JAMES B. SEWARD

ABSTRACT. ***Objective.*** To assess the safety and efficacy of echocardiographically guided pericardiocentesis for patients with rheumatoid arthritis (RA) and hemodynamically significant pericardial effusion.

Methods. We identified 16 patients with RA who underwent 18 echocardiographically guided pericardiocentesis procedures at our institution over a 20-year period. Clinical and laboratory characteristics of the patients, response to treatment, complications, and need for future pericardial surgery were abstracted from the echocardiography database.

Results. Ten patients were men and 6 were women (mean age, 62 yrs; range, 36-75 yrs). On average, patients were diagnosed with RA 11 years before pericardial disease developed. Twelve of 15 patients were seropositive for rheumatoid factor, 10 patients had radiographic evidence of erosions, and 7 patients had rheumatoid nodules. Cardiac tamponade was present in 11 of the 18 cases. Mean volume drained on the first pericardiocentesis was 504 ± 264 ml (range 120-1000 ml). The fluid was an exudate with a mean protein concentration of 5 g/dl (range 3.3-51.1 g/dl). All cultures and cytologic findings were negative for bacteria and neoplastic cells. No serious complications resulted from echocardiographically guided pericardiocentesis. For 11 patients, a catheter was placed for intermittent drainage over an average of 3 days. Seven patients ultimately required a more definitive surgical procedure.

Conclusion. Echocardiographically guided pericardiocentesis is a safe and effective treatment for this uncommon but serious complication of RA. (J Rheumatol 2006;33:2173–7)

Key Indexing Terms:
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Rheumatoid arthritis (RA) is a chronic, progressive disease associated with systemic inflammation and a significantly shorter life expectancy for affected patients[1]. A common cardiac manifestation of RA is pericardial involvement, with or without valvular and coronary artery involvement[2-4]. An uncommon but potentially life-threatening consequence of pericardial involvement is symptomatic pericardial effusion and cardiac tamponade, for which optimal management and clinical outcomes are unknown. The preferred treatment method at our institution since 1979 has been echocardiographically guided pericardiocentesis.

We assessed the efficacy of echocardiographically guided pericardiocentesis and describe the clinical course of patients with RA after the procedure.

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MATERIALS AND METHODS

Since 1979, information about all patients undergoing echocardiographically guided pericardiocentesis at Mayo Clinic has been prospectively collected in a database. The pericardiocentesis procedure has been described[5]. After the Mayo Foundation Institutional Review Board approved the study, medical records and the echocardiography patient database were reviewed comprehensively. Patients who did not have echocardiographically guided pericardiocentesis and patients with non-RA causes of pericardial effusion were excluded. All patients met American Rheumatism Association classification criteria for RA[6] at the time of pericardiocentesis. Details of pericardiocentesis, clinical and laboratory features of the patient, and patient demographics were examined.

RESULTS

We evaluated 10 men and 6 women with a mean age of 62.3 ± 9.9 years (range 36-75 yrs). All patients had clinically significant pericardial involvement approximately 11 years after receiving the diagnosis of RA. Five patients had a history of hypertension or congestive heart failure (or both). Atrial fibrillation was present in 4 patients, and 3 patients had coronary artery disease and chronic obstructive pulmonary disease. Twelve of 15 patients were seropositive for rheumatoid factor (1 patient was not evaluated). Of the 16 patients, 10 had radiographic evidence of erosions, 7 had rheumatoid nodules, and 5 had undergone total joint arthroplasty.

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For these patients, echocardiographically guided pericardiocentesis was performed a total of 18 times between 1980 and 1998. The procedure was repeated for 1 woman (1 day after the first drainage) and 1 man (166 days after the first drainage). There were 11 (61%) emergency procedures. Patients were examined before each procedure. Findings are presented as number of cases; fewer than 18 cases indicate missing data. The most common clinical symptoms were shortness of breath (15 of 16), fatigue (14 of 16), and chest pain (7 of 16). Elevated jugular venous pressure (13 of 18), fever (9 of 16), pulsus paradoxus (9 of 18), tachycardia (7 of 18), leg edema (5 of 13), and tachypnea (5 of 16) were the most frequent clinical findings. Pericardial friction rub was documented in 2 of 15 patients. Mean systolic blood pressure was 125 ± 30 mmHg (range 64-176 mmHg) and mean diastolic blood pressure was 78 ± 16 mmHg (range 38-100 mmHg). The average heart rate was 94 ± 22 beats per minute (range 57-140 beats/min).

Echocardiography showed circumferential pericardial fluid distribution in all patients (Figure 1). Cardiac tamponade was present in 11 of 18 cases and was confirmed by 2-dimensional echocardiography in 10 cases and Doppler echocardiography in 3 cases (both types of echocardiography were used to evaluate 2 patients). The mean ejection fraction was 51-23.5% (range 5-74%). Drained pericardial fluid was sanguineous in 14 cases and serous in 4 cases. None of the fluids were chylous. The fluid was an exudate with a mean protein concentration of 5 g/dl (range 3.3-51.1 g/dl). Mean leukocyte count was 775×10^9 cells/μl (range 100-29, 450×10^9 cells/μl). For all patients, cytologic findings were negative for neoplastic cells; all Gram stains and cultures were negative for bacteria. Results of pericardial fluid and serum analysis are shown in Table 1.

The mean volume of fluid drained with the first pericardiocentesis was 504 ± 264 ml (range 120-1,000 ml) and a catheter was placed for intermittent drainage in 11 patients (catheterization was maintained for an average of 2.6 ± 1 days). There were no major complications during or after the pericardiocentesis or catheter drainage. One patient had transient hypotension that responded to an intravenous saline infusion.

After pericardiocentesis, 7 patients were referred for surgical

Table 1. Results of pericardial fluid and serum analysis for 16 patients with RA. Fractions indicate number of patients with a clinical feature (e.g., low C3 levels) over the total number of patients tested.

Variable	Pericardial Fluid	Serum
Glucose, median, range, mg/dl*	22 (1–206)	99 (57–336)
Complement		
C3	Low 1/1	Normal 3/3
C4	Low 1/1	Normal 2/2
Total hemolytic complement (CH50)	Low 4/5	Normal 4/5
RF	Positive 3/8	Positive 12/15
ANA	Positive 0/4	Positive 7/13

ANA: antinuclear antibody; RF: rheumatoid factor. * p = 0.02.

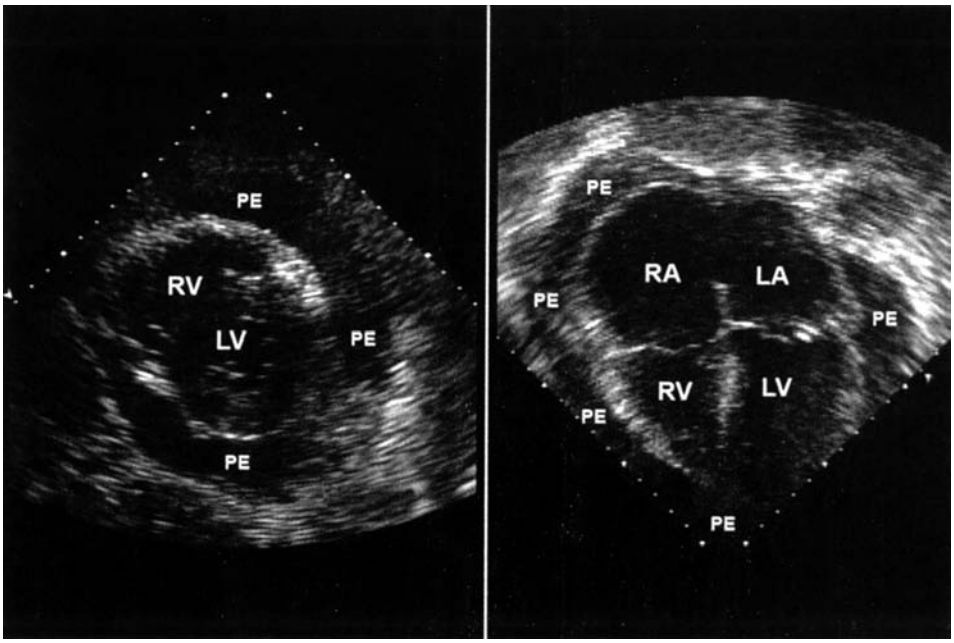

Figure 1. Echocardiographic image of a moderately sized circumferential pericardial effusion (PE). The patient had mild tamponade physiology according to echocardiography or Doppler criteria. Left panel. Parasternal short axis view of the heart. Right panel. Apical 4-chamber view of the heart. LA: left atrium; LV: left ventricle; RA: right atrium; RV: right ventricle.

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pericardectomy because of recurring symptoms suggestive of constrictive pericarditis. From the date of pericardiocentesis, the mean time to surgery was 8 days (range 3-1445 days). Although only 4 surgical cases showed evidence of constrictive pericarditis upon incision of the pericardial sac, extensive fibrosis was evident in all 7 patients. Two patients had a thickened pericardium (3 mm and 5 mm, respectively). Clinical presentation, duration of the RA, patient age, and volume of the pericardial effusion were not associated with need for surgery.

Eight men and 3 women died (mean age at death 65 ± 10 yrs; range 42-75 yrs). The survival curve after pericardiocentesis is shown in Figure 2. Survival rate was 85% at 1 year, 50% at 5 years, and 10% at 10 years. Timing of events during the RA clinical course and causes of death are shown in Table 2.

DISCUSSION

Our report constitutes the largest series of patients with RA and cardiac tamponade to date and describes patient management using echocardiographically guided pericardiocentesis. Table 3 compares previous large studies of pericarditis in patients with RA. Although echocardiographically guided pericardiocentesis was effective for symptom management, surgery was ultimately necessary for 7 of 16 patients.

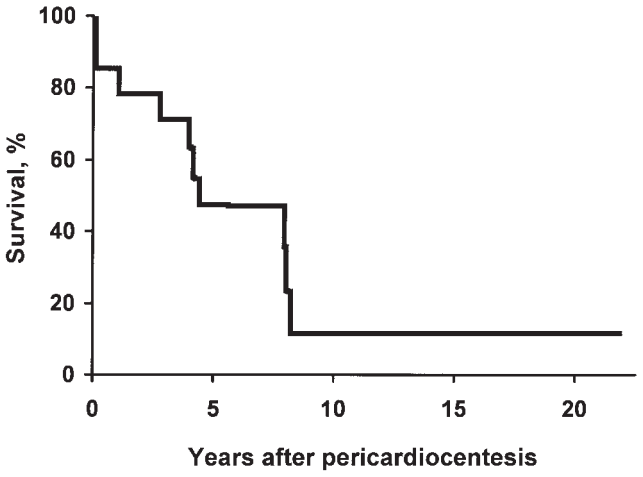

Figure 2. Survival curve after electrocardiographically guided pericardiocentesis for patients with RA (n = 16). Patients were diagnosed with RA approximately 11 years before undergoing pericardiocentesis.

Table 2. Clinical course and cause of death for patients with RA (8 men and 3 women).

Feature	Value
Clinical course, median ± SD (range), yrs	
Diagnosis of RA to pericardiocentesis	11 ± 10 (3–40)
Pericardiocentesis to death	4.2 ± 3.5 (0.01–8.2)
Followup	4.4 (0.01–22)
Primary cause of death, n	
Cardiovascular	5
Infection	2
Unknown	4

Pericardial involvement is relatively common in RA; if pericarditis is diagnosed on the basis of echocardiographic data, prevalence varies from 30%[7-9] to 50%[10-12]. However, clinically significant pericarditis is diagnosed in only about 3% of patients with RA[13]. Cardiac tamponade, hemodynamically significant pericardial effusion, and chronic constriction of the heart are even more uncommon[11,16]. From 1979 through 2000, fewer than 2% of patients requiring pericardiocentesis at our institution had RA[17]. Our identification of only 16 patients from a period exceeding 20 years also shows that cardiac tamponade in RA is rare.

Rheumatoid pericarditis may be treated by instillation of depot corticosteroids into the pericardial sac[18,19]. Patients in those studies included children with juvenile arthritis. Our series included only adults, and none of our patients received this type of therapy.

Echocardiographically guided pericardiocentesis has many clinical advantages. As an initial procedure, it is effective for symptom management, and it is less expensive and safer than alternative procedures such as the creation of a surgical pericardial window or total pericardiectomy[20,21]. Echocardiographically guided pericardiocentesis can be performed on an emergency basis[22] and as an outpatient procedure[23]. Pericardial fluid samples for diagnostic cytologic, bacterial, and chemical analyses can be obtained without surgery[24]. Rapid diagnosis and intervention may be facilitated through echocardiography, which can serially document the accumulation of pericardial fluid and detect physiologic abnormalities.

Previous reports showed that rates of congestive heart failure and cardiac death were higher in patients with RA than the general population, even in the absence of cardiac tamponade[13,25,26]. Our patient series also confirmed previous reports indicating that pericardial disease occurs more frequently in men with RA[8,10,11,13], even though RA is more common in women[27]. However, gender bias in the referral of patients could also explain this finding[28].

Excess mortality is apparent within 8 to 10 years of onset of RA[28]. Patients in our series were diagnosed with RA about 11 years before pericardiocentesis. The survival rate of patients with RA who undergo pericardiocentesis may be lower than that of patients with RA who do not undergo the procedure. In this patient series, survival rates following pericardiocentesis after 1, 5, and 10 years were 85%, 50%, and 10%, respectively[27]. This is lower than the survival rates of patients with RA, which are 98%, 90%, and 78%, at 1, 5, and 10 years, respectively[28]. We note that this comparison is problematic because survival curves began at different stages of the disease course (11 years after diagnosis or immediately after diagnosis). For patients with clinically significant pericardial disease, the survival curve was lower than that of the general RA population. Death was not associated with age, duration of RA, performance of pericardiectomy, or other comorbid conditions.

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Table 3. Summary of pericarditis studies using large numbers of patients with RA.

Author[Ref], Year	Patients with RA and Pericarditis, no.	Type of Study	Comment
Kirk and Cosh[15], 1969	10	Retro	Clinical pericarditis
Bonfiglio and Atwater[9], 1969	17	Retro	Autopsy study
Nomeir, *et al*[11], 1973	14	Pro	Echocardiography study
Prakash, *et al*[12], 1973	7	Pro	Echocardiography study
Bacon and Gibson[10], 1974	11	Pro	Echocardiography study
MacDonald, *et al*[8], 1977	18	Pro	Echocardiography study
Jurik and Graudal[14], 1986	16	Retro	Clinical pericarditis
Escalante, *et al*[7], 1990	12	Retro	Clinical pericarditis
Hara, *et al*[13], 1990	41	Retro	Symptomatic study
Cauduro, *et al*, 2006	16	Retro	Echocardiography study

Retro: retrospective; Pro: prospective.

The small number of patients in our series made it difficult to draw definitive conclusions about survival. However, the previously published series of patients with RA with pericarditis from our institution also showed a decrease in survival[13]. We note that 5 patients in our current study were also included in the previous report. Our study differs from the previous study because ours was limited to patients with RA who underwent echocardiographically guided pericardiocentesis, whereas the previous study included all patients with pericarditis. Furthermore, the treatment of RA has changed markedly since the earlier publication. As we enter the "biologic" era, we anticipate that the frequency of extraarticular manifestations of RA will decrease.

Although pericardial involvement in RA is common, symptomatic pericardial involvement is rare. Echocardiographically guided pericardiocentesis appears to be a safe and effective treatment for these patients. In our subset of patients with RA, pericardial effusion causing cardiac tamponade is also rare. For patients with RA who undergo electrocardiographically guided pericardiocentesis, survival is decreased.

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