Pericardial Effusion as a Cause of Morbidity in Patients on Maintenance Hemodialysis: Is it Preventable?

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Abstract

Objective: Cardiovascular diseases are the cause for 45% mortality and 20% morbidity in hemodialysis (HD) patients. Pericardial effusion (PE) accounts for 03 - 04% of all deaths in HD patients as a result of tamponade, arrhythmias or heart failure. This study aims to find out the prevalance and precipitating factors for PE in hemodialysis patients.
Patients and Methods: Fifty five patients were identified for echo-cardiographic assessment on the basis of signs and symptoms suggestive of PE i.e., hypotension during dialysis, dyspnea, globular heart in chest x-ray, raised JVP, soft heart sounds and low voltage ECG. A matched controlled group of 55 patients for age, sex, dialysis schedule, cause of ESRD and dialysis bath, was also studied echocardiographically.
Results: Pericardial Effusion was detected in 12 patients (10.9%), 10 (83.3%) were on 2/week and only two on 3/week dialysis. Of these 75% were non-compliant in fluid intake and 58.3% were irregular in treatment. The morbidity of PE in study group (18.2%) is significantly higher as compared to controls (3.6%) (P= <0.05). No correlation was found between development of PE and high iPTH and low albumin levels. Ten patients with mild PE responded to vigorous dialysis. Two patients developed cardiac tamponade needing pericardiocentesis.
Conclusion: We have identified 2/week dialysis (inadequate dialysis dose), acetate bath and fluid and dialysis non-compliance as factors contributing to development of PE in HD patients (JPMA 51:146:2001).

Introduction

In Pakistan, at present 3000 patients are on maintenance dialysis program. The incidence of End Stage Renal Disease (ESRD) is about 100 patients/million/year[1]. Maintenance hemodialysis is available as a replacement therapy for the majority of patients with ESRD. Transplantation activity in Pakistan is confronted by many impediments, and absence of cadaver organ donation program has severely restricted the transplant program. As a result, the transplantation rate in Pakistan remains below five per million population[2].
Cardiovascular disease account for 45-50% of mortality and about 20% of morbidity in dialysis patients[3-6]. There is a whole spectrum of cardiovascular disorders in dialysis patients. Pericarditis and/or pericardial effusion (RE.) is one of them. The factors already known to be associated with an increased incidence of pericardial effusion in patients on maintenance dialysis are:
hypercatabolism, volume overload, inadequate dialysis, hyperparathyroidisni, hyperuricemia, malnutrition, intercurrent bacterial or viral infection[6]. We conducted this study to ascertain the precipitating factors for the development of pericardial effusion in our patients on maintenance dialysis.

Patients and Method

Of 160 patients on maintenance hemodialysis at The Kidney Centre, 55 were identified on the basis of signs and symptoms suggestive of pericardial effusion i.e. off and on
dyspnea, drop in blood pressure during dialysis, chest x-ray suggestive of pericardial effusion, raised

JVP, soft heart sounds and low voltage ECG. These patients were investigated echocardiographically (M-Mode and 2-dimensional) for the presence of pericardial effusion.
A control group of 55 patients matched for sex, dialysis schedule, cause of ESRD and dailysis bath were also studied echocardiographically. All patients were dialyzed with a hollow fibre, cellulose diacetate dialyzer. Blood flow ranged from 250-300 nil /min.
Medical records were analyzed to determine the gender, age, cause of ESRD, dialysis schedule, dialysis bath, type of dialysis (reuse/single use) and duration on dialysis (Table 1).

Table 1. Medical records

		Pts. With suggestive symptomatology of PE (55)	Pts., in control group (55)
Sex		36 Males 19 Females	36 Males 19 Females
Mean duration on H.D.		3.43 years	3.2 years
Primary Diagnosis	CGN	21	20
	Diabetes Mellitus	16	17
	Hypertension	15	14
	APKD	02	03
	Obs. Uropathy	01	01
Frequency of dialysis (Twice / week)		37	38
(Twice / week)		18	17
Dialysis Solution - Acetate		37	38
Bicarbonate		18	19
Reuse		37	38
Single Use		18	19
Dialyzer		Hollow fibre	Hollow fibre
Membrane		Cellulose diacetate	Cellulose diacetate

Mean pre-dialysis intact parathyroid hormone, serum albumin, serum urea and serum creatinine were also analyzed. Poor compliance was determined on the basis of weight gain greater than 0.5kg/day, missing dialysis schedule or receiving less than prescribed dialysis dose.

Results

Of the 55 patients in whom echocardiography was performed, pericardial effusion was detected in JO patients (18.2%) (Table 2).

Table 2. Suggestive symptomatology of PE.

Pt. #	Echo finding	Sex	Age	Cause of ESRD	Duration of HD (Years)	Freq of HD	Dial. Sol.	SU or RU	Fluid Compliance	Dialysis Compliance	PTH pg/ml	Albumin g%
1.	Mild PE	F	52	CGN	4	2/wk	A	RU	Good	Good	469	4
2.	Mild PE	F	72	CGN	4	2/wk	A	RU	Bad	Bad	70	3
3.	Mild PE	F	42	CGN	4	2/wk	Bic	SU	Good	Good	44	4.1
4.	Large PE	M	34	CGN	6	2/wk	A	RU	Bad	Bad	102	3.8
5.	Mild PE	M	58	HTN	2	2/wk	A	RU	Bad	Good	252	3.8
6.	Mild PE	M	34	CGN	1	2/wk	A	RU	Good	Good	300	4.3
7.	Mild PE	M	30	CGN	2	2/wk	A	RU	Bad	Bad	464	4.1
8.	Mild PE	M	51	DM	1	2/wk	A	RU	Bad	Bad	68	3.4
9.	Large PE	M	60	DM	5	3/wk	A	SU	Bad	Bad	678	4.1
10.	Mild PE	M	35	CGN	3	2/wk	A	RU	Bad	Bad	290	4.6
Patients in Control Group												
1.	Mild PE	M	39	CGN	3	3/wk	A	RU	Bad	Good	273	3.9
2.	Mild PE	M	51	CGN	3	2/wk	A	RU	Bad	Bad	120	4.2

PE = Pericardial Effusion; HTN= Hypertension; DM= Diabetes Mellitus;
CGN= Chronic Glomerulo Nephritis; F=Female; M= Male; RU = Reuse;
SU = Single Use; A= Acetate; BIC = Bicarbonate. HD = Haemadialysis.

Eight patient had mild pericardial effusion all around the heart, while two had large amount of fluid. Mean duration on dialysis was 3.2 years. Seven patients were males and 3 were females. Cause of ESRD was chronic glomerulonepritis (CON) in seven, diabetes mellitus (DM) in two and hypertension (H TN) in one. Nine patients were on twice/week dialysis schedule and one on thrice/week dialysis schedule. Nine patients were on acetate dialysis and only one on bicarbonate dialysis. Eight patients were on reuse of dialyzer and two on single use of dialyzer. None of the 10 patients had symptoms of pericarditis i.e. pleuritic retrosternal chest pain and/or pericardial rub.

Seven cases (70%) were non-compliant in fluid intake (inter dialytic weight. gain - 2.7 kg or above), six (60%) were non-compliant in receiving the prescribed dialysis dose. Only three had PTH levels greater than 300 pg/mi. Albumin levels in four was <4 G%. In the control group, PE was detected only in two patients (3.6%). Both were males and both had mild pericardial effusion. Mean duration on dialysis was three years and cause of ESRD in one was chronic glomerulonepritis and diabetes mellitus in the other. Dialysis schedule of first patient was thrice per week acetate reuse. Although, he was compliant in receiving the prescribed dose but showed marked noncompliance in fluid intake (weight gain 4-5kg/session). Dialysis schedule of second patient was twice per week acetate reuse. He had chronic history of non-compliance in receiving prescribed dialysis dose and fluid intake. Serum albumin and PTH level in both patients were normal and none of the two patients had symptoms of pericarditis. The overall morbidity of PE was 10.9%. The morbidity of' PE in study group (18.2%) was significantly higher as compared to the controls (3.6%) $p < 0.05$.

Discussion

The association of pericarditis with renal failure was first described by Richard Bright in his land mark observation of 100 cases of patients with albuminous urine, which appeared in the Guys Hospital report of 1836.

Autopsy studies demonstrated pericarditis or pericardial effusion in 37 of these patients[7,8].

Uremic pericarditis is observed in 6 - 10% of patients with advanced renal failure (acute or chronic) before dialysis has been instituted[9]. Prompt initiation of renal replacement therapy is the first line of treatment in this setting[10]. The occurrence of uremic pericarditis has declined significantly since the advent of dialysis. Still pericarditis accounts for 3-4% of alt deaths in dialysis patients, as a result of tamponade. cardiac arrythmias or heart failure[6].

Dialysis associated pericarditis, occurs in about 13% of patients on maintenance dialysis[11]. Results of some studies have shown much higher prevalence, for example in a study conducted by Adiku et a!. pericardial effusion was diagnosed in 41% of patients by echocardiographic assessment. The criteria for patients selection was different as compared to our study. They included all those patients who were on dialysis for more than six months, regardless whether symptornatology was present or not[12]. In comparison, PE was detected in 12 of our patients (7.5%).

In our study 75% of patients showing pericardial effusion had chronic glomerulonephritis as the primary cause of ESRD. These results do not correlate with study conducted by Pedro et al[13] in which 58% of their patients with pericardial effusion were diabetics. Chronic glomerulonephritis is a leading cause of end stage renal disease in our patients (3 7%). followed by diabetes mellitus (33%). In our study chronic glomerulonephritis is an independent risk factor for the development of pericardial effusion (75%).

Our results show that tinder dialysis contributes to the development of PE as 10 out of 12 (83.3%) patients were on twice/week schedule. And even on this schedule more the 50% of them persistently showed non-compliance in receiving the prescribed dialysis dose. These results are almost identical to the study conducted by Compty et al in 1971 in which 18 out of 25 patients (72%) were on twice/week

schedule who showed evidence of pericarditis with or without effusion[8]. We found a significant correlation between volume over load and development of PE. Similar results were reported by Pedro on acetate dialysis indicating our inability to achieve dry et al in 198513. Eleven out of twelve (91.6%) patients were weight. in these patients because of hypotension. vomiting and cramps. Ten of our patients were on reuse program. Association with the reuse of dialyzer could be explained by our inability to achieve desired dry weight of patients, secondary to frequent clotting of dialyzers.
In our control group only two had pericardial effusion. Frequency of dialysis was twice per week in one and thrice per week in the other. The patient who although was on thrice per week schedule, was on acetate reuse programme and had marked non-compliance in his fluid intake. The second patient Was on twice per week acetate reuse programme, not ready to switchover to thrice per week schedule and not restricting his fluid intake. Our result does not correlate with that of Comty et al with respect to parathyroid status, sex and age of patients[8]. As far as nutritional status is concerned, we found no statistically significant relationship between low albumin levels and development of pericardial effusion (P:NS).

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