ruptured diaphragm. It is probable that there was a left subphrenic abscess at about the same time and that infection from this site tracked up through the foramen of Blokdalec into the chest. This would account for the inflammatory mass at the posterior aspect of the left chest at the site of the first paracentesis and for the subsequent softening, and finally the rupture, of the diaphragm and the sudden passage of the stomach into the chest.

EFFECT OF CHLORPROMAZINE ON RENAL HAEMODYNAMICS AND FUNCTION IN CONGESTIVE HEART FAILURE

PRELIMINARY REPORT

BY

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On the basis of an earlier observation of ours that chlorpromazine ("largactil") has a marked diuretic action in cases of congestive heart failure we investigated 12 cardiac patients and, for comparison, 6 normal persons for the effect of chlorpromazine (25 mg. intravenously) on diuresis, sodium excretion, glomerular filtration (endogenous creatinine clearance), and renal plasma flow (para-aminohippuric acid clearance).

Results

After the intravenous injection of the above dose an immediate increase in diuresis was seen in oedematous cardiac patients, reaching its maximum within about half an hour. The rise averaged two or three times the initial value, and in our 12 cases the average of the maximal diuresis rose to four times as much. Even the lowest values due to chlorpromazine were much higher than those observed in the control periods (Tables I and II).

Sodium excretion varied together with the diuresis, rising upon administration of chlorpromazine in general to more than twice that observed in the control periods. The peak values in some of the experiments reached three times those of the control periods. In the chlorpromazine-treated cases even the lowest sodium excretion was significantly higher than the control values.

The glomerular filtration rate also increased as the result of chlorpromazine, though by no means to the extent seen in diuresis and sodium excretion. In the periods after chlorpromazine administration the glomerular filtration rate was some 20 to 50% higher than the control values, the rise being statistically significant in only the first two periods after administration of the drug. The maximal glomerular filtration rate values in the periods after chlorpromazine were on the average 86% higher than in the controls. The minimal values were 9.5% lower than the control values, and are not statistically significant.

Chlorpromazine produced an average rise of 30% in the renal plasma flow, but this rise, except for the first period after administration, cannot be regarded as statistically significant. The average of maximal values due to chlorpromazine exceeded the controls by 69%, the difference being highly significant. The mean of the lowest values was actually 12% lower than the controls, but from the standpoint of statistical analysis was not substantially different.

Comment

From the above, therefore, it appears that in congestive heart failure chlorpromazine has a pronounced diuretic and

TABLE I.—*Results in 12 Cases*

Case No.	Diuresis (ml./min.)						Glomerular Filtration						P.A.H. Clearance						Sodium Excretion (mg./min.)					
	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6
1	0·5	0·6	2·3	1·0	1·6	1·2	85	90	152	48	74	51	300	390	620	200	227	180	2·5	3·4	12·0	5·4	8·5	6·1
2	0·9	1·4	1·8	2·7	2·6	3·2	77	86	83	93	74	87	190	280	200	310	250	300	0·8	1·3	1·6	2·2	1·6	2·2
3	0·3	0·4	0·3	0·3	1·0	1·6	74	102	74	44	105	91	—	260	250	173	380	350	0·3	0·3	0·2	0·3	1·5	1·4
4	0·5	0·6	0·5	1·0	0·9	0·9	73	86	51	102	81	88	—	230	149	323	240	180	3·1	3·9	3·3	6·6	6·7	7·5
5	0·4	0·5	0·6	5·9	2·2	3·8	46	49	65	177	55	100	—	—	—	—	—	—	2·3	3·3	1·5	13·3	5·5	9·5
6	0·7	0·8	1·5	1·6	0·9	0·7	34	35	50	28	23	28	103	162	204	133	118	—	2·9	2·6	3·6	2·5	2·0	2·7
7	1·3	1·3	2·6	2·2	1·6	—	60	60	130	89	72	—	218	219	390	331	199	—	4·4	5·3	9·2	7·7	5·1	—
8	0·8	0·9	1·5	1·1	1·1	—	60	63	112	74	82	—	—	434	560	462	590	—	3·5	4·8	7·8	7·1	5·1	—
9	0·5	0·4	1·6	1·9	1·4	1·0	60	57	160	179	140	86	138	156	493	530	510	264	1·6	1·6	6·1	7·4	5·7	3·8
10	0·9	1·3	6·5	4·7	4·2	—	113	109	142	85	77	—	272	—	280	178	166	—	1·3	1·6	8·8	6·6	6·3	—
11	0·5	0·4	1·1	0·9	1·1	0·6	68	78	185	148	171	102	183	171	405	352	381	233	0·4	0·4	0·9	0·9	1·1	0·6
12	1·5	1·4	1·0	2·1	6·0	6·0	108	91	48	90	91	91	318	341	112	254	320	286	6·8	6·4	3·6	6·4	7·3	5·5

1 and 2=Control periods. 3, 4, 5, and 6=Periods after administration of chlorpromazine. P.A.H.=Para-aminohippuric acid.

TABLE II.—*Effect of Chlorpromazine on Glomerular Filtration Rate, Renal Plasma Flow, and Water and Salt Excretion, Expressed as Percentage of Mean of Control Periods*

		1	2	3	4	5	6	Min.	Max.
Diuresis (ml./min.) ..	Mean	94	106	216	298	260	301	146	396
	S.D.	9·5	9·3	164	95	124	207	82	298
	t			3·491	10·225	6·357	4·738	2·726	4·905
	P			≪0·1	≪0·1	≪0·1	0·1	1·0	≪0·1
Glomerular filtration rate	Mean	97	103	151	145	122	116	90·5	186
	S.D.	6·2	6·2	73	100	58	38	43	100
	t			3·511	2·224	1·870	1·611	1·073	4·971
	P			0·1	3·0	7·0	10·0	30·0	<0·1
P.A.H. clearance ..	Mean	92	106	138	133	133	112	88	169
	S.D.	9·3	8·8	71	86	83	42	39	73
	t			2·259	1·616	1·690	1·156	1·241	3·970
	P			3·0	12·0	10·0	30·0	25·0	<0·1
Sodium excretion (mg./min.)	Mean	92	108	211	213	234	210	141	311
	S.D.	9·6	9·6	136	133	135	129	101	159
	t			3·852	4·014	4·682	4·067	1·903	6·270
	P			<0·1	≪0·1	≪0·1	≪0·1	5·0	≪0·1

1 and 2=Control periods. 3, 4, 5, and 6=Periods after chlorpromazine administration. Min.=Mean of individual minimal values after chlorpromazine administration. Max.=Mean of the individual maximal values after chlorpromazine administration.

saluretic action. This effect could be explained by alterations of renal haemodynamics—that is, to be due to the rise of renal plasma flow and filtration rate, resulting in the changes of water and salt reabsorption. This possibility is not in the least excluded by the fact that the rise in glomerular filtration and renal plasma flow was much less than that in water and sodium excretion. Against this view, however, stands the fact that the changes in glomerular filtration and plasma flow were not always followed by similar changes in water and sodium excretion. It is to be noted in our experiments that out of 45 post-chlorpromazine clearance periods water excretion rose considerably in 11 cases, and sodium excretion in 7, in spite of a significant fall in glomerular filtration rate and renal plasma flow.

In six normal persons chlorpromazine had no consistent effect on renal function. Diuresis increased in three cases, decreased in two, and in one was unaltered. Glomerular filtration decreased in three cases, and showed no change in the other three. The renal plasma flow diminished in three cases. was unchanged in one, and showed a slight but inconsiderable rise in the other two. Sodium excretion decreased in two cases, and did not alter in three.

Our results will be communicated in detail in the *Acta Medica Academiae Scientiarum Hungaricae.*

PERICARDITIS AND ELECTROCARDIOGRAPHIC CHANGES IN REITER'S SYNDROME

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Reiter's syndrome is a condition which has been known for many years, but has been studied in detail only during the last ten to fifteen years. It presents with non-gonococcal urethritis, polyarthritis, conjunctivitis, and sometimes iritis, a characteristic balanitis, or eruption on the skin (keratoderma blennorrhagica), and the syndrome may show all these features or only two or three.

Several authors have described evidence suggesting cardiac involvement in the course of these infections, but, as one would expect with a non-fatal condition most commonly affecting young people, post-mortem evidence is lacking.

Electrocardiographic changes suggesting myocarditis were reported by Gadrat and Morrell (1935), Bang (1940), Candel and Wheelock (1945), Feiring (1946), Paronen (1948), Lövgren and Masreliez (1949), Trier (1950), Shapiro *et al.* (1949), and Weinberger *et al.* (1952). Paronen also recorded seven cases which developed pericarditis with an audible friction rub out of a total of 308 patients suffering from the syndrome. Lever and Crawford (1944) recorded a case of a 35-year-old man who, during the fourth month of a severe attack of Reiter's disease, complained of substernal oppression and whose electrocardiogram showed changes suggestive of recent myocardial infarction. An electrocardiogram earlier in the attack had been normal. He died four days later, but a post-mortem examination was not carried out.

Mayne (1955) described a case of Reiter's syndrome with electrocardiographic changes suggesting pericarditis which at the time of publication had persisted unaltered over the unusually long period of 15 months. He also recorded a further case of a man aged 30 with Reiter's syndrome who had electrocardiographic changes strongly suggestive of anterior myocardial infarction. Neither of these patients had any symptoms of cardiac disease.

Present Series

In 128 cases of complete Reiter's syndrome, mostly in men between 20 and 35 years of age, clinical evidence of heart disease developed during the attack in only two patients, both of whom suffered from pericarditis. Six patients had complained of transient chest pain, which was thought at the time to be due to connective-tissue involvement. In view of our later experience it is possible that some of these patients may also have had pericarditis.

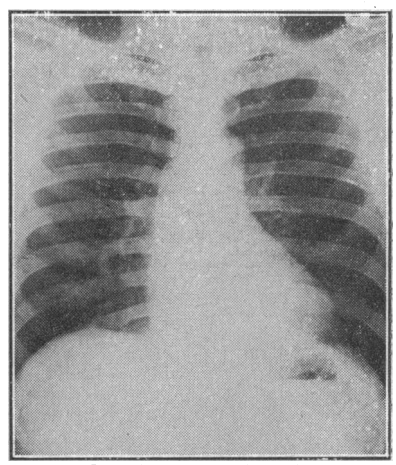

FIG. 1.—Case 1. Heart enlarged. Screening showed this to be of left ventricular origin.

Electrocardiography now forms a routine part of our investigation of all patients with Reiter's syndrome, and 4 out of 25 cases have shown abnormal tracings. The case histories of these four patients illustrate some of the cardiological abnormalities which may be found in Reiter's syndrome.

Case 1

On admission to hospital a West Indian man aged 38 gave a history of urethral discharge and polyarthritis for a month. His urethral infection had been treated originally by his own doctor with a course of a sulphonamide, but recurred two weeks later, together with terminal haematuria. Many joints of both arms and legs were involved, and there was also pain in the lumbar region and marked plantar fasciitis and swelling of the Achilles tendons. For the first week

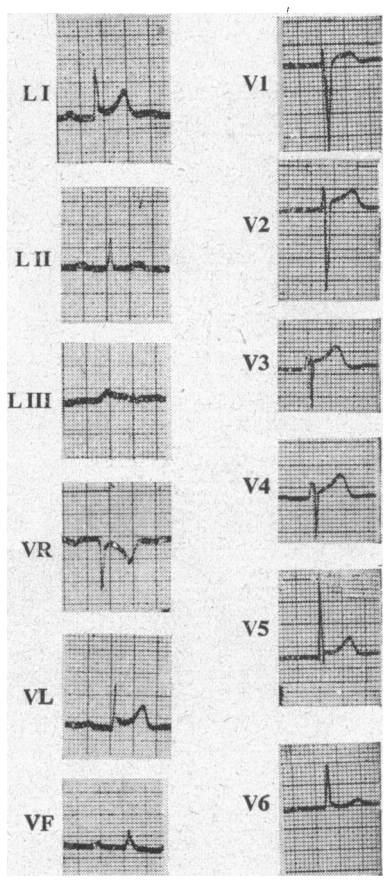

FIG. 2.—Case 1. Prolonged P–R interval of 0.28 second and ST elevation in L I, VL, V1, V2, V3, and V4.