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Renal Hemodynamics During Erect Lordosis in Normal Man and Subjects with Orthostatic Proteinuria.* (21186)

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Orthostatic proteinuria has been attributed to a marked reduction in renal blood flow occurring characteristically in this condition during standing(1-4). The inference that there is a difference in hemodynamic postural response between orthostatic proteinuria patients and normal individuals is based on inadequate evidence chiefly utilizing urea and creatinine clearance methods.

Smith(5) described reduction in renal plasma flow and glomerular filtration rate in a normal subject in the passive erect posture (tilt). The confirmatory data of Brun, Knudsen and Raaschou(6) are of equivocal significance since observations were made during periods of marked change in urinary volume, and some specimens were collected without urethral catheterization. In the present study observations on renal hemodynamics in recumbency and erect lordosis have been made in normal subjects and individuals with orthostatic proteinuria under conditions providing relatively constant rates of urine flow. The findings suggest that there is no significant difference in the renal hemodynamic response of these two groups.

Methods. Glomerular filtration rate (GFR) as measured by inulin clearance and renal plasma flow (RPF) as measured by p-aminohippurate clearance were determined in 5 normal young adult males and 5 with orthostatic proteinuria. Observations were made with subjects in a basal state and under moderately hydropenic conditions. Clearances were determined during three 20-minute control periods with the subject in the supine position and during 15 to 20 minutes in erect lordosis. All urine specimens were obtained by urethral catheterization and analyzed for protein as well as for the clearance substances. Inulin was determined by a modification of Harrison's method(7); p-aminohippurate by the method of Smith and associates(8). Quantitative urinary protein was determined by the biuret method of Foster, Rick and Wolfson(9) in those specimens exhibiting protein with 20% sulfosalicylic acid [>10 mg %(10)].

Results. In the 5 normal individuals (Table I) GFR during lordosis decreased an average of 29%, ranging from −6% to −56%; RPF an average of 37% with a range from −9% to −55%. The filtration fraction was unchanged in 2 and increased in 3. Urinary volume (V) decreased an average of 41% with a range from −7 to −67%. Urinary protein did not appear during or after erect lordosis.

In the 5 subjects with orthostatic proteinuria (Table II) GFR during lordosis decreased an average of 17% with a range of +6% to −40%; RPF an average of 27%, ranging from −11% to −42%. The filtration fraction was unchanged in 2 and increased in

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TABLE I. Effect of Erect Lordosis on Renal Hemodynamics, Urine Volume and Protein Excretion in 5 Normal Subjects. Age 20 to 24 Years.

GFR		RPF		Filtration fraction		Urine vol (V)		Protein excr.		% change			
Recumbent,* cc/min.	Erect lordosis, cc/min.	Recumbent,* cc/min.	Erect lordosis, cc/min.	Recumbent*	Erect lordosis	Recumbent,* cc/min.	Erect lordosis, cc/min.	Recumbent, mg/min.	Erect lordosis, mg/min.	GFR	RPF	F.F.	V.
114	77	597	353	.19	.22	1.41	.91	0	0	−32	−41	+16	−35
112	98	545	367	.21	.27	1.16	.73	0	0	−12	−33	+29	−37
140	131	545	496	.26	.26	1.42	1.32	0	0	− 6	− 9	0	− 7
140	86	748	398	.19	.22	1.26	.52	0	0	−39	−47	+16	−59
109	48	728	324	.15	.15	2.56	.84	0	0	−56	−55	0	−67

* Avg of 3 periods.

TABLE II. Effect of Erect Lordosis on Renal Hemodynamics, Urine Volume and Protein Excretion in 5 Subjects with Orthostatic Proteinuria. Age 18 to 24 years.

GFR		RPF		Filtration fraction		Urine vol (V)		Protein excr.		% change			
Recumbent,* cc/min.	Erect lordosis, cc/min.	Recumbent,* cc/min.	Erect lordosis, cc/min.	Recumbent*	Erect lordosis	Recumbent,* cc/min.	Erect lordosis, cc/min.	Recumbent, mg/min.	Erect lordosis, mg/min.	GFR	RPF	F.F.	V.
100	60	502	343	.20	.18	.69	.26	0	.78	−40	−32	−10	−62
134	112	899	525	.15	.21	1.34	1.48	0	.41	−16	−42	+40	+10
111	101	591	471	.19	.22	.71	.52	0	.64	− 9	−20	+16	−27
137	98	634	432	.22	.23	.87	.57	0	.68	−28	−32	+ 5	−34
91	96	613	548	.15	.18	.62	.74	0	.55	+6	−11	+20	+19

* Avg of 3 periods.

3. Urinary volume decreased in 3, increased in one and remained unchanged in one. Proteinuria averaging 0.61 mg/min. appeared during erect lordosis in these subjects.

Discussion. These results indicate that significant reduction in glomerular filtration rate and renal plasma flow, usually with an increased filtration fraction occurs in the erect lordotic posture in both normal individuals and those with orthostatic proteinuria. The changes in these two groups appear to be in the same range in the 10 subjects studied here. In the patients with orthostatic proteinuria the rate of protein excretion is not related to the degree of concurrent renal hemodynamic change on erect lordosis. These observations do not confirm any direct or causal relationship between alterations of renal hemodynamics in erect lordosis and the excretion of protein as suggested by others(1-4).

Despite a moderate hydropenic state with control urinary volumes averaging 1.20 cc/min, the anticipated antidiuresis of the erect posture was obtained in 7 of the 10 subjects.

Errors in clearance determinations inherent in studies by others(4,6), due to transition from induced water diuresis during recumbency to oliguria on standing were avoided in the present study. The hydropenic state assured initial low urine flow, preventing extreme change in urine volume on assumption of erect lordosis. Precise urine collections were obtained by urethral catheterization.

Conclusions. 1. Decreased glomerular filtration rate, renal plasma flow and urine volume of a comparable degree occur in erect lordosis in both normal man and subjects with orthostatic proteinuria. 2. The rate of protein excretion in orthostatic proteinuria is not related to the magnitude of hemodynamic change occurring with erect lordosis.

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Inhibition of Egg-White Edema by Proteolytic Enzymes. (21187)

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Trypsin has a marked anti-inflammatory action(1,2) and a thrombolytic effect(2), and catalyzes the conversion of profibrinolysin to fibrinolysin(3). The action of trypsin on inflammation occurs before its effect on thrombi (2). The mechanism of the anti-inflammatory effect is not clear but its rapidity appears to rule out activation of another enzyme. The following results indicate that the profibrinolysin-fibrinolysin reaction is not of primary importance in this action.

Methods. A number of proteolytic enzymes were tested to determine their effect on the inflammatory reaction. The egg-white edema reaction of Selye(4), as previously reported (1), was used throughout. This has been used as a standard testing method in our laboratory, although trypsin has been shown to reduce edemas(5) produced by other agents, such as yeast(6). The egg-white edema test was carried out on rats 60-90 g in weight. The enzymes tested were injected