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Sexual dysfunction in the male patient with uremia: A reappraisal

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Sexual dysfunction in the male patient with uremia: A reappraisal. Partial or complete impotence is common in uremia. It is not clear whether the impotence is organic or psychogenic in nature and whether uremia itself or the state of chronic illness is responsible for it. We examined these questions, by psychiatric interviews and nocturnal penile tumescence (NPT), in 50 normal subjects, 48 patients with chronic uremia, including 23 patients treated with maintenance dialysis, and 22 patients with chronic illness and normal renal function. About 40 to 50% of patients with uremia, but not those with chronic illness and normal renal function, complained of erectile dysfunction and reported a significant decrease in frequency of intercourse. There were no significant differences between patients with uremia prior to initiation of therapy and those treated with maintenance hemodialysis. NPT declines after 40 years of age. In all age groups, NPT was significantly ($P < 0.01$) lower in uremics than in normals or those with chronic illness. There was no correlation between erectile complaints, frequency of intercourse or NPT, and the presence or absence of depression. The frequency of intercourse correlated significantly ($r = 0.68$, $P < 0.01$) with NPT in patients with uremia. Data indicate that 50% of male patients with uremia have partial or complete impotence, which is most probably organic in nature and is related to uremia or its metabolic or hormonal consequences rather than to the state of chronic illness.

Disfonctionnement sexuel chez le malade urémique de sexe masculin: Une réévaluation. L'impuissance partielle ou totale est fréquente au cours de l'urémie. La nature organique ou psychogénique de l'impuissance n'est pas claire et il n'est pas non plus établi si l'urémie par elle même ou la maladie chronique en sont responsables. Nous avons étudié ces prodromes chez 50 sujets normaux, 48 malades atteints d'urémie chronique, parmi lesquels 23 étaient traités par hémodialyse itérative, et 22 malades atteints d'affections chroniques, mais avec des fonctions rénales normales au moyen des interrogatoires psychiatriques et des érections nocturnes. Quarante à cinquante pour cent des malades urémiques, mais non pas ceux atteints de maladies chroniques avec des fonctions rénales normales, se sont plaint d'anomalies de l'érection et d'une diminution significative de la fréquence des rapports sexuels. Il n'a pas été observé de différence significative entre les malades urémiques non traitées et ceux soumis à l'hémodialyse. Les érections nocturnes dominent à partir de 40 ans. Dans tous les groupes d'âge les érections nocturnes sont significativement ($P < 0{,}01$) moins fréquentes chez les urémiques que chez les sujets normaux ou les sujets atteints d'autres maladies chroniques. Il n'a pas été observé de corrélation entre la fréquence des rapports sexuels ou les érections nocturnes et la présence ou l'absence de dépression. La fréquence des rapports est significativement corrélée ($r = 0{,}68$; $P < 0{,}01$) à celle des érections nocturnes chez les sujets urémiques. Les résultats indiquent que 50% des malades urémiques mâles ont une impuissance partielle ou totale qui est très probablement d'origine organique et liée à l'urémie ou à ses conséquences métaboliques ou hormonales plutôt qu'à l'état de maladie chronique.

Numerous studies have shown that patients with end-stage renal failure display sexual dysfunction [1–14]. About 28 to 80% of the male uremic patients claim partial reduction in potency, and 11 to 55% report that they are totally impotent. Dialysis may not improve these abnormalities, and frequently dialysis patients describe worsening in the their sexual dysfunction [3].

Several issues should be considered in the interpretation of the results of these studies. First, the conclusions were based exclusively on data provided by the patients through personal interviews or questionnaires. Second, although it is generally accepted that reduced potency or total impotence is experienced by the male uremic patients, it is not evident whether this abnormality is a manifestation of uremia itself or if it is secondary to the long-standing chronic illness and disability. Third, a decline in potency may be part of aging [15, 16], and this factor has not been taken into consideration in the reported studies evaluating the sexual dysfunction in uremia. Finally, depression may affect sexual dysfunction [17], and the relative roles of uremia itself or of the associated affective disturbances in the pathogenesis of the sexual dysfunction has not been systematically evaluated.

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The present study was undertaken to investigate impotence in the male patient with uremia, to evaluate whether nocturnal penile tumescence can provide an objective criteria for evaluation of the disturbance in potency, and to examine the role of chronic illness, age, and depression in the sexual dysfunction experienced by these patients.

Methods

A total of 120 subjects were studied. They included 50 normal individuals, 22 patients with chronic illness but normal renal function, 25 patients with advanced uremia prior to initiation of dialytic therapy, and 23 patients treated with chronic dialysis. The pertinent clinical data are given in Table 1. Patients with conditions interfering with potency, such as diabetes mellitus or treatment with medications that affect sexual function, were excluded. The nature of the investigation was explained to each of the subjects, and an informed consent was obtained prior to admission to the study.

The subjects were considered normal if they had normal serum creatinine (1.09 ± [SEM] 0.03 mg/dl), normal creatinine clearance (113 ± 7 ml/min), no overt evidence of systemic disease, and no complaints of sexual dysfunction. They all volunteered to the study, and their ages ranged between 22 and 57 (33.4 ± 1.3) years. The younger age groups (18 to 39 years) were recruited from medical students, fellows, housestaff, full-time faculty members, and technicians. The older age group (40 to 60 years) came from normal volunteers in other research projects.

The patients with chronic illness were recruited from the general medical and subspecialty outpatient clinics. The criteria for their inclusion in the study were the presence of chronic and disabling disease (rheumatoid arthritis, chronic obstructive pulmonary disease, chronic asthma, chronic gout, and lymphoma or Hodgkins disease) and normal renal function. No inquiry on their sexual function was made prior to their admission to the study. Their age ranged between 22 and 60 (43.7 ± [SEM] 2.9) years, and their creatinine clearance was 108.5 ± 8.6 ml/min.

All male patients with advanced uremia and without other conditions affecting potency who were admitted to the renal ward between September, 1977, and July, 1979, were asked to enter the study. Of 30 consecutive patients, 25 agreed to participate in the investigation. Their ages ranged between 19 and 54 (35.2 ± 2.2) years.

The dialysis patients were recruited from the inpatient dialysis center and from three satellite dialysis units affiliated with the Division of Nephrology of the University of Southern California. All eligible

Table 1. Clinical data on patients with chronic illness and on those with chronic renal failure[a]

	No. of patients	Age *yr*	Duration of illness *yr*	Duration of dialysis *months*	Serum creatinine *mg/dl*
Chronic illness					
Total	22	43.7 ± 2.9 (22 to 60)	9.4 ± 1.9 (2 to 40)		1.0 ± 0.02 (0.8 to 1.3)
18 to 39 yr	8	28.3 ± 2.1 (22 to 39)	5.6 ± 0.9 (2 to 10)		1.0 ± 0.04 (0.9 to 1.2)
40 to 60 yr	14	52.5 ± 1.8 (40 to 60)	11.6 ± 2.8 (3 to 40)		1.0 ± 0.04 (0.8 to 1.3)
Advanced uremia					
Total	25	35.2 ± 2.2 (19 to 54)	5.7 ± 1.6 (1 to 25)		13.0 ± 1.0 (6.1 to 22.5)
18 to 39 yr	16	27.5 ± 1.5 (19 to 37)	6.4 ± 2.3 (1 to 25)		14.2 ± 1.2 (6.8 to 22.5)
40 to 60 yr	9	48.4 ± 1.3 (41 to 54)	4.7 ± 2.1 (1 to 19)		10.9 ± 1.7 (6.1 to 19.2)
Dialysis patients					
Total	23	40.4 ± 3.0 (20 to 60)	11.8 ± 1.9 (3 to 39)	48.4 ± 6.8 (12 to 108)	
18 to 39 yr	13	29.1 ± 1.8 (20 to 39)	8.4 ± 1.4 (3 to 17)	41.7 ± 7.4 (12 to 85)	
40 to 60 yr	10	55.1 ± 1.6 (45 to 60)	16.9 ± 3.6 (5 to 39)	58.4 ± 12.7 (18 to 108)	

[a]Chronic illness included rheumatoid arthritis in 4 patients, chronic obstructive pulmonary disease in 4, chronic asthma in 2, chronic gout in 3, lymphoma or Hodgkins disease in 6, ulcerative colitis in 1, sarcoid in 1, and sclerodema in 1. Renal failure was due to nephrosclerosis in 19 patients, chronic glomerulonephitis in 19, interstitial nephritis in 4, congenital disease in 4, and obstructive uropathy in 2. Data above brackets gives the means ± SEM. Data in parentheses gives the range.

patients were asked to participate in the study, and 23 of 35 agreed to do so. Their ages ranged between 20 and 60 (40.4 ± 3.0) years. They were treated with dialysis for 12 to 108 (48.4 ± 6.8) months. The dialytic therapy consisted of three dialyses of 5 hours each per week, with a dialysate containing 7.0 g/dl calcium.

All patients were admitted to the Clinical Research Center for 3 to 4 days and were evaluated with a psychiatric interview, tested for evidence of depression, and examined for erectile capacity. The interview was specially structured and conducted by a psychiatrist.[1] Although the interview evaluated various aspects of sexual function, emphasis was placed on the ability to obtain and maintain erection and on the frequency of intercourse per month. Erectile dysfunction was considered to be present when the patient complained of inability to obtain or to maintain an erection satisfactorily for completing intercourse in at least 50% of his sexual attempts. Both current and pre-illness information were obtained. Whenever possible, the sexual partner participated in the interview.

The presence of depression was evaluated by three tests: Feighner's Criteria [18], Beck's Depression Inventory [19], and Raskin's Criteria [20]. Patients were considered depressed if they fulfilled all the three criteria, mildly depressed if they fulfilled one or two of the three criteria, and without evidence of depression if all three criteria were negative.

The erectile activity was examined by monitoring the nocturnal penile tumescence (NPT) during at least two consecutive nights in the Clinical Research Center according to Karacan et al [21, 22]. The data obtained during the first night was discarded as suggested by Karacan et al [22], and only observations from the second night were used in the analysis. The NPT was recorded with an American Medical System monitor made of a recording device connected to two mercury strain gauges attached to the tip and the base of the penis. The subject wears the strain gauges throughout the night. Erection during sleep is sensed by the strain gauges and registered by the device as a deflection in the recorded graph. The height of the deflection reflects the change in penile circumference. An erection was considered adequate when the change in penile circumference equalled or exceeded 13 mm. The duration during which a change of this magnitude is maintained was calculated. Two reasons led us to use the figure of 13-mm change. First, Fisher et al [23] reported that the mean increase in nocturnal penile circumference in 19 male patients with organic impotence was 13.1 mm; this prompted us to use a 13-mm increase in penile circumference as an optimal figure to discriminate the presence of abnormal NPT. Second, Karacan et al [22] used the figure 16-mm change, and analysis of our data using the 16-mm change yielded results not different from those obtained with the 13-mm change. In the dialysis patients, the NPT recording that was used for the analysis of the data was the one made the night before the dialysis procedure. The duration of sleep of each individual was calculated from the NPT tracings.

[1] A copy of this interview is available on request.

Results

The results are presented in Table 2 and Figs. 1 through 3. NPT varied widely both in normal subjects and in patients with chronic illness and in those with chronic renal failure (Fig. 1). In the normal subjects, NPT ranged between 18 and 216 (78.8 ± [SEM] 6.1) min and was not statistically different from patients with chronic illness (58.6 ± 7.3 min). The duration of NPT in our normal subjects (78.8 ± 6.1 min) was not different from that reported by Karacan et al [22], who found a mean of 81.9 ± 7.5 min by using a change of 16 mm in circumference. If we use the same criteria as Karacan et al [22] did, the duration of NPT in our normal subjects would be 67 ± 6.0, a value not different from theirs. There was a considerable degree of overlap between the values of NPT in normal subjects and patients with chronic illness and those with chronic renal failure. But the mean values for NPT in all patients with chronic renal failure (27.7 ± 4.5 min), those with uremia but not treated with dialysis (28.5 ± 6.8 min), and in dialysis patients (26.8 ± 5.9 min) were significantly lower ($P < 0.01$) than the values of NPT in both normal subjects and patients with chronic illness. Furthermore, 22 of the 48 patients with chronic renal failure (45%) had NPT's lower than the lowest values noticed in normal subjects or in those with chronic illness.

Analysis of NPT values in normal subjects showed that there is no significant difference between the age group of 18 to 29 or 30 to 39 years. Therefore, these two age groups were combined together with a mean NPT of 84.8 ± 7.3 min. NPT declined, however, in the older age groups (40 to 60 years) and was 59.8 ± 9.0 min, a value significantly lower ($P < 0.05$) than the younger age group (Fig. 2). Similarly, NPT was lower in the older age group

Table 2. Data on sexual indices and depression in patients with chronic illness and in those with chronic renal failure

	No. of patients	No. of patients with complaints of erectile dysfunction		Frequency of intercourse per month			NPT[a] (>13-mm change in circumference) *min*	Duration of sleep[b] *min*	No. of patients with depression		
		Before illness	Current	Before illness	Current	*P*			None	Mild	Major
Chronic illness											
Total	22	1	4	9.0 ± 1.6 (1 to 20)	6.1 ± 1.6 (0 to 20)	NS	58.6 ± 7.3 (12 to 120)	449 ± 19.3 (283 to 579)	16	5	1
18 to 39 yrs	8	0	1	7.7 ± 2.3 (1 to 15)	8.7 ± 2.6 (0 to 20)	NS	74.4 ± 11.9 (20 to 110)	454 ± 37.4 (283 to 570)	6	2	0
40 to 60 yr	14	1	3	9.4 ± 2.2 (3 to 20)	4.3 ± 1.9 (0 to 20)	NS	49.6 ± 8.6 (12 to 120)	445 ± 22.4 (313 to 579)	10	3	1
Advanced uremia											
Total	25	1	10	10.8 ± 1.7 (1 to 30)	2.2 ± 0.6 (0 to 10)	<0.01	28.5 ± 6.8[c] (0 to 101)	456 ± 17.1 (304 to 580)	10	10	5
18 to 39 yr	16	0	5	12.1 ± 2.3 (1 to 30)	2.9 ± 0.9 (0 to 10)	<0.01	36.0 ± 9.7[c] (0 to 101)	469 ± 22.5 (347 to 580)	7	5	4
40 to 60 yr	9	1	5	8.8 ± 2.4 (1 to 20)	1.1 ± 0.5 (0 to 4)	<0.01	15.2 ± 5.5[c] (0 to 49)	433 ± 25.3 (304 to 563)	3	5	1
Dialysis patients											
Total	23	1	11	12.3 ± 1.1 (4 to 20)	4.7 ± 1.1 (0 to 20)	<0.01	26.8 ± 5.9[c] (0 to 121)	402 ± 23.4 (224 to 636)	17	3	3
18 to 39 yr	13	1	5	12.8 ± 1.6 (4 to 20)	6.3 ± 1.6 (1 to 20)	<0.01	33.5 ± 9.3[c] (1 to 121)	370 ± 30.5 (224 to 618)	9	2	2
40 to 60 yr	10	0	6	11.6 ± 1.4 (4 to 20)	2.8 ± 1.1 (0 to 10)	<0.01	18.2 ± 5.7[c] (0 to 61)	444 ± 33.2 (318 to 636)	8	1	1

[a] NPT denotes nocturnal penile tumescence. Normal values for NPT are: total population, 78.8 ± 6.1 (range, 18 to 216) min; 18 to 39 yr, 84.8 ± 7.3 (range, 19 to 216) min; 40 to 60 yr, 59.8 ± 9.0 (range, 18 to 113) min.

[b] Normal values for duration of sleep are: total population, 405 ± 10.6 min; 18 to 39 yr, 405 ± 11.2 (range, 269 to 553) min; 40 to 60 yr, 405 ± 27.8 (range, 258 to 554) min.

[c] Significantly different ($P < 0.01$) from normal total population

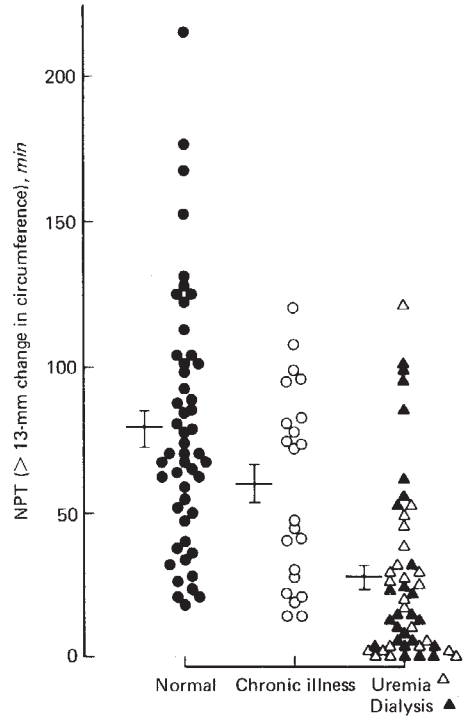

Fig. 1. *Nocturnal penile tumescence (NPT) in normal subjects, patients with chronic illness and normal renal function, those with advanced renal failure (uremia), and dialysis patients.* The brackets represent the mean ± SEM.

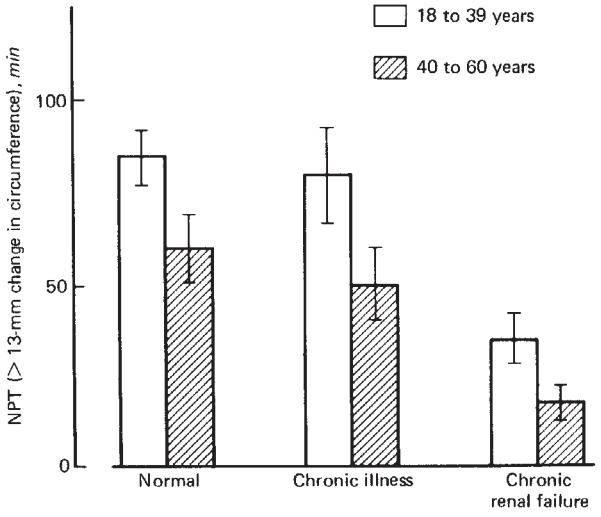

Fig. 2. *Effect of age on nocturnal penile tumescence (NPT) in normal subjects, patients with chronic illness and normal renal function, and in patients with chronic renal failure.*

than it was in the younger one in the patients with chronic illness (18 to 39 years, 74.4 ± 11.9 min; 40 to 60 years, 49.6 ± 8.6 min) and in all those with chronic renal failure (18 to 39 years, 35.0 ± 6.7 min; 40 to 60 years, 16.8 ± 3.9 min). The difference was significant in the renal failure patients ($P < 0.05$) but

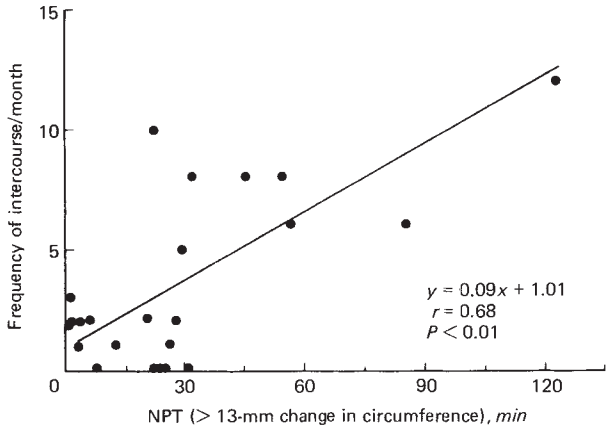

Fig. 3. *Relationship between frequency of intercourse per month and nocturnal penile tumescence (NPT) in 23 patients with chronic renal failure who had no evidence of depression and had sexual partner.*

not in those with chronic illness. The lack of statistical significance in the latter group is probably due to the smaller number of patients studied in the younger age group. The duration of sleep was not significantly different among the various groups studied. It is of interest that Karacan et al [16] reported a decline in NPT beginning at 20 years of age. We did not study an adequate number of subjects below this age, and therefore, our data does not permit evaluation of change in NPT at age 20 years.

Although there was a tendency for patients with chronic illness to report a decrease in the frequency of intercourse per month (9.0 ± 1.6 vs. 6.1 ± 1.6), the difference was not statistically significant. Patients with chronic renal failure experienced a significant decrease in frequency of intercourse (11.5 ± 1.0 vs. 3.4 ± 0.62, $P < 0.01$), and this difference was also evident when the patients were divided into those not treated with dialysis (10.8 ± 1.7 vs. 2.2 ± 0.6, $P < 0.01$) or hemodialysis patients (12.3 ± 1.1 vs. 4.7 ± 1.1, $P < 0.01$).

Ten of 25 patients with uremia (40%) and 11 of 23 dialysis patients (47%) complained of erectile dysfunction, whereas only 1 patient in each of these groups had such a complaint prior to renal failure. It is interesting that the patients who complained of erectile dysfunction reported a frequency of intercourse of 2.10 ± 0.22, a value significantly lower ($P < 0.05$) than that (4.5 ± 0.98) in patients who did not complain of erectile dysfunction. Only 4 of 22 patients with chronic illness complained of erectile dysfunction, and they also had a marked decrease in the frequency of intercourse.

Six of the 22 patients (27%) with chronic illnesses and 21 of the 48 patients with chronic renal failure (43%) displayed evidence of mild or major depression. There was no correlation, however, between the presence of evidence for depression, the frequency of intercourse, or NPT (Table 3). Furthermore, 9 of the 21 depressed patients with uremia (43%) and 12 of the 27 patients with renal failure but without depression (44%) complained of erectile dysfunction.

Discussion

The results of the present study demonstrate that about half of the patients with renal failure complained of erectile dysfunction and reported a significant and marked decline in the frequency of intercourse. The change in the latter parameter was not due to some of our patients not having sexual partners at all times because a significant decline in the frequency of intercourse from 12.3 ± 1.2 to 3.7 ± 0.7 ($P < 0.01$) was present in those who had available and active sexual partners. Our data are in agreement with other reports [1–14]. Our results also provide evidence that the sexual dysfunction in patients with renal insufficiency is not related to a state of chronic illness but rather to renal failure itself, because patients with other chronic disease but normal renal function did not report a significant de-

Table 3. Relationship between depression, frequency of intercourse, and nocturnal penile tumescence in patients with chronic illness and those with chronic renal failure

	No. of patients	Frequency of intercourse	NPT[a] (>13-mm change in circumference) *min*
Chronic illness	22		
No depression	16	4.2 ± 1.1	66.9 ± 9.0
Mild or major depression	6	8.8 ± 3.8	45.7 ± 10.6
P		NS	NS
Chronic renal failure	48		
No depression	27	2.7 ± 0.7	25.5 ± 5.8
Mild or major depression	21	3.9 ± 1.1	30.5 ± 7.1
Major depression	8	5.6 ± 2.3	47.5 ± 13.8
P		NS	NS

[a] NPT is nocturnal penile tumescence.

cline in frequency of intercourse, and only a few complained of erectile difficulty.

It has been reported that primary depression may affect sexual function and that depressed individuals may have reduced libido and decreased frequency of intercourse [17]. Patients with uremia and undergoing dialysis could be depressed [2, 10, 11, 13, 24], and it had, therefore, been suggested that depression may play an important role in the genesis of sexual dysfunction in these patients [3, 10, 13]. Our data demonstrate that the overall incidence of mild and major depression in our patients with renal failure was 43%, with 16% having major depression and 27% a mild depression. There were, however, no significant differences in the complaints of erectile difficulty or the frequency of intercourse among the depressed and the nondepressed patients. These observations support the notion that depression is not a major factor in the overall pathogenetic processes underlying the sexual dysfunction in the uremic patients. Similarly, the presence or absence of depression was not associated with differences in the frequency of sexual intercourse in patients with chronic illness. Our observations suggest that depression associated with chronic diseases with and without renal failure may be different from primary depression in regard to its effects on sexual function.

Nocturnal penile tumescence (NPT) has been developed as a means for the differentiation between organic and psychogenic impotence [22, 23]. Our results on NPT demonstrate that almost half of our patients with uremia have abnormally low NPT, indicating that organic causes may be responsible for their sexual dysfunction. The finding that NPT is normal in patients with chronic illnesses and normal renal function strongly supports the theory that the organic disturbances responsible for the sexual dysfunction in patients with renal disease are secondary to the uremic state. It should be emphasized that the interpretation of the values of NPT should be related to the age of the subject because NPT tends to decline after age 40 both in normal subjects and in patients with and without renal failure.

To evaluate whether NPT may provide an indication for sexual dysfunction in the uremic patient, we correlated NPT with the frequency of intercourse in 23 patients who did not have evidence for depression and who had available and active sexual partners. We chose this segment of the patients to avoid any possible effect of depression or lack of easy partner availability on the frequency of intercourse. Figure 3 depicts a significant and direct correlation between NPT and frequency of intercourse ($r = 0.68$, $P < 0.01$), suggesting that NPT could be a useful tool for the objective evaluation of the disturbances in sexual function in the male patient with uremia.

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