Is Erythropoietin Effective for Impotence in Dialysis Patients?

A.	Akio	Imagawa
Y.	Yasuo	Kawanishi
A.	Akira	Numata

Kidney Center, Takamatsu Red Cross Hospital, Kagawa, Japan

A. Imagawa, Kidney Center, Takamatsu Red Cross Hospital, Bancho 4-1-3, Kagawa 760 (Japan)

Dear Sir,

Clinical use of erythropoietin (r-EPO) is one of the recent advances in the field of dialysis therapy. r-EPO increases the patient's red cell count with a concomitant rise in blood viscosity. Increased blood viscosity does cause some adverse side effects such as hypertension and occlusion of the arteriovenous fistula [1, 2]. However, we observed a beneficial side effect, an increase in the circumference of the penis during sleep which may also be caused by the increase in blood viscosity.

We measured maximum nocturnal penile tumescence in 4 patients (32, 37, 46, and 51 years old) receiving long-term hemodialysis before and after a course of r-EPO therapy. We measured nocturnal penile tumescence for 3 nights using an in-house erectometer [3]. All patients had sexual dysfunction before r-EPO therapy. Two complained of slight difficulty during sexual intercourse due to inadequate erection, and another patient complained of difficulty achieving ejaculation due to rapid detumescence during sexual intercourse. These 3 patients were able to achieve full erection after intracavernous papaverine injection [4]. The 4th patient had not been able to achieve erection adequate for coitus for a 5-year period, and was also unable to achieve erection in a papaverine test. The penile-brachial index [5] of the 4 patients was within normal limits (> 0.7). Before r-EPO therapy, the maximum increase in the circumference of the penis during sleep in each patients was 2, 12, 24, and 26 mm, and their hematocrit (Ht) counts were 14, 19, 20, and 19, respectively. After 3 months of r-EPO therapy, 3 patients subjectively reported an increase in sexual ability. In all 3 patients, both Ht and circumference increased significantly after therapy. However, in the 1 patient with impotence, no change in sexual ability was indicated by either subjective or objective evaluation. Also the increase in his Ht was slight (fig. 1).

Δ NPT (mm)

y

30

0

Jr

10 20 30 40 Ht(%)

Fig. 1. Changes in the circumference and Ht before and after r-EPO therapy in hemodialysis patients. • = Before treatment; ○ = after treatment; NPT = nocturnal penile tumescence.

An erection is the result of an increase in blood flow into the corpus cavernosum and a decrease in blood flow from the corpus cavernosum [6]. After adequate pooling of blood, the cavernous pressure begins to rise. The cavernous pressure after maximum pooling of blood in the penis can be explained by Poiseuille's law.

$P = \frac{3}{8}Q$,

where P = intracavernous pressure, μ = blood viscosity, r = radius of corpus cavernosum, and Q = velocity of blood flow.

As shown by the above law, blood viscosity is one of the important elements for achieving the pressure needed for erection. In normal males, blood viscosity is constant and has no effect on erection. As we have observed, however, increased blood viscosity seems to act beneficially for erection in dialysis patients.

There have been reports that the frequency of sexual disorder is high in patients with renal failure [7, 8]. The pathogenesis of sexual disorders has been attributed to hormonal abnormality, zinc deficiency, nerve disturbance, vascular change and psychogenic factors. We

96

Imagawa/Kawanishi/Numata

found that serum testosterone level was low in our patients, but that free testosterone was usually within the normal range while sex hormone binding protein was low [9]. We, therefore, do not think that a low testosterone level was the cause of impotence in patients receiving hemodialysis. Zinc deficiency as a cause has also been abandoned already. As we have previously reported, some impotents with chronic renal failure do have neural or vascular lesions.

Our new observation suggested that anemia (low viscosity) may be a cause of impotence in hemodialysis patients. However, just as the increase in viscosity is not the only cause of r-EPO-related hypertension [10], neither is an increase in viscosity likely to be the only cause for r-EPO improved erection. More detailed studies should be made in a large population in the future.

References

1 Winearls CG, Oliver DO, Rippard MJ, et al: Effect of human erythropoietin derived from recombinant DNA on the anaemia of patients maintained by chronic haemodialysis. *Lancet* 1986;ii:1175-1177.

2 Eschbach JW, Egrie JC, Downing MR, et al: Correction of the anemia of end-stage renal disease with recombinant human erythropoietin: Results of the Phase 1 and 2 clinical trial. *N Engl J Med* 1987;316:73-78.

Morales A, Marshall PG, Surraidge DH, et al: A new device for diagnostic screening of nocturnal penile tumescence. *J Urol* 1983;129:288-290.

Virag R: Intracavernous injection of papaverine for erectile failure. *Lancet* 1982;ii:938.

Engel G, Burnham SJ, Carter MF: Penile blood pressure in the evaluation of erectile impotence. *Fertil Steril* 1978; 30:687-690.

Lue TF, Tanago EA: Physiology of erection and pharmacological management of impotence. *J Urol* 1987; 137:829-836.

Levy NB: Sexual adjustment to maintenance hemodialysis and renal transplantation: National survey by questionnaire: Preliminary report. *Trans Am Soc Artif Intern Organs* 1973; 19:138-143.

Abram HS, Hester LR, Sheridan WF, et al: Sexual functioning in patients with chronic renal failure. *J Nerv Ment Dis* 1975; 160:220-226.

Kawanishi Y, Imagawa A, Hiraishi K, et al: Erectile function and testicular function in chronic hemodialysis patients. *J Jpn Soc Dial Ther* 1987;20:851–854.

10 Canaud B, Donadieu P, Polito P, et al: Erythropoietin-associated hypertension: What role for blood viscosity changes? *Nephron* 1989;51:430–431.