Effect of Captopril on Renal Function during Exercise in a Patient with Unilateral Renal Agenesis

O.	Osamu	Hotta ^a
Y.	Yoshio	Taguma ^b

^aDepartment of Internal Medicine, Sendai Jieitai Hospital, and ^bRenal Unit of Sendai Shakaihoken Hospital, Sendai, Japan

Osamu Hotta, MD, Department of Internal Medicine, Sendai Jieitai Hospital, 1-1 Minaminometate, Sendai 983 (Japan)

Dear Sir,

Table I. Renal function and urinary albumin excretion during rest and exercise

The frequent incidence of focal glomerular sclerosis (FGS) in solitary kidneys has attracted a great deal of attention in recent years [1, 2]. It is supposed that glomerular hyperfiltration is mainly related to the development and progress of FGS [3].

We would like to report on the changes of renal function and urinary albumin excretion during exercise and the effect of captopril on those functions in a patient with unilateral renal agenesis.

Case Report

A 21-year-old man was referred to our hospital for evaluation of orthostatic proteinuria from which he had suffered since the age of 18. Unilateral (right) renal agenesis was revealed by intravenous pyelography and computed tomography. Surgical renal biopsy revealed glomerular hypertrophy, although focal and segmental glomerular sclerotic lesions were not seen in 54 glomeruli including juxtamedullary glomeruli.

After admission we examined two factors: (1) the changes in renal function and urinary albumin excretion during exercise, and (2) the influence of captopril (50 mg peroral dosage) on the above-mentioned functions. Urinary albumin excretion during moderate exercise remarkably increased to 161.2 ng/min, and the filtration fraction (FF) during moderate exercise also increased to 0.35. Captopril was particularly effective in decreasing urinary albumin excretion during moderate exercise to 30.2 ng/min accompanied by a decrease in the FF to 0.21 (table I).

Discussion

Renal vasoconstriction during exercise, especially of the efferent arterioles, is regarded as an important factor in regulating the glomerular filtration rate (GFR), and the renin-angiotensin system seems to play an important role in the regulation of renal vasoconstriction [4, 5]. In the case presented here, it is seen that during moderate exercise, urinary albumin excretion increased and was associated with an increase in FF. Taking into consideration

332

Hotta/Taguma

the several reports on animal experiments [6] involving solitary kidneys or oligomeganephronia, we could surmise that pore size of the glomerular capillary wall of humans becomes larger. In a

situation such as this, it is thought that protein filtration readily increases when filtration pressure is increased due to factors such as exercise. Such factors also might enhance the mesangial deposition of proteins that could be essential for the development of glomerulosclerosis. Thus, we assume that captopril is capable of preventing an increase in glomerular filtration pressure, thus resulting in the prevention of the development or progress of FGS in patients considered to be susceptible to FGS due to unilateral renal agenesis or patients having been subjected to unilateral nephrectomy early in life.

References

1 Bhathena, D.B.; Julian, B.A.; McMorrow, R.G.; Baehler, R.W.: Focal sclerosis of hypertrophied glomeruli in solitary functioning kidneys of humans. *Am. J. Kidney Dis.* 5: 226–232 (1985).

Kiproff, D.D., Colvin, R.B.; McCluskey, R.T.: Focal and segmental glomerulosclerosis and proteinuria associated with unilateral renal agenesis. *Lab. Invest.* 46:275–281 (1982).

Hostetter, T.H.; Olson, J.L.; Rennke, H.G.; Venkatachalam, M.A.; Brenner, B.M.: Hyperfiltration in remnant nephrons: a potentially adverse response to renal ablation. *Am. J. Physiol.* 247: F85–F93 (1981).

Poortmans, J.R.: Exercise and renal function. *Exerc. Sports Sci. Rev.* 5:255–294(1977).

Ichikawa, I.; Brenner, B.M.: Glomerular actions of angiotensin II. *Am. J. Med.* 37:43–49 (1984).

Shea, S.M.; Raskova, J.; Morrison, A.B.: Ultrastructure of glomerular basement membrane of rats with proteinuria due to subtotal nephrectomy. *Am. J. Physiol.* 700:513–520 (1980).