Renal Excretion of Phenols in Patients with Chronic Renal Insufficiency

O.		Schück
M.		Vidláková
J.		Erben

Institute for Clinical and Experimental Medicine, Prague, Czechoslovakia

Prof. O. Schück, MDDSc, Institute for Clinical and Experimental Medicine, PO Box 10, 14000 Prague 4-Krč (Czechoslovakia)

Dear Sir,

According to the present knowledge, phenols are included among the low-molecular uremic toxins [1]. The plasma concentration of these substances increases in patients with chronic renal insufficiency (CRI). The mechanism of renal excretion of phenols in healthy subjects as well as the changes of their excretion by residual nephrons in patients with CRI have not yet been studied in detail.

We have studied renal clearance of phenols, urea and creatinine in healthy subjects and in patients with CRI. The patients with CRI received a low-protein diet (0.5 g/ kg/day). The intake of sodium and fluids was individualized. Plasma and urinary concentrations of phenols were estimated using the spectrophotometric method of Folin and Ciocalteu [2]. Our results are summarized in the table 1, from which it is evident that renal clearance of phenols (C_{phenols}) is relatively low, and in healthy controls it amounts to only 0.09 of creatinine clearance on average. In patients with CRI the value of C_{phenols} is significantly lower but the ratio of C_{phenols} /creatinine clearance indicating fractional excretion of phenols (FE_{phenols}) is significantly higher than in controls.

$FE_{\text{phenols}} = \frac{C_{\text{phenols}}}{C_{\text{creatinine}}} \times 100$

80-

$r = 0.793$

$p < 0.001$

$y = -19.83 + 1.191x$

60-

40 20-I

(per cent)

20 40 60 80 100 FE_{phenols}

Fig. 1. The relationship between FE_{phenols} and fractional excretion of urea (FE_{urea}) in patients with CRI.

phenols

FE_{phenols}

increased in linear relation to fractional excretion of H_2O ($r = 0.765$; $p < 0.001$). Interestingly, there was also a significant linear relation between FE_{phenols} and fractional excretion of urea (fig. 1). The results suggest that in healthy subjects as well as in patients with CRI there is a significant tubular reabsorption of phenols. The tubular reabsorption of phenols is decreased in

patients with CRI, parallel to that of urea. Further study should elucidate the tubular transport of the individual phenolic substances.

Table 1. Average values of plasma concentration (PCr, Pu and in patients with CRI a, Pphe[lois], urinary excretion of phenols, Cphenols, and FEphenols in healthy subjects

Group
Per
μmol/l
mmol/l
^phenols
μmol/l
Urinary excretion of phenols μmol/24 h
^phenols
ml/min
FE
phenols

Controls (n = 30) CRI(n = 32)
90.7: 636.2:
11.5 : 366.1***
5.79 ± 1.26 19.44 ± 8.10***
368.2 ± 73.0 627.4 ± 215.0***
4,458.8 ± 1,086.7 3,671.7 ± 1,567.1*
8.52 ± 2.69 4.13 ± 2.02***
9.53 ± 4.14 42.38 ± 21.59***
Values are means ± SD. *p < 0.05; ***p < 0.001.

280

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References

Börgström, J.; Fürst, P.: Uraemic toxicity, in Drukker, Pearsons, Replacement of renal function by dialysis (Nijhoff, Boston 1984).
Folin, O.; Ciocalteu, U.V.: Method for phenol determination. J.biol. Chem. 74:627–629(1927).