Trend Evaluation of Aluminium in Uraemic Patients on Chronic Hemodialysis

B.R.		Di Iorio ^a
L.		Scarpino ^c
A.		Bruno ^d
A.		Confessore ^c
G.		Gaudiano ^a
C.		Altieri ^a
F.		Smilari ^d
D.		Papaleo ^b
G.		Cosentino ^b
V.		Terracciano ^a

^aDepartment of Nephrology, ^bLaboratory, Hospital 'Lentini', Lauria, ^cDepartment of Nephrology, Hospital of Castrovillari, and ^dLaboratory of Chemistry, Castrovillari, Italy

Dr. Biagio Di Iorio, Department of Nephrology, Hospital 'Lentini', I-85045 Lauria (Italy)

Dear Sir,

The exposure to aluminium (Al) represents a serious hazard to patients with chronic renal failure and particularly to those on dialysis.

In subjects with normal renal function the total content of Al is not above 30 mg, and the kidney is substantially its only excretion route. Thus, an increasing accumulation occurs in uraemic patients and it can be above 3 g.

The Al-overloaded state is associated with several clinical syndromes including encephalopathy, bone disease and anaemia.

We have studied 81 patients (48 males and 33 females) for two consecutive years (1992 and 1993). Their mean $\pm$ SD personal age was 55.49 ± 13.15 years (range 22-81) and the dialytic age was 60.03 ± 3.74 months (range 9-143) at the first observation.

The patients were undergoing bicarbonate dialysis (n = 61), haemodiafiltration (n = 15) or acetate-free biofiltration (n = 5). We found no difference of Al serum levels, immunoreactive parathyroid hormone (iPTH), ferritin, calcium and phosphorus among the patients distinguished by different treatments. In particular, in 1992, the mean $\pm$ SD Al serum concentration was 21.39 ± 18.05 μ g/l, in 1993 it was 16.96 ± 10.82 μ g/l ($p < 0.001$); the iPTH changed from 181.62 ± 178.87 to 187.13 ± 176.97 pg/ml (NS). Ferritin, calcium and phosphorus did not change.

Table 1 shows the results of the desfer-rioxamine (DFO) test carried out in 45 patients in 1992 and after 12 months: Al before DFO changes from 26.48 ± 26.41 to 16.48 ± 12.95 μ g/l ($p < 0.01$), Al after DFO from

Table 1. DFO test in 45 patients: 2 years of observation

Table 2. Multiple regression between iPTH (independent vari-

56.68 ± 37.46 to 39.44 ± 21.87 $\mu\text{g/l}$ ($p < 0.001$), $\delta\text{-Al}$ from 29.80 ± 19.82 to 22.88 ± 13.03 $\mu\text{g/l}$ ($p < 0.001$), iPTH from 99.08 ± 165.44 to 136.17 ± 156.71 pg/ml (NS) and the oral intake of Al from 880 ± 660 to 392 ± 462 mg/day ($p < 0.001$).

Table 2 shows the multiple correlation between iPTH (independent variable) and personal age, dialytic age, Al before, Al after, $\delta\text{-Al}$ calcium and phosphorus (dependent variables). There is only a correlation between iPTH and Al before ($p < 0.023$) and Al after ($p < 0.020$). De Broe et al. [1] observed a striking decrease followed by stabilization of serum Al over the years in a retrospective multicentre study on dialysis patients, interpreting this evolution as due to an increased alertness of the nephrologist and to the reduced use of phosphate-binding gels containing Al, substituted by alternative binders [2].

The data of our patients who have not been treated with DFO show good values of serum Al during the first year of observation, which became reduced to levels of 16.96 ± 10.82 $\mu\text{g/l}$ in the following months, stressing a good control of Al in this group of patients. Therefore, both an efficacious treatment of the dialysis water and a reduced use of phosphorus chelators containing Al hydroxide are important.

The hypothesis that the progressive reduction of serum Al is the expression of a reduction of the deposits is strengthened by the DFO test effected in 45 patients after 12 months.

Consensually, the oral intake of Al with drugs, reduced from 880 ± 660 to 392 ± 464 mg/day ($p < 0.001$), confirm the iatro-genic responsibility for the Al accumulation, too.

Besides, it is important to underline that iPTH did not change significantly in the two consecutive observations.

In the multiple correlation, the negative correlation between iPTH and Al before (t value = -2.31; $p = 0.023$) and the positive correlation between iPTH and Al after confirm the interdependence between PTH and bone storage of Al described by various authors [3, 4].

In fact, it has already been pointed out that Al may interfere with PTH secretion by altering calcium, by a direct inhibitory action on parathyroid glands and by behaving as a hindrance for the peripheral effects of the hormone [5, 6].

References

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Gaudiano/Altieri/Smilari/Papaleo/
Cosentino/Terracciano