

## Renal functional reserve in kidney transplant recipients

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In the last few years different authors have observed that kidney transplant recipients with good organ function do not have a renal functional reserve (RFR). This condition is accompanied by a high glomerular filtration rate (GFR) [2–6]. We studied RFR in patients with very good organ function under different immunosuppressive therapies, who were divided into groups based on the presence or absence of RFR.

**Key words:** Renal transplantation – Kidney function

### Materials and methods

We studied 18 kidney transplant recipients and eight normal subjects. The patients had a transplant age between 1 and 10 years, were of both sexes, and had a serum creatinine less than 1.4 mg %, and none had diabetes mellitus. In all patients arterial pressure was within normal limits, with or without pharmacological therapy.

Immunosuppressive therapies were cyclosporine ( $n = 5$ ), azathioprine ( $n = 6$ ) and combined ( $n = 7$ ). A pharmacologically-free period was introduced starting 5 days before testing. Patients and controls were on a free diet. RFR was determined by oral protein load (1 g/kg ideal body weight). GFR was determined by ETDA Cr51 and renal blood flow (RBF) by hippuran I<sup>125</sup> clearance. Statistical analysis was performed with the Student's *t*-test and the Fischer exact test with a significance level of  $P < 0.05$ .

### Results

There were two groups of kidney transplant recipients: group A, with RFR ( $n = 8$ ), and group B, without RFR ( $n = 10$ ). In group A, basal GFR was  $67 \pm 28.25$  ml/min, significantly lower than in group B ( $128.6 \pm 39.9$  ml/min,  $P < 0.01$ ) and in controls ( $133.6 \pm 27.8$  ml/min,  $P < 0.01$ ). There was no significant difference between group B and controls. In group A, RFR was similar to normal subjects ( $14.1 \pm 11.7\%$  vs  $15.1 \pm 10.9\%$ ;  $P$ , NS). RBF was  $234.3 \pm 65.03$  ml/min in group A and  $367.7 \pm 104.2$  ml/min

in group B, both significantly lower than in normal subjects ( $490 \pm 80.7$  ml/min;  $P < 0.01$ ). There was no difference in RBF between group A and B. In group A, RBF increment was  $18.7 \pm 10.5\%$  and  $19.4 \pm 12.1\%$  in the normal subjects.

Filtration fraction (FF) was higher in group B before and after protein load than in group A and normal subjects ( $0.36 \pm 0.09$  vs  $0.26 \pm 0.06$  and  $0.26 \pm 0.09$ ;  $P = 0.02$ ). The transplant age of the two groups was not different ( $5.7 \pm 2.5$  in A vs.  $4.7 \pm 3.1$  in B (years)). Cyclosporinaemia was not significantly different ( $330.5 \pm 140$  ng/ml in A vs.  $447 \pm 120.1$  ng/ml in B).

In group A, 12.5% were being treated with azathioprine, 37.5% with cyclosporine, and 50% with combined therapy. In group B 50% were being treated with azathioprine, 20% with cyclosporine, and 30% with combined therapy.

There was a total of 11 cases of hypertension, five (45%) in group B and six (55%) in group A. Patients under azathioprine therapy were hypertensive in 66% of cases, and patients under cyclosporine therapy (alone or combined) in 50% of cases. In group B, five patients were being treated with cyclosporine, five were hypertensive, and seven had a transplant age  $> 5$  years (relative risk (Fischer's test), not significant).

### Discussion

RFR is currently a matter of debate among nephrologists. Although several studies have been performed on kidney transplant recipients, results are not in agreement. The cause must perhaps be sought in the different types of protocols applied.

We studied kidney transplant recipients with optimal organ function and have noted that these patients consist of two subgroups, the first with RFR comparable with normal subjects, and the second without RFR and a higher GFR. It is important to stress that, whatever the meaning of RFR [1, 7, 8], absence of functional reserve was not due to cyclosporine therapy and that there was no correlation with

blood pressure (hypertensive patients were present in both groups). It also seems as though transplantation age has no important effect on RFR. The other point to stress was the presence in the group without RFR of high FF values. This probably indicates the presence of high pressure between afferent and efferent arterioles (high  $\Delta P$ ) or a high ultrafiltration coefficient ( $k_f$ ).

Next we have to investigate the meaning of RFR absence in prognostic terms and it is necessary to check whether or not hyperfiltration is due to a high protein diet.

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