Volume Changes in Autosomal Dominant Polycystic Kidneys after the Initiation of Hemodialysis

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Dear Sir,

There have been few studies [1-6] on changes in kidney size in dialysis patients with autosomal dominant polycystic kidney disease (ADPKD). Conflicting results [1-6] have been reported in a few longitudinal studies. We examined the relationship between the duration of hemodialysis and kidney volume for the initial 5 years with frequent CT studies in each case. The kidney volume was estimated using the CT scan [7]. The CT scan was sequentially applied from the upper pole to the lower pole of the kidney. 8 ADPKD patients were studied: 5 females and 3 males. Their mean age was 48.6 ± 8.8 years at the initiation of hemodialysis. Hemodialysis was performed 3 times week for 4 h each session, except for the initial 6 months when a 3-hour session was applied, using 1.3-2.1 m² dialyzers. 68 CT scans were performed for the 8 patients beginning just before hemodialysis up to 5 years after the initiation of treatment. The data were expressed as mean $\pm$ SD. The statistical significance was judged by the paired Student t test or the Wilcoxon signed-rank test.

The kidney volumes at the start or just before the start of hemodialysis were remarkably different between patients. The values ranged from 1,068 to 5,452 ml (mean $3,086 \pm 1,214$ ml) (fig. 1).

After the start of hemodialysis the kidney volume decreased in all 8 patients. The minimum volume was obtained 1 year after the start of hemodialysis in 3 patients, 2 years later in 2 patients, 3 years later in 2 patients and 4 years later in 1 patient (fig. 1). Thus, the minimum renal volume was $2,066 \pm 840$ ml 23.4 ± 16.0 months after the initiation of hemodialysis ($p < 0.01$). The kidney volume in ADPKD increased after the initial reduction and was $2,844 \pm 1,591$ ml 53.7 ± 15.1 months after the initiation of hemodialysis ($p < 0.025$) (fig. 1, 2). The increased volumes ranged from

111 to 175% of the minimum renal volume (100%) in all except 2 patients whose follow-up duration was rather short.

1-4 years after the initiation of hemodialysis all 8 ADPKD patients showed a reduction in kidney size to $67.6 \pm 15.4\%$ of that for the predialysis period. This result was clinically correlated with the finding that the patients with ADPKD reported relief of abdominal fullness 6 months to 1 year after the start of hemodialysis.

Thaysen et al. [8] described the involution of polycystic kidneys after replacement therapy in 1975 [1] and 1982 [2]. We reported [3] that the involution of polycystic kidneys after the start

of hemodialysis was not a universal phenomenon and observed enlargement of polycystic kidneys in some dialysis patients. However, at that time, the size of the polycystic kidneys was not frequently observed during the first 2 years. Thaysen et al. [4] again pointed out regression of ADPKD in the majority of patients and enlargement of the kidneys in some patients after dialysis treatment. Another group reported that the kidney volume in almost all cases of ADPKD decreased [5] or did not change during hemodialysis [6].

Our study is the first longitudinal study in which the kidney size was followed prospectively from the start of hemodialysis. The reduction in kidney volume in dialysis patients with ADPKD was observed 2 years (mean) after the start of hemodialysis. This phenomenon was similar to that seen in chronic glomerulonephritic dialysis patients [7]. Therefore, it is conceivable that the initial reduction of kidney size in ADPKD may be due to the reduction of retained fluid secondary to decreased solute loading after initiation of hemodialysis and a reduction in renal blood flow and/or glomerular filtration rate. 3 years after the start of hemodialysis, the kidney volume in some dialysis patients with chronic

Fig. 1. The relationship between duration of hemodialysis and the kidney volume in patients with ADPKD.

glomerulonephritis increases due to acquired renal cysts [7]. At least one of the reasons for the slow increase in size of the kidneys observed in patients with ADPKD after 2 years of hemodialysis might be the complication of developing acquired renal cysts.

These results suggest that the majority of hemodialysis patients with ADPKD exhibit on initial rapid reduction of kidney size followed by a slow enlargement of the kidney size.

Fig. 2. This 45-year-old male ADPKD patient had a kidney size of 3,160 ml before the initiation of hemodialysis (a), which decreased to 1,923 ml 23 months later (b) and then increased to 5,230 ml 73 months after the initiation of hemodialysis (c).

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650

Ishikawa/Saito

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