

Effects of *Astragalus membranaceus*-based Chinese Medicine Formulae on Residual Renal Function in Patients on Peritoneal Dialysis

KEY WORDS: Chinese medicine; continuous ambulatory peritoneal dialysis; residual renal function.

Preservation of residual renal function (RRF) has important survival benefits for patients undergoing continuous ambulatory peritoneal dialysis (CAPD) (1). Effective measures that can slow down the loss of RRF in CAPD patients are still limited and there is a need to identify new therapeutic options. Traditional Chinese medicine is frequently used in conjunction with Western medicine among patients with chronic kidney diseases in China and many Asian countries (2).

Astragalus membranaceus is a traditional Chinese herbal medicine with potent anti-fibrotic properties and is commonly used for strengthening the immune system, improving cardiovascular function, and enhancing vitality (3). Some of our patients have been treated with *Astragalus membranaceus*-based Chinese medicine formulae since the commencement of CAPD, primarily to improve their general wellbeing and vitality. The aim of this study was to determine the effects of *Astragalus membranaceus*-based Chinese medicine formulae on RRF and daily urine volume in patients on CAPD.

SUBJECTS AND METHODS

This study is a retrospective, single-center, case control, observational study. The study protocol was approved by the Hospital's Institutional Review Board. Patients more than 18 years of age with RRF more than 1 mL/min/1.73 m², who had received *Astragalus membranaceus*-based Chinese medicine formulae since the commencement of CAPD and continued for at least 2 years (CM group) were identified from hospital chart review. Control patients consisted of stable CAPD patients selected from among 180 peritoneal dialysis (PD) patients in our center who had not received Chinese medicine, matched for age, sex, duration of dialysis and diabetic status with the patients in the CM group in a 2:1 ratio (control group).

The *Astragalus membranaceus*-based Chinese medicine formulae contained *Astragalus membranaceus* and a number of other herbs (such as *Epimedium brevicornum Maxim*, *Salvia miltiorrhiza Bunge*, *Cuscuta chinensis Lam.*, *Lycium barbarum L.*). They were prescribed by a registered Chinese Medicine practitioner who managed the patients jointly with the nephrologist in our Integrated Medicine Clinic. The *Astragalus membranaceus*-based Chinese medicine formulae were ingested as decoction prepared from raw herbs in 5 patients and as concentrated Chinese medicine granules in 3 patients.

Residual renal function was measured from a 24-h urine sample and calculated as the mean of creatinine clearance

and urea clearance, normalized to the standard body surface area of 1.73 m². Residual renal function and daily urine volume were determined at the commencement of CAPD and then yearly thereafter. Statistical analysis was performed using SPSS (SPSS Inc., version 16, Chicago, IL, USA) statistical software. Numerical data are given as mean ± standard deviation (SD). Means between groups were compared with Student's *t*-test and Mann-Whitney test when appropriate. A *p* value equal to or less than 0.05 is considered statistically significant.

RESULTS

Eight CM group and 16 control group patients were included in this analysis. The baseline demographic and clinical characteristics of the 2 groups of patients were similar (Table 1). The 2 groups also did not differ in their use of diuretics, angiotensin converting enzyme inhibitor (ACEI)/angiotensin receptor blocker (ARB) and erythropoiesis-stimulating agents. The mean dose of ACEI/ARB and loop diuretics given to the patients in the CM and control groups were similar. One patient in the CM group and 2 patients in the control group required a period of temporary hemodialysis prior to initiation of PD. Table 2 shows the changes in the RRF and daily urine volume of the CM and control groups in the first 2 years of CAPD. The RRF and daily urine volume of the CM and control groups were similar at baseline. Patients in the CM group had significantly higher RRF at 2 years and daily urine volume at 1 and 2 years. Their rate of decline of RRF and daily urine volume were significantly lower than those of the control group (-0.30 ± 0.40 mL/min/1.73 m²/year vs -1.42 ± 0.30 mL/min/1.73 m²/year, *p* = 0.004 and -56.9 ± 108.5 mL/day/year vs -299.8 ± 59.7 mL/day/year, *p* = 0.007, respectively). Kt/V values of the 2 groups were similar at all time-points. The proportion of patients who were peritonitis-free at 2 years did not differ between the 2 groups (87.5% vs 81.3%, *p* = 0.699).

TABLE 1
Baseline Characteristics of Patients in CM and Control Groups

	CM group	Control group	<i>P</i>
Number of patients	8	16	
Sex (male:female)	5:3	5:3	1
Age (years)	66.3±11.6	64.0±11.6	0.659
Body weight (kg)	56.8±7.8	57.5±12.2	0.951
Diabetic nephropathy	50%	50%	1
Charlson Comorbidity Index	5.50±2.20	5.44±1.67	0.900
Use of ACEI/ARB	25%	31.3%	0.751
Use of loop diuretics	100%	100%	1
Use of ESA	87.5%	68.8%	0.317
Kt/V at baseline	1.99±0.35	2.22±0.41	0.172

CM = Chinese medicine; ACEI = angiotensin converting enzyme inhibitors; ARB = angiotensin receptor blockers; ESA = erythropoiesis stimulating agents.

TABLE 2
Changes in RRF, Daily Urine Volume and KT/V Between the
CM and Control Groups During the First 2 Years of CAPD

Year	CM group	Control group	P
RRF (mL/min/1.73 m ²)			
0	3.52±2.00	4.19±1.80	0.412
1	3.07±1.41	1.87±1.71	0.102
2	2.92±1.43	1.36±1.54	0.026
Daily urine volume (mL/day)			
0	883±342	838±347	0.452
1	707±363	398±379	0.032
2	769±576	238±268	0.005
Kt/V (total)			
0	1.99±0.35	2.22±0.41	0.172
1	1.96±0.38	1.87±0.29	0.524
2	2.05±0.28	1.88±0.28	0.174

RRF = residual renal function; CM = Chinese medicine; CAPD = continuous automated peritoneal dialysis.

DISCUSSION

The therapeutic options of proven value in preserving RRF in CAPD patients are limited. The potential benefits of biocompatible dialysis fluids remain controversial (4). Expansion of extracellular volume in PD patients was not helpful in retarding the loss of RRF (5). The findings of this study highlight the potential of Chinese herbal medicine in preserving RRF in CAPD patients. The CM and control group patients have similar baseline demographic and clinical characteristics. Their usage of diuretics and ACEI/ARB, adequacy of dialysis, and peritonitis-free rate also did not differ, suggesting that the better preservation of RRF in the CM group could be related to the consumption of Chinese herbal medicine.

The exact mechanisms by which *Astragalus membranaceus*-based Chinese medicine formulae help to preserve RRF in CAPD patients are not completely understood. In animal studies, it has been demonstrated that treatment with *Astragalus membranaceus* is effective in reducing renal interstitial fibrosis in diabetic nephropathy (6) and progressive proteinuric nephropathy (7). The renal protective effects of *Astragalus membranaceus* is believed to be mediated, in part, through suppression of transforming growth factor beta expression (8) and enhancement of nitric oxide production (9).

The *Astragalus membranaceus*-based Chinese medicine formulae were prescribed to our patients initially to enhance their general wellbeing and vitality. The observed effects of the Chinese medicine formulae on RRF appear to be an added advantage. It is also worth noting the *Astragalus membranaceus*-based Chinese medicine formulae contain a number of other herbs which serve to assist or augment the therapeutic effects of *Astragalus membranaceus*, in accordance with the principles of Chinese herbal formulation (10).

This study is retrospective in nature and involved a relatively small number of patients. Given the association between RRF

and survival, it is possible that our observations are contaminated by survivor bias. Nevertheless, our findings suggest that the use of *Astragalus membranaceus*-based Chinese medicine formulae might be beneficial in preserving RRF in CAPD patients during the first 2 years of dialysis. Further prospective randomized control trials are warranted to confirm these preliminary observations.

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DISCLOSURES

The authors have no financial conflicts of interest to declare.

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