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Selected Abstracts

Guest Editor

Tao Wei, Beijing
Twist Contributes to the Growth of Human Peritoneal Mesothelial Cells and Peritoneal Fibrosis by Regulating Transcription of YB-1 Gene

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Short Summary: We demonstrate that the activation of Twist/YB-1 pathway contributes to the growth of HPMCs and the progression of PM fibrosis during PD. Targeting the Twist/YB-1 pathway in HPMCs may be clinically useful to prevent peritoneal proliferation and fibrosis in patients on long-term PD.

Background: We have previously shown that the E-box-binding transcription factor Twist is overexpressed in high glucose-induced human peritoneal mesothelial cells (HPMCs) and is involved in peritoneal membrane (PM) fibrosis in vitro. However, its function is yet unclear.

Methods: HPMCs were isolated from the effluent of end-stage renal disease (ESRD) patients on peritoneal dialysis (PD). Peritoneal exposure rat model was established by peritoneal injection of high glucose dialysate. Cell proliferation was analyzed by flow cytometry based on propidium iodide (PI) staining. Overexpression lentivirus vector or short interfering RNA (siRNA) lentivirus vector was used to up-regulate or down-regulate the expression of Twist. Real-time quantitative PCR and western blotting were performed to measure the expression levels of Twist, E-cadherin, α-SMA, YB-1, cyclin D1, cyclin E, CDK2, CDK4 and p27. Immunofluorescence was used to show the expression and location of Twist, E-cadherin, α-SMA and YB-1. The interaction between Twist and the YB-1 promoter region was evaluated by chromatin immunoprecipitation and luciferase reporter assay.

Results: Overexpression and activation of Twist and YB-1 were found and positively correlated each other in HPMCs from 93 continuous ambulatory peritoneal dialysis (CAPD) patients and under extensive periods of PM fibrosis ex vivo. In high glucose-induced immortalized HPMCs and PD animal model, Twist and YB-1 were also up-regulated. Re-expression of Twist and YB-1 resulted in the decrease of HPMCs growth, the arrest of cell cycle, and PM fibrosis. Contrarily, down-regulation of Twist or YB-1 promoted the growth and cell cycle of high glucose-induced HPMCs, increased the expressions of cyclin D1/CDK2 and cyclin E/CDK4, and inhibited PM fibrosis. Results from chromatin immunoprecipitation and luciferase reporter assay indicated that the transcription of YB-1 was regulated by the binding of Twist to E-box.

Conclusions: Twist contributes to the proliferation of HPMCs and the progression of PM fibrosis during PD by regulating the transcription of YB-1.

Key Words: Peritoneal membrane fibrosis; Twist; YB-1; Cyclins/CDKs.
hemodialysis centers before and after the establishment of HD union for 2 years.

**Results:** The leading center of the HD union was the Hemodialysis Center of Peking University People’s Hospital. The members included two centers from ‘class three’ hospitals and 6 centers from ‘class two’ hospitals. Quarterly CQI meeting was held, and all member centers in HD union learned how to perform medical quality control and improvement. The member centers then established standards and procedures for diagnosis, cure and nursing of their patients, set up rules for laboratory examinations and ward round, implemented the all-round administration for hemodialysis patients, and created green channels for transfer of intractable and complicated cases. After establishment of the HD union for 2 years, many medical parameters improved. HD sessions ≥3/week increased from 68.0±21.6% to 87.0±7.6% (P < 0.05), hemoglobin in the range of 110–120 g/l increased from 29.8±7.7% to 36.3±7.6% (P < 0.05), corrected serum calcium in the range of 2.10–2.54 mmol/l increased from 53.5±13.9% to 75.0±10.8% (P < 0.05), serum phosphorus in the range of 0.8 to 1.45 mmol/l increased from 22.9±7.9% to 34.1±7.5% (P < 0.05). The ratio of normal pre-dialysis CO2CP increased from 38.2±14.8% to 74.8±21.0% (P < 0.05). Other parameters including Kt/V, iPTH, albumin and blood pressure also improved but without statistical significance.

**Conclusions:** The union of hemodialysis centers for quality control and improvement of hemodialysis is an effective management model in Beijing, China. It can improve professional quality of community hospitals by balancing the technical advantages of medical centers and community hospitals.

### 3

**Serum Response Factor Accelerates the High Glucose-Induced Epithelial-to-Mesenchymal Transition (EMT) via Snail Signaling in Human Peritoneal Mesothelial Cells**

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**Background:** Epithelial-to-mesenchymal transition (EMT) induced by glucose in human peritoneal mesothelial cells (HPMCs) is a major model for peritoneal membrane (PM) fibrosis and dysfunction.

**Methods:** To investigate the impact of serum response factor (SRF) on PM fibrosis due to EMT, we isolated HPMCs from the effluents of peritoneal dialysis (PD) patients with end-stage renal disease (ESRD) to analyze the alterations during PD. We also observed the response of PM to SRF in a rat model.

**Results:** Our results demonstrated the activation and translocation of SRF into the nuclei of HPMCs after extensive periods of PD. Additionally, HPMCs lost their epithelial morphology with a decrease of E-cadherin expression and an increase of α-smooth muscle actin (α-SMA) expression, implying a phenotype transition. PD with 4.25% glucose solution significantly induced the up-regulation of SRF and increased peritoneal thickness. High glucose (60 mmol/l) stimulated the over-expression of SRF in transformed fibroblastic HPMCs. SRF-siRNA treatment to decrease SRF mRNA preserved HPMC morphology, while transfection of SRF plasmid into HPMCs resulted in the morphological change of HPMCs. Evidence from electrophoretic mobility shift assay, chromatin immunoprecipitation and luciferase reporter assay further supported that SRF transcriptionally regulated Snail, a potent inducer of EMT, by directly binding to its promoter.

**Conclusions:** Our data suggested that activation of SRF/Snail pathway contributes to the progressive PM fibrosis during PD.

**Key Words:** SRF; Snail; Peritoneal mesothelial cells; Peritoneal membrane fibrosis.

### 4

**Comparison of Paricalcitol with Salmon Calcitonin and Parathyroidectomy in Hemodialysis Patients with Refractory Secondary Hyperparathyroidism**

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**Background:** Refractory secondary hyperparathyroidism (SHPT) mainly refers to the resistance to vitamin D receptor activator treatment, and is characterized by hypercalcemia, drug resistant hyperphosphatemia, and elevated serum intact parathyroid hormone (iPTH). Parathyroidectomy (PTX) is usually used for the treatment of refractory SHPT. However, some patients may not be suitable for the surgery due to patients’ conditions. Paricalcitol is a vitamin D receptor activator that attenuates iPTH level and depresses parathyroid hyperplasia without increase of serum calcium and phosphate. In recent years, the application of salmon calcitonin in the treatment of renal osteodystrophy showed that it can inhibit the secretion of PTH and decrease the level of serum calcium (Ca). This study was to investigate the safety and efficacy of paricalcitol combined with salmon calcitonin in hemodialysis patients with refractory SHPT, and to compare the curative effect of this therapy with PTX.

**Methods:** Patients with refractory SHPT treated in the First Affiliated Hospital of Harbin Medical University between December 2013 and June 2014 were retrospectively analyzed. Corrected serum Ca, serum phosphate (P), calcium-phosphorus product (Ca×P), and serum iPTH were measured before and after the treatment for one and
two months. Changes of clinical symptoms were evaluated. These changes were compared between the patients treated with PTX and those used paricalcitol combined with salmon calcitonin.

**Results:** In the patients with refractory SHPT, 5 were treated with PTX, and 7 with paricalcitol plus salmon calcitonin. No significant differences in baseline age, sex, dialysis age, corrected serum Ca, serum P, serum Ca×P and iPTH were found between PTX and medication groups. Patients in both groups had obvious pain, itching and myasthenia gravis. In PTX group after the surgery for one and 3 months, serum Ca, Ca×P and iPTH decreased significantly ($P < 0.05$), serum P decreased significantly after 3 months. In paricalcitol combined with salmon calcitonin group after the treatment for one and 3 months, serum Ca, P, Ca×P and iPTH decreased but without statistical significance compared to those before the treatment ($P > 0.05$). In PTX group and paricalcitol combined with salmon calcitonin group after the treatment for 3 months, iPTH was 412.8±193.0 pg/ml and 632.7±303.7 pg/ml ($P > 0.05$), respectively; serum P was 5.0±0.3 mg/dl and 6.5±1.3 mg/dl ($P > 0.05$), respectively; serum Ca was 9.84±0.8 mg/dl and 10.8±0.9 mg/dl ($P < 0.05$), respectively; Ca×P was 50.0±11.3 mg²/dl² and 70.2±15.9 mg²/dl² ($P < 0.05$), respectively. In PTX group, itching disappeared but bone pain and weakness improved only mildly. In paricalcitol combined with salmon calcitonin group, bone pain and weakness rapidly relieved but itching remained; gastrointestinal discomfort was found in 3 cases but was tolerated.

**Conclusions:** Both PTX and paricalcitol plus salmon calcitonin were effective to refractory SHPT. PTX improved hyperphosphatemia, hypercalcemia and high iPTH quickly. However, more cases and longer follow-up period are required to evaluate the long-term efficacy of the two therapeutic modalities.

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**Association of Serum Uric Acid Level with Nutritional Status and Dialysis Adequacy in Peritoneal Dialysis Patients**

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**Objective:** Uric acid is known to be involved in the progression of chronic kidney disease. However, its effect on peritoneal dialysis patients has not yet been elucidated. Our study aimed to investigate the association of serum uric acid level with nutritional status and dialysis adequacy in peritoneal dialysis (PD) patients.

**Methods:** This was a retrospective study involving 151 subjects who started PD in our department between January 2008 and April 2013. All of them underwent PD for more than 10 months. There were 94 males and 57 females. The median age was 54 years old. Patients were divided into hyperuricemia group (serum UA level ≥420 μmol/l for males and ≥360 μmol/l for females) and normal UA group. Serum prealbumin (PA), albumin (ALB), Hb, total cholesterol (TC), triglyceride (TG), nPCR, urea KT/V, and Ccr were compared between two groups at baseline, 1st, 5th, and 10th months of PD.

**Results:** (a) At baseline, there were 109 patients in hyperuricemia group (median UA was 519 μmol/l) and 42 patients in normal UA group (median UA was 374 μmol/l). The diastolic pressure (86.53±12.81 vs. 80.02±11.52 mmHg, $P = 0.009$) and PA (336.33±79.50 vs. 306.83±64.33 mg/l, $P = 0.022$) in hyperuricemia group were much higher than those in normal UA group. However, there were no significant differences in ALB, Hb, TC, and TG between the two groups. At the 1st month and 5th month of PD, KT/V was significantly lower in hyperuricemia group (2.37 vs. 2.80, $P = 0.012$; 2.31 vs. 2.74, $P = 0.001$). At the 10th month of PD, PA (379.79±82.89 vs. 346.81±83.33 mg/l, $P = 0.045$), ALB (32.94±4.54 vs. 31.24±4.29 g/l, $P = 0.030$) were much higher in hyperuricemia group than in normal UA group. (b) At the end of the study, serum UA decreased obviously in hyperuricemia group (519 vs. 419 μmol/l, $P < 0.001$), whereas UA in normal UA group did not change throughout the study. Compared with normal UA group, urine UA was much lower in hyperuricemia group (0.66 vs. 0.79 mmol/l, $P = 0.03$) at the 10th month of PD, but was indifferent between two groups at baseline, 1st and 5th months of PD. In contrast, UA in peritoneal dialysis fluid did not differ between two groups at the 10th month of PD, but was obviously higher in hyperuricemia group at the 1st and 5th months of PD (217 vs. 199 μmol/l, $P = 0.02$; 226 vs. 185 μmol/l, $P = 0.002$). (c) At the 1st and 5th months of PD, serum UA was positively correlated with PA ($r = 0.182$, $P = 0.027$; $r = 0.468$, $P < 0.001$) and ALB ($r = 0.232$, $P = 0.004$; $r = 0.184$, $P = 0.024$), and was negatively correlated with KT/V ($r = -0.184$, $P = 0.025$; $r = -0.221$, $P = 0.007$); these correlations were not found at the 10th month of PD.

**Conclusions:** This study showed that PD can improve hyperuricemia mainly by removing UA from PD fluid at the early stage. Serum UA level was positively correlated with several nutritional parameters such as PA and ALB and was negatively correlated with KT/V, indicating that slightly elevated serum UA in patients at early PD stage may associate with relatively better nutritional status and poor dialysis adequacy.

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**Study on Incidence of Low Bone Mineral Density in Hemodialysis Patients with Different Bone Turnover**

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**Objective:** To analyze the incidence of low bone mineral density (BMD) and the relationship between several biochemical markers and BMD in patients on hemodialysis.

**Method:** A total of 145 hemodialysis patients were enrolled in this study. Patients were divided into 3 groups according to the intact parathyroid hormone (iPTH) level. There were 66 cases in high bone turnover (HT) group (iPTH >300 pg/ml), 40 cases in mixed bone turnover (MT) group (iPTH >150 pg/ml and ≤300 pg/ml), and 39 cases in low bone turnover (LT) group (iPTH <150 pg/ml). The BMD
value was calculated using dual-energy X-ray absorptiometry (GE lunar prodigy) at the lumbar spine and hip. Blood sample was taken for the measurements of serum calcium (Ca), phosphate (P), intact parathyroid hormone (iPTH), 25 hydroxy-vitamin D (25(OH)D3), alkaline phosphatase (AKP), albumin (ALB), triglyceride (TG), cholesterol (TC), creatinine (Scr) and C reactive protein (CRP). Clinical characteristics such as gender, age, height, weight, and body mass index (BMI) were also collected.

**Results:** (1) Mean age of the 145 hemodialysis patients (86 males and 59 females) was 56.4±14.57 years. Totally 43.4% (63 cases) of the patients were diagnosed as low BMD (including osteopenia and osteoporosis). (2) The incidence of osteoporosis in HT, MT and LT groups was 16.7% (11 cases), 17.5% (7 cases) and 20.5% (8 cases), respectively. No significant differences of the frequency of low BMD were observed among the three groups (P = 0.477). (3) There were statistically differences in serum P, AKP, 25(OH)D3 (P = 0.001, 0.001, 0.003) among the three groups. The serum P level of HT group (2.00±0.69 mmol/l) was significantly higher than either MT group (1.54±0.57 mmol/l) or LT group (1.63±0.70 mmol/l). Serum AKP assumed reduced tendency with the descent of bone turnover, but 25(OH)D3 behaved in opposite way. The discriminations of all remaining biochemical markers and BMD values among the three groups were insignificant (P > 0.05). (4) Multiple linear regression analysis showed that L1~4 BMD was associated with body weight (r = 0.006, P < 0.001) and 25(OH)D3 levels (r = 0.001, P = 0.02); the BMDs of femoral neck, femoral shaft and total hip were positively correlated with body weight (r = 0.005, P < 0.001; r = 0.005, P < 0.001; r = 0.005, P < 0.001), negatively correlated with age (r = -0.003, P < 0.001; r = -0.003, P < 0.001; r = -0.002, P < 0.001), and had no correlations with other biomarkers.

**Conclusions:** On primary treatment of renal osteodystrophy (calcium and low dose calcitriol), hemodialysis patients with a low BMD is still as high as 43.4%. However, there were no significant differences in the incidence of low BMD among hemodialysis patients with different bone turnover. Therefore, DEXA may not be a good predictor for fracture risk among hemodialysis patients. The BMD of lumbar and hip showed positive correlation with body weight, suggesting that body weight may be one of the most important protective factors for osteoporosis in hemodialysis patients.

**Magnesium Prevents β-Glycerophosphate-Induced Calcification of Rat Aortic Vascular Smooth Muscle Cells**

**Objective:** Serum phosphate level is closely related to vascular calcification in patients with end stage renal disease (ESRD). As the natural antagonist of calcium, magnesium may play important role in the prevention of vascular calcification. The aim of this study was to investigate whether magnesium has effects on hyperphosphate-induced calcification of rat aorta vascular smooth muscle cells (RASMCS).

**Methods:** RASMCs were isolated from the thoracic aorta of adult male SD rats. Cells were maintained in DMEM supplemented with 15% FBS, and the medium was replaced twice a week. RASMCs were identified by their typical hill and valley morphology, and purity of the primary cell culture was checked by immunocytochemistry using a monoclonal antibody against α-smooth muscle actin protein 1A4 (Acta 2). The cells were randomly divided into three groups including control group, hyperphosphate group (10 mM β-glycerophosphate, BGP) and hyperphosphate-magnesium group (10 mM BGP + 2 mM MgSO4). At the time points of 6 h, 12 h, 24 h, 72 h, 96 h, 8 d, 10 d, RT-PCR was used to determine the expression level of core binding factor alpha 1 (Cbfα1) mRNA. Alizarin red staining was used to identify calcium in RASMCS. Ca2+ content in RASMCS was determined by biochemical measurement. Alkaline phosphatase (ALP) activity was assayed by chemiluminescence. Statistical analyses were performed using SPSS13.0 software. P < 0.05 was considered to be statistically significant.

**Results:** Ca2+ content, ALP activity and expression of Cbf1mRNA in the hyperphosphate group were higher than those in the control group. The expression of Cbf1 mRNA in RASMCS increased as early as 6 h after exposure to hyperphosphate medium, reached its peak at 72 h, decreased remarkably at 96 h, and increased again after 96 h, reacting to the stimulation in a profile like a hill-valley-hill curve. Compared with the hyperphosphate group, Ca2+ content and expression of Cbf1 mRNA decreased in a time-dependent manner in the hyperphosphate-magnesium group.

**Conclusion:** One of the mechanisms of magnesium preventing the hyperphosphate-induced calcification of RASMCS may be that magnesium blocks the hyperphosphate-induced phenotype transition of RASMCS via influencing the expression of Cbf1 mRNA.

**Key Words:** Rat vascular smooth muscle cells; β-glycerophosphate; Magnesium; Calcification; Core binding factor alpha 1; Alkaline phosphatase; Ca2+ content.

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**IFN-γ Attenuates Hyperphosphate-Induced Calcification of Rat Aortic Vascular Smooth Muscle Cells**

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**Objective:** The aim of this study was to investigate whether IFN-γ had effects on hyperphosphate-induced calcification of rat aortic vascular smooth muscle cells (RASMCS).

**Methods:** RASMCs were isolated from the thoracic aorta of adult male SD rats. RASMCs were identified by their typical hill and valley morphology, and purity of the primary cell culture was checked by immunocytochemistry using a monoclonal antibody against...
α-smooth muscle actin protein 1A4 (Acta 2). The cells were randomly divided into three groups including control group, hyperphosphate group (10 mM β-glycerophosphate, BGP), hyperphosphate-IFN-γ group (10 mM BGP + 100 u/ml IFN-γ). Alizarin red staining was performed to identify the calcium in RASMCs. Ca^{2+} content in RASMCs was determined by biochemical measurement. Alkaline phosphatase (ALP) activity was assayed by chemiluminescence. RT-PCR was used to determine the expression level of core binding factor alpha 1 (Cbfα1) mRNA. Statistical analyses were performed using the SPSS13.0 software. P < 0.05 was considered to be statistically significant.

**Results:** Ca^{2+} content, ALP activity and expression of Cbfα1 mRNA in the hyperphosphate group were higher than those in the control group (P < 0.05). Compared with hyperphosphate group, ALP activity and expression of Cbfα1 mRNA decreased in the hyperphosphate-IFN-γ group.

**Conclusion:** One of the mechanisms of IFN-γ preventing the hyperphosphate-induced calcification of RASMCs may be that IFN-γ blocks the hyperphosphate-induced phenotype transition of RASMCs via influencing the expression of Cbfα1 mRNA and ALP activity.

**Key Words:** Rat vascular smooth muscle cells; β-glycerophosphate; IFN-γ; Calcification; Core binding factor alpha 1; alkaline phosphatase; Ca^{2+} content.

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**Vitamin K Attenuates β-Glycerophosphate-Induced Calcification of Rat Aortic Vascular Smooth Muscle Cells**


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**Objective:** Cardiovascular disease is closely associated with the mortality risk of chronic kidney disease (CKD) patients. Vascular calcification is a highly regulated cell-mediated process, and is prevalent in CKD patients. Recent evidence has shown that vitamin K may play an important role in vascular calcification. The aim of this study was to investigate whether vitamin K had effects on hyperphosphate-induced calcification of rat vascular smooth muscle cells (RASMCs).

**Methods:** RASMCs were isolated from thoracic aorta of adult male SD rats. RASMCs were identified by their typical hill and valley morphology, and purity of the primary cell culture was checked by immunocytochemistry using a monoclonal antibody against α-smooth muscle actin protein 1A4 (Acta 2). The appropriate vitamin K concentration was determined by MTT method. The cells were randomly divided into six groups including control group, hyperphosphate group (10 mM β-glycerophosphate, BGP), hyperphosphate-10 μM vitamin K group (10 mM BGP + 10 μM vitamin K), hyperphosphate-25 μM vitamin K group (10 mM BGP + 25 μM vitamin K), hyperphosphate-50 μM vitamin K group (10 mM BGP + 50 μM vitamin K) and hyperphosphate-10 μM vitamin K-25 μM warfarin group (10 mM BGP + 10 μM vitamin K + 25 μM warfarin). Alizarin red staining was performed to identify calcification of RASMCs. Ca^{2+} content in RASMCs was determined by biochemical measurement. Alkaline phosphatase (ALP) activity was assayed by chemiluminescence. RT-PCR was used to determine the expression level of core binding factor alpha 1 (Cbfα1) mRNA. Statistical analyses were performed using the SPSS13.0 software. P < 0.05 was considered to be statistically significant.

**Results:** The results of MTT showed no significantly different among hyperphosphate group, hyperphosphate-10 μM vitamin K group, hyperphosphate-25 μM vitamin K group, hyperphosphate-50 μM vitamin K group (P > 0.05). Ca^{2+} content, ALP activity and expression of Cbfα1 mRNA in hyperphosphate group were higher than those in control group (P < 0.05). Compared with hyperphosphate group, the expression of Cbfα1 mRNA and Smad1 mRNA decreased in hyperphosphate-25 μM vitamin K group and hyperphosphate-50 μM vitamin K group.

**Conclusion:** One of the mechanisms of vitamin K preventing the hyperphosphate-induced calcification of RASMCs may be that vitamin K blocks the hyperphosphate-induced phenotype transition of RASMCs via the signaling pathway of bone morphogenetic proteins.

**Key Words:** Rat vascular smooth muscle cells; β-glycerophosphate; Vitamin K; Calcification; Core binding factor alpha 1; Alkaline phosphatase; Ca^{2+} content; Smad1.

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**Plasma Urotensin II Level Is Associated with All-Cause Mortality in Hemodialysis Patients**

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**Background:** Human urotensin-II (UII) is a vasoactive undeca-peptide originally isolated from fish spinal cord later in mammals and humans as the agonist for the orphan receptor GPR14 (now known as UT), and is demonstrated as the most potent vasoconstrictor identified so far. On the other hand, it has been discovered that human UII can have vasodilatation effect on small resistant arteries. It is not clear whether circulating UII determines adverse clinical outcomes, especially all-cause mortality. This study examined the impact of UII on mortality in hemodialysis patients and the relationship between UII and nutritional status.

**Methods:** One hundred and twenty-one hemodialysis patients were prospectively studied. At baseline, the mean age was 61.1±12.8 years, 75 patients were male. Clinical data and laboratory results were recorded. UII was measured using radioimmunoassay method at baseline, and the clinical outcome was followed up for 3 years.

**Results:** At baseline, plasma UII was lower in all-cause mortality group than in survival group (38.2±3.5 g/l vs. 40.9±3.2 g/l, P = 0.012). In the follow-up period, 22 patients died, of whom 11 patients died of cardiovascular disease. Patients with plasma UII <26.5 pg/ml had lower
survival rate by Kaplan merrier analysis. Multivariate Cox regression confirmed that plasma UII but not albumin level was the independent risk factor for all-cause mortality in hemodialysis patients.

**Conclusion:** Low plasma UII but not the malnutrition status was the independently predicted risk for all-cause mortality in hemodialysis patients.

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**Primary Study on the Maturation of Autoarteriovenous Fistula in Wrist in Maintenance Hemodialysis Patients**

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**Objectives:** To investigate the status of the cephalic vein for the maturity evaluation of the autoarteriovenous fistula, and to find out the indicators for a matured autoarteriovenous fistula.

**Methods:** The diameter, flow rate and wall thickness of the cephalic vein was prospectively measured by Doppler ultrasonography after the autofistula was created. The maturity was judged by skilled nurses depending on their experience before the fistula was punctured. The ultrasound data were used as the reference at the same time. After three dialysis sessions, if the blood flow was sufficient in hemodialysis sessions and complications such as prolonged bleeding and hematoma after dialysis were not found, matured fistula was then confirmed.

**Results:** Thirty-one patients were enrolled in this study, and 30 fistulas were finally matured. The average age of the patients was 52.93±3.21 years old, and 13 patients were female. Twenty two fistulas located in left arms. The primary disease was diabetic nephropathy in 13 cases. The average diameter of cephalic vein increased from 3.10±0.11 mm before surgery to 4.74±0.16 mm after maturation, smaller than the diameter (6 mm) recommended by K/DOQI guideline. The average maturation period was 57.10±3.21 days. Maturated fistulas have a high flow rate of 569.76±48.34 ml/min and an average wall thickness of 0.95±0.04 mm. The one-side 95% confidence interval of diameter, flow rate, and wall thickness of the cephalic vein was 4.44 mm, 486.37 ml/min, and 0.67 mm, respectively.

**Conclusion:** The diameter of cephalic vein in a matured autoarteriovenous fistula was significantly smaller in our study than the diameter recommended by K/DOQI guideline. The indicators for a matured autoarteriovenous fistula may be different from other countries.

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**The Short-Term Efficacy of Microwave Ablation of Secondary Hyperparathyroidism Guided by Ultrasound: A Preliminary Study**

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**Aims:** To study on the efficacy and complications of microwave ablation (MWA) of secondary hyperparathyroidism (SHPT).

**Methods:** Clinical data of the 34 SHPT cases treated with MWA in our department from Feb. 2014 to Sept. 2014 were retrospectively analyzed. The inclusion criteria were as follow: (a) resistant to drug treatment, (b) higher values of serum calcium and phosphorus, and intact parathyroid hormone (iPTH) >600 pg/ml; (c) presence of SHPT related symptoms including ostealgia, pruritus, disability. Four cases bound to wheelchairs, including two cases with shrink-man syndrome. Twenty-eight cases were incipient and 6 cases were postoperatively recurrent. Five recurrent patients had ectopic SHPT located in supra-sternal fossa in 3 cases and anterior superior mediastinum in 2 cases. One hyperplasia nodule of SHPT occurred in 13 cases, two nodules in 10 cases, three in 8 cases, and four in 3 cases. The maximum diameter of SHPT nodules was 0.6–3.3 cm (mean = 1.5±0.6 cm). The pre-ablation iPTH was 651.4–5,062 pg/ml (mean = 1,603.2±1,034.1 pg/ml). Before MWA, the spacer fluid was injected inside the thyroid capsule guided by ultrasound for reduction of intraoperative pain and protection of recurrent laryngeal nerve from heat damage. For ectopic SHPT, spacer fluid was injected into the tissue space surrounding SHPT. The 17G water cooled shaft microwave antenna was then inserted into the hyperplasia nodule guided by ultrasound, and the ablation with power of 25W was applied by moving-shot strategy. Ten minutes after ablation, the contrast enhancement ultrasound was used to evaluate the effect of ablation. A supplementary ablation may be needed in case of focal contrast enhancement emerging inside nodule. iPTH, serum calcium, phosphorus and alkaline phosphatase (ALP) were measured and compared before ablation and one week after ablation.

**Results:** Complete ablation was achieved in all of the 69 nodules in 34 cases. The mean ablation time for a nodule was 208.6±127.7 s. Serum iPTH, calcium and phosphorus one week after ablation were statistically lower than those before ablation (P < 0.05). However, ALP after ablation was not lower than that before ablation (P > 0.05). Symptoms such as ostalgia, pruritus, insomnia and restless legs were transiently cured (22/34, 64.7%) or obviously improved (12/34, 35.3%) one day after ablation. Two cases bound on wheelchairs before ablation could walk independently 3 days after ablation. Within 24 hours after ablation, but successfully managed by calcium supplement. Recurrent laryngeal nerve injury at one side was encountered in one case (2.9%).

**Conclusion:** MWA guided by ultrasound can be regarded as a minimally invasive, relatively safe and effective approach to manage SHPT.

**Key Words:** Secondary hyperparathyroidism; Microwave ablation; Intact parathyroid hormone.
Comparison Efficacy between Cinacalcet and Parathyroidectomy in Treating Resistant Secondary Hyperparathyroidism

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Purpose: To compare the efficacy between cinacalcet and parathyroidectomy (PTX) in treating resistant secondary hyperparathyroidism (SHPT).

Methods: We retrospectively analyzed 25 SHPT patients treated with cinacalcet (25 mg daily; calcitriol 0.25 μg twice/day for some cases) at our outpatient clinic from Jan. 2010 to Jan. 2014. According to the baseline data, we matched corresponding 25 patients treated with PTX (including PTX + autotransplantation and sPTX). All of the patients were followed for at least 6 months. We collected patients’ basic information including age, dialysis duration and clinical symptoms, calibrated serum calcium (Ca), serum phosphorus (P), calcium-phosphorus product (CaxP), and intact parathyroid hormone (iPTH). Laboratory examinations were performed after the treatment for one week, one month, 3 months, and 6 months. We compared these parameters between the two groups before and after the treatment.

Results: Baseline data were statistically indifferent between the two groups (P > 0.05). The preoperative values in PTX group were Ca 2.51±0.24 mmol/l, P 2.06±0.53 mmol/l, CaxP 62.26±12.61 mm²/dl², and iPTH 1,933.68±790.29 pg/ml. The pre-treatment values in cinacalcet group were Ca 2.63±0.17 mmol/l, P 2.01±0.53 mmol/l, CaxP 63.12±16.78 mm²/dl², and iPTH 1,699.83±1326.90 pg/ml. Symptoms such as bone and joint pain, muscle weakness and pruritus were found in both groups. In PTX group after the surgery for one month, iPTH decreased by 82.3% (343±502.78 pg/ml), Ca, P, CaxP dropped to 2.00±0.51 mmol/l, and 28.76±14.05 mg/dl² (P < 0.05), respectively. Gender was not a significant effector (P = 0.6 and 0.7 for Kt/V and Ccr, respectively). However, diabetes significantly affected the renal clearance significantly (P = 0.04 and 0.03 for Kt/V and Ccr, respectively). Logistic analysis revealed that diabetes rather than age, gender and hypertension affected the renal clearance decline. Diabetes was the major effector for renal clearance decline.

Conclusions: Both PTX and cinacalcet can effectively treat resistant SHPT. PTX improved hypercalcemia, hyperphosphatemia, hyperparathyroidism and symptoms faster than cinacalcet. Cinacalcet improved hypercalcemia, hyperphosphatemia, hyperparathyroidism, and symptoms gradually, and is suitable for those who refuse PTX.

Diabetes Was the Major Effector for Renal Solute Clearance Decline in Peritoneal Dialysis Patients

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Objectives: In the study of efficacy and safety of Changfu peritoneal dialysis solution, we found that both Kt/V and Ccr declined in the period from baseline to 48 weeks. It is known that the solute clearance consists of renal and peritoneal parts, and the renal clearance may be more important. So we evaluated the effectors for the residual renal clearance decline.

Methods: The data were all from the study of Changfu peritoneal dialysis solution. Kt/V and Ccr were both separated into two parts, i.e., peritoneal part and residual renal part. By comparison of solute clearance of peritoneal and residual renal function from baseline to 48 week, we identified the main part of clearance decline. Then, by ANOVA and logistic analysis we found that diabetes was the major effector for small solute clearance decline.

Results: The decline of small solute clearance from baseline to 48 weeks was mainly from residual renal function rather than peritoneum after baseline-adjusted analysis. The median decline rate of Kt/V was 11.9% (43.9% and 1.1% for renal and peritoneal, respectively). The median decline rate of Ccr was 13.6% (44.8% and –6.0% for renal and peritoneal, respectively). Age >60 years didn’t affect renal clearance significantly (P = 0.6 and 0.7 for Kt/V and Ccr, respectively). Gender was not a significant effector (P = 0.9 and 0.3 for Kt/V and Ccr, respectively), and hypertension was neither an effector (P = 0.9 and 0.9 for Kt/V and Ccr, respectively). However, diabetes significantly affected the renal clearance (P = 0.04 and 0.03 for Kt/V and Ccr, respectively). Logistic analysis revealed that diabetes rather than age, gender and hypertension affected the residual renal clearance significantly (RR = 1.8 and 1.7 for Kt/V and Ccr, respectively).

Conclusions: During the course of peritoneal dialysis therapy, the decline of small solute clearance (Kt/V and Ccr) was mainly from residual renal function rather than peritoneum. Diabetes was the major effector for clearance decline, and the risk was nearly doubled.