doi: 10.13241/j.cnki.pmb.2014.22.023

不同透析方式治疗终末期糖尿病肾病临床疗效比较 *

李晖云[1] 于 磊[1] 刘艾芹[1] 张德鱼[1] 王春艳[1] 杨书彦[1] 刘国平[1] 包春春[2]
(内蒙古自治区人民医院:1 肾内科,2 内分泌科 内蒙古 呼和浩特 010010)

摘要 目的:比较应用血液透析(hemodialysis, HD)与持续不卧床腹膜透析(continuous ambulatory peritoneal dialysis, CAPD)两种不同透析方式治疗终末期糖尿病肾病的临床疗效。**方法:**回顾性分析 2010 年 6 月至 2013 年 2 月在我院接受透析治疗的终末期糖尿病肾病患者 98 例的临床资料,其中 55 例为接受 HD 治疗,43 例接受 CAPD 治疗,统计分析及比较两组的临床治疗效果。**结果:** HD 组透析后的体重(50.2± 8.9Kg)较透析前(58.4± 10.1Kg)明显减轻(P<0.05),也明显低于 CAPD 组透析后体重(60.4± 9.1 kg)(P<0.05), HD 组透析后血压下降明显 (SBP 157.6± 20.2 vs 144.3± 14.4 mmHg, DBP 71.4± 12.9 vs 83.2± 10.9 mmHg)(P<0.05),同时明显低于 CAPD 组透析后血压(SBP 144.3± 14.4 mmHg vs 159.4± 17.1 mmHg, DBP 71.4± 12.9 vs 84.3± 10.5 mmHg)(P<0.05),两组透析后尿量与透析前比较无明显差异(>0.05),但 HD 组尿量(487.0± 332.0 mL)明显少于 CAPD 组(593.0± 420.0 ml)(P<0.05),两组透析后生化指标如肌酐(HD 310.6± 210.1 μmol/L,CAPD425.9± 267.2 μmol/L)、尿素氮(HD 11.6± 4.1 mmol/L, CAPD 19.5± 6.9 mmol/L)、血钾(HD 3.4± 0.4 mmol/L, CAPD 3.6± 0.5 mmol/L)有明显下降(P<0.05),HD 组透析后血浆总蛋白(59.4± 8.1 g/L)及白蛋白(37.4± 6.1 g/L)水平较透析前(TP 55.2± 9.0 g/L, ALB 33.2± 5.9 g/L)显著性升高(P< 0.05),且 HD 组血浆总蛋白(55.2± 9.0 g/L)及白蛋白水平(33.2± 5.9 g/L)显著高于 CAPD 组(TP 52.5± 7.3 g/L, ALB 33.4± 5.1 g/L)(P< 0.05),HD 组发生心血管并发症(36.3%)、出血事件(30.9%)的比例较 CAPD 组(16.2%,13.9%)升高,差异具有统计学意义(P< 0.05)。**结论:**两种透析方式都是治疗终末期糖尿病肾病的有效措施,两者各有特点。对于不同病人应采取个体化方针,能够提高患者的生活质量,减少并发症及改善预后。

关键词:糖尿病肾病;血液透析;腹膜透析;透析疗法
中图分类号:R587.2;R459.5 **文献标识码:**A **文章编号:**1673-6273(2014)22-4294-04

Clinical Curative Comparison between Two Ways of Dialysis Treatment of Patient with end-stage Diabetic Nephropathy*

LI Hui-yun[1], YU Lei[1], LIU Ai-qin[1], ZHANG De-yu[1], WANG Chun-yan[1], YANG Shu-yan[1], LIU Guo-ping[1], BAO Chun-chun[2]
(The Inner Mongolia Autonomous Region people's Hospital, 1 Department of internal medicine, 2 Department of Endocrinology, Yinchuan, 010010, China)

ABSTRACT Objective: To discuss and compare the clinical curative effect of application of hemodialysis (HD) and continuous ambulatory peritoneal dialysis (CAPD) on patients with terminal-stage diabetic nephropathy. **Methods:** A retrospective review was conducted on the data of 98 patients with terminal-stage diabetic nephropathy who underwent dialysis therapy in our hospital between June 2010 and February 2013. Among them, 55 had HD treatment and the other 43 received CAPD. The clinical therapeutic effect of the two therapies were analyzed and compared between the two groups. **Results:** The patients in HD group had their weights(50.2± 8.9 Kg) down significantly after dialysis(58.4± 10.1 Kg)(P<0.05) and had less weight after dialysis than that in the CAPD group (60.4± 9.1 kg) (P<0.05). The blood pressure of the patients in HD group greatly declined after dialysis (SBP 157.6± 20.2 mmHg vs 144.3± 14.4 mmHg, DBP 71.4± 12.9 mmHg vs 83.2± 10.9 mmHg) (P<0.05) and was lower than that of patients in CAPD group after dialysis (SBP 144.3± 14.4 mmHg vs 159.4± 17.1 mmHg, DBP 71.4± 12.9 mmHg vs 84.3± 10.5 mmHg) (P<0.05). The urine volume of the two groups after dialysis were similar with that before dialysis, but patients in HD group had less urine volume (487.0± 332.0 ml) than those in CAPD group (593.0± 420.0 ml) after dialysis (P<0.05). The biochemical indicators such as creatinine (HD 310.6± 210.1 μmol/L, CAPD 425.9± 267.2 μmol/L), urea nitrogen (HD 11.6± 4.1 mmol/L, CAPD 19.5± 6.9 mmol/L), potassium (HD 3.4± 0.4mmol/L, CAPD 3.6± 0.5 mmol/L) after dialysis were significantly lower than those before dialysis (P<0.05). The level of plasma total protein (59.4± 8.1 g/L) and plasma albumin (37.4± 6.1 g/L) of patients in HD group after dialysis were significantly higher than those before dialysis(TP 55.2± 9.0 g/L, ALB 33.2± 5.9 g/L) (P<0.05), and the two levels after dialysis in HD group (TP 55.2± 9.0 g/L, ALB 33.2± 5.9g/L) were also significantly higher than that in CAPD group (TP 52.5± 7.3g/L, ALB 33.4± 5.1 g/L)(P<0.05). The incidences of cardiovascular complications (36.3%) and bleeding (30.9%) in HD patients were higher than in CAPD patients (16.2% and 13.9%, respectively)(P< 0.05). **Conclusions:** Both dialysis methods were effective measures to treat patients with terminal-stage diabetic nephropathy and had their own characteristics. We can improve the quality of life of patients, reduce incidence of complications and promote prognosis by means of individualized principle for different patients.

Key words: Diabetic nephropathy; Hemodialysis; Peritoneal dialysis; Dialysis therapy
Chinese Library Classification: R587.2; R459.5 Document code: A
Article ID: 1673-6273(2014)22-4294-04

* 基金项目:内蒙古自治区自然科学基金资助项目(2010BS1102)
作者简介:李晖云(1973-),女,副主任医师,研究方向:狼疮性肾炎的诊治,Tel:13739915287 , Email:2678151479@qq.com
(收稿日期:2013-11-11 接受日期:2013-12-08)

前言

目前,糖尿病肾病所引起的终末期肾病在全国有明显增长趋势,此类患者透析治疗的并发症多,存活率较低,预后较差,因而透析方式的选择是一个重要而又棘手的问题[1],虽然越来越多的终末期糖尿病肾病患者最终寻求肾脏替代疗法[2,3],但肾脏资源的不足使得很大一部分终末期糖尿病患者选择了透析治疗,所以对于如何选择透析的方式,延长患者生命,提高患者生活质量,显得尤为重要。国内外曾有报道各种透析疗法的特点,但仍存在不少争议[4,5],为进一步探讨应用血液透析与持续不卧床腹膜透析两种不同透析方式治疗终末期糖尿病肾病的临床疗效,指导临床工作,本文回顾性总结分析了我院 2010 年 6 月至 2013 年 2 月在我院接受 HD 及 CAPD 治疗的终末期糖尿病肾病患者 98 例的临床资料,现报道如下。

1 资料与方法

1.1 研究对象

2010 年 6 月至 2013 年 2 月在我院接受 HD 及 CAPD 治疗的终末期糖尿病肾病患者,共 98 例,其中接受 HD 治疗 55 例,接受 CAPD 治疗 43 例。两组患者中男性 59 例,女性 39 例,年龄 25-78 岁,平均年龄 63± 12.9 岁,患糖尿病时间 1-13 年,平均 5.6± 2.3 年, 患者都符合 WHO 关于糖尿病肾病诊断标准,排除患者合并恶性肿瘤,临床资料不全及不按规定时间透析者。两组患者在透析前年龄、性别、体重、每日尿量、血压及生化和血常规指标存在可比性,详见表 1。

1.2 方法

1.2.1 **透析方法** 血液透析治疗组采用碳酸氢盐透析, 每周透析 2～3 次,每次 4h,根据个体情况适当调整超滤量及超滤模式,常规条件下控制血压,及时皮下注射胰岛素保持血糖稳定,并补充红细胞生成素、铁、钙、骨化三醇等药物[2]。持续不卧床腹膜透析治疗组采用美国 Baxter 生产的透析装置及透析液,每日交换 2-4 次,每次 1500-2500ml,常规控制血压、血糖等。

1.2.2 **观察指标** 两组透析前后体重、尿量、血压、生化指标如血肌酐、尿素氮、血浆白蛋白、总蛋白、钾离子、血糖及血红蛋白等,并统计两组透析后心血管并发症、出血、感染、脑血管并发症及死亡率。

1.3 统计方法

应用 SPSSl5.0 统计软件进行分析, 计量资料以 ($\bar{x}$± s)表示,两组间均数比较采用两独立样本 t 检验;计数资料比较采用 x^2 检验,检验水准均取 α=0.05。

2 结果

HD 组透析后的体重 (50.2± 8.9Kg) 较透析前 (58.4± 10.1Kg)明显减轻(P<0.05),也明显低于 CAPD 组透析后体重(60.4± 9.1kg)(P<0.05), HD 组透析后血压下降明显(SBP 157.6± 20.2 vs 144.3± 14.4 mmHg, DBP 71.4± 12.9 vs 83.2± 10.9 mmHg)(P<0.05), 同时明显低于 CAPD 组透析后血压(SBP 144.3± 14.4 mmHg vs 159.4± 17.1 mmHg, DBP 71.4± 12.9 vs 84.3± 10.5 mmHg)(P<0.05), 两组透析后尿量(HD 487.0± 332.0 ml, CAPD 组 593.0± 420.0 ml) 与透析前(HD 620.0± 457.0ml, CAPD 组 645.0± 480.0 ml) 比较无明显差异(>0.05),但 HD 组尿量(487.0± 332.0 ml)明显少于 CAPD 组(593.0± 420.0 ml)(P<0.05), 两组透析后生化指标如肌酐(HD 310.6± 210.1 μmol/L, CAPD425.9± 267.2 μmol/L)、尿素氮(HD 11.6± 4.1 mmol/L, CAPD 19.5± 6.9 mmol/L)、血钾(HD 3.4± 0.4 mmol/L, CAPD 3.6± 0.5 mmol/L)有明显下降(P<0.05),HD 组透析后血浆总蛋白(59.4± 8.1 g/L)及白蛋白(37.4± 6.1 g/L)水平较透析前 (TP 55.2± 9.0 g/L, ALB 33.2± 5.9 g/L) 显著性升高(P＜0.05),且 HD 组血浆总蛋白(55.2± 9.0 g/L)及白蛋白水平(33.2± 5.9 g/L) 显著高于 CAPD 组 (TP 52.5± 7.3 g/L, ALB 33.4± 5.1 g/L)(P＜0.05),(见表 2)。

HD 组发生心血管并发症(36.3%)、出血事件(30.9%)的比例较 CAPD 组 (16.2%,13.9%) 升高, 差异具有统计学意义 (P＜0.05);两组感染率,脑血管并发症及死亡率比较(HD vs CAPD 32.7% vs 39.5%, 9.1% vs 23.2%, 20.9% vs 18.1%), 差异无统计学意义(P＞0.05),详见表 3。

表 1 两组患者透析前临床资料比较

Table 1 The comparison of clinical data before dialysis between the two groups

Items	HD group (n=55 cases)	CAPD group (n=43 cases)	t/x^2 Value	P Value
Age(year)	60.4± 11.3	62.6± 10.9	0.971	0.334
Age>60years(n/%)	24(43.6%)	30(69.7%)	6.661	0.009
Sex(male/femal)	34/21	26/17	0.018	0.891
weight(Kg)	58.4± 10.1	59.1± 10.3	0.338	0.737
Urine volume(ml/d)	620.0± 457.0	645.0± 480.0	0.263	0.793
SBP(mmHg)	165.2± 19.9	157.6± 20.2	1.864	0.065
DBP(mmHg)	87.2± 11.1	83.2± 10.9	1.784	0.078
Cr (μmol/L)	737.2± 243.9	756.9± 289.3	0.366	0.716
BUN(mmol/L)	24.2± 7.9	25.5± 9.0	0.760	0.449
K+ (mmoL/L)	4.8± 0.6	4.7± 0.7	0.761	0.448
Hemoglobin(g/L)	86.3± 15.9	85.8± 14.3	0.161	0.872
TP(g/L)	55.2± 9.0	53.2± 7.9	1.151	0.253
ALB(g/L)	33.2± 5.9	34.8± 4.2	-1.504	0.139
Glu(mmoL/L)	9.3± 6.9	8.8± 6.2	0.372	0.710

表 2 两组透析前后临床一般资料及生化指标比较

Table 2 Comparison of clinical data and biochemical indicators between the two groups

Group		Weight	Urine vlome	SBP	DBP	Cr	BUN
HD group	Before dialysis	58.4± 10.1	620.0± 457.0	157.6± 20.2	83.2± 10.9	737.2± 243.9	24.2± 7.9
	After dialysis	50.2± 8.9	487.0± 332.0	144.3± 14.4	71.4± 12.9	310.6± 210.1	11.6± 4.1
t Value		2.865	1.444	3.516	4.582	9.022	8.832
P Value		0.005	0.152	0.001	0.000	0.000	0.000
CAPDgroup	Before dialysis	59.1± 10.3	645.0± 480.0	165.2± 19.9	87.2± 11.1	756.9± 289.3	25.5± 9.0
	After dialysis	60.4± 9.1*	593.0± 420.0*	159.4± 17.1*	84.3± 10.5*	425.9± 267.2*	19.5± 6.9*
t Value		0.620	0.535	1.639	1.480	5.512	4.048
P Value		0.536	0.594	0.104	0.162	0.000	0.000

Group		ALB	TP	Hb	Glu	K^+
HD group	Before dialysis	33.2± 5.9	55.2± 9.0	86.3± 15.9	9.3± 6.9	4.8± 0.6
	After dialysis	37.4± 6.1	59.4± 8.1	98.3± 14.6	6.8± 4.1	3.6± 0.5
t/x^2 Value		3.670	2.572	4.123	2.310	11.395
P Value		0.0004	0.0116	0.0001	0.0228	0.0000
CAPD group	Before dialysis	34.8± 4.2	53.2± 7.9	85.8± 14.3	8.8± 6.2	4.7± 0.7
	After dialysis	33.4± 5.1*	52.5± 7.3*	92.6± 15.1*	7.4± 4.5	3.4± 0.4
t/x^2 Value		0.385	0.427	2.144	1.198	10.574
P Value		0.598	0.670	0.0349	0.234	0.0000

Note: *P<0.05 vs HD group

表 3 两组透析中及透析后并发症比较

Table 3 The comparison of the complications of the two groups during dialysis and after dialysis

group	Cardiovascular complications(n/%)	Infections (n/%)	Cerebrovascular complications(n/%)	Bleeding(n/%)	Rate of death(n/%)
HD group	20(36.3%)	18(32.7%)	5(9.1%)	17(30.9%)	10(18.1%)
CAPD group	7(16.2%)	17(39.5%)	10(23.2%)	6(13.9%)	9(20.9%)
x^2 Value	4.877	0.487	3.373	3.862	0.117
P Value	0.027	0.485	0.053	0.049	0.733

3 讨论

当前,随着我国经济社会的发展及人们物质条件水平的提高,糖尿病成为危害人类健康的主要杀手之一[6],而在老龄人中糖尿病引起的疾病及相关并发症更是居于前三位,由其血管并发症引起的糖尿病肾病,成为诱发慢性肾功能衰竭及尿毒症的高危因素[7],终末期表现为大量蛋白尿,水肿,低蛋白血症,肾功能损害等,因此透析治疗逐渐成为终末期糖尿病肾病最重要的的替代疗法。对于接受 HD 和 CAPD 治疗的终末期糖尿病肾病患者,其生活质量明显提高,预后能够得到改善,生存率相对延长。但是终末期糖尿病肾病患者,由于其本身往往存在心功能不全、高血压、冠心病、脑血管病变、出血感染等合并症,患者接受透析疗法的同时也存在一定的风险,主要表现为透析治疗后并发症多,死亡率较高,因而对选择哪一种透析方式则显得尤为重要[8,9]。

我们的研究显示通过比较终末期糖尿病肾病患者 HD 和 CAPD 治疗前后的临床及生化指标的差异,发现 HD 组治疗后体重、血肌酐、血尿素氮及血钾都下降明显(<0.05),HD 组及 CAPD 组尿量透析后都有减少,但前者尿量减少量多于后者。这些临床及生化指标都可以说明在毒素清除(小分子及中分子毒素充分)方面 HD 组较 CAPD 组明显。HD 组患者体重下降程度相较后者多可能原因是每次血液透析超滤脱水较多所致[10,11]。通过本研究我们还发现 HD 组血浆白蛋白及总蛋白水平较透析前显著升高(<0.05),而 CAPD 组血浆白蛋白及总蛋白较透析前无明显改善,并显著低于 HD 组(<0.05),可推测糖尿病肾病患者进行 HD 治疗较 CAPD 治疗可能在某种意义上更有助于改善患者的营养状况,其中的原因可能是 CAPD 治疗中,尤其并发腹膜炎时经腹膜途径可丢失大量白蛋白,而且从腹膜透析液中持续吸收的葡萄糖抑制患者的食欲[12],腹膜透析液过多可增加腹部饱胀感,可致患者食欲差,进食少,故较易发生营养

不良,造成低蛋白血症[13,14]。

在本研究中,HD 组心血管并发症（心血管并发症包括心力衰竭、急性冠脉综合症、心律失常、心脏骤停等）及出血发生率较 CAPD 组高,这些结果与既往文献所报道的相一致[15,16],这种情况的发生除了糖尿病肾病患者本身存在着不同程度的大及微动脉血管硬化、血管顺应性降低,同时由于血液透析时体外循环及超滤的影响可导致血容量波动变化,尤其是血压降低等,这些变化进而导致心率增加,外周阻力增大,且糖尿病肾病患者本身由于植物神经功能调节絮乱很容易出现急剧的血流动力学变化[17,18],进而可导致心血管并发症的出现。心血管并发症亦是导致透析患者死亡的主要原因[19,20]。HD 组发生出血的机率较高,主要原因可能是糖尿病存在小血管及微血管硬化的病理改变,而且糖尿病肾病患者多合并有高血压,高血脂等,多数患者血压及血脂控制效果不佳,常促使微血管病变恶化,增加微血管破裂出血的机率,所以对于有严重心脏病或脑出血的病人应首选 CAPD 治疗[21]。本次研究提示虽然两组的感染率比较无明显差异(>0.05),但 CAPD 组感染率还是稍高于 HD 组的,致使没有统计学意义的原因可能是样本量偏小,选择偏倚的存在，这些局限性在一定程度上也影响到了我们研究的精准性,CAPD 组感染率稍高可能与患者丢失血浆蛋白较多,营养不良导致抵抗力低下以及腹膜导管相关感染等原因所致[22-23]。

综上所述,HD 治疗与 CAPD 治疗各有特点及利弊之处,HD 能更充分的使毒素(小分子及中分子毒素充分)得到清除,过滤体内过多水分,明显减轻由于水肿引起的体重增加,能够相对提高患者的血浆白蛋白,改善营养状况,但存在的问题就是治疗时血液体外循环和超滤导致血容量变化、血流动力学不稳定,加上自身微血管硬化病变及自主神经功能调节异常[24],心血管及出血并发症的发生率较高。相对来说 CAPD 治疗对病人生活的影响较小，操作简便,是一种最接近生理状态的透析方法[25]。在透析过程中没有血液动力学及血容量的剧烈变化、内环境保持相对稳定。透析后并发症较少,患者生活质量较好。总之对于患者治疗应当采取个体化治疗,两种治疗措施应当取长补短,以改善病人的生存质量及预后为目标。

参 考 文 献(References)

[1] MyKKan en I, Kuu lsisto J. Cardiovascular disease risk factors as predictors of type 2 diabetes mellitus in elderly subjects [J]. Diabetologia, 2003,24: 1820-1841

[2] Halawa MR, Karawagh A, Zeidan A, et al. Prevalence of painful diabetic peripheral neuropathy among patients suffering from diabetes mellitus in Saudi Arabia[J]. Curr Med Res Opin, 2010, 26(2):337-343

[3] Haslbeck M. Diabetic neuropathy: therapeutic nihilism is no longer acceptable[J]. MMW Fortschr Med, 2007, 5(9):121-124

[4] Nybo M, Jespersen B, Aarup M. Determinants of bone mineral density in patients on haemodialysis or peritoneal dialysis-- a cross-sectional, longitudinal study[J] . Biochem Med (Zagreb),2013, 23(3):342-350

[5] García-Cantón C, Rufino-Hernández JM. A comparison of medium-term survival between peritoneal dialysis and haemodialysis in accordance with the initial vascular access[J]. Nefrologia, 2013, 33 (5):629-639

[6] Lucatello A, Cocchi R, Degli E. Myths and reality concerning hypertension in peritoneal dialysis patients of a multicenter study [J]. Blood Press Mon it, 2001, 3(2): 983-901

[7] Yang WS, Min WK, Pank J. Effect of increasing serum album in on serum lipoptotein concentrateion in patients receiving CAPD [J]. Am J Kidney Dis, 2002, 30 (4): 5071

[8] Remón Rodríguez C, Quirós Ganga PL. Current evidence shows that survival outcomes are equivalent for dialysis techniques [J]. Nephrol, 2011, 31(5): 520-527

[9] Yang W, Lu J, Weng J, et al. Prevalence of diabetes among men and women in China[J]. N Engl J Med, 2010, 362(12): 1090-1191

[10] Donauer J. Hemodialysis-induced hypotension: impact of technologic advances [J]. Semin Dial, 2009, 17(5): 333-335

[11] Thorp ML. Diabetic nephropathy: Common questions [J]. Am Fam Physician, 2008, 72(1): 96-99

[12] Melissa Stanley. Peritoneal dialysis versus hemodialysis (adult)[J]. Nephrology, 2010, 15: S24-S31

[13] Kovesdy CP, Shinaberger CS, Kalantar-Zadeh K. Epidemiology of dietary nutrient intake in ESRD[J]. Semin Dial, 2010, 23(4):353-358

[14] Dong J, Wang T, Wang HY. The impact of new comorbidities on nutritional status in continuous ambulatory peritoneal dialysis patients [J]. Blood Purif, 2006, 24(5-6):517-23

[15] Vonesh EF, Snyder JJ, Foley RN, et al. Mortality studies comparing peritoneal dialysis and hemodialysis: what do they tell us? [J]. Kidney Int Suppl, 2006,(103):S3-S11

[16] Bagdasarian N, Heung M, et al. Infectious complications of dialysis access devices[J]. Infect Dis Clin North Am, 2012, 26(11): 127-141

[17] Zhao Fang-fang, Wang Ji-meng, Cheng Can. Research on pathogenesis of diabetic nephropathy [J]. Progress in Modern Biomedicine, 2010, 10(6): 4796-4798

[18] Hakim FA, Pflueger A. Role of oxidative stress in diabetic kidney disease[J]. Med Sci Monit, 2010, 16(2):RA37-48

[19] Li Ai-qin, Lu Huan, Xu Wen-jing, et al. The Research Development of Oxidative Stress and T2DM [J]. Progress in Modern Biomedicine, 2010, 11(6): 2371-2373

[20] Fieghen HE, Friedrich JO, Burns KE, et al. The homodynamic tolerability and feasibility of sustained low efficiency dialysis in the management of critically ill patients with acute kidney injury [J]. BMC Nephrology, 2010, 25(11):32-34

[21] Navarro-González JF, Mora-Fernández C, Muros de Fuentes M, et al. Inflammatory molecules and pathways in the pathogenesis of diabetic nephropathy[J]. Nat Rev Nephrology, 2011,7(6):327-340

[22] Prakash J, Singh L K, Shreeniwas S, et al. Non-infectious complications of continuous ambulatory peritoneal dialysis and their impact on technique survival[J]. Indian J Nephrology, 2011, 21(2):112-115

[23] Remón Rodríguez C, Quirós Ganga PL. Current evidence shows that survival outcomes are equivalent for dialysis techniques [J]. Nephrology, 2011, 4(4): 230-233

[24] Zhou Ying, Chen Hong. Relationship between endothelial dysfunction and cardiovascular disease [J]. Progress in Modern Biomedicine, 2006, 8(6): 65-68

[25] Zhang AH, Cheng LT. Comparison of quality of life and causes of hospitalization between hemodialysis and peritoneal dialysis patients in China[J]. Health Quall Life Outcomes, 2007, 9(14): 2301-2303