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复方 α -酮酸联合血液透析和血液灌流治疗慢性肾衰竭的疗效及对钙磷代谢的影响*

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摘要 目的: 研究复方 α -酮酸联合血液透析和血液灌流治疗慢性肾衰竭(CRF)的临床疗效及对钙磷代谢的影响。方法: 选择 94 例 CRF 患者为研究对象, 按照随机数表法将患者分为联合组与对照组各 47 例。对照组采用血液透析、血液灌流进行治疗, 联合组则在对照组基础之上联合使用复方 α -酮酸治疗。比较治疗前及治疗 6 个月后两组患者肾功能指标[血清胱抑素 C(CysC)、血清肌酐(Scr)、血尿素氮(BUN)]及钙磷代谢(血钙、血磷)变化, 并分析治疗 6 个月后两组患者疗效及治疗 6 个月内药物不良反应发生情况差异。结果: 治疗 6 个月后, 联合组治疗总有效率明显高于对照组($P<0.05$); 两组患者 CysC、Scr、BUN 及血磷水平均较治疗前显著降低, 且联合组明显低于同一时间对照组($P<0.05$)。两组患者血钙水平均较治疗前显著升高, 且联合组明显高于同一时间对照组($P<0.05$)。治疗 6 个月内, 两组患者药物不良反应总发生率比较差异均无统计学意义($P>0.05$)。结论: 复方 α -酮酸联合血液透析和血液灌流治疗 CRF 的疗效显著, 且能够改善肾功能与钙磷代谢, 对患者疾病转归有利。

关键词: 复方 α -酮酸; 血液透析; 血液灌流; 慢性肾衰竭; 钙磷代谢

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Therapeutic Effect of Compound α -ketoacid Combined with Hemodialysis and Hemoperfusion in the Treatment of Chronic Renal Failure and Its Effect on Calcium and Phosphorus Metabolism*

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ABSTRACT Objective: To investigate the clinical effect of compound α -ketoacid combined with hemodialysis and hemoperfusion in the treatment of chronic renal failure(CRF) and its effect on calcium and phosphorus metabolism. **Methods:** 94 patients with CRF were selected as subjects, the patients were divided into the combined group and the control group according to the random number table method, each group was 47 cases. The control group was treated with hemodialysis and hemoperfusion, the combined group was treated with compound α -ketoacid in addition to the control group. Renal function indexes of the two groups were compared before and after 6 months of treatment[Cystine-C(CysC), Serum creatinine(Scr), Blood Urea Nitrogen(BUN)] and changes in calcium and phosphorus metabolism (blood calcium, blood phosphorus), to analyze the difference between the two groups in the therapeutic effect and the occurrence of adverse drug reactions 6 months after treatment and within 6 months after treatment. **Results:** After 6 months of treatment, the total effective rate of the combined group was significantly higher than that of the control group ($P<0.05$). The levels of CysC, Scr, BUN and blood phosphorus in both groups were significantly lower than those before treatment and those in the combined group were significantly lower than the control group at the same time ($P<0.05$). Blood calcium levels in both groups were significantly higher than before treatment and that in the combined group was significantly higher than the control group at the same time ($P<0.05$). Within 6 months of treatment, there was no significant difference in the total incidence of adverse drug reactions between the two groups ($P>0.05$). **Conclusion:** The therapeutic effect of compound α -ketoacid combined with hemodialysis and hemoperfusion in the treatment of CRF is significant and it can improve renal function, calcium and phosphorus metabolism, it's benefit to the patients' prognosis of disease.

Key words: Compound α -ketoacid; Hemodialysis; Hemoperfusion; Chronic renal failure; Calcium and phosphorus metabolism

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前言

慢性肾衰竭(CRF)是由各种原因造成肾实质性损伤的慢性进行性疾病,终末期肾功能可完全丧失,继而发展为尿毒症,

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临床治疗一般采用血液透析、血液灌流^[1,2]。随着时代与科学技术发展,血液净化技术也在不断完善与进步,患者生存率随之提高,但 CRF 患者高死亡率仍不能忽视^[3,4]。钙磷代谢紊乱、继发性甲状腺功能亢进(SPTH)是维持性血液透析患者常见的并发症,可能引起心脑血管并发症而间接增高死亡风险^[5,6]。提高血液净化效率和 CRF 疗效及钙磷代谢紊乱预防、降低 SPTH 的发生率已成为当前研究重点。因复方 α - 酮酸能够与磷结合阻止磷吸收、降低氮的摄入,早前有学者研究复方 α - 酮酸联合尿毒清治疗维持性血液透析患者,已证实复方 α - 酮酸可改善钙磷代谢,但在治疗 CRF 方面临床研究仍较少^[7,8]。本次研究通过对本院 94 例 CRF 患者采取复方 α - 酮酸联合血液净化治疗及单纯血液净化治疗来观察两组患者的疗效及钙磷代谢情况,旨在为临床治疗 CRF 提供一定的数据参考。

1 资料与方法

1.1 一般资料

选择我院 2017 年 4 月到 2019 年 3 月期间收治的 94 例 CRF 患者为研究对象,按照随机数表法将患者分为联合组与对照组各 47 例。纳入标准:①符合 CRF 诊断标准者^[9];②年龄 ≥ 18 岁者;③首次接受治疗者;④经沟通患者同意此次研究者。排除标准:①妊娠期或哺乳期妇女;②对此次研究药物过敏者;③入组前 1 个月内有使用抗生素或糖皮质激素者;④既往有精神疾病史者。联合组男性 32 例,女性 15 例;年龄为 29~73 岁,平均(51.39 $\pm$ 6.41)岁;病程为 8~48 个月,平均(30.23 $\pm$ 3.64)个月;其中肾小球肾炎 23 例,肾盂肾炎 15 例,间质性肾炎 7 例,尿毒症 2 例。对照组男性患者为 29 例,女性患者为 18 例;年龄 30~74 岁,平均(53.16 $\pm$ 5.65)岁;病程 6~60 个月,平均(31.15 $\pm$ 3.41)个月;其中肾小球肾炎 25 例,肾盂肾炎 18 例,间质性肾炎 3 例,尿毒症 1 例。两组患者的一般临床资料均无统计学差异($P>0.05$),具有可比性。

1.2 方法

1.2.1 治疗方法 对照组应用血液透析、血液灌流治疗,灌流

选择 HA130 树脂灌流器,150~200 mL/min 血液流量,1.5~2 h,完成后 2 h 再进行血液透析,透析仪器采用德国 Fresenius 公司的 4008S 型透析机,透析液采用常规碳酸氢盐,流量为 500 mL/min,血流量 300 mL/L,3 h/次,2 次/1 周,持续治疗 6 个月。联合组在对照组基础上联合口服复方 α - 酮酸片(商品名:开同,生产企业:北京费森尤斯卡比医药有限公司,规格:0.63g/片,国药准字 H20041442),5 片/次,tid,于用餐期间整片吞服,持续治疗 6 个月。

1.2.2 检测方法 于治疗前及治疗 6 个月后采集患者空腹静脉血样,置入离心机 3400 r/min 离心 10 min 获得血清,用血清胱抑素 C(CysC)、血清肌酐(Scr)、血尿素氮(BUN)、血钙、血磷对应的酶联免疫吸附法(ELISA)试剂盒检测上述指标的浓度。

1.3 评估标准

临床疗效^[10]:治疗后患者 Scr 较治疗前降低 $>30\%$ 、临床症状消失为显效;治疗后患者 Scr 较治疗前降低 $5\% \sim 30\%$ 、临床症状有明显好转为有效;治疗后患者 Scr 无明显变化、临床症状无明显好转则为无效;有效率=(显效例数+有效例数)/本组总例数 $\times 100\%$ 。

1.4 观察指标

比较治疗前及治疗 6 个月后两组患者肾功能指标(CysC、Scr、BUN)及钙磷代谢(血钙、血磷)变化,并分析治疗 6 个月后两组患者疗效及 6 个月内药物不良反应发生情况差异。

1.5 统计学分析

数据分析采用 SPSS22.0 软件进行分析统计,计量资料以均数 $\pm$ 标准差来表示,组间同一时间比较采用独立样本 t 检验,组内不同时间比较采用配对 t 检验;计数资料以率(%)表示,采用 χ^2 检验。 $P<0.05$ 为差异有统计学意义。

2 结果

2.1 两组患者疗效比较

治疗 6 个月后,联合组治疗总有效率明显高于对照组($P<0.05$),见表 1。

表 1 两组患者临床疗效比较 [例(%)]

Table 1 Comparison of clinical effect between the two groups [n(%)]

Groups	n	Excellent	Valid	Invalid	Total effective rate
Combined group	47	28(59.57)	17(36.17)	2(4.25)	95.74
Control group	47	19(40.43)	19(40.43)	9(19.14)	80.85
χ^2					5.045
P					0.025

2.2 两组患者肾功能比较

治疗 6 个月后,两组患者 CysC、Scr、BUN 水平均较治疗前

显著降低,且联合组明显低于同一时间对照组($P<0.05$),见表 2。

表 2 两组患者治疗前后 CysC、Scr、BUN 水平比较($\bar{x} \pm s$)

Table 2 Comparison of CysC, Scr, BUN levels between the two groups before and after treatment($\bar{x} \pm s$)

Groups	Time	CysC(mg/L)	Scr(μ mol/L)	BUN(mmol/L)
Combined group(n=47)	Before treatment	1.69 $\pm$ 0.56	518.73 $\pm$ 105.33	15.78 $\pm$ 3.97
	6 months after treatment	1.32 $\pm$ 0.35 [#]	435.65 $\pm$ 92.65 [#]	11.65 $\pm$ 3.41 [#]
Control group(n=47)	Before treatment	1.68 $\pm$ 0.48	517.88 $\pm$ 102.12	15.56 $\pm$ 4.12
	6 months after treatment	1.48 $\pm$ 0.38 [#]	475.33 $\pm$ 99.48 [#]	13.03 $\pm$ 3.15 [#]

Note: compare with before treatment, [#] $P<0.05$; compare with the control group, * $P<0.05$.

2.3 两组患者钙磷代谢水平比较

治疗 6 个月后, 两组患者血钙水平较治疗前显著升高, 且联合组明显高于同一时间对照组 ($P < 0.05$); 血磷水平均较治

疗前显著降低, 且联合组明显低于同一时间对照组 ($P < 0.05$), 见表 3。

表 3 两组患者治疗前后血钙、血磷水平比较 ($\bar{x} \pm s$)

Table 3 Comparison of blood calcium, blood phosphorus levels between the two groups before and after treatment ($\bar{x} \pm s$)

Groups	Time	Blood calcium (mmol/L)	Blood phosphorus (mmol/L)
Combined group (n=47)	Before treatment	2.25 $\pm$ 0.39	2.33 $\pm$ 0.51
	6 months after treatment	2.56 $\pm$ 0.37* [#]	1.89 $\pm$ 0.79* [#]
Control group (n=47)	Before treatment	2.21 $\pm$ 0.33	2.35 $\pm$ 0.4
	6 months after treatment	2.40 $\pm$ 0.39 [#]	2.15 $\pm$ 0.42 [#]

Note: compare with before treatment, [#] $P < 0.05$; compare with the control group, * $P < 0.05$.

2.4 两组患者药物不良反应发生情况比较

治疗 6 个月内, 两组患者药物不良反应总发生率比较差异

均无统计学意义 ($P > 0.05$), 各类药物不良反应程度均较轻, 未经任何干预均自行缓解, 见表 4。

表 4 两组患者药物不良反应比较例 (%)

Table 4 Comparison of adverse drug reaction between the two groups n (%)

Groups	Fever	Cram	Diarrhea	Total incidence
Combined group (n=47)	3 (6.38)	1 (2.13)	2 (4.26)	6 (12.77)
Control group (n=47)	1 (2.13)	2 (4.26)	1 (2.13)	4 (8.51)
χ^2				0.447
P				0.503

3 讨论

CRF 作为多数慢性肾脏疾病发展至终末期后的共同表现, 发病原因相对复杂, 如慢性间质性肾炎、代谢异常、肿瘤细胞浸润肾间质等^[11-13]。目前临床主要采用的治疗方式有血液透析、血液灌流等, 但长期维持性血液透析不仅对患者造成极大经济与精神负担, 还容易引起严重并发症, 因此临床通过结合药物治疗改善疗效必要性较大^[14,15]。

目前临床治疗 CRF 一般采用血液透析、血液灌流, 血液透析主要利用半透膜将体内多种有害、多余代谢废物及电解质通过扩散、对流等方式排出体外, 从而纠正酸碱平衡、净化血液; 血液灌流是利用灌流器的固态吸附剂清除患者血液内毒素及有害物质^[16,17]。常规透析能有效清除患者体内中、小分子毒素, 但对体内大分子物质清除效果较差; 而血液灌流特殊的作用机制可吸附体内大分子物质净化血液, 因而血液透析联合血液灌流能更彻底实现血液净化^[18-20]。早前李松杨等^[21]曾有研究探讨复方 α -酮酸对非透析慢性肾病患者具有降压作用, 取得良好疗效。本研究结果也显示, 两组患者肾功能指标均虽较治疗前有明显改善, 且联合组改善效果显著较同一时间对照组更好, 这表明复方 α -酮酸联合血液透析、血液灌流治疗 CRF 疗效更好, 究其原因, 可能因为复方 α -酮酸是一种复方制剂, 能够将人体内非必需氨基酸转化为必需氨基酸, 从而减少摄入氨基酸、降低尿素的合成, 减少毒性产物的积累, 对 CRF 患者的肾功能有正面影响^[22,23]。

相关研究表明, 长期维持性血液透析患者来的磷代谢紊乱、SPTH 属于常见并发症, 也是增高死亡率的重要因素之一, 血液净化虽能有效清除患者体内血磷, 但在下次透析前血磷浓度可能会再次上升, 因此在施加血液净化治疗的同时, 可联用复方 α -酮酸改善钙磷代谢紊乱, 降低 SPTH 发生率^[24-26]。汪嘉

莉^[27]等曾用复方 α -酮酸联合醋酸钙治疗维持性血液透析高磷血症, 证实复方 α -酮酸能改善钙磷代谢水平。本次研究结果显示, 两组患者经过治疗后钙磷代谢指标均较治疗前有明显改善, 其中联合组钙磷代谢水平改善效果显著较同一时间对照组更好, 提示复方 α -酮酸联合血液透析、血液灌流对 CRF 患者钙磷代谢水平有明显改善, 分析其原因认为复方 α -酮酸可与磷结合, 减少磷在体内的吸收, 从而降低血磷, 且复方 α -酮酸因其减少氮的摄入、降低蛋白质的降解, 配合上低蛋白饮食可减少因蛋白摄入不足而造成的营养不良并提高血钙^[28-30]。

综上所述, 复方 α -酮酸联合血液透析、血液灌流治疗能够明显改善 CRF 患者的肾功能, 优化患者钙磷代谢水平, 药物不良反应发生率较低, 该方案安全性良好, 有较高的临床推广价值。

参考文献 (References)

- [1] Khoury T, Tzuket K, Abel R, et al. The gut-kidney axis in chronic renal failure: A new potential target for therapy[J]. Hemodial Int, 2017, 21(3): 323-334
- [2] Akyüz Özdemir A, Erdal R, Haberal M. Factors Predisposing to the Use of Complementary Therapies in Patients With Chronic Renal Failure[J]. Exp Clin Transplant, 2018, 16 Suppl 1(Suppl 1): 64-69
- [3] Milovanova LY, Dobrosmyslov IA, Milovanov YS, et al. Fibroblast growth factor-23 (FGF-23) / soluble Klotho protein (sKlotho) / sclerostin glycoprotein ratio disturbance is a novel risk factor for cardiovascular complications in ESRD patients receiving treatment with regular hemodialysis or hemodiafiltration [J]. Ter Arkh, 2018, 90(6): 48-54
- [4] Anderson CAM, Nguyen HA. Nutrition education in the care of patients with chronic kidney disease and end-stage renal disease [J]. Semin Dial, 2018, 31(2): 115-121
- [5] Lu JR, Yi Y, Xiong ZX, et al. The Study of Low Calcium Dialysate on

- Elderly Hemodialysis Patients with Secondary Hypoparathyroidism [J]. *Blood Purif*, 2016, 42(1): 3-8
- [6] Li HL, Li H, Cao YF, et al. Effects of keto acid supplements on Chinese patients receiving maintenance hemodialysis: a prospective, randomized, controlled, single-center clinical study[J]. *Chin Med J (Engl)*, 2020, 133(1): 9-16
- [7] 刘乃全, 孙广萍. 尿毒清联合复方 α -酮酸片对维持性血液透析患者钙磷代谢的影响[J]. *解放军预防医学杂志*, 2016, 34(2): 172-174, 182
- [8] 翟力军. 尿毒清、阿托伐他汀对糖尿病肾病维持性血液透析患者微炎症反应的影响[J]. *河北医药*, 2019, 41(14): 2193-2195
- [9] 中国中西医结合学会肾脏疾病专业委员会. 慢性肾衰竭中西医结合诊疗指南[J]. *河北中医*, 2016, 38(2): 313-317
- [10] 梁文浩, 崔卫华. 金水宝胶囊联合复方 α -酮酸片治疗慢性肾功能衰竭的临床研究[J]. *现代药物与临床*, 2016, 31(9): 1443-1446
- [11] Brunet P. La prise en charge de l'insuffisance rénale chronique par hémodialyse Treatment of chronic kidney failure by haemodialysis[J]. *Soins*, 2018, 63(826): 21-23
- [12] Chilelli NC, Cremasco D, Cosma C, et al. Effectiveness of a diet with low advanced glycation end products, in improving glycoxidation and lipid peroxidation: a long-term investigation in patients with chronic renal failure[J]. *Endocrine*, 2016, 54(2): 552-555
- [13] 邵秋媛, 张苗, 张庆燕, 等. 血液透析和腹膜透析对慢性肾衰竭患者微炎症状态和生活质量影响的临床研究[J]. *现代生物医学进展*, 2018, 18(13): 2478-2482
- [14] Lu W, Ren C, Han X, et al. The protective effect of different dialysis types on residual renal function in patients with maintenance hemodialysis: A systematic review and meta-analysis [J]. *Medicine (Baltimore)*. 2018, 97(37): e12325
- [15] Wang XF, Zhang BH, Lu XQ, et al. Efficacy of different hemodialysis methods on dendritic cell marker CD40 and CD80 and platelet activation marker CD62P and P10 in patients with chronic renal failure [J]. *J Clin Lab Anal*, 2019, 33(3): e22713
- [16] Lu W, Jiang GR. HD/HP versus HD trial Group. Randomised, open-label, multicentre trial comparing haemodialysis plus haemoperfusion versus haemodialysis alone in adult patients with end-stage renal disease (HD/HP vs HD): study protocol[J]. *BMJ Open*, 2018, 8(7): e022169
- [17] Cobo G, Lindholm B, Stenvinkel P. Chronic inflammation in end-stage renal disease and dialysis [J]. *Nephrol Dial Transplant*, 2018, 33(suppl 3): iii35-iii40
- [18] Maduell F. Hemodiafiltration versus conventional hemodialysis: Should "conventional" be redefined? [J]. *Semin Dial*, 2018, 31 (6): 625-632
- [19] Ahmadmehrabi S, Tang WHW. Hemodialysis-induced cardiovascular disease[J]. *Semin Dial*, 2018, 31(3): 258-267
- [20] Sabatino A, Piotti G, Cosola C, et al. Dietary protein and nutritional supplements in conventional hemodialysis [J]. *Semin Dial*, 2018, 31 (6): 583-591
- [21] 李松杨, 顾波, 马骏, 等. 复方 α 酮酸对 CKD 3~5 期非透析慢性肾脏病患者的降压作用探讨[J]. *世界临床药物*, 2016, 37(2): 115-119
- [22] Wang M, Xu H, Chong Lee Shin OL, et al. Compound α -keto acid tablet supplementation alleviates chronic kidney disease progression via inhibition of the NF- κ B and MAPK pathways [J]. *J Transl Med*, 2019, 17(1): 122
- [23] 丁宏, 韩鸷赢, 张戈. 海昆肾喜胶囊联合复方 α -酮酸片治疗慢性肾功能衰竭的临床研究 [J]. *现代药物与临床*, 2019, 34(10): 3050-3054
- [24] Demirci BG, Tutal E, Eminsoy IO, et al. Dietary Fiber Intake: Its Relation With Glycation End Products and Arterial Stiffness in End-Stage Renal Disease Patients [J]. *J Ren Nutr*, 2019, 29 (2): 136-142
- [25] Wang J, Lv MM, Zach O, et al. Calcium-Polystyrene Sulfonate Decreases Inter-Dialytic Hyperkalemia in Patients Undergoing Maintenance Hemodialysis: A Prospective, Randomized, Crossover Study[J]. *Ther Apher Dial*, 2018, 22(6): 609-616
- [26] Jin K, Ban TH, Jung JY, et al. Stabilization of serum alkaline phosphatase in hemodialysis patients by implementation of local chronic kidney disease-mineral bone disorder management strategy: A quality improvement study[J]. *Kidney Res Clin Pract*, 2018, 37(2): 157-166
- [27] 汪嘉莉, 张林, 王松, 等. 复方 α -酮酸联合醋酸钙对维持性血液透析患者钙磷代谢的影响[J]. *医学综述*, 2015, 21(7): 1344-1345
- [28] Milovanova SY, Milovanov YS, Taranova MV, et al. Vliianie keto/aminokislota i ogranicheniia belka na status pitaniia bol'nykh khronicheskoi bolezniu pochetk IIIB-IV stadii [Effects of keto/amino acids and a low-protein diet on the nutritional status of patients with Stages 3B-4 chronic kidney disease][J]. *Ter Arkh*, 2017, 89(6): 30-33
- [29] Zeng X, Liu C, Yang W, et al. A general two-step one-pot synthesis process of ynones from α -keto acids and 1-iodoalkynes [J]. *Chem Commun (Camb)*, 2018, 54(68): 9517-9520
- [30] David C, Peride I, Niculae A, et al. Very low protein diets supplemented with keto-analogues in ESRD predialysis patients and its effect on vascular stiffness and AVF Maturation [J]. *BMC Nephrol*, 2016, 17(1): 131
- (上接第 1171 页)
- [24] 王晓亮, 葛亚力, 张勇, 等. 喉罩下七氟醚用于先天性心脏病患儿介入手术的麻醉效果[J]. *临床麻醉学杂志*, 2011, 27(7): 687-689
- [25] 赵振海, 张文斌, 李亚琴, 等. 快速通道麻醉在小儿先天性心脏病手术中的应用及对镇静、镇痛效果的影响 [J]. *现代生物医学进展*, 2019, 19(6): 1160-1163
- [26] Akçay L, Soyalt C, Yüzkat N, et al. Comparison of the Effects of Desflurane and Sevoflurane on Cerebral Oxygen Saturation in Patients Undergoing Thyroidectomy: A Randomised Controlled Clinical Study[J]. *Turk J Anaesthesiol Reanim*, 2019, 47(5): 396-401
- [27] Tang S, Huang W, Zhang K, et al. Comparison of effects of propofol versus sevoflurane for patients undergoing cardiopulmonary bypass cardiac surgery[J]. *Pak J Med Sci*, 2019, 35(4): 1072-1075
- [28] Zhou H, Zhou D, Lu J, et al. Effects of Pre-Cardiopulmonary Bypass Administration of Dexmedetomidine on Cardiac Injuries and the Inflammatory Response in Valve Replacement Surgery with a Sevoflurane Postconditioning Protocol: A Pilot Study [J]. *J Cardiovasc Pharmacol*, 2019, 74(2): 91-97
- [29] Huang G, Hao F, Hu X. Downregulation of microRNA-155 stimulates sevoflurane-mediated cardioprotection against myocardial ischemia/reperfusion injury by binding to SIRT1 in mice [J]. *J Cell Biochem*, 2019, 120(9): 15494-15505
- [30] Begum U, Singh PR, Naithani B, et al. Dexmedetomidine as Bolus or Low-dose Infusion for the Prevention of Emergence Agitation with Sevoflurane Anesthesia in Pediatric Patients [J]. *Anesth Essays Res*, 2019, 13(1): 57-62