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胰岛素联合补钾对小儿糖尿病酮症酸中毒疗效及对 1,5-AG、β-HB 影响 *

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摘要 目的：探讨胰岛素联合补钾对小儿糖尿病酮症酸中毒疗效及对 1,5- 脱水葡糖苷 (1,5-anhydroglucitol，1,5-AG)、β 羟丁酸(β-hydroxybutyricacid，β-HB)影响。**方法：**选取我院 2016-2019 年所收治的 120 例小儿糖尿病酮症酸中毒患者，根据胰岛素不同剂量，将其分为研究组和对照组，每组患儿 60 例，两组患儿均予以补钾等常规治疗，在此基础上，研究组患儿联合小剂量胰岛素，对照组患儿联合大剂量胰岛素，对比不同治疗方案的疗效及对 1,5-AG、β-HB 影响。**结果：**两组患儿治疗前血糖、1,5-AG 对比无统计学差异（$P>0.05$），治疗后，研究组患儿血糖及 1,5-AG 明显优于对照组（$P<0.05$）；两组患儿治疗前血清β-HB、白介素 6(interleukin，IL-6)、IL-10 对比无统计学差异（$P>0.05$），治疗后，两组患儿相关指标均较治疗前明显降低（$P<0.05$），其中研究组患儿治疗后β-HB 明显低于对照组（$P<0.05$），而两组患儿治疗后 IL-6、IL-10 对比无统计学差异（$P>0.05$）；两组患儿治疗有效率对比无统计学差异（$P>0.05$）；研究组患儿并发症发生率明显低于对照组（$P<0.05$）。**结论：**小剂量胰岛素联合补钾对小儿糖尿病酮症酸中毒疗效良好，可改善患儿炎症反应，促使临床症状改善，升高 1,5-AG，降低β-HB，因此，在临床治疗中，需全面评估患儿病情，结合患儿实际情况，合理选择胰岛素剂量，保证患儿最佳治疗效果。

关键词：胰岛素；补钾；小儿糖尿病酮症酸中毒；1,5-AG；β-HB

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Effect of Insulin Combined with Potassium Supplementation on Pediatric Diabetic Ketoacidosis and Effects on 1,5-AG and β-HB*

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ABSTRACT Objective: To investigate the effect of insulin combined with potassium supplementation on diabetic ketoacidosis and the effects on 1,5-AG and β-HB. **Methods:** 120 patients with pediatric diabetic ketoacidosis admitted to our hospital from 2016 to 2019 were divided into study group and control group according to different doses of insulin. 60 children in each group were given potassium supplementation. On the basis of routine treatment, the study group combined with low-dose insulin, the control group combined with high-dose insulin, compared the efficacy of different treatment options and the impact on 1,5-AG, β-HB. **Results:** There was no significant difference in pre-treatment blood glucose and 1,5-AG between the two groups ($P>0.05$). After treatment, the blood glucose and 1,5-AG of the study group were significantly better than the control group ($P<0.05$). There was no significant difference in serum β-HB, IL-6 and IL-10 between the two groups ($P>0.05$). After treatment, the related indexes of the two groups were significantly lower than those before treatment ($P<0.05$). The β-HB of the study group was significantly lower than that of the control group ($P<0.05$), but there was no significant difference in IL-6 and IL-10 between the two groups ($P>0.05$). There was no significant difference in the effective rate of treatment ($P>0.05$). The incidence of complications in the study group was significantly lower than that in the control group ($P<0.05$). **Conclusion:** Low-dose insulin combined with potassium supplementation is effective in children with diabetic ketoacidosis, which can improve the children's inflammatory response, promote clinical symptoms, increase 1,5-AG, and lower β-HB. Therefore, in clinical treatment, It is necessary to comprehensively evaluate the condition of the child, and combine the actual situation of the child to reasonably select the insulin dose to ensure the best therapeutic effect of the child.

Key words: Insulin; Potassium supplementation; Pediatric diabetic ketoacidosis; 1,5-AG; β-HB

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前言

糖尿病酮症酸中毒是糖尿病一种常见并发症，主要表现为恶心、脱水、多尿、腹痛等症状，同时也诱导了其他疾病的发生

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几率，病情严重[1,2]，如果发病后，未能及时采取有效治疗方案，将严重威胁患儿生命安全[1]。治疗小儿糖尿病酮症酸中毒，临床上主要是给予胰岛素控制患儿的病情，补液以恢复血容量，纠正脱水状态，降低血糖，纠正电解质及酸碱平衡失调，同时积极的寻找诱因，防止并发症，降低患儿的病死率[3,4]。胰岛素治疗作为基础治疗，有十分重要的作用，但是不同剂量胰岛素，临床效果存在较大的差异，对于胰岛素剂量的选择至今存在争议，以往的治疗常采用大剂量胰岛素，但是患儿易出现脑水肿、低血糖等不良反应，有学者认为小剂量的效果更佳，且引起的不良反应几乎没有[5]，因此，研究新的、安全有效的胰岛素使用剂量至关重要，为探讨小儿糖尿病酮症酸中毒最佳的治疗方案，分析适宜的剂量范围，探究最佳的治疗方案，本研究选取我院近3年所收治的120例小儿糖尿病酮症酸中毒患者纳入研究，探讨补钾联合不同剂量胰岛素的疗效，以下为详细汇报。

1 资料与方法

1.1 一般资料

选取我院2016-2019年所收治的小儿糖尿病酮症酸中毒患者，纳入标准：符合临床诊断标准[6]；患儿家属均签署知情同意书。排除标准：合并心、肝、肾等严重性疾病患者；有遗传性家族史、免疫性疾病患者；不依从本次研究者。根据不同治疗方法，将其分为研究组和对照组，每组患儿60例，两组的一般资料对比无统计学意义（$P>0.05$），见表1，可对比。

表1 两组一般资料对比

Table 1 Comparison of general data between the two groups of children

Groups	n	Gender(Male/Female)	Age (years)	Diabetes course (month)	The course of diabetic ketoacidosis (d)
Research group	60	31/29	5.12± 1.34	10.09± 1.23	5.31± 0.42
Control group	60	32/28	5.21± 1.15	10.11± 1.31	5.52± 0.31

1.2 治疗方法

两组在入院后，均给予吸氧、心电监护等治疗，全面评估患儿酸中毒、脱水情况，每隔1 h检测患儿血糖水平，每隔4 h检测患儿的电解质及血气分析。由于受病情影响，机体钾水平会降低，对此，需补充适量钾元素。在此基础上，研究组采取小剂量胰岛素注射液（江苏万邦生化医药集团有限责任公司，国药准字：H10890001；规格：10 mL:400 Iu），持续静脉给药0.05～0.10 U/(kg·h)。对照组采取大剂量胰岛素，用药同研究组，用药剂量0.1~0.20 U/(kg·h)胰岛素。

两组在整个治疗过程中，针对患儿实际情况，予以补液治疗，平衡患儿机体电解质，注意观察患儿各项指标变化情况，若指标一旦达正常标准，则立即停药。

1.3 观察指标

取3 mL空腹静脉血，放入无菌试管内，以3000 r/min转速分离15 min后，利用放射免疫法检测两组患儿治疗前后IL-6、IL-10、β-HB，采取血糖监测仪检测两组患儿治疗前后血糖，利用酶法测定两组患儿治疗前后1,5-AG，1,5-AG值和血糖呈负相关[7,8]。

1.4 疗效评定标准

临床症状消失，尿酮体呈阴性，则治愈；临床症状改善，尿酮体减少，则有效；临床症状无改变，尿酮体无减少，则无效[9,10]。

1.5 统计学方法

采用SPSS 19.0，血糖、1,5-AG、β-HB、IL-6、IL-10等计量资料采取（$\bar{x}\pm s$）表示，行t检验；治疗效果、并发症等计数资料采取%表示，行χ^2检验，$P<0.05$有统计学意义。

2 结果

2.1 治疗前后血糖、1,5-AG对比

两组治疗前血糖、1,5-AG对比无统计学差异（$P>0.05$），治疗后，两组血糖较治疗前明显降低，1,5-AG较治疗前明显升高（$P<0.05$），其中研究组治疗后血糖及1,5-AG明显优于对照组（$P<0.05$）。如表2。

表2 治疗前后血糖、1,5-AG对比（$\bar{x}\pm s$，mmol/L）

Table 2 Comparison of blood glucose and 1,5-AG before and after treatment ($\bar{x}\pm s$, mmol/L)

Groups	n	Blood sugar		1,5-AG	
		Pretherapy	Post-treatment	Pretherapy	Post-treatment
Research group	60	5.57± 0.70	4.61± 0.64*#	0.019± 0.007	0.093± 0.018*#
Control group	60	5.60± 0.69	5.21± 0.80*	0.018± 0.069	0.042± 0.017*

Note: Compared with the control group, *$P<0.05$; compared with before treatment, #$P<0.05$.

2.2 两组治疗前后血清β-HB、IL-6、IL-10对比

两组治疗前血清β-HB、IL-6、IL-10对比无统计学差异（$P>0.05$），治疗后，两组相关指标均较治疗前明显降低（$P<0.05$），其中研究组治疗后β-HB明显低于对照组（$P<0.05$），两组治疗后IL-6、IL-10对比无统计学差异（$P>0.05$）。如表3。

2.3 两组疗效对比

两组治疗总有效率对比无统计学差异（$P>0.05$）。如表4。

2.4 两组并发症发生情况对比

研究组并发症发生率明显低于对照组（$P<0.05$）。如表5。

表 3 两组治疗前后血清 β-HB、IL-6、IL-10 对比($\bar{x}\pm s$)

Table 3 Comparison of serum β-HB, IL-6 and IL-10 before and after treatment in both groups($\bar{x}\pm s$)

Groups	n	β-HB(h)		IL-6(ng/L)		IL-10(ng/L)	
		Pretherapy	Post-treatment	Pretherapy	Post-treatment	Pretherapy	Post-treatment
Research group	60	27.49± 2.28	18.41± 1.45*#	428.39± 42.38	155.39± 14.57*	168.37± 15.09	120.47± 12.07*
Control group	60	27.96± 2.31	23.14± 2.11*	429.41± 42.29	156.21± 20.74*	167.42± 15.11	120.87± 13.20*

表 4 两组疗效对比(例,%)

Table 4 Comparison of efficacy between the two groups (n,%)

Groups	Cases	Cure	Effective	Invalid	Total efficiency
Research group	60	42(70.0)	13(21.7)	5(8.3)	55(91.7)
Control group	60	38(63.3)	11(18.3)	11(18.3)	49(81.7)

表 5 两组并发症发生情况对比(例,%)

Table 5 Comparison of complications in two groups of children (n,%)

Groups	Cases	Hypoglycemia	Hypokalemia	Hyponatremia	Complication rate
Research group	60	4	2	2	8(13.3)*
Control group	60	9	11	3	23(38.3)

Note: Compared with the control group, *P<0.05.

3 讨论

小儿糖尿病是一种常见的临床疾病,起病急,并且在治疗过程中,容易并发多种疾病,酮症酸中毒是其中一种严重并发症,病情严重,严重威胁患儿生命安全[11-13]。临床上治疗该病关键在于改善酸中毒、水电解紊乱、补充胰岛素[14,15]。在常规治疗基础上,给予胰岛素补充治疗,抑制酮体生成,控制病情[16,17]。但是在整个治疗过程中,科学把握胰岛素用药剂量尤为重要[18,19]。经临床研究发现,不同剂量胰岛素的治疗效果差异较大[20,21],大剂量胰岛素会大幅度降低机体血糖浓度,降低机体血浆渗透浓度,容易发生低血糖、低血钠等并发症,增加脑水肿风险,并且由于小儿年龄较小,机体各项机能发育不完善,影响预后[22-24]。对此,选择合理剂量的胰岛素至关重要。

1,5-AG 是近几年新发展起来的检测项目, 该指标和人血清葡萄糖浓度呈负相关。在机体中,1,5-AG 源于食物[25],每天摄入量和排出来是 5-10 mg ,一般是保持均衡稳定,在血糖高的时候,1,5-AG 和葡萄糖从肾小球一起滤出,如果超出肾小管重吸收能力,尿 1,5-AG 随着尿糖增多而增加[26,27]。1,5-AG 作为糖尿病诊断指标之一,可灵敏、准确反映出短时间内糖尿病控制程度 [28]。通过本次研究结果显示, 研究组患儿治疗后血糖及 1,5-AG 明显优于对照组,由此说明,补钾联合小剂量胰岛素治疗糖尿病酮症酸中毒,可更有效改善患儿血糖。

据相关研究表明[29,30],糖尿病酮症酸中毒和感染有一定关系, 可激活单核 - 吞噬细胞系统中多种细胞, 释放 IL-6、IL-10 等炎症细胞因子,IL-6 受到炎症刺激后, 发挥促炎反应功能。β-HB 酸性较强,是糖尿病酮症酸中毒主要因素之一,在糖尿病酮症酸中毒中的诊断及治疗价值都比较高[31]。通过本次研究结果显示,两组患儿治疗前血清 β-HB、IL-6、IL-10 对比无统计学差异,治疗后,两组患儿相关指标均较治疗前明显降低,其中研究组患儿治疗后β-HB 明显低于对照组,两组患儿治疗后 IL-6、IL-10 对比无统计学差异。由此说明,补钾联合小剂量胰岛素联合治疗可降低β-HB,而补钾联合不同剂量胰岛素联合治疗,均可有效缓解炎症反应,改善患儿临床症状,但是小剂量胰岛素是小儿糖尿病酮症酸中毒承受的最佳值,可改善炎症水平。另外,从两组患儿的治疗有效率及并发症发生情况进一步对比不同剂量胰岛素的治疗效果,研究结果显示,两组患儿治疗有效率对比无统计学意义,且研究组患儿的并发症发生率明显低于对照组,由此提示,小剂量胰岛素联合补钾治疗不仅可以保证治疗效果,还可以降低患儿的并发症发生率,用药安全。

总而言之,小剂量胰岛素联合补钾对小儿糖尿病酮症酸中毒疗效良好,可改善患儿炎症反应,促使临床症状改善,升高 1,5-AG,降低 β-HB,因此,在临床治疗中,需全面评估患儿病情,结合患儿实际情况,合理选择胰岛素剂量,保证患儿最佳治疗效果。

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