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## 新生儿维生素 D 水平与肺炎炎症指标水平的相关性

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**[摘要]** **目的:** 分析新生儿维生素D水平与肺炎炎症指标水平的相关性, 旨在为临床新生儿肺炎的预防和病情评估提供依据。**方法:** 选择2020年7月至2021年7月苏州大学附属第二医院收治的150例新生儿肺炎患儿为观察组, 再选择同期健康体检的150例新生儿为对照组。将观察组分为观察A组、观察B组, 观察A组行拉氧头孢治疗, 观察B组行拉氧头孢联合维生素D治疗。对比对照组、观察组治疗前维生素D水平、炎症因子水平与观察组治疗前后维生素D水平、炎症因子水平, 分析新生儿肺炎患儿治疗前后维生素D水平与炎症因子水平的相关性。**结果:** 观察组治疗前维生素D水平低于对照组, C反应蛋白、降钙素原与白细胞水平高于对照组( $P<0.05$ ); 观察A组、观察B组治疗后维生素D水平高于治疗前, C反应蛋白、降钙素原与白细胞水平低于治疗前( $P<0.05$ ); 且观察B组治疗后维生素D水平高于观察A组, C反应蛋白、降钙素原与白细胞水平低于观察A组( $P<0.05$ ); 经多因素回归分析, 新生儿肺炎患儿维生素D水平与C反应蛋白、降钙素原与白细胞水平呈现明显负相关( $P<0.05$ )。**结论:** 新生儿肺炎患儿维生素D水平与C反应蛋白、降钙素原与白细胞水平呈现明显负相关, 给予维生素D进行治疗可明显降低患儿炎症因子水平。

**[关键词]** 新生儿; 维生素D; 肺炎; 炎症指标; 相关性

## Correlation of neonatal vitamin D level and inflammation index level of pneumonia

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**Abstract** **Objective:** To analyze the correlation between neonatal vitamin D level and inflammatory index levels of pneumonia, in order to provide basis for clinical prevention and condition evaluation of neonatal pneumonia. **Methods:** A total of 150 cases of neonatal pneumonia admitted to our hospital from July 2020 to July 2021 were selected as the observation group, and 150 newborns who came to our hospital for physical examination during the same period were selected as the control group. The observation group was divided into observation group A and observation group B. Observation group A was treated with moxalactam, and observation group B was treated with moxalactam combined with vitamin D. The vitamin D levels and inflammatory factor levels before treatment in the control group and the observation group were compared with those in the observation group before and

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after treatment, and the correlation between vitamin D levels and inflammatory factor levels before and after treatment in neonatal pneumonia children was analyzed. **Results:** The vitamin D levels of the observation group before treatment were lower than those of the control group, and the levels of C-reactive protein, procalcitonin and white blood cells were higher than those of the control group ( $P<0.05$ ); the vitamin D levels of observation group A and observation group B after treatment were higher than those before treatment; C-reactive protein, procalcitonin, and white blood cell levels were lower than before treatment ( $P<0.05$ ); and the level of vitamin D after treatment in the observation group B was higher than that in the observation group A, and the levels of C-reactive protein, procalcitonin and white blood cells were lower than those in observation group A ( $P<0.05$ ); after multivariate regression analysis, vitamin D levels in children with neonatal pneumonia were significantly negatively correlated with C-reactive protein, procalcitonin, and white blood cell levels ( $P<0.05$ ). **Conclusion:** The level of vitamin D in children with neonatal pneumonia is significantly negatively correlated with the levels of C-reactive protein, procalcitonin, and white blood cells. Vitamin D treatment can significantly reduce the levels of inflammatory factors in children.

**Keywords** newborn; vitamin D; pneumonia; inflammatory indicators; correlation

维生素D作为一种脂溶性维生素,具有较为广泛的生理活性,维生素D<sub>2</sub>及D<sub>3</sub>是其中最重要的成分,维生素D<sub>2</sub>主要由皮下7-脱氢胆固醇经紫外线照射生成,维生素D<sub>3</sub>主要由植物或酵母中的麦角固醇经紫外线照射生成<sup>[1-2]</sup>。以25-羟维生素D<sub>3</sub>的理化性质最稳定,且其于人体内血清中含量最高,所以目前临床研究中通常将患者维生素D水平作为重要检查指标之一<sup>[3]</sup>。维生素D含量减少可造成哮喘、支气管肺炎等疾病,同时其对慢性疾病患者的炎症中起到有效调控效果<sup>[4]</sup>。目前临床对于新生儿肺炎炎症指标与维生素D水平相关性的研究并不多见,因此在本研究中对苏州大学附属第二医院收治的新生儿肺炎患儿,分析其维生素D水平与炎症指标水平的相关性,以为临床治疗提供依据。

## 1 对象与方法

### 1.1 对象

选择2020年7月至2021年7月苏州大学附属第二医院收治的150例新生儿肺炎患儿作为观察组,再选择同期健康体检的150例新生儿作为对照组。对照组男82例,女68例;胎龄37~42(39.37±1.02)周;出生体重1 750~4 985(3 061.27±482.37) g。观察组男80例,女70例;胎龄37~42(39.42±1.05)周;出生体重为1 758~4 974(3 045.62±480.61)g。将观察组分为观察A组( $n=75$ )与观察B组( $n=75$ )。观察组纳入标准:经临床症状结合影像学检查均确诊为肺炎;近2周末接受激素治疗。排除标准:合并先

天性喉喘鸣;合并严重肝肾功能障碍;合并严重心脑血管疾病;严重营养不良。本研究取得苏州大学附属第二医院医学伦理委员会批准(审批号:2020711)。两组性别、胎龄及出生体重差异无统计学意义( $P>0.05$ )。

### 1.2 方法

观察A组给予40 mg/kg拉氧头孢(浙江惠迪森药业有限公司,国药准字H20083975),连续治疗5~7 d后停药。观察B组在对照组的基础上给予维生素D[国药控股星鲨制药(厦门)有限公司,国药准字H35021450]口服治疗,400~800 U/d,治疗时间为2个月,随访3个月。

### 1.3 观察指标

对照组于体检第2天抽取空腹静脉血5 mL,观察组在治疗前及治疗3个月取空腹静脉血5 mL,在室温下放置30 min后离心,速度为3 000 r/min,分离血清。采用放射免疫法检测维生素D水平,采用免疫比浊法测定C反应蛋白(C-reaction protein, CRP),采用免疫色谱检测法测定降钙素原,白细胞水平采用血常规监测仪测定。

### 1.4 统计学处理

采用SPSS 22.0统计软件分析数据。计量资料以均数±标准差( $\bar{x}\pm s$ )表示,比较采用 $t$ 检验;新生儿肺炎患儿治疗前后维生素D水平与炎症因子水平相关性采用单因素、多因素分析。 $P<0.05$ 为差异有

统计学意义。

## 2 结果

### 2.1 对照组与观察组治疗前维生素 D 水平、炎症因子水平比较

观察组治疗前维生素D水平低于对照组, CRP、降钙素原与白细胞水平高于对照组( $P<0.05$ , 表1)。

### 2.2 观察组治疗前后维生素 D 水平、炎症因子水平比较

观察A组、观察B组治疗后维生素D水平高于治疗前, CRP、降钙素原与白细胞水平低于治疗前( $P<0.05$ ); 且观察B组治疗后维生素D水平高于观

察A组, C反应蛋白、降钙素原与白细胞水平低于观察A组( $P<0.05$ , 表2)。

### 2.3 新生儿肺炎患儿治疗前维生素 D 水平与炎症因子水平相关性

经多因素回归分析, 新生儿肺炎患儿治疗前维生素D水平与CRP、降钙素原与白细胞水平呈现明显负相关( $P<0.05$ , 表3)。

### 2.4 新生儿肺炎患儿治疗后维生素 D 水平与炎症因子水平相关性

经多因素回归分析, 新生儿肺炎患儿治疗后维生素D水平与CRP、降钙素原与白细胞水平呈现明显负相关( $P<0.05$ , 表4)。

表1 对照组与观察组治疗前维生素D水平、炎症因子水平比较( $n=150$ )

Table 1 Comparison of vitamin D levels and inflammatory factor levels before treatment between the control group and the observation group ( $n=150$ )

组别	维生素D水平/(nmol·L <sup>-1</sup> )	CRP/(mg·L <sup>-1</sup> )	降钙素原/(μg·mL <sup>-1</sup> )	白细胞/(× 10 <sup>9</sup> ·L <sup>-1</sup> )
对照组	74.17 ± 15.26	9.68 ± 2.38	11.17 ± 2.28	7.68 ± 0.79
观察组	56.71 ± 17.23	13.61 ± 3.27	60.72 ± 9.58	11.42 ± 4.27
<i>t</i>	9.291	11.901	61.501	10.548
<i>P</i>	<0.001	<0.001	<0.001	<0.001

表2 观察组治疗前后维生素D水平、炎症因子水平比较( $n=75$ )

Table 2 Comparison of vitamin D levels and inflammatory factor levels before and after treatment in the observation group ( $n=75$ )

时间	组别	维生素D/(nmol·L <sup>-1</sup> )	CRP/(mg·L <sup>-1</sup> )	降钙素原/(μg·mL <sup>-1</sup> )	白细胞/(× 10 <sup>9</sup> ·L <sup>-1</sup> )
治疗前	观察A组	56.03 ± 9.48	13.08 ± 4.38	60.77 ± 11.47	11.97 ± 4.17
	观察B组	56.09 ± 9.71	13.11 ± 4.19	60.83 ± 10.95	11.86 ± 4.05
	<i>t</i>	0.054	0.061	0.046	0.232
	<i>P</i>	0.957	0.952	0.963	0.817
治疗后	观察A组	58.59 ± 10.03	11.36 ± 2.94	35.49 ± 9.36	6.07 ± 1.12
	观察B组	72.91 ± 8.47	9.44 ± 2.03	11.85 ± 3.02	1.86 ± 0.59
	<i>t</i>	13.360	6.582	29.438	40.731
	<i>P</i>	<0.001	<0.001	<0.001	<0.001

表3 新生儿肺炎患儿治疗前维生素D水平与炎症因子水平相关性

Table 3 Correlation between vitamin D levels and inflammatory factor levels before treatment in children with neonatal pneumonia

炎症因子	回归系数	标准化回归系数	t	P
CRP	-0.842	-0.257	-3.175	0.005
降钙素原	-1.352	-0.501	-4.184	0.001
白细胞	-3.051	-0.972	-6.275	<0.001

表4 新生儿肺炎患儿治疗后维生素D水平与炎症因子水平相关性

Table 4 Correlation between vitamin D levels and inflammatory factor levels in children with neonatal pneumonia after treatment

炎症因子	回归系数	标准化回归系数	t	P
CRP	-0.913	-0.355	3.216	0.004
降钙素原	-1.296	-0.496	4.074	0.002
白细胞	-3.171	-0.984	6.268	<0.001

### 3 讨论

通常维生素D在人体内的血液中以25-羟维生素D3的形式而存在,同时其在人体血清中含量较高,结构也相较于其他理化类型更为稳定,所以临床通常将其作为测量维生素D的指标以反映机体内维生素D水平<sup>[5-6]</sup>。维生素D参与多种细胞的生长及分化,且在临床中可作为免疫调节剂,是一种重要的类固醇激素,具有较强抗佝偻病效果<sup>[7]</sup>。新生儿肺炎是一种发病率较高的儿科呼吸系统疾病,在病情进展过程中,Th1细胞亚群功能下降,而Th2细胞亚群功能上升,致使Th1/Th2亚群比例发生失衡,且其机体炎症指标发生明显上升情况<sup>[8]</sup>。

CRP是一种急性时相蛋白,其主要由干细胞生成,在机体出现感染情况,血清CRP水平会发生明显上升,但因为CRP对于感染的特异性较差,因此大部分感染以外的因素如免疫反应、手术刺激等,亦可引发血清CRP水平上升<sup>[9-10]</sup>。PCT是由甲状腺C细胞产生的蛋白质,在新生儿发生感染且机体处于炎症状态时,在4 h后即可检测到机体内PCT水平显著升高,同时其不会受到机体内激素的影响,因而具有较好稳定性<sup>[11-12]</sup>。白细胞计数是单位体积血液内含有白细胞的数目,在机体发生炎症反应后,白细胞计数水平会出现明显上升情况<sup>[13]</sup>。本研究结果可见观察组治疗前维生素D水平低于对照组,且CRP、降钙素原与白细胞水

平高于对照组。表明新生儿肺炎患儿机体内维生素D水平较低。分析原因主要为在患儿体内缺乏维生素D时,其呼吸道上皮会出现角化、变性、增生的情况,且呼吸道抵抗力会降低,在病原体经呼吸道侵入时,发生感染的概率更高<sup>[14-15]</sup>。此外维生素D可与T淋巴细胞、单核细胞等结合,并有效调节免疫功能,提升免疫细胞对病原微生物的杀灭作用<sup>[16]</sup>。而在机体内维生素D水平较低的情况下,上述免疫细胞的杀灭病原微生物的作用也会下降,因而机体易发生感染。本研究中,观察B组治疗后维生素D水平高于观察A组,CRP、降钙素原与白细胞水平低于观察A组。表明通过给予新生儿肺炎患儿维生素D治疗可有效改善病情,缓解炎症反应。其原因主要为:通过给予患儿补充维生素D可有效调整机体内免疫失调状态,通过影响树突状细胞周期,包括阻碍单核细胞分化为树突状细胞,阻止幼稚树突状细胞向成熟树突状细胞分化等影响炎症反应,且其可诱导树突状细胞向半成熟状态树突状细胞分化,以形成T细胞耐受<sup>[17-18]</sup>。本研究经多因素回归分析,发现新生儿肺炎患儿维生素D水平与CRP、降钙素原、白细胞水平呈明显负相关。表明通过给予新生儿肺炎患儿补充维生素D,可有效调节其免疫功能,缓解气道炎症反应,对患儿呼吸系统的器官起重要保护作用<sup>[19-20]</sup>。虽然维生素D应用于新生儿肺炎患儿中有利于病情恢复,但大剂量服用会出现如低热、

体重下降、烦躁等不良反应,病情严重者甚至会出现肝肾功能损害及骨骼硬化等疾病。此外,维生素D还可对血脂代谢造成一定影响,从而影响甲状旁腺功能。目前我国临床针对维生素D缺乏的标准依旧沿用早期针对佝偻病设置的标准,而对于感染性疾病、肿瘤等缺乏相关维生素D使用标准。虽然美国儿科学会推荐儿童每日维生素D摄入量至少在400 U以上,但全球范围内对于儿童的维生素D补充剂量尚未达成共识。而本研究中给予患儿400~800 U/d剂量,以避免个别患儿由于维生素D水平过高而造成维生素D中毒。

综上所述,新生儿肺炎患儿维生素D水平与CRP、降钙素原、白细胞水平呈明显负相关,给予维生素D进行治疗可明显降低患儿炎症因子水平。

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