腹腔内压力变化与儿童脓毒症预后的关系

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摘　要：【目的】了解脓毒症患儿腹腔内高压(IAH)的发生率，并探讨腹腔内压力变化与脓毒症预后的关系。【方法】将2014年1月至2016年1月期间入住我院儿童重症监护室脓毒症患儿纳入前瞻性队列观察性研究，入组年龄>28 d至≤18岁、PICU治疗时间>24 h；排除对象：年龄≤28 d、使用神经肌肉阻滞、神经源性膀胱或膀胱手术史患儿。采用膀胱测压法监测腹腔内压力(IAP)并记录相关临床资料。采用时间依赖受试者工作特征曲线(survival ROC)确定IAP对脓毒症60 d内死亡的预测价值。【结果】纳入163例患儿，中位年龄2.2(0.6～5.8)岁，中位IAP 5.5(4.4～8.8)mmHg，发生IAH 30例(30/163，18.4%)。死亡组(45例)较非死亡组患儿(118例)IAP明显升高5.2(3.7～8.8) *vs.* 6.6(5.2～11.0)，P=0.01。IAH患儿脏器损伤数量以及机械通气使用时间较非IAH患儿明显升高。IAP与住院死亡风险呈非线性关系，IAP在10 mmHg以下随着腹腔压力增加，患者死亡风险比呈现上升趋势，IAP>10 mmHg风险比大于1。Survival ROC评估发现，腹腔内压力、PRISMⅢ评分、PCIS评分、乳酸对脓毒症60 d死亡的预测价值相当，其中乳酸预测的价值最高，曲线下面积0.64。乳酸联合IAP可提高对脓毒症死亡的预测价值(AUC 0.70)，灵敏度0.80，特异度0.56。【结论】IAH在儿童脓毒症发病率高，其与脓毒症死亡、脏器损伤发生数量以及机械通气使用时间相关。我们认为IAP可成为预测脓毒症预后的新的重要指标。建议在儿童脓毒症，尤其是脓毒性休克救治中应进行腹腔压力监测。

关键词：脓毒症；儿童；腹腔内高压；腹腔内压力；预后
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The Prognosis of Changes of Intra-abdominal Pressure in Children with Sepsis

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Abstract：【Objective】To understand the incidence of intra-abdominal hypertension (IAH) in children with sepsis and to confirm the prognosis of changes of intra-abdominal pressure (IAP) in children with sepsis.【Methods】Children with sepsis who were admitted to the pediatric intensive care unit from January 2014 to January 2016 were enrolled in this prospective cohort observational study. The exclusion criteria were as follows: age≤28 days or≥18 years, discharged from PICU within 24 h, or a history of neurogenic bladder or bladder surgery. IAP was measured every 8 h manually based on the bladder pressure measurements and the clinical data were recorded. Time-dependent receiver operating characteristic curve (Survival ROC) was used to determine the predictive value of IAP in 60-day mortality in sepsis.【Results】A total of 163 children were included, the median age was 2.2 (0.6~5.8) years, their IAP was 5.5 (4.4~8.8) mmHg, and 30 cases had IAH (18.4%). Compared with the survival group, the IAP was significantly higher in mortality group [5.2(3.7~8.8) vs. 6.6 (5.2~11.0), P< 0.01]. The number of organ dysfunction and the duration of mechanical ventilation were significantly

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higher in IAH children than those without IAH. IAP had a non-linear relationship with the risk of hospital mortality. The risk ratio value of mortality in patients with IAP < 10mmHg showed an upward trend with the increase of abdominal pressure, and the risk ratio of IAP > 10mmHg was greater than 1. Survival ROC evaluation showed that IAP, PRISM Ⅲ, PCIS score and lactate had similar value in predicting 60-day mortality in sepsis. Lactic acid had the highest predictive value for mortality, with an area under the curve of 0.64. Lactic acid combined with IAP could improve the predictive value of septic mortality (AUC 0.70), with a sensitivity of 0.80, and a specificity of 0.56.【Conclusions】The incidence of IAH is high in septic children, which may be related to mortality, number of organ dysfunction, and the duration of mechanical ventilation. We believe that IAP can be a new and important indicator for predicting the prognosis of sepsis. It is suggested that IAP monitoring should be carried out in the treatment of sepsis, especially for septic shock patient.

Key words: sepsis; children; intra-abdominal hypertension; intra-abdominal pressure; prognosis

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腹腔内高压(intra-abdominal hypertension,IAH)是指腹腔内压力(intra-abdominal pressure,IAP)升高,持续或反复的IAH会引起心血管、肺、肾、胃肠以及颅脑等多器官系统功能障碍,是重症儿童死亡的独立危险因素[1]。其具体机制目前尚未被完全阐明,目前主要认为IAP升高使腹腔灌注压下降,导致腹腔脏器缺血缺氧,膈肌上抬,肺脏及心脏受压,呼吸顺应性及回心血量减少,从而导致腹腔以外的其他脏器的受累[2]。脓毒症是PICU里最常见的疾病和死亡原因之一[3]。脓毒症时由于液体治疗,尤其是脓毒性休克液体复苏,导致患者体内液体累积急剧增加,容易并发IAH,目前研究发现,脓毒症是发生IAH的独立危险因素[4]。在成人,脓毒性休克患者IAH发生率可高达32.8%~82.7%[5-6],IAH与脓毒症器官功能障碍的发展有关[7]。但IAH在儿童脓毒症的研究较少,这可能与儿童重症监护人员对IAH危害性的认知尚未深入有关[8]。目前暂未见IAH对儿童脓毒症预后影响的研究。因此,本研究通过前瞻性观察性队列研究的方法,旨在了解脓毒症患儿IAH发生率,并探讨IAP变化对脓毒症预后的影响。现报道如下。

1 材料与方法

1.1 一般资料

本研究为前瞻性观察性队列研究,纳入标准为2014年1月至2016年1月期间入住我院PICU脓毒症患儿206例。排除未征得监护人同意的,或年龄≤28 d和年龄>18岁,或PICU住院时间<24 h,或使用神经肌肉阻滞或有膀胱测压禁忌症,如神经源性膀胱或膀胱手术史的患儿,最后入组163例患儿。此研究已通过医院伦理委员会审批[(2013)170号],所有入组患儿都征得监护人同意。

1.2 方法

1.2.1 资料搜集 收集入组患儿性别、年龄、主要疾病诊断,记录脓毒症期间体温、平均动脉压、血糖、机械通气(mechanical ventilation, MV)、持续时间、血气分析、乳酸、C反应蛋白、血常规、电解质、脑钠肽(BNP)、肝肾功能、出凝血功能、血管活性药物使用情况、脏器功能损害数量及持续时间。小儿危重病例评分(pediatric critical illness score, PCIS)、第3代小儿死亡危险评分(pediatric risk of mortality Ⅲ, PRISM Ⅲ)、PICU住院时间,对患儿进行为期60 d的随访并记录出院后预后情况。

1.2.2 膀胱测压法及腹腔内高压诊断 测量采用国际标准的膀胱测压法[9]:取平卧位,经尿道膀胱导尿,排空膀胱后夹闭尿管,经尿管向膀胱缓慢注入无菌生理盐水1 mL/kg,最少注入3 mL,最大不超过25 mL;停留30~60 s,将注射NS的输液管与注射器分离,使输液管最上端与空气相通;以腋中线耻骨联合水平为零点,待输液管中液体自然下降至不再下降,在患儿呼气末、腹肌无主动收缩时读取读数。测得数值为cmH_2O,转化为国际单位(1 cmH_2O =1.35 mmHg,1 cmH_2O=0.098 kPa)。每天每8 h一次测量取均值,依据所测得的最高IAP均值将脓毒症患儿分为IAH组和非IAH组。根据世界腹腔室间隔综合症指南,IAH被定义为持续或反复的IAP升高>10 mmHg[9]。

1.2.3 脓毒症、脓毒性休克及脏器功能损伤标准 脓毒症是指感染(可疑或证实)引起的全身炎症反

应综合征。脓毒性休克是指脓毒症诱导的组织低灌注和心血管功能障碍。脓毒症器官功能损伤的诊断参照国际儿童脓毒症器官功能障碍定义[10]。

1.3　统计学处理

采用IBM SPSS 22.0（IBM，Armonk，NY，USA）和R 3.6.2（https://www.r-project.org）进行统计分析。符合正态分布的变量用平均值±标准差（$\bar{x} \pm s$）描述、非正态分布数据采用中位数和四分位数[M（P_{25}~ P_{75}）]描述、分类变量用频数和百分比表示。使用独立样本t检验或Mann-Whitney U检验比较两组之间连续变量的差异。分类变量使用卡方检验或Fisher精确检验进行评估。采用限制性立方样条（restricted cubic spline，RCS）结合cox比例风险模型绘制曲线探索IAP与患者住院死亡风险的非线性关系，根据文献设置样条函数节点的个数（k=4）和位置（ti=10）。采用时间依赖受试者工作特征曲线（time dependent receiver operating characteristic curve，survival ROC）确定IAP、PRISMⅢ、PCIS和乳酸对脓毒症60 d死亡的预测价值。通过Cox比例风险模型纳入乳酸和IAP这两个变量构建乳酸+IAP的联合评估指标。以上所有检验以P<0.05认为差异有统计学意义。

2　结 果

2.1　一般情况

纳入研究共163例患儿中，中位年龄2.2（0.6~5.8）岁，其中男93例，女70例。入组的脓毒症患儿中位IAP 5.5（4.4~8.8）mmHg，其中符合IAH有30例（18.4%）。共计45例（27.6%）患者发生死亡，其中有44例发生在60 d内，在脓毒症死亡病例中，腹腔内高压占26.7%（12/45），腹腔压力正常占73.3%（33/45）；死亡组较非死亡组患儿IAP明显升高5.2（3.7~8.8）*vs.* 6.6（5.2~11.0），P=0.01，两组差异有统计学意义。此外，体温、血乳酸、纤维蛋白原、D-二聚体、尿素氮、PRISMⅢ评分、PCIS评分在死亡组与非死亡组的差异有统计学意义（表1）。

2.2　腹腔内高压对脓毒症预后的影响

IAH患儿较非IAH患儿脏器损伤发生数量更多，机械通气使用时间更长，详见表2。发生IAH的脓毒症患儿死亡比例更高（40.0% *vs.*24.8%），但两组差异没有统计学意义，P=0.15（检验功效1-验功效差异没有）。RCS结合cox比例风险模型绘制曲线发现，IAP与住院死亡风险呈非线性关系，IAP在10以下随着腹腔压力增加患者死亡风险比呈现上升趋势，IAP>10风险比大于1，提示IAH是患儿死亡等高危因素（图1）。Survival ROC对死亡风险的评估发现，腹腔内压力、PRISMⅢ、PCIS评分、乳酸对脓毒症60 d死亡预测的价值相当，其中乳酸预测的价值最高，曲线下面积（area under curve，AUC）0.64，95%置信区间（0.57，0.77），P<0.001。乳酸联合IAP可提高对脓毒症死亡的预测价值，AUC 0.70，95%置信区间（0.61，0.81），P<0.001，其灵敏度80%，特异度56%（表3），其ROC曲线比较见图2。

3　讨 论

这是一项关于腹腔压力与脓毒症预后的前瞻性观察性研究。本研究评估IAP变化对儿童脓毒症预后的影响，同时探索脓毒症以往常用预后指标的评估价值。本研究发现IAH与脓毒症患儿脏器损伤数量以及机械通气使用时长有关，IAP对脓毒症患儿60 d死亡有一定的预测价值，随着IAP增加，患者死亡风险比呈上升趋势。而且IAP与国内外广泛使用的儿童死亡风险预测评分系统PCIS评分、PRISMⅢ泛评分以及对脓毒症预后有良好预测价值的乳酸相比，其对60 d死亡的预测价值相当，且IAP联合乳酸可提升对脓毒症死亡的预测价值。因此，我们认为IAP可成为预测脓毒症预后的新的重要指标。

腹腔内高压是脓毒症高发的并发症，IAH的发生与脓毒症严重程度可能有关。本研究发现IAH在儿童脓毒症中有相当高的发病率（18.4%）。张笃飞等在儿童脓毒症中也发现有较高的IAH发生率（32.8%），且液体正平衡、PCIS、多器官功能障碍、休克、胃肠功能障碍和腹水是脓毒症儿童发生IAH的高危因素[6]。本研究人群IAH发生率稍低，可能与脓毒症救治技术提高，包括限制性液体复苏等策略的实施有关，避免过度液体复苏，可能有助于避免IAH的发生。此外，IAH是胃肠功能障碍乃至衰竭的重要临床表现之一。胃肠功能衰竭常继发于各种危重疾病，如脓毒症、严重缺氧等，以胃肠道黏膜损害以及运动和屏障功能障碍为主要特点，是影响危重患者预后的重要因素[11]。胃肠道是严重感染、组织缺血缺氧时受累最早和最严重的器官之

表1 脓毒症患儿存活组与死亡组各参数的比较

Table 1 Comparison of characteristics between survival and non- survival group in septic children

[$(\bar{x} \pm s)$, $M(P_{25}\sim P_{75})$, n (%)]

	Survivors (n=118)	Non-survivors (n=45)	$\chi^2/t/Z$	P
Age/year	1.7 (0.5~5.8)	3.2 (0.8~5.8)	−1.6 [2)]	0.10
Boy	74 (62.7)	19 (42.2)	4.8 [3)]	0.03
Temperature	37.3±0.9	37.8±0.9	−3.2 [1)]	0.002
MAP/mmHg	76.2 (66.8~88.0)	80.7 (65.0~90.0)	−0.55 [2)]	0.56
Shock	13 (11.0)	7 (15.6)	4.8 [3)]	0.60
IAP/mmHg	5.2 (3.7~8.8)	6.6 (5.2~11.0)	−2.6 [2)]	0.01
Glycemia/(mmol/L)	8.1 (7.1~9.8)	8.5 (7.3~12.2)	−1.5 [2)]	0.14
Lactic acid	1.2 (0.9~2.0)	2.0 (1.0~3.9)	−2.9 [2)]	0.004
BNP	1711.0 (760.9~5633.0)	2805.0(605.7~25307.5)	−0.28 [2)]	0.79
Creactive protein	19.0 (3.0~58.0)	13.0 (2.0~84.0)	−0.24 [2)]	0.81
White blood cell	10.7(5.1~17.3)	11.5(6.2~14.9)	−0.13 [2)]	0.90
Lymphocyte	1.9 (1.0~4.0)	1.8 (0.9~3.0)	−1.1 [2)]	0.26
Platelet	232.0 (133.0~388.0)	181.5 (63.3~391.0)	−1.6 [2)]	0.24
APTT	32.7 (29.0~40.9)	35.8 (28.8~54.5)	−4.6 [2)]	0.15
Fibrinogen	2.4 (1.6~3.6)	1.7 (1.1~2.6)	−4.2 [2)]	0.01
D-Dimer	4.6 (1.2~48.6)	23.0 (5.9~949.3)	−19.4 [2)]	0.001
Sodium	134.7 ± 6.4	135.3 ± 6.3	−0.51 [1)]	0.61
Potassium	4.1 ±0.8	4.2 ±0.8	−0.30 [1)]	0.52
ALT	35.0 (25.3~55.5)	46.0 (25.0~98.1)	−1.6 [2)]	0.12
Albumin	30.0 (24.0~36.0)	28.0 (24.0~34.0)	−0.61 [2)]	0.55
Tbil	12.0 (7.4~17.7)	13.1 (8.7~27.4)	−1.4 [2)]	0.16
BUN	3.6 (2.6~.4)	5.0 (3.1~8.2)	−2.4 [2)]	0.02
Scr	31.5 (23.3~44.0)	40.0 (26.0~54.0)	−1.7 [2)]	0.10
PCIS	84.0 (78.0~92.0)	80.0 (74.0~88.0)	−2.1 [2)]	0.04
PRISM Ⅲ	10.0 (10.0~15.0)	14.0 (10.0~18.0)	−2.4 [2)]	0.02

$M(P_{25}\sim P_{75})$, median and interquartile range; χ^2: Chi-square value; t: T-statistic; Z: Z value of Mann-Whitney U test; [1)] Normally distributed variables (Temperature, Sodium, Potassium) were expressed as $\bar{x} \pm s$, and the differences in variables between the two outcome groups were compared using the independent samples t-test; [2)] Non-normally distributed variables (Age, MAP, IAP, Glycemia, Lactic acid, BNP, Creactive protein, White blood cell, Lymphocyte, Platelet, APTT, Fibrinogen, D-Dimer, ALT, Albumin, Tbil, BUN, Scr, PCIS, PRISM Ⅲ) were expressed as median and interquartile range, and the differences in variables between the two outcome groups were compared using Mann-Whitney U test; [3)] Categorical variables were expressed as frequency (proportions, %), and the differences between the two outcome groups were assessed by the chi-square test; ALT: alanine aminotransferase; APTT: activated partial thromboplastin time; BUN: blood urea nitrogen; BNP: brain natriuretic peptide; CRRT: continuous renal replacement therapy; IAP: intra-abdominal pressure; MAP: mean arterial pressure; Scr: serum creatinine; Tbil: total bilirubin; PCIS: pediatric critical illness score; PRISM Ⅲ: pediatric risk of mortality Ⅲ.

一。脓毒症时,由于全身炎症反应、毛细血管渗漏、大量液体渗出、血管舒缩功能障碍,导致急性胃肠功能损伤,胃肠Ⅱ级及以上的损伤则可导致IAH的发生[5]。因此,IAH在脓毒症人群中高发,且脓毒症严重程度越重,IAH发生越高,我们强烈建议对脓毒症患儿开展常规IAP监测,特别是脓毒症休克,需要液体复苏的患儿。

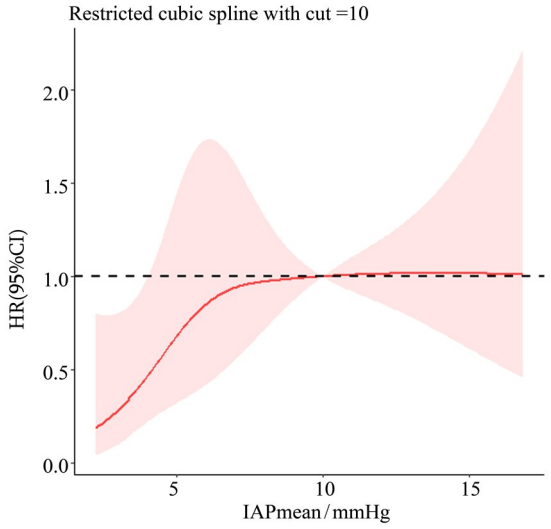
腹腔内压力变化对脓毒症死亡有预测价值。脓毒症是PICU常见的急危重症,是重症儿童死亡的主要原因之一[12]。积极寻找影响脓毒症预后的因素将有助于提高脓毒症救治的成功率。本研究再次确认了既往研究中发现的与脓毒症预后有关

表2　不同腹腔内高压组与脓毒症各预后指标的关系

Table 2　Effect of intra-abdominal hypertension on prognostic indexes of sepsis　[$M(P_{25}\sim P_{75})$, n (%)]

Prognostic indexes	Non-IAH (n=133)	IAH(n=30)	$\chi^2/t/Z$	P
Incidence of organ dysfunction	99 (74.4)	27 (90.0)	9.5 [1)]	0.11
Number of organ dysfunction	1.0 (0.0~2.0)	2.0(1.0~ 3.0)	−2.9 [2)]	0.004
Organ dysfunction duration /d	3.0 (1.0~ 9.0)	5.0 (2.0~12.0)	−1.3 [2)]	0.20
PICU stay /d	10.0 (4.0~18.0)	12.5(5.3~22.8)	−0.81 [2)]	0.40
MV duration /d	1.0(0.0~6.0)	4.0(2.0~7.8)	−2.9 [2)]	0.004
Mortality	33 (24.8)	12 (40.0)	2.1 [1)]	0.15

$M(P_{25}\sim P_{75})$, median and interquartile range; χ^2: Chi-square value; t: T-statistic; Z: Z value of Mann-Whitney U test; The number of organ dysfunction and the duration of mechanical ventilation were significantly higher in IAH children than those without IAH. [1)] Categorical variables (Incidence of organ dysfunction, Mortality) were expressed as frequency (proportions, %), and the differences between the two outcome groups were assessed by the chi-square test; [2)] Non-normally distributed variables (Number of organ dysfunction, Organ dysfunction duration day, PICU stay, MV duration day) were expressed as median and interquartile range, and the differences in variables between the two outcome groups were compared using Mann-Whitney U test; IAH: intra-abdominal hypertension; MV: mechanical ventilation; PICU: pediatric intensive care unit.



The restricted cubic spline (RCS) combined with cox proportional hazard model were used to draw the curve. It was found that there was a non-linear relationship between IAP and the risk of death in hospital. According to the literature, the number of spline nodes (K=4) and position (ti=10), IAP < 10 showed an upward trend of mortality with the increase of IAP, and the risk ratio of IAP > 10 was greater than 1. Due to the limitation of sample size, the interval estimation was not statistically significant; IAP: intra-abdominal pressure.

图1　腹腔内压力与住院死亡风险相关性分析

Fig. 1　Correlation analysis between intra-abdominal pressure and hospital mortality

的因素，如血乳酸、凝血功能等因素[13-14]，在死亡组与非死亡组患儿中差异是有统计学意义的。虽然在既往研究中已发现，IAP对重症儿童住院28 d死亡有良好的预测价值[15]，且IAH在其他疾病中已被证实，即使在控制影响死亡的其他已知预测因子时，IAH也是一个独立的死亡预测因素[16]，但其在脓毒症的研究却很少，IAP变化对儿童脓毒症预后的影响目前尚不清楚。这可能与大家低估了IAH在脓毒症中的发病率及其对危害有关[4]。本研究通过前瞻性观察发现，脓毒症死亡组患儿腹腔内压力明显增高。IAP在10mmHg以下时，随着腹腔压力增加患者死亡风险比呈上升趋势。乳酸水平是目前公认的预测脓毒症预后的最重要指标[17]。本研究通过Survival ROC分析发现，IAP对脓毒症患儿60 d死亡的预测价值与乳酸相当。目前国内外应用最广泛的两种儿童危重病评分PCIS评分、PRISM Ⅲ应评分也常用于脓毒症患儿预后的评估[18]，IAP对脓毒症患儿60 d死亡的预测效能与两种危重病评分相当。此外，Gupta HP等研究发现，IAH持续时间与血清乳酸升高和器官功能障碍之间存在很强的“风险累积”关系[19]。本研究同样发现，乳酸联合IAP对脓毒症60 d死亡的预测效能有更好的提升。

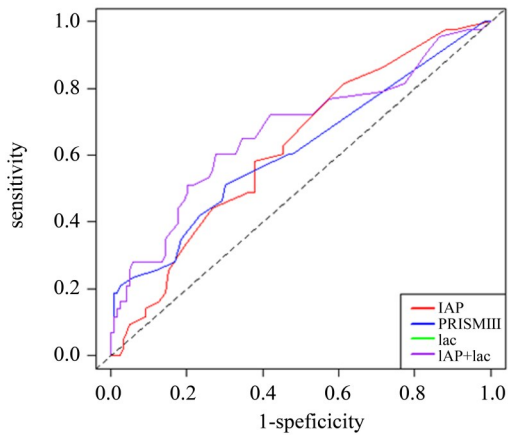
本研究发现，IAH与脓毒症患儿脏器损伤数量增加及机械通气使用时间延长有关。目前研究认为，IAH本质是危重症中多脏器功能不全/衰竭中的胃肠功能障碍/衰竭的表现，且持续的IAH与脑、消化、呼吸、心血管和肾脏等多器官功能障碍有关[4,9]。胃肠功能衰竭不仅是多器官功能障碍的损伤器官之一，也是多器官功能障碍的启动因子[20]。胃肠功能受损后，IAH升高，不仅影响肠道菌群及其产物的吸收和调控，影响胃肠的内分泌和免疫功

表3 基于Survival ROC对儿童脓毒症60 d死亡风险的评估

Table 3 The predictive value of 60-day mortality in children with sepsis based on Survival ROC

	AUC	95%CI	*P*	Cut-off	Sensitivity	Specificity
IAP	0.56	(0.54,0.72)	0.01	8.1	0.40	0.72
PRISM Ⅲ	0.60	(0.52,0.72)	0.02	14.0	0.29	0.71
PCIS	0.62	(0.51,0.71)	0.04	42.0	0.99	0.01
Lactic acid	0.65	(0.57,0.77)	<0.001	1.6	0.62	0.68
IAP+ Lactic acid[1)]	0.70	(0.61,0.81)	<0.001	−0.20	0.80	0.56

note: The predictive value of IAP is similar to that of PRISM Ⅲ, PCIS and lactic acid. IAP combined with lactic acid can improve the prediction of 60-day mortality in sepsis; [1)] IAP+ Lactic acid joint model for 60-day mortality predicting: $ln[(h(t,X)/h_0(t)]$=0.047×IAP+0.196×Lac, based on this model, the R predict function saved the risk coefficient value predicted (maximum 2.5836, minimum −0.5699); AUC: Area Under Curve; CI: confidence interval; IAP: intra-abdominal pressure; PCIS: Pediatric Critical Illness Score; PRISM Ⅲ: Pediatric Risk of Mortality Ⅲ; ROC: receiver operating characteristic curve; Lac: lactic acid



Survival ROC evaluation showed that IAP, PRISM Ⅲ, PCIS and lactic acid had similar value in predicting 60-day mortality in sepsis. Lactic acid had the highest predictive value for mortality. Lactic acid combined with IAP can improve the predictive value of septic mortality (AUC 0.71), sensitivity was 0.80, and specificity was 0.56; AUC: area under curve; CI: confidence interval; Lac: lactic acid; IAP: intra-abdominal pressure; PCIS: pediatric critical illness score; PRISM Ⅲ: pediatric risk of mortality Ⅲ.

图2 不同死亡预测参数的Survival ROC曲线

Fig. 2 Survival ROC Curves of different mortality prediction parameters

能,还导致菌群移位,进而继发肠源性感染,导致肠源性脓毒症的发生[21]。近年研究还发现,IAH与炎症反应加剧及细胞凋亡有关。有研究发现,IAH患者IL-10水平明显升高,IL-10水平升高与脓毒症器官损害及预后不良有关[22]。近期研究也发现,IAH与神经元凋亡和血脑屏障的破坏有关,并可能是脓毒症相关脑病的一个新的危险因素[23]。因此,IAH是加重脓毒症脏器功能损伤的一个重要因素,并与脓毒症不良预后密切相关,IAP变化的监测可能对脓毒症患儿的救治起到重要的作用,呼吁重症医护人员在脓毒症患者的监护中增加IAP项目的监测。

但本研究系单中心研究,可能存在一定的偏倚和误差。但本研究主要是对IAH与脓毒症预后关系进行了初步的探索,后续将扩大样本量、开展多中心前瞻性大样本研究,以进一步明确腹腔压力监测在儿童脓毒症诊疗中的作用。

综上所述,本研究发现IAH在儿童脓毒症发病率高,腹腔内压力变化与儿童脓毒症死亡、脏器损伤数量以及机械通气使用时间密切相关,我们认为IAP可成为预测脓毒症预后的新的重要指标。其无创,测量简单容易,无需采血,较适用于儿童进行动态监测。建议在儿童脓毒症,尤其是脓毒性休克的救治过程中进行常规腹腔压力监测,防治腹腔内高压的发生,可能有助于降低脓毒症潜在的死亡危险。

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