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胱抑素C估算肾小球滤过率对人工肝治疗HBV相关性慢加急性肝衰竭短期预后的预测价值*

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【摘要】 **目的** 探讨胱抑素C估算肾小球滤过率（cystatin C-based estimated glomerular filtration rate, eGFR-CysC）对人工肝治疗的乙型肝炎病毒相关性慢加急性肝功能衰竭（hepatitis B virus-related acute-on-chronic liver failure, HBV-ACLF）预后的预测价值。**方法** 回顾性收集我院364例人工肝治疗的HBV-ACLF住院患者，根据28 d死亡率将患者分为存活组269例和死亡组95例，分析临床资料和实验室数据对患者短期预后的价值。**结果** 多因素Cox回归分析显示，基线eGFR-CysC水平低是HBV-ACLF患者28 d死亡率的独立风险因素之一（风险比=0.987；95%置信区间：0.979～0.996，P=0.003）。基线eGFR-CysC水平与终末期肝病模型评分（the model for end-stage liver disease, MELD）（r=−0.439，P<0.001）、MELD联合血清钠评分（r=−0.481，P<0.001）和慢性肝衰竭联盟-慢加急性肝衰竭预后评分（Chronic Liver Failure Consortium ACLF, CLIF-C ACLF）（r=−0.340，P<0.001）呈负相关。受试者工作特性（receiver operating characteristic, ROC）曲线分析示基线值，第一次、第二次、第三次使用人工肝治疗后的eGFR-CysC值判断患者28 d死亡与否的曲线下面积分别为0.639、0.697、0.716、0.749（P<0.001），eGFR-CysC最佳临界值分别为70.620、67.525、61.725、64.685 mL/(min·1.73 m^2)。**结论** eGFR-CysC水平能辅助评价人工肝治疗HBV-ACLF患者短期死亡率，动态监测的临床应用价值更高。

【关键词】 乙型肝炎相关性慢加急性肝衰竭 28 d死亡率 胱抑素C估算肾小球滤过率 人工肝治疗

Clinical Value of Cystatin C-Based Estimated Glomerular Filtration Rate in Assessing Short-Term Mortality in Patients with Hepatitis B Virus-Related Acute-on-Chronic Liver Failure Treated with Artificial Liver Support System

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【**Abstract**】 **Objective** To evaluate the predictive value of using cystatin c-based estimated glomerular filtration rate (eGFR-CysC) in assessing the prognosis of hepatitis B virus-associated acute-on-chronic liver failure (HBV-ACLF) patients treated with artificial liver support system (ALSS). **Methods** A total of 364 HBV-ACLF inpatients treated with ALSS at our hospital were enrolled retrospectively in the study. The patients were divided into the survival group (n=269) and non-survival group (n=95) according to mortality within 28 d, and their clinical information and laboratory data were analyzed for assessing short-term prognostic values. **Results** Multivariate Cox regression analysis identified eGFR-CysC as one of the independent risk factors associated with mortality within 28 days in HBV-ACLF patients (the hazard ratio=0.987; 95% confidence interval, 0.979-0.996, P=0.003). In addition, baseline eGFR-CysC was negatively correlated with the model for end-stage liver disease (MELD) score (r=−0.439, P<0.001), MELD plus sodium (MELD-Na) score (r=−0.481, P<0.001) and Chronic Liver Failure Consortium ACLF (CLIF-C ACLF) score (r=−0.340, P<0.001). Receiver operating characteristic (ROC) curve analysis showed area under the curve (*AUC*) of eGFR-CysC were 0.639, 0.697, 0.716, 0.749 and the best cut-off value were 70.620, 67.525, 61.725, 64.685 mL/(min·1.73 m^2), respectively, for baseline value and the first, second, and third treatment with ALSS. **Conclusion** eGFR-CysC could be used to assist clinical assessment of short-term mortality in HBV-ACLF patients treated with ALSS, and has better clinical application value for dynamic monitoring.

【**Key words**】 Hepatitis B virus-related acute-on-chronic liver failure 28-day mortality Cystatin C-based estimated glomerular filtration rate Artificial liver support system

慢加急性肝衰竭（acute-on-chronic liver failure, ACLF）是一种肝脏功能快速恶化的疾病，以器官衰竭和高短期死亡率为主要特征[1-3]。乙型肝炎病毒（hepatitis B virus, HBV）感染是我国患者发生ACLF的主要原因之一[4-5]。ACLF患者预后极差，一般的对症治疗无法解决根本问题，目前肝脏移植是提高患者生存率的有效治疗方式，但是器官来源有限，因此在过去几十年中，人工肝治疗（artificial liver support system, ALSS）已经作为肝衰竭患者的重要治疗手段，可为未获得肝移植机会的ACLF患者

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争取更多的时间, 但是有学者认为其应用在不同的患者安全性和疗效不一[6-7]。

导致ACLF高短期死亡率的主要因素包括多器官衰竭, 其中肾衰竭也是重要因素。近年来研究表明, 胱抑素C(cystatin C, CysC)可作为肝硬化等肝脏疾病患者发生肾损伤、短期死亡等的预后标志物[8-10], 胱抑素C估算肾小球滤过率(cystatin C-based estimated glomerular filtration rate, eGFR-CysC)可作为急性失代偿性肝硬化患者判断肾功能不全、ACLF的预后指标[10]。eGFR-CysC在肝硬化患者较肌酐估算肾小球滤过率(creatinine-based estimated glomerular filtration rate, eGFR-Crea)更能准确反映患者肾损伤和生存预后等[11]。CysC是一种半胱氨酸蛋白酶抑制剂, 以恒定速率产生, 由肾小球膜自由过滤, 在肝病患者中CysC不受年龄、性别和身体代谢的影响[12]。目前评估eGFR-CysC作为ALSS治疗的HBV-ACLF患者短期死亡率预测指标的价值还未见报道。因此, 本研究旨在探讨eGFR-CysC在评估ALSS治疗的HBV-ACLF患者短期死亡率预后的临床应用价值。

1　对象和方法

1.1　研究对象

回顾性分析四川大学华西医院2011年1月–2018年6月共364例应用ALSS治疗的HBV相关性ACLF(HBV-ACLF)住院患者。人工肝治疗包括血浆置换和胆红素吸附, 采用德国贝朗Diapact CRRT人工肝支持系统和HB-H-6胆红素吸附柱, 以肝素为抗凝剂。单次ALSS包括血浆灌流2 h、血浆置换1 500 mL, 患者每周接受2 ~ 3次人工肝治疗。ACLF诊断参照亚太肝病学会(Asia-Pacific Association for the Study of Liver, APASL)诊断标准[13]: 在慢性肝病基础上, 出现急性肝损伤表现, 黄疸伴总胆红素(total bilirubin, TBIL)≥5 mg/dL, 凝血功能障碍〔凝血酶原活动度(prothrombin activity, PTA)< 40%或国际标准化比值(international normalized ratio, INR)≥1.5〕。本研究遵循世界医学会赫尔辛基宣言, 经四川大学华西医院伦理委员会审查通过(2021年审140号)。

1.2　器官衰竭定义

器官衰竭评估根据慢性肝功能衰竭联盟-器官功能衰竭评分(Chronic Liver Failure Consortium organ failure score, CLIF-COFs)[14], 肝衰竭指血清TIBL≥12 mg/dL; 肾衰竭指血清肌酐(creatinine, Crea)≥2.0 mg/dL或使用肾脏替代疗法; 凝血功能衰竭指INR≥2.5或血小板计数(platelet count, PLT)≤20×10^9 L^{-1}; 循环衰竭指使用血管加压素等药物治疗。

1.3　检测指标

eGFR-CysC计算参照文献[11], eGFR-Crea计算参照文献[15]; 评估肝衰竭患者预后的经典模型——终末期肝病模型(the model for end-stage liver disease, MELD)计算参照文献[16]。MELD联合血清钠(MELD plus sodium, MELD-Na)评分参照文献[17]。慢性肝衰竭联盟-慢加急性肝衰竭预后评分(Chronic Liver Failure Consortium ACLF, CLIF-C ACLF)参照文献[18-19]。患者临床特征、器官衰竭状态、实验室指标及MELD、MELD-Na、CLIF-C ACLF均以患者入院时基线指标计算评估。ALSS治疗后eGFR-CysC以ALSS术后第二日晨8点采血CysC结果计算。

1.4　统计学方法

非正态分布的连续性变量用中位数和四分位数间距表示, 采用Mann-Whitney *U*检验对两组进行比较。分类变量用绝对数和百分数描述, 组间比较采用卡方检验或Fisher精确检验。采用多因素Cox回归分析评价28 d死亡的独立危险因素。相关分析采用Spearman相关性检验。应用受试者工作特性曲线(receiver operating characteristic curve, ROC curve)和Kaplan-Meier生存率分析评价eGFR-CysC对HBV-ACLF患者28 d死亡率的预测价值。$P<0.05$为差异有统计学意义。

2　结果

2.1　一般资料

本研究共纳入364例HBV-ACLF患者, 男性330例(90.66%), 女性34例(9.34%), 中位年龄42.5岁(15 ~ 77岁)。按28 d内是否死亡分为生存组(269例, 73.90%)和死亡组(95例, 26.10%)。死亡组肾功能衰竭、凝血功能衰竭和肝性脑病的发生率高于生存组($P<0.05$)。生存组MELD、MELD-Na和CLIF-C-ACLF评分低于死亡组($P<0.001$)。死亡组血清TBIL、CysC、INR和白细胞(white blood cell, WBC)均高于生存组($P<0.05$), 总蛋白(total protein, TP)、eGFR-Crea、eGFR-CysC、纤维蛋白原(fibrinogen, FIB)和PLT均低于存活组, 且差异均有统计学意义($P<0.05$)。见表1。

2.2　HBV-ALCF患者28 d死亡的独立危险因素

将表1中两组患者相比差异有统计学意义的参数纳入多因素Cox回归分析中进一步检验, 结果显示TBIL高〔回归系数(β) = 0.003; 风险比(hazard ratio, *HR*) = 1.003; 95%置信区间(confidence interval, *CI*), 1.001 ~ 1.004; $P=0.001$〕、有肝性脑病($\beta=-0.644$; *HR* = 0.525; 95%*CI*, 0.310 ~ 0.891; $P=0.017$)、INR($\beta=0.578$; *HR* = 1.782; 95%*CI*, 1.436 ~ 2.211; $P<0.001$)和基线eGFR-CysC水平低

表 1 纳入患者的基线特征和观察指标

Table 1 Baseline characteristics and observational indicators of patients enrolled in the study

Item	Survival group (n=269)	Non-survival group (n=95)	P
Clinical characteristics			
Age/yr., median (P_{25}-P_{75})	42.0 (32.0–50.0)	43.0 (37.0–52.0)	0.088
Male/case (%)	240 (89.9)	90 (92.8)	0.541
Cirrhosis/case (%)	210 (78.1)	79 (83.2)	0.376
Bacterial infection/case (%)	181 (67.3)	72 (75.8)	0.154
Gastrointestinal bleeding/case (%)	30 (11.2)	12 (12.6)	0.710
Hepatic encephalopathy/case (%)	21 (7.9)	25 (25.8)	<0.001
Organ failure/case (%)			
Liver	245 (91.1)	92 (96.8)	0.070
Kidney	4 (1.5)	6 (6.2)	0.023
Coagulation	65 (24.3)	52 (53.6)	<0.001
Circulation	3 (1.1)	1 (1.0)	1.000
Laboratory data			
TBIL/(mg/dL), median (P_{25}-P_{75})	20.9 (14.8–26.4)	25.0 (20.5–31.3)	<0.001
ALT/(IU/L), median (P_{25}-P_{75})	264.0 (94.5–753.0)	275.0 (107.0–803.0)	0.756
AST/(IU/L), median (P_{25}-P_{75})	198.0 (101.5–538.5)	280.0 (142.0–495.0)	0.197
TP/(g/L), median (P_{25}-P_{75})	60.0 (55.6–66.1)	58.3 (54.1–64.6)	0.042
ALB/(g/L), median (P_{25}-P_{75})	33.0 (30.5–36.1)	32.2 (29.7–34.9)	0.136
GLB/(g/L), median (P_{25}-P_{75})	26.7 (22.6–31.7)	25.3 (21.1–29.8)	0.082
ALB/GLB (median [P_{25}-P_{75}])	1.25 (1.02–1.54)	1.33 (1.03–1.65)	0.271
GGT/(IU/L), median (P_{25}-P_{75})	75.0 (50.5–109.0)	66.0 (42.0–121.0)	0.640
ALP/(IU/L), median (P_{25}-P_{75})	144.0 (115.5–179.0)	146.0 (117.0–174.0)	0.955
Crea/(mg/dL), median (P_{25}-P_{75})	0.84 (0.70–1.00)	0.87 (0.73–1.12)	0.098
eGFR-Crea/(mL/[min·1.73 m^2]), median (P_{25}-P_{75})	105.80 (89.31–117.82)	99.18 (78.66–114.13)	0.034
CysC/(mg/L), median (P_{25}-P_{75})	1.04 (0.92–1.18)	1.15 (0.98–1.37)	<0.001
eGFR-CysC/(mL/[min·1.73 m^2]), median (P_{25}-P_{75})	79.86 (63.72–95.00)	67.73 (53.60–82.47)	<0.001
INR (median [P_{25}-P_{75}])	2.1 (1.8–2.5)	2.6 (2.2–3.3)	<0.001
FIB/(g/L), median (P_{25}-P_{75})	1.38 (1.05–1.62)	1.12 (0.83–1.47)	<0.001
AT Ⅲ activity/%, median (P_{25}-P_{75})	21.6 (15.1–27.4)	19.9 (14.1–25.0)	0.211
RBC/(10^{12} L^{-1}), median (P_{25}-P_{75})	4.2 (3.7–4.6)	4.1 (3.7–4.5)	0.449
PLT/(10^9 L^{-1}), median (P_{25}-P_{75})	97.0 (74.0–135.0)	80.0 (57.5–116.7)	0.007
WBC/(10^9 L^{-1}), median (P_{25}-P_{75})	6.5 (5.1–8.4)	8.3 (6.3–11.1)	<0.001
HBV-DNA/(lg IU/mL), median (P_{25}-P_{75})	5.40 (3.83–7.12)	5.23 (3.87–6.57)	0.280
$HBeAg^+$/case (%)	93 (34.6)	40 (42.1)	0.270
Scores (median [P_{25}-P_{75}])			
MELD	24.4 (22.0–27.8)	28.9 (25.5–32.4)	<0.001
MELD-Na	25.0 (22.8–29.1)	30.7 (26.9–36.4)	<0.001
CLIF-C ACLF	37.9 (33.1–42.4)	43.5 (39.2–46.6)	<0.001

TBIL: Total bilirubin; ALT: Alanine aminotransferase; AST: Aspartate transaminase; TP: Total protein; ALB: Albumin; GLB: Globulin; GGT: γ-glutamyl transpeptidase; ALP: Alkaline phosphate; Crea: Creatinine; eGFR-Crea: Creatinine-based estimated glomerular filtration rate; CysC: Cystatin C; eGFR-CysC: Cystatin C-based estimated glomerular filtration rate; INR: International normalized radio; FIB: Fibrinogen; AT Ⅲ: Thrombin antithrombin Ⅲ; RBC: Red blood cell; PLT: Platelet; WBC: White blood cell; HBV-DNA: Hepatitis B-DNA; HBeAg: Hepatitis B-e antigen; MELD: The model for end-stage liver disease; MELD-Na: The model for end-stage liver disease plus sodium; CLIF-C ACLF: Chronic Liver Failure Consortium ACLF.

(β= −0.013; *HR*= 0.987; 95%*CI*, 0.979 ~ 0.996; *P*= 0.003)是HBV-ACLF患者28 d内死亡的独立危险因素。

2.3　基线eGFR-CysC水平和eGFR-Crea对HBV-ACLF患者28 d死亡率的预测价值分析

Spearman相关性显示, 基线eGFR-CysC水平与CLIF-C ACLF评分(r= −0.340, P< 0.001)、MELD-Na评分(r= −0.481, P< 0.001)和MELD评分(r= −0.439, P< 0.001)均呈负相关(图1)。为进一步了解eGFR-CysC水平预测HBV-ACLF患者28 d死亡率的效能, 进行了ROC曲线分析, 结果显示基线eGFR-CysC用于判断HBV-ACLF患者预后的曲线下面积(area under the curve, *AUC*)为0.639(95%*CI*, 0.573 ~ 0.704; P< 0001), 优于eGFR-Crea(*AUC*为0.575, 95%*CI*, 0.505 ~ 0.646; P= 0.029), 差异有统计学意义(P= 0.033)(图2)。用Youden指数确定基线eGFR-CysC最佳临界值为70.620 mL/(min·1.73 m^2), 灵敏度57.9%, 特异度68.0%, 阳性预测值39.0%, 阴性预测值82.0%。Kaplan-Meier分析显示, 基线eGFR-CysC< 70.620 mL/(min·1.73 m^2)的ACLF患者28 d平均生存时间为21.730 d, 基线eGFR-CysC≥70.620 mL/(min·1.73 m^2)的ACLF患者28 d平均生存时间为25.112 d, 两组间差异有统计学意义(Log-

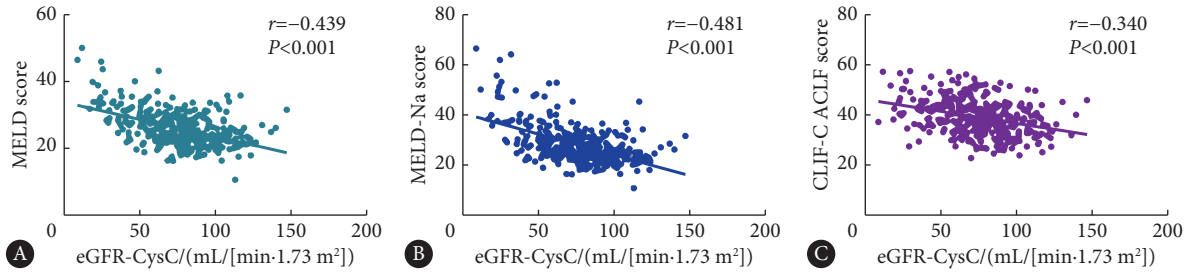

图 1　eGFR-CysC与预后模型MELD评分、MELD-Na评分和CLIF-C ACLF评分的相关性分析

Fig 1　Correlation analysis between eGFR-CysC and MELD score, MELD-Na score and CLIF-C ACLF score in HBV-ACLF patients

eGFR-CysC, MELD, MELD-Na, CLIF-C ACLF: Denotes the same as those in Table 1.

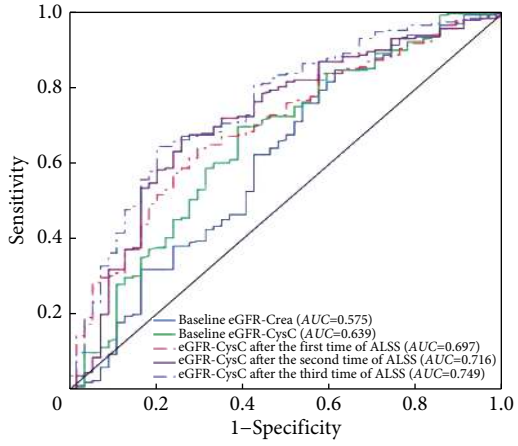

图 2　eGFR-Crea及eGFR-CysC评估HBV-ACLF患者28 d死亡率的ROC曲线分析

Fig 2　ROC curve analysis of eGFR-Crea and eGFR-CysC for assessing 28 d mortality in patients with HBV-ACLF

eGFR-Crea, eGFR-CysC: The abbrevations denote the same as those in Table 1. HBV-ACLF: Hepatitis B virus-related acute-on-chronic liver failure; *AUC*: Area under the curve; ALSS: Artificial liver support system.

Rank χ^2= 20.376, P< 0.001)(图3A)。

2.4　ALSS治疗过程中eGFR-CysC动态监测对HBV-ACLF患者28 d死亡率的预测价值分析

接受第一次、第二次、第三次ALSS治疗后的患者的eGFR-CysC水平逐渐降低(表2), 与基线值相比, 第一次ALSS治疗后生存组eGFR-CysC水平下降4.80%, 死亡组eGFR-CysC水平下降18.89%。第二次和第三次ALSS治疗后, 生存组eGFR-CysC分别下降7.93%和8.91%, 死亡组分别下降27.68%和25.98%。死亡组eGFR-CysC下降率约为生存组的3 ~ 4倍, 且生存组和死亡组eGFR-CysC水平变化比较差异有统计学意义(P< 0.001)。进一步对eGFR-CysC值进行ROC曲线分析, 第一次、第二次、第三次使用ALSS治疗后的*AUC*分别为0.697、0.716、0.749(图2), 用Youden指数确定其最佳临界值分别为67.525、61.725、64.685 mL/(min·1.73 m^2), 其灵敏度分别为69.9%、75.7%、78.6%, 特异度分别为63.1%、66.5%、64.1%, 阳性预测值分别为40.1%、37.9%、34.6%, 阴性预测值分别为85.6%、91.0%、92.5%。按第一次、第二次、第三次ALSS治疗后eGFR-CysC最佳临界值进行分层后分别作Kaplan-Meier分析, 结果显示分层后两组间差异均有统计学意义(P< 0.001)(图3B ~ 3D)。

3　讨论

在我国, HBV感染是导致ACLF的主要因素, ACLF患者28 d死亡率可高达30% ~ 40%[20]。在本研究中, 所有ACLF患者都接受ALSS治疗。虽然ALSS可以帮助患者稳定病情并等待肝移植的机会, 但其疗效在不同患者中不能确定, 不能提高整体生存率[21]。结果表明, ALSS治疗后28 d死亡的患者肾功能衰竭、凝血功能衰竭和肝性脑病

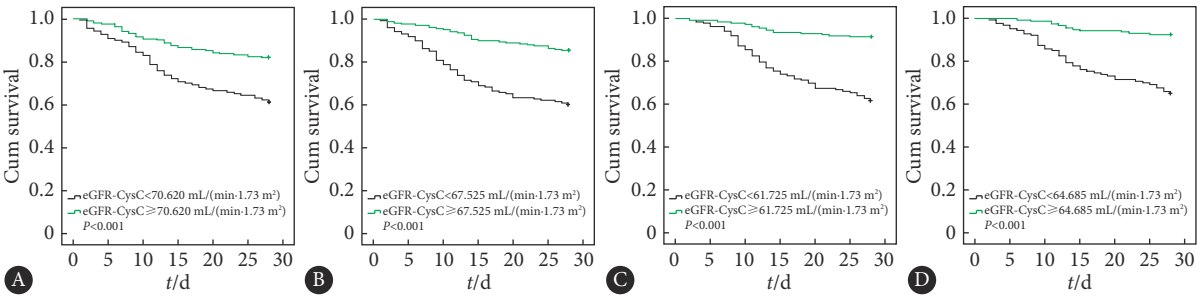

图 3 按eGFR-CysC分层的28 d生存曲线分析

Fig 3 Kaplan-Meier analysis was made to compare the cumulative risk for eGFR-CysC

A: Baseline eGFR-CysC; B: eGFR-CysC after the first ALSS; C: eGFR-CysC after the second ALSS; D: eGFR-CysC after the third ALSS. eGFR-CysC: The abbreviations denote the same as those in Table 1.

表 2 人工肝治疗HBV-ACLF患者eGFR-CysC水平动态变化比较〔中位数(P_{25}～P_{75})〕

Table 2 Dynamic measurements of eGFR-CysC levels of HBV-ACLF patients based on ALSS treatment (median [P_{25}-P_{75}])

Number of ALSS	eGFR-CysC/(mL/[min·1.73 m^2])			Decreased rate of eGFR-CysC (compare to baseline level)/%		
	Survival group (*n*=369)	Non-survival group (*n*=95)	*P*	Survival group (*n*=369)	Non-survival group (*n*=95)	*P*
1	74.23 (55.86–88.64)	54.47 (34.95–71.22)	<0.001	4.80 (4.25–18.67)	18.89 (4.16–34.86)	<0.001
2	72.34 (56.42–87.40)	50.79 (31.47–62.22)	<0.001	7.93 (2.84–22.06)	27.68 (12.43–37.47)	<0.001
3	71.46 (55.07–86.81)	50.39 (32.42–63.35)	<0.001	8.91 (4.30–20.89)	25.98 (10.34–43.46)	<0.001

ALSS denotes the same term as the one in Fig 2; eGFR-CysC denotes the same term as the one in Table 1.

的发生率均高于存活患者，分别为存活患者的4倍、2倍和3倍。这也表明，在接受ALSS治疗的HBV-ACLF患者中，肾功能不全/衰竭可能是预后不良甚至死亡的一个预测因素。APASL和欧洲肝病学会的研究也报道了肾功能衰竭是预测ACLF患者早期死亡率的预后指标[13, 22]，所以肾功能相关指标也可能作为ACLF的预后指标。目前临床上常用的肾小球滤过率指标是根据血清Crea计算而来，而作为肾功能参数的eGFR-CysC尚未被广泛应用。因为肝病患者自身代谢紊乱等因素影响，eGFR-Crea不能体现患者的真实情况[11]，eGFR-CysC则不受此类因素的干扰，故eGFR-CysC在肝硬化患者评估肾损伤和生存的效能优于eGFR-Crea[23]。已有研究认为，CysC联合TBIL可预测ACLF患者短期生存率[8]，CysC可预测ACLF患者急性肾损伤[9]，但eGFR-CysC是否为预测HBV-ACLF预后的有用指标值得进一步探索。本研究中多因素Cox回归分析表明eGFR-CysC是预测HBV-ACLF患者28 d死亡率的独立指标，而eGFR-Crea不是，表明在此类人群中相较于常规使用的eGFR-Crea，eGFR-CysC更不可忽略。

本研究结果显示，eGFR-CysC与已广泛应用于ACLF患者病情严重程度的评估和预后评估的MELD评分、MELD-Na评分或CLIF-C ACLF评分呈负相关。表明eGFR-CysC作为单一的生物标志物也可辅助临床判断ALSS治疗的HBV-ACLF患者的预后。对基线eGFR-CysC进行ROC分析和Kaplan-Meier生存率分析表明，eGFR-CysC用于评估HBV-ACLF患者28 d死亡率有一定临床应用预测价值，eGFR-CysC≥70.620 mL/(min·1.73 m^2)可提示约82.0%HBV-ACLF患者预后良好。

由于基线eGFR-CysC对HBV-ACLF患者28 d死亡率预测价值有限，我们进一步探讨ALSS治疗过程中eGFR-CysC的动态监测对预测HBV-ACLF患者28 d死亡率的意义。ALSS治疗后患者eGFR-CysC均持续下降，但死亡组eGFR-CysC下降幅度明显大于生存组，约为生存组的3～4倍。ACLF患者肾小球滤过率下降可能由于患者基础循环异常和机体炎症等疾病状态导致[24]，相较于生存患者，死亡患者疾病进展更为迅速，提示在死亡患者中ALSS治疗未能有效延缓死亡组患者疾病状态，从而导致肾小球滤过率急剧恶化，肾脏功能损伤更加严重。已有研究证明在肝脏疾病患者中，肾脏功能损伤愈严重，患者预后愈差[25]。本研究结果提示肾脏功能损伤程度与ALSS治疗的HBV-ACLF患者的预后相关，肾功能越差，患者死亡的风险越大。对使用ALSS第一次、第二次、第三次的eGFR-CysC值进行ROC曲线分析，发现*AUC*随ALSS治疗次数的增加逐渐增高，且使用人工肝后患者28 d生存情况的eGFR-CysC临界值与基线临界值相比呈下降趋势，在ALSS治疗后eGFR-CysC降低至67 mL/(min·1.73 m^2)以下时，需要重视患者预后。因此，不止基线eGFR-CysC对评估HBV-ACLF患者28 d死亡率有一定的预测价值，连续的eGFR-CysC测定更有助于评估HBV-ACLF患者的短

期死亡率。对于频繁使用ALSS治疗的HBV-ACLF患者密切关注其肾功能变化，尤其是基于eGFR-CysC评估的肾功能对于评估患者短期生存率具有一定临床价值。

综上所述，eGFR-CysC可辅助临床判断ALSS治疗的HBV-ACLF的短期生存预后，其计算简便，临床易获取，相较于临床上常用的eGFR-Crea，在ALSS治疗过程中对eGFR-CysC进行监测有助于临床医生掌握患者病情变化，及时调整治疗方案，降低病死率。但是本研究尚存局限，即回顾性研究受限于在单一中心收集的小样本数据。因此，有必要展开多中心研究，以验证eGFR-CysC对ALSS治疗的HBV-ACLF患者预后的临床应用价值。

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利益冲突　所有作者均声明不存在利益冲突

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