

doi: 10.13241/j.cnki.pmb.2021.22.030

重症肺炎患儿 suPAR 水平对比分析及与影像学表现的相关性 *

余菲菲^{1,2} 朱晓萍^{1Δ} 龙梅² 唐贵文³ 凌萍⁴

(1 贵州医科大学 / 贵州医科大学附属医院儿科 贵州 贵阳 550025; 2 贵阳市第二人民医院儿科 贵州 贵阳 550081;

3 贵阳市第二人民医院检验科 贵州 贵阳 550081; 4 贵阳市儿童医院儿童重症监护室 贵州 贵阳 550003)

摘要 目的:探讨重症肺炎患儿可溶性尿激酶型纤溶酶原激活物受体(soluble urokinase-type plasminogen activator receptor, suPAR)水平并对比分析及与影像学表现的相关性。**方法:**选取贵阳市第二人民医院及贵阳市儿童医院 2020 年 1 月到 2020 年 12 月共收治的 70 例肺炎患儿作为研究对象,其中重症肺炎患儿 35 例,男 22 例、女 13 例,将其分为重症组,轻症肺炎患儿 35 例,男 20 例、女 15 例,将其分为轻症组。对比两组患儿的 suPAR 水平、心肌酶水平以及肺部影像学结果,了解 suPAR 在重症肺炎中是否具有敏感性 & 特异性,并分析重症肺炎 suPAR 水平与心肌酶、肺部影像学结果是否存在相关性。**结果:**重症组 suPAR 水平较轻症组明显升高,差异具有统计学意义($P < 0.05$),重症组患儿肌酸激酶同工酶(creatine kinase isoenzymes-MB, CK-MB)、肌酸激酶(creatine kinase, CK)、乳酸脱氢酶(lactate dehydrogenase, LDH)、谷草转氨酶(Aspartate aminotransferase, AST)心肌酶相关指标明显高于轻症组,差异具有显著性($P < 0.05$);两组患儿密度增高影、带片絮状影、节段性实变、斑片状影人数对比无明显差异($P > 0.05$),两组患儿肺不张、大片状影、双肺纹增多人数对比差异显著($P < 0.05$);suPAR 水平与 CK-MB、CK、LDH、AST 以及影像学特征呈正相关($P < 0.05$)。血清 suPAR 水平对重症肺炎病情危重程度 ROC 的 AUC 为 0.897 (95%CI:0.819~0.975),最佳 cutoff 值为 1.9 ng/mL,此时特异度、灵敏度为 82.86 %、85.71 %。**结论:**重症肺炎组 suPAR 的值与心肌酶呈正相关;suPAR 水平与影像学表现具有相关性;suPAR 水平越高提示病情越危重,在重症肺炎评估中其敏感性 & 特异性增高。

关键词:重症肺炎; suPAR; 影像学表现; 心肌酶

中图分类号: R563.1; R445 **文献标识码:** A **文章编号:** 1673-6273(2021)22-4344-04

Comparative Analysis of SuPAR Level in Children with Severe Pneumonia and Its Correlation with Imaging Findings*

YU Fei-fei^{1,2}, ZHU Xiao-ping^{1Δ}, LONG Mei², TANG Gui-wen³, LING Ping⁴

(1 Department of Pediatrics, Guizhou Medical University/Affiliated Hospital of Guizhou Medical University, Guiyang, Guizhou, 550025, China; 2 Department of Pediatrics, Guiyang Second People's Hospital, Guiyang, Guizhou, 550081, China; 3 Department of Laboratory Medicine, Guiyang Second People's Hospital, Guiyang, Guizhou, 550081, China; Children's Intensive Care Unit, Guiyang Children's Hospital, Guiyang, Guizhou, 550003, China)

ABSTRACT Objective: To investigate the correlation between suPAR (soluble urokinase type plasminogen activator receptor) levels and imaging findings in children with severe pneumonia. **Methods:** 70 cases of children with pneumonia in our hospital from January 2020 to December 2020 were selected as the research object. Among them, 35 children with severe pneumonia, 22 males and 13 females, were divided into severe group, 35 children with mild pneumonia, 20 males and 15 females. The levels of suPAR, myocardial enzymes, and lung imaging results were compared between the two groups, to understand whether suPAR has sensitivity and specificity in severe pneumonia, and to analyze whether there is correlation between suPAR level and myocardial enzyme and lung imaging results. **Results:** The level of suPAR in the severe group was significantly higher than that in the mild group, and the difference was statistically significant ($P < 0.05$). The severe group was creatine kinase isoenzyme (CK-MB) and creatine kinase (CK), lactate dehydrogenase (LDH), aspartate aminotransferase (AST) myocardial enzyme related indicators were significantly higher than the mild group, and the difference was statistically significant ($P < 0.05$), the two groups of children with increased density, flocculent shadows, knots, there was no significant difference in the number of segmental consolidation and patchy shadows ($P > 0.05$). There was a significant difference in the number of atelectasis, large patchy shadows, and double lung striae between the two groups ($P < 0.05$); suPAR level and CK-MB, CK, LDH, AST and imaging characteristics were positively correlated ($P < 0.05$). The AUC of serum suPAR level for ROC of severe pneumonia was 0.897 (95% CI: 0.819-0.975), and the optimal cutoff value was 1.9 ng/ml. the specificity, sensitivity were 82.86 %, 85.71 %, respectively. **Conclusion:** The value of suPAR in the severe pneumonia group is positively correlated with myocardial enzymes; the level of suPAR is correlated with imaging findings; the higher the level of suPAR, the more critical the condition, high sensitivity and specificity in the evaluation.

* 基金项目:贵州省科技厅社发公关项目(黔科合支撑[2020]4Y124号)

作者简介:余菲菲(1983-),女,本科,主治医师,研究方向:儿童呼吸与免疫,电话:13984050112, E-mail: yufeifei20101226@163.com

Δ 通讯作者:朱晓萍(1963-),女,博士,主任医师,研究方向:小儿呼吸、免疫、感染性疾病,电话:15185145684, E-mail: zxp_1963819@163.com

(收稿日期:2021-02-26 接受日期:2021-03-23)

tion of severe pneumonia.

Key words: Severe pneumonia; suPAR; Imaging findings; Myocardial enzymes

Chinese Library Classification (CLC): R563.1; R445 **Document code:** A

Article ID: 1673-6273(2021)22-4344-04

前言

肺炎是儿童时期,尤其是婴幼儿常见的感染性疾病,是儿童住院的最主要的原因,也是5岁以下儿童死亡的主要原因。我国每年肺炎发病人数高达2100万人,在所有肺炎中约7%~13%属于重症肺炎,重症肺炎起病急,并发症多,死亡率高,故早诊断早治疗是降低死亡率的关键^[1-3]。在世界范围内,每年有1.56亿肺炎患儿,其中1.51亿在发展中国家,医疗资源较差的国家中,重症肺炎儿童的死亡率甚至超过2%^[4-6]。早期诊断、准确评估患者的病情及合理救治非常重要。近年来,国内外对重症肺炎尚缺乏特异性早期诊断指标,早期诊断细菌感染的重症肺炎除了出现严重的通换气功能障碍或肺内外并发症外,检查多是通过白细胞计数(white blood count, WBC)、中性粒细胞(neutrophil, N)、C反应蛋白(C reaction protein, CRP)、降钙素原(procalcitonin, PCT)等确定严重程度,而近期研究表明^[7-9],可溶性尿激酶型纤溶酶原激活物受体(soluble urokinase-type plasminogen activator receptor, suPAR)在评估肺炎的严重程度及预后方面有指导意义。suPAR是一种新的标志物,来源于尿激酶型纤溶酶原激活物受体(urokinase-type plasminogen activator receptor, uPAR)。uPAR是分子量50000-65000的糖化磷脂酰肌醇锚膜蛋白,物理条件下表达于单核细胞、巨噬细胞、中性粒细胞、内皮细胞、激活的T细胞表面,在肿瘤和炎症等病理条件下,脱落成suPAR,其昼夜水平稳定,不受饮食影响^[10]。suPAR在炎症反应中具有介导炎症细胞迁移、粘附、趋化、细胞信号传导等作用,监测suPAR水平研究疾病已成为重要研究方向^[11]。因此本文选取2020年1月到2020年12月共收治的70例肺炎患儿作为研究对象,探讨重症肺炎患儿suPAR水平对比分析及与影像学表现的相关性,具体报告如下。

1 资料与方法

1.1 一般资料

选取70例2020年1月至2020年12月在贵阳市第二人民医院及贵阳市儿童医院住院的患儿,入组患儿家属签署知情同意书并获得伦理委员会通过,入组年龄>28 d, <14岁,按照我国儿童社区获得性肺炎诊疗规范(2019年版)分为35例轻症肺炎及35例重症肺炎。轻症组,男20例、女15例;年龄1个月~4岁,平均(2.34±1.61)岁;病程5~7 d,平均(4.12±1.54)d。重症组,男22例、女13例;年龄1个月~2岁,平均(0.64±0.25)岁;病程11~16 d,平均(10.43±1.58)d。两组患儿性别构成差异无统计学意义($P>0.05$)。

本研究中纳入的病例是指在医院外(社区)发病的感染性肺炎,包括在医院外(社区)感染了具有明确潜伏期的病原体而在入院后发病的肺炎。不包括吸入性以及过敏性等非感染性肺炎。

1.2 纳入标准与排除标准

1.2.1 纳入标准 (1)轻症肺炎入选标准:①一般情况好;②无意识障碍;③无低氧血症;④无超高热,持续高热<5 d;⑤无脱水征及拒食;⑥胸片或胸部CT小于2/3一侧肺浸润,无多叶肺浸润、胸腔积液、气胸、肺不张、肺坏死、肺脓肿;⑦无肺外并发症。上述情况所有都存在考虑轻症肺炎^[12]。(2)重症肺炎入选标准:①一般情况差;②有意识障碍;③有紫绀;呼吸增快,RR≥70次/分(婴儿),RR≥50次/分(1岁以上);辅助呼吸(呻吟、鼻扇、三凹征),间歇性呼吸暂停;氧饱和度<92%;④超高热,持续高热>5 d;⑤有脱水征及拒食;⑥胸片或胸部CT≥2/3一侧肺浸润,有多叶肺浸润、胸腔积液、气胸、肺不张、肺坏死、肺脓肿;⑦有肺外并发症。出现以上任何一种情况考虑重症肺炎^[13]。(3)确诊为细菌感染的依据:①外周血白细胞数和中性粒细胞比例升高(28 d>年龄<1岁:WBC>11-12×10⁹/L, N>31%~40%;1>年龄<14岁:WBC>8-10×10⁹/L, N>40%~70%),或白细胞数和中性粒细胞比例明显下降,可有核左移。②CRP:>10 mg/L。③降钙素原(PCT):>0.25 ng/mL。以上依据需综合考虑^[14]。

1.2.2 排除标准 ①患有先天性心脏病;②肾病综合征、肾小球肾炎;③多发性骨髓瘤、肺癌、白血病;④肺结核;⑤免疫缺陷病;先天及后天免疫缺陷(如慢性肉芽肿、先天性胸腺发育不良、HIV、自身免疫性溶血等)。

1.3 方法

受试对象入组第1 d分别抽取静脉血2~3 mL, 3000 r/min离心10 min,吸取上层血清液移入EP管,置于-80℃冰箱保存待测。采用酶联免疫吸附法检测血清中的suPAR浓度水平,电化学发光法测心肌酶[肌酸激酶同工酶(creatine kinase isoenzyme, CK-MB)、肌酸激酶(creatine kinase, CK)、乳酸脱氢酶(lactate dehydrogenase, LDH)、谷草转氨酶(Aspartate aminotransferase, AST)],收集肺部影像学结果,并进行登记整理。用两组的suPAR数据进行对比,了解重症肺炎组的suPAR与轻症肺炎组的差别,另外用重症肺炎组suPAR与心肌酶(CK-MB、CK、LDH、AST)以及影像学对比,了解是否具有相关性。受试者工作特性曲线(receiver operating characteristic curve, ROC)分析预估诊断价值,计算ROC曲线下面积(area under curve, AUC)及对应的敏感性、特异性。

1.4 统计学方法

本研究数据采取统计学软件SPSS 23.0进行数据分析,计数资料以例数/百分比(n/%)表示,进行 χ^2 检验;计量资料以符合正态分布则用($\bar{x} \pm s$)表示,多组间比较采用t检验;采用Spearman相关分析方法分析心肌酶、肺部影像学与suPAR水平的相关性;ROC曲线分析预估诊断价值。以 $P<0.05$ 为差异有统计学意义。

2 结果

2.1 两组患儿suPAR水平及心肌酶水平对比分析

两组患儿 suPAR 水平对比差异显著,重症组明显高于轻症组($P<0.05$),如表 1。
重症组患儿 CK-MB、CK、LDH、AST 心肌酶相

表 1 两组患儿 suPAR 水平对比分析($\bar{x} \pm s$)
Table 1 Comparative analysis of suPAR levels in the two groups($\bar{x} \pm s$)

Groups	n	suPAR(ng/ mL)	CK-MB(U/L)	CK(U/L)	LDH(U/L)	AST(U/L)
Severe group	35	4.12 $\pm$ 1.32*	31.57 $\pm$ 9.25*	276.31 $\pm$ 31.53*	224.21 $\pm$ 76.31*	36.21 $\pm$ 16.15*
Mild group	35	1.52 $\pm$ 0.64	22.43 $\pm$ 10.41	142.47 $\pm$ 46.21	185.31 $\pm$ 48.24	22.53 $\pm$ 16.32

Note: compared to the mild group, * $P<0.05$.

2.2 两组患儿肺部影像学特征对比分析

人数对比无明显差异($P>0.05$),两组患儿肺不张、大片状影、
两组患儿密度增高影、带片絮状影、节段性实变、斑片状影 双肺纹增人数对比差异显著($P<0.05$),如表 2。

表 2 两组患儿肺部影像学特征对比分析(例,%)
Table 2 Comparative analysis of lung imaging features in the two groups(n,%)

Groups	n	Density Increase Shadow	Atelectasis	Large shadow	Flocculation with a patch	Segmental consolidation	Double lung striations increased	Variegated shadow
Severe group	35	17 (48.57)	5(14.29)*	4(11.43)*	2(5.71)	3(8.57)	1(2.86)*	3(8.57)
Mild group	35	19(54.29)	0(0.00)	0(0.00)	0(0.00)	0(0.00)	8(22.88)	1(2.86)

Note: compared to the mild group, * $P<0.05$.

2.3 suPAR 水平与心肌酶、肺部影像学相关性分析

学特征具有相关性,差异具有统计学意义($P<0.05$),如表 3。

suPAR 水平与 CK-MB、CK、LDH、AST 呈正相关,与影像

表 3 suPAR 水平与心肌酶、肺部影像学相关性分析
Table 3 Correlation analysis between suPAR levels and myocardial enzymes, lung imaging

Index	suPAR level	
	r	P
CK-MB	0.586	0.013
CK	0.579	0.018
LDH	0.374	0.009
AST	0.345	0.029
Imaging features	0.463	0.011

2.4 血清 suPAR 水平对重症肺炎患儿病情危重程度的预测价值

血清 suPAR 水平预测重症肺炎患儿病情危重程度的 ROC 曲线见图 1,AUC 为 0.897(95%CI:0.819~0.975)。血清 suPAR 的最佳 cutoff 值为 1.9 ng/mL,此时 suPAR 水平对重症肺炎病情危重程度的特异度、敏感度分别为 82.86 %、85.71 %。

3 讨论

肺炎是指由病原体感染或吸入羊水及油类和过敏反应等所引起的肺部炎症。当肺炎患儿出现严重的通换气功能障碍或肺内外并发症时,即为重症肺炎^[9]。细菌感染性肺炎是伴有 WBC、N、CRP、PCT 等感染指标增高的肺炎。suPAR 也是儿科重症监护病房的一个新的生物标志物,在小儿下呼吸道感染患者 suPAR 升高,重症肺炎患儿 suPAR 值高于轻症肺炎患者。该指标可作为急诊科呼吸窘迫综合征患者死亡率的预后生物学指标^[10]。

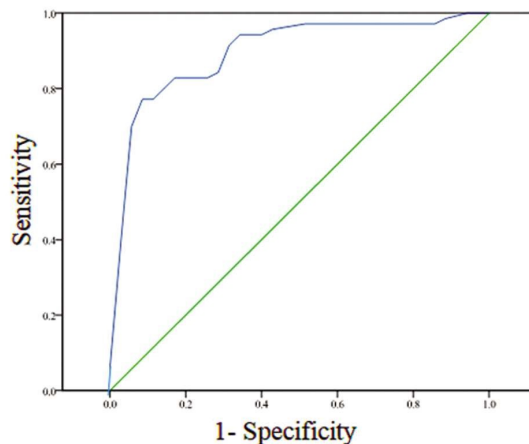


图 1 血清 suPAR 水平预测重症肺炎患儿病情危重程度的 ROC 曲线
Fig.1 ROC of serum suPAR level in predicting the severity of severe pneumonia in children

本研究结果表明,重症组与轻症组患儿 suPAR 水平对比差异显著,重症组明显高于轻症组,重症组患儿 CK-MB、CK、LDH、AST 心肌酶相关指标明显高于轻症组,邹芳等^[17]对 69 例重症肺炎和轻症肺炎血清 suPAR、PCT、RAGE 研究表明,PCT、suPAR 水平高于健康组,且重症肺炎高于轻症肺炎组,与本研究的结果类似。血清 suPAR、PCT 对重症肺炎及其预后评估价值较高。或可为重症肺炎早期诊断和预后评估提供参考^[18]。本研究还发现,心肌酶相关指标与重症肺炎患儿的疾病严重程度也存在一定关系,但是具体原因有待进一步研究探讨。张涛^[19]等在对 63 例重症肺炎患者血清 suPAR 及多配体蛋白聚糖 4 水平研究中,重症 CAP 患者血清 suPAR 水平较非重症 CAP 患者显著升高,与本研究相符。两组患儿密度增高影、带片絮状影、节段性实变、斑片状影人数对比无明显差异,两组患儿肺不张、大片状影、双肺纹增人数对比差异显著,由此证明,轻度肺炎和重症肺炎患儿,临床上影像学表现具有一定差异,但是多数患儿呈现密度增高影;suPAR 水平与 CK-MB、CK、LDH、AST 以及影像学特征呈正相关。孙印等^[20]对例重症肺炎血清 suPAR、sTREM-1 水平分析结果,两者值均较轻症肺炎增高,与 PSI 评分呈正相关,表明 suPAR 可用于评估重症肺炎的严重程度。Sunnetcioglu 等^[21]对 31 例 VAP 研究,患者血清 suPAR 水平明显高于无 VAP 者。A.W 等^[22]对 74 例肺炎研究发现,CRP 值较高的患者 suPAR 水平高于 CRP 浓度较低的患者,suPAR 水平与 CRP 水平呈正相关^[23-25]。Wrotek A 等指出,suPAR 在肺组织的先天宿主防御中有其重要作用^[26-28]。本研究证实,suPAR 水平与 CK-MB、CK、LDH、AST、以及影像学特征呈正相关,也是对相关研究的一个补充性结果;suPAR 水平对重症肺炎病情危重程度的特异度、灵敏度分别为 82.86 %、85.71 %,由此证明,在肺炎的诊断方面,suPAR 与传统的炎症标志物或胸片相比,更能提示肺炎的严重程度,对 CAP 中的重症肺炎有一定的预测作用^[29]。唐智敏^[30]在对例重症肺炎患者研究中发现,血清 suPAR 水平明显增加,和疾病严重程度呈正相关,具有较高的特异度、准确度、临床应用价值高,与本研究相符。目前对于重症肺炎组患儿 suPAR 水平与影像学表现,国内外的研究甚少,本研究首次将患儿的 suPAR 水平与影像学表现联系在一起,结果也发现 suPAR 水平与影像学表现具有相关性,这为以后研究影像学结合肺炎指标诊断重症肺炎提供了新的评价方向。本研究也存在一定的不足,样本量少,结果可能存在一定的偏倚,同时没有具体的探究 suPAR 在肺炎中的具体作用机制。

综上所述,重症肺炎组 suPAR 的值与心肌酶呈正相关;suPAR 水平与影像学表现具有相关性;suPAR 水平越高提示病情越危重,在重症肺炎评估中敏感性及特异性高。

参考文献(References)

- [1] Yan ST, Sun LC, Lian R, et al. Diagnostic and predictive values of procalcitonin in bloodstream infections for nosocomial pneumonia[J]. J Crit Care, 2018, 44: 424-429
- [2] Wahl B, Knoll MD, Shet A, et al. National, regional, and state-level pneumonia and severe pneumonia morbidity in children in India: modelled estimates for 2000 and 2015 [J]. Lancet Child Adolesc Health, 2020, 4(9): 678-687
- [3] Alamneh YM, Adane F, et al. Magnitude and Predictors of Pneumonia among Under-Five Children in Ethiopia: A Systematic Review and Meta-Analysis[J]. J Environ Public Health, 2020, 2020: e1606783
- [4] Jahan Y, Rahman SA, Chowdhury AS, et al. Management of severe childhood pneumonia by day care approach in developing countries [J]. Health Promotion Perspectives, 2018, 8(1): 88-91
- [5] Mondal D. Clinico-Aetiological Study of Severe and Very Severe Pneumonia in Two Months to Five Years Children in a Tertiary Health Care Centre in Odisha, India [J]. Journal of Clinical & Diagnostic Research, 2017, 11(9): 1-12
- [6] Abhiram I, Panchanathan S, Ganesan R, et al. Serum zinc level: a prognostic marker for severe pneumonia in children [J]. International Journal of Contemporary Pediatrics, 2019, 6(2): e1132
- [7] Benito J, Luaces-Cubells C, Santiago Mintegi, et al. Lack of value of midregional pro-adrenomedullin and C-terminal pro-endothelin-1 for prediction of severe bacterial infections in infants with fever without a source[J]. Eur J Pediatr, 2013, 172(11): 1441-1449
- [8] Alejandre C, Guitart C, Mònica Balaguer, et al. Use of procalcitonin and C-reactive protein in the diagnosis of bacterial infection in infants with severe bronchiolitis[J]. Eur J Pediatr, 2020, 14: e20
- [9] 吕迎霞,杨俊梅,郑娟娟,等. 细菌性肺炎、支原体肺炎和病毒性肺炎患儿的 PCT、WBC、CRP 水平对比 [J]. 包头医学院学报, 2019, 35(7): 72-73
- [10] 孙颖,王翠兰,刘持善,等. 中枢神经系统感染患者脑脊液中 suPAR、sICAM-1 的变化及意义[J]. 中国临床神经科学, 2007, 15(4): 387-391
- [11] Rovina N, Akinosoglou K, Eugen-Olsen J, et al. Soluble urokinase plasminogen activator receptor (suPAR) as an early predictor of severe respiratory failure in patients with COVID-19 pneumonia [J]. Critical Care, 2020, 24(1): e187
- [12] 儿童社区获得性肺炎诊疗规范 (2019)[Z]. 国家卫生健康委员会、国家中医药管理局, 2019
- [13] 中华医学会儿科学分会呼吸学组.《中华儿科杂志》编辑委员会.儿童社区获得性肺炎管理指南 (2013 修订)(上)[J]. 中华儿科杂志, 2013, 51(10): 745-752
- [14] 童朝晖,王巍伟. 细菌性肺炎的诊断与治疗 [J]. 传染病信息, 2008, 21(1): 16-19
- [15] 王卫平,孙锬,常立文.儿科学第 9 版[M]. 北京:人民卫生出版社, 2018
- [16] Savava A, Raftogiannis M, Adyaman F, et al. Soluble urokinase plasminogen activator receptor (suPAR) for assessment of disease severity in ventilator-associated pneumonia and sepsis [J]. J infect, 2011, 63(5): 344-350
- [17] 邹芳,王金龙,杜彪.重症肺炎患儿血清 suPAR、RAGE、PCT 水平及临床意义[M].解放军医药杂志, 2020, 32(8): 57-61
- [18] Wrotek A, Jackowska T. The role of the soluble urokinase plasminogen activator (suPAR) in children with pneumonia [J]. Respir Physiol Neurobiol, 2015, 209: 120-123
- [19] 张涛,李娟.血清 suPAR 及多配体蛋白聚糖 4 水平与社区获得性肺炎严重程度和预后的相关性研究 [M]. 中国医刊, 2020, 55(2): 195-199
- [20] 孙印,韦海燕,何士杰.重症肺炎患者血清 suPAR、sTREM-1 水平变化及意义[J].山东医药, 2017, 57(22): 59-60 (下转第 4362 页)

- nese women[J]. *Gynecol Oncol*, 2020, 159(1): 1164-1175
- [18] Nasioudis D, Sakamuri S, Ko EM, et al. Radical hysterectomy is not associated with a survival benefit for patients with stage II endometrial carcinoma[J]. *Gynecol Oncol*, 2020, 157(2): 34-48
- [19] Tanimoto I, Sudo K, Kato M, et al. 245P Clinicopathological features including response to platinum-based chemotherapy in endometrial carcinomas involving SWI/SNF complex inactivation[J]. *Ann Oncol*, 2020, 31: S1338-S1339
- [20] Timmerman S, Rompuy ASV, Gorp TV, et al. Analysis of 108 patients with endometrial carcinoma using the PROMISE classification and additional genetic analyses for MMR-D[J]. *Gynecol Oncol*, 2020, 157(1): 1-21
- [21] Zhao D, Ren C, Yao Y, et al. Identifying prognostic biomarkers in endometrial carcinoma based on ceRNA network [J]. *J Cell Biochem*, 2020, 121(3): 36-48
- [22] Wang J, Li Z, Wang X, et al. The tumor suppressive effect of long non-coding RNA FRMD6-AS2 in uteri corpus endometrial carcinoma [J]. *Life Sci*, 2020, 243(13): 117-126
- [23] Conlon N, Paula ADC, Ashley CW, et al. Endometrial Carcinomas with a "Serous" Component in Young Women Are Enriched for DNA Mismatch Repair Deficiency, Lynch Syndrome, and POLE Exonuclease Domain Mutations[J]. *Am J Surg Pathol*, 2020, 44(5): 1-18
- [24] Berg HF, Ju Z, Myrvold M, et al. Development of prediction models for lymph node metastasis in endometrioid endometrial carcinoma[J]. *Br J Cancer*, 2020, 122(1): 457-469
- [25] Pasanen A, Ahvenainen T, Pellinen T, et al. PD-L1 Expression in Endometrial Carcinoma Cells and Intratumoral Immune Cells [J]. *The Am J Surg Pathol*, 2020, 44(2): 174-181
- [26] A TTY, CTMB, FSADE, et al. Loss of ARID1A expression in endometrial samplings is associated with the risk of endometrial carcinoma[J]. *Gynecol Oncol*, 2018, 150(3): 426-431
- [27] Shi K, Wang Q, Su Y, et al. Identification and functional analyses of differentially expressed metabolites in early stage endometrial carcinoma[J]. *Cancer Sci*, 2018, 109(4): 1032-1043
- [28] Concin N, Matias-Guiu X, Vergote I, et al. ESGO/ESTRO/ESP guidelines for the management of patients with endometrial carcinoma [J]. *Int J Gynecol*, 2020, 31(1): 2230-2241
- [29] Alhilli M, Amarnath S, Elson P, et al. Impact of vaginal brachytherapy on survival in stage I endometrioid endometrial carcinoma [J]. *Int J Gynecol*, 2020, 30(6): 1182-1194
- [30] Thompson EF, Leung S, Lum A, et al. Molecular classification of endometrial carcinoma across Canada: Variation in practice and opportunities to move towards consistency of care[J]. *Gynecol Oncol*, 2020, 159(34): 241-249
- [31] Joly F, Brachet PE, Lacourtoisie SA, et al. Multicentre randomized phase II trial of olaparib as maintenance therapy in platinum-sensitive advanced endometrial carcinoma: The GINECO-UTOLA study [J]. *J Clin Oncol*, 2020, 38(15): 6109-6120
- [32] 郑学民. HE4, CA125, CA19-9 结合经阴道超声在子宫内膜癌诊断中的价值[J]. *中国实验诊断学*, 2018, 22(4): 64-67
- [33] 陈华丽. 彩色多普勒超声联合血清脂联素检测在子宫内膜癌诊断中的价值[J]. *中国妇幼保健*, 2017, 32(21): 5452-5455

(上接第 4347 页)

- [21] Sunnetcioglu Aysel, Sunnetcioglu Mahmut, Adıyaman Fırat, et al. Could soluble urokinase plasminogen receptor (suPAR) be used as a diagnostic biomarker for ventilator-associated pneumonia? [J]. *ERJ Open Res*, 2019, 5(1): 00212-2018
- [22] A.Wrotek, K.Pawlik, T. Jackowska (2013). Soluble Receptor for Urokinase Plasminogen Activator in Community-Acquired Pneumonia in Children[J]. *Adv Exp Med Biol*, 2013, 788: 329-334
- [23] 张静静, 王兆君, 陶冬英, 等. 原发性肾病综合征患儿血清 STREM-1、suPAR 的表达及临床意义 [J]. *海南医学*, 2019, 30(20): 2640-2643
- [24] 吕涛, 郭淑利, 徐晓燕. 多发性骨髓瘤血浆 suPAR 水平的临床探讨及[J]. *中国实用医药*, 2013, 8(15): 102-103
- [25] 燕忠平, 郑曙民. 宫颈癌患者联合检测血清 suPAR 及 SCC-Ag 的意义[J]. *中国当代医生*, 2010, 48(7): 9-10
- [26] Wrotek A, Jackowska T, Pawlik K. Soluble urokinase plasminogen activator receptor: an indicator of pneumonia severity in children[J]. *Adv Exp Med Biol*, 2015, 835: 1-7
- [27] Luo Q, Ning P, Zheng Y, et al. Serum suPAR and syndecan-4 levels predict severity of community-acquired pneumonia: a prospective, multi-centre study[J]. *Crit Care*, 2018, 22(1): e15
- [28] El-Mekkawy MS, Saleh NY, Sonbol AA. Soluble Urokinase Plasminogen Activator Receptor: A New Biomarker in the Pediatric Intensive Care Unit [J]. *Indian Journal of Pediatrics*, 2016, 83 (7): 661-669
- [29] Hale Citlenbik, MD, EmelUlusoy, MD, AnilEr, et al. Levels of Soluble Urokinase Plasminogen Activator Receptor in Pediatric Lower Respiratory Tract Infections, *Pediatric Allergy*[J]. *Pediatr Allergy Immunol Pulmonol*, 2019, 32(3): 121-127
- [30] 唐智敏, 高媛, 杨世忠. 血清 suPAR、D-二聚体及 IL-6 在重症肺炎患者中的表达及临床意义[J]. *临床肺科杂志*, 2018, 23(9): 1691-1695