

doi: 10.13241/j.cnki.pmb.2019.03.013

降钙素原联合 SOFA 评分对老年脓毒症患者预后的评估价值*

郭亚威 王 征 朱丹丹 王 萌 王长远[△]

(首都医科大学宣武医院急诊科 北京 100053)

摘要 目的:探讨降钙素原(procalcitonin,PCT)联合 SOFA 评分(sequential organ failure assessment,SOFA)对老年脓毒症患者预后的评估价值。**方法:**选择首都医科大学宣武医院急诊抢救室收治的 105 例老年脓毒症患者,入院后给予血常规、血清 PCT 水平、血气分析及生化全项等检查,并进行急性生理及慢性健康状况评分(acute physiology and chronic health evaluation,APACHE II)和 SOFA 评分。根据预后将患者分成死亡组 27 例和存活组 78 例,比较两组患者血清 PCT 水平、白细胞(WBC)、SOFA 评分和 APACHE II 评分,同时比较和分析 APACHE II 评分、血清 PCT 水平、SOFA 评分、PCT 和 SOFA 评分联合预测患者死亡的受试者工作特征曲线(Receiver operating characteristic curve,ROC)下面积。**结果:**死亡组患者血清 PCT 水平、SOFA 评分和 APACHE II 评分均明显高于存活组($P<0.05$),两组 WBC 比较无统计学差异($P=0.132$);PCT 预测患者死亡的 ROC 曲线下面积为 0.694($P=0.001$),SOFA 预测患者死亡的 ROC 曲线下面积为 0.660($P=0.012$),APACHE II 评分预测患者死亡的 ROC 曲线下面积为 0.852($P=0.001$),大于 PCT 和 SOFA 评分($P<0.05$),PCT 和 SOFA 评分联合预测患者死亡的 ROC 曲线下面积 0.761($P=0.001$),与 APACHE II 评分比较无统计学差异($P=0.139$)。**结论:**血清 PCT 水平联合 SOFA 评分预测老年脓毒症患者预后的临床价值与 APACHE II 评分相当,均明显优于血清 PCT 水平和 SOFA 评分单项检测。

关键词:SOFA 评分;降钙素原;APACHE II 评分;脓毒症;老年

中图分类号:R631.2 **文献标识码:**A **文章编号:**1673-6273(2019)03-458-03

Prognostic Evaluation Value of Procalcitonin Combined with Sequential Organ Failure Assessment for the Elderly Patients with Sepsis*

GUO Ya-wei, WANG Zheng, ZHU Dan-dan, WANG Meng, WANG Chang-yuan[△]

(Department of Emergency, Xuanwu Hospital of Capital Medical University, Beijing, 100053, China)

ABSTRACT Objective: To evaluate the prognostic value of procalcitonin (PCT) combined with sequential organ failure assessment (SOFA) score for the elderly patients with sepsis. **Methods:** 105 cases of elderly patients with sepsis admitted in the emergency resuscitation room in the Xuanwu Hospital of Capital Medical University were selected. After admission, the blood routine, serum PCT level, blood gas analysis and biochemical examination were given, the acute physiology and chronic health evaluation (APACHE II) and SOFA score were carried out. According to the prognosis, the patients were divided into 27 cases of death group and 78 cases of survival group, the serum PCT level, white blood cell (WBC), SOFA score and APACHE II score were compared between two groups. The area under receiver operating characteristic curve (ROC) of APACHE II score, serum PCT level, SOFA score, PCT and SOFA score were compared to predict the patients' death. **Results:** The serum PCT level, SOFA score and APACHE II scores in the death group were higher than those in the survival group ($P<0.05$), and WBC showed no significant difference between two groups ($P=0.132$). The area under ROC curve (AUC) to predict patients' death of serum PCT level was 0.694($P=0.001$), which was 0.660($P=0.012$) of SOFA score 0.852 of APACHE II score ($P=0.001$), and 0.761 of PCT combined with SOFA score ($P=0.001$). There was no statistical difference in the AUC between APACHE II scores and PCT combined with SOFA score ($P=0.139$). **Conclusion:** The clinical value of serum PCT level combined with SOFA score in predicting the prognosis of elderly patients with sepsis was equivalent to that of APACHE II score, which was obviously superior to the serum PCT level or SOFA score alone.

Key words: SOFA; Procalcitonin; APACHE II score; Sepsis; Elderly

Chinese Library Classification(CLC): R631.2 **Document code:** A

Article ID: 1673-6273(2019)03-458-03

前言

目前,我国已经进入人口老龄化社会,老年患者不断增多,

特别是在急诊科,老年危重患者较多,且老年患者多合并多器官疾病,治疗难度大,预后差。脓毒症(sepsis)是机体对感染的反应失调而导致危及生命的器官功能障碍,是导致患者死亡的常

* 基金项目:北京市扬帆计划研究专项(ZYLX201706)

作者简介:郭亚威(1983-),女,硕士,主治医师,主要研究方向:急诊医学,电话:13641214333,E-mail: guoyaweixw@163.com

△ 通讯作者:王长远,男,硕士,主任医师,主要研究方向:急诊医学,E-mail: wangchangyuan73@163.com

(收稿日期:2018-06-04 接受日期:2018-06-29)

见原因。全球每年有约 1 800 万人被诊断为脓毒症,大约 25% 的患者死于脓毒症,因此脓毒症已经成为全球严重的公共卫生问题^[1]。目前广谱抗生素以及各种治疗手段在临床上的不断进步和广泛应用,但老年脓毒症患者的病死率仍居高不下,为了改善老年脓毒症患者的预后,降低病死率,根据患者病情及时调整治疗方案是脓毒症诊治的重点,因此及时准确地评估老年脓毒症患者的病情非常重要^[2]。目前评估脓毒症患者病情的指标有 C 反应蛋白、动脉血乳酸、APACHEII 评分等^[3-5],这些指标由于准确性差或者操作不便影响了临床应用。近年来,降钙素原(procalcitonin, PCT)及 SOFA 评分(sequential organ failure assessment, SOFA) 在脓毒症的诊断和病情评估成为了重要临床指标^[6,7],得到了急诊医生的认可,本研究探讨 PCT 联合 SOFA 评分对老年脓症患者预后的评估意义,结果报道如下。

1 资料与方法

1.1 临床资料

选择 2017 年 6 月~2018 年 4 月于首都医科大学宣武医院急诊抢救室就诊的老年脓症患者 105 例,年龄 60~95 岁,平均 75.21±8.05 岁,男 54 例,女 51 例。所有病例符合 2016 年脓毒症与脓毒性休克治疗国际指南(sepsis-3)制定的标准^[8],并遵循指南进行治疗。排除既往有严重心脏病、急性冠脉综合征、急性脑血管病和严重肝肾等疾病以及病人或家属不配合治疗者。入选病例包括社区获得性肺炎 53 例,支气管哮喘合并感染 28 例,泌尿系感染 10 例,肺纤维化合并感染 8 例,其他 6 例。

表 1 死亡组与存活组 WBC、血清 PCT 水平、SOFA 评分和 APACHE II 评分的比较

Table 1 Comparison of the WBC, serum PCT level, SOFA scores and APACHE II scores between death group and survival group

Groups	n	year	WBC($\times 10^9/L$)	PCT(ng/mL)	SOFA scores	APACHE II scores
Death group	27	75.70± 7.53	9.83± 2.67	4.48± 2.01	7.81± 3.23	22.48± 3.39
Survival group	78	75.03± 8.26	8.69± 3.55	3.02± 2.16	6.14± 2.90	16.95± 3.75
<i>P</i>		0.713	0.132	0.003	0.014	0.001

2.2 血清 PCT 水平、SOFA 评分和 APACHE II 评分预测老年脓症患者死亡的 ROC 曲线比较

如图 1 所示,PCT 预测脓症患者死亡的 ROC 曲线下面积为 0.694($P=0.001$),最佳截断点为 3.44,敏感性为 77.78%,特异性为 61.54%。SOFA 评分的 ROC 曲线下面积为 0.660($P=0.012$),最佳截断点为 7,敏感性为 62.96%,特异性为 73.08%。APACHE II 评分 ROC 曲线下面积为 0.852($P=0.001$),最佳截断点为 20,敏感性为 74.07%,特异性为 83.33%。PCT 联合和 SOFA 评分预测死亡的 ROC 曲线面积 0.761($P=0.001$),敏感性为 74.07%,特异性为 75.64%。APACHE II 评分 ROC 曲线下面积均大于 PCT 和 SOFA 评分 ($P<0.05$),PCT 联合 SOFA 评分预测死亡的 ROC 曲线下面积与 APACHE II 评分比较无统计学差异($P=0.139$),见图 1。

3 讨论

脓毒症(sepsis)是机体对感染的反应失调而导致危及生命的器官功能障碍,是导致急诊患者死亡的常见原因。老年患者多合并多个脏器功能不全,对抗生素治疗不敏感,死亡率更高,

患者存活 78 例,死亡 27 例,2 组年龄、性别及疾病构成无统计学差异($P>0.05$)。

1.2 研究方法

患者入院后立即收集年龄、性别等一般资料,给与血常规、生化全项、血气分析和降钙素原等检查。分别进行 SOFA 评分和急性生理及慢性健康状况评分(Acute Physiology and Chronic Health Evaluation, APACHE II)^[9,10]。根据预后患者分成死亡组 27 例和存活组 78 例,分别比较死亡组和存活组的 PCT,白细胞(WBC)、SOFA 评分和 APACHE II 评分的差别,同时比较 APACHE II 评分、PCT、SOFA 评分预测死亡的 ROC 曲线下面积的区别,并比较 PCT 联合 SOFA 评分预测死亡的 ROC 曲线面积与 APACHE II 评分的区别。

1.3 统计学分析

应用 SPSS 17.0 软件包进行分析,计量资料以均数±标准差表示,采用 2 个独立样本 t 检验,ROC 曲线下面积计算应用 MedCalc 16.2 软件, $P<0.05$ 有统计学意义。

2 结果

2.1 死亡组和存活组 WBC、血清 PCT 水平、SOFA 评分和 APACHE II 评分的比较

死亡组血清 PCT 水平、SOFA 和 APACHE II 评分均明显高于存活组($P<0.05$),两组 WBC 比较差异无统计学意义($P=0.132$),具体见表 1。

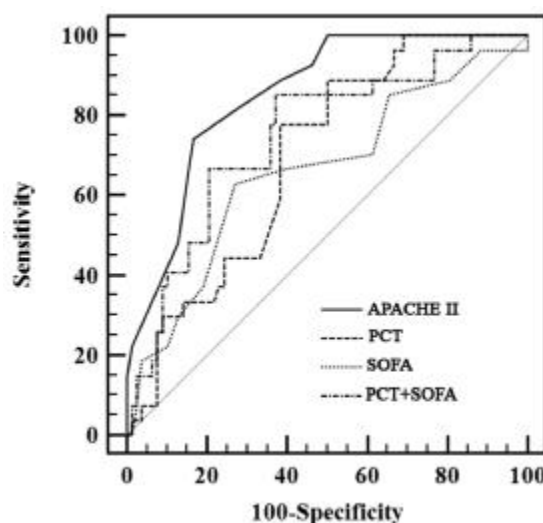


图 1 SOFA 评分、血清 PCT 水平和 APACHE II 评分预测老年脓症患者死亡的 ROC 曲线面积比较

Fig. 1 Comparison of the area of ROC curve of SOFA score, PCT, APACHE II score to predict the death of elderly patients with sepsis

因此及时正确的评估老年脓毒症患者的病情和预后对指导治疗非常重要。目前,临床应用于评估脓症患者病情和预后的指标有乳酸、C反应蛋白和 APACHE II 评分等^[11,12],这些指标多准确性欠佳或较复杂,限制了其在临床上的广泛应用。

降钙素原(procalcitonin,PCT)是降钙素的前体分子,由 116 个氨基酸的蛋白质构成,在正常机体内含量极低,当机体受到细菌或真菌等病原体感染时,于 2 h 内开始升高,24 h 达峰值,不受机体免疫状态及激素的影响,是鉴别和诊断细菌感染和病毒感染的重要指标^[13,14],也是调整抗生素和评估病情的重要临床依据^[15,16]。Iankova 等^[17]对 3489 例脓症患者进行荟萃分析,发现根据降钙素原水平指导治疗可减少抗生素的持续时间,对患者预后无不良影响。Chenggong 等^[18]对 141 例脓症患者进行研究,发现 PCT 对 28 天死亡的 ROC 曲线下面积为 0.73,最佳截断点为 3.75 ng/mL,与本研究结果基本一致。本研究结果显示死亡组患者血清 PCT 水平明显高于存活组,预测患者死亡的 ROC 曲线下面积为 0.694,对评估预后有一定的应用价值,与国内一些研究结果一致^[19,20]。但其对死亡的预测价值仍低于 APACHE II 评分,考虑单一的指标对老年脓症患者预后的预测价值有限。赵蓉等^[21]对 104 例脓症患者进行研究,发现 PCT 预测死亡的 ROC 曲线下面积为 0.763,小于 APACHE II 评分的 0.899,与本研究结果一致。

SOFA 评分是由欧洲重症监护医学会(ESICM)于 1994 年建立的评估危重病人器官功能障碍严重程度的临床评分系统^[9]。此后,其与 APACHE II 评分系统一样已被广泛应用于评估危重患者的病情^[22]。2016 年脓毒症与脓毒性休克治疗国际指南(sepsis-3)制定的标准中,SOFA 评分成为诊断脓毒症的基础。该评分系统包括的 6 项指标分别反映了肺、肝、心血管、肾、脑、血液系统的脏器功能情况,每项赋值 0~4 分,分值越高,脏器功能不全越严重,病情越重。Kim 等^[23]研究发现 SOFA 评分对脓症患者死亡的 ROC 曲线面积为 0.679,APACHE II 的 ROC 曲线下面积为 0.762,与本研究结果基本一致。本研究结果显示脓症患者死亡组 SOFA 评分明显大于存活组,对预后有良好的评估价值,与既往文献报道一致^[24]。但 ROC 曲线下面积仍小于 APACHE II 评分,对预后评估价值低于 APACHE II 评分,考虑原因为 SOFA 评分需要的临床指标较少,因此准确性与 APACHE II 评分相比较差一些。APACHE II 评分是目前评估危重患者病情和预后的金标准,能够准确评估患者的病情和预后^[25],但是由于需要临床数据较多,不能够及时获得,因此应用受限。本研究结果显示 PCT 和 SOFA 评分预测死亡的 ROC 曲线下面积均小于 APACHE II 评分,但是 PCT 联合 SOFA 评分预测死亡的 ROC 曲线下面积与 APACHE II 评分比较无统计学差异,考虑 PC 与 SOFA 评分联合应用有能够和 APACHE II 评分一样准确评估脓毒症患者的病情,且比 APACHE II 评分更加方便快捷。

综上所述,单一的 PCT 或 SOFA 评分对脓症患者病情评估价值有限,SOFA 评分联合 PCT 可以准确评估老年脓毒症患者的病情,但是脓毒症的发生和发展是一个动态过程,临床医生应动态观察这些指标的变化,根据变化及时调整治疗方案,以改善脓毒症患者的预后。

参考文献(References)

- [1] 安欣,章志丹,马晓春.2016 国际脓毒症和感染性休克管理指南与日本脓毒症诊疗指南之异同 [J]. 中华危重病急救医学, 2017, 29(4): 289-293
- [2] Lee SH, Hsu TC, Lee MG, et al. Nationwide Trend of Sepsis: A Comparison Among Octogenarians, Elderly, and Young Adults [J]. Crit Care Med, 2018, 46(6): 926-934
- [3] Xu Y, Ku X, Wu C, et al. Exosomal proteome analysis of human plasma to monitor sepsis progression [J]. Biochem Biophys Res Commun, 2018, 499(4): 856-861
- [4] Chambers KA, Park AY, Banuelos RC, et al. Outcomes of severe sepsis and septic shock patients after stratification by initial lactate value [J]. World J Emerg Med, 2018, 9(2): 113-117
- [5] Pantzaris ND, Platanaki C, Pierrako C, et al. Neutrophil-to-lymphocyte Ratio Relation to Sepsis Severity Scores and Inflammatory Biomarkers in Patients with Community-acquired Pneumonia: A Case Series [J]. J Transl Int Med, 2018, 6(1): 43-46
- [6] Pravin Charles MV, Kalaivani R, Venkatesh S, et al. Evaluation of procalcitonin as a diagnostic marker in neonatal sepsis [J]. Indian J Pathol Microbiol, 2018, 61(1): 81-84
- [7] 汪颖,王迪芬,付江泉,等. SOFA、qSOFA 评分和传统指标对脓毒症预后的判断价值 [J]. 中华危重病急救医学, 2017, 29(8): 700-704
- [8] Rhodes A, Evans LE, Alhazzani W, et al. Surviving Sepsis Campaign: International Guidelines for Management of Sepsis and Septic Shock: 2016 [J]. Intensive Care Med, 2017, 43(3): 304-377
- [9] Vincent JL, Moreno R, Takala J, et al. The SOFA (Sepsis-related Organ Failure Assessment) score to describe organ dysfunction/failure [J]. Intens Care Med, 1996, 22(7): 707-710
- [10] Knaus WA, Draper EA, Wagner DP, et al. APACHE II: A severity of disease classification system [J]. Crit Care Med, 1985, 13(10): 818-829
- [11] 张运君,卓小岸,周小曼,等.血清降钙素原、C-反应蛋白及乳酸对老年脓毒症患者的预后评估 [J]. 中华老年多器官疾病杂志, 2018, 17(1): 47-52
- [12] 张越新,张玲,郭贤庆. PCT、CRP、血乳酸、APACHE II、SOFA 评分在脓症患者疾病严重程度及预后评估中的价值研究 [J]. 中国急救医学, 2017, 37(12): 1109-1114
Zhang Yue-xin, Zhang Ling, Guo Xian-qing. Study on predictive and evaluation value on prognosis and disease severity in septic patients by PCT CRP serum lactic acid APACHE II and SOFA score [J]. Chin J Crit Care Med, 2017, 37(12): 1109-1114
- [13] Murri R, Mastroianni I, Taccari F, et al. Procalcitonin is useful in driving the choice of early antibiotic treatment in patients with bloodstream infections [J]. Eur Rev Med Pharmacol Sci, 2018, 22(10): 3130-3137
- [14] Li Q, Gong X. Clinical significance of the detection of procalcitonin and C-reactive protein in the intensive care unit [J]. Exp Ther Med, 2018, 15(5): 4265-4270
- [15] 王莹,王晓琴,陈正岗,等.降钙素原、白细胞介素-6 及 D-二聚体动态检测对儿童脓毒症早期诊断的临床意义 [J]. 中国临床医生杂志, 2017, 45(11): 100-102
- [16] Daubin C, Valette X, Thiollière F, et al. Procalcitonin algorithm to guide initial antibiotic therapy in acute exacerbations of COPD admitted to the ICU: a randomized multicenter study [J]. Intensive Care Med, 2018, 44(4): 428-437

(下转第 510 页)

- Breast Cancer Cell Lines Have a Unique Expression Profile [J]. *J Proteome Res*, 2017, 16(4): 1391-1400
- [20] 董科,傅健飞,楼菁菁,等.分子影像 SPECT/CT 对乳腺癌骨转移的临床应用价值[J]. *中国临床医学影像杂志*, 2015, 26(7): 465-468
- [21] Ma H, Ursin G, Xu X, et al. Body mass index at age 18 years and recent body mass index in relation to risk of breast cancer overall and ER/PR/HER2-defined subtypes in white women and African-American women: a pooled analysis [J]. *Breast Cancer Res*, 2018, 20(1): 5
- [22] Kumar M, Sahu RK, Goyal A, et al. BRCA1 Promoter Methylation and Expression-Associations with ER+, PR+ and HER2+ Subtypes of Breast Carcinoma [J]. *Asian Pac J Cancer Prev*, 2017, 18(12): 3293-3299
- [23] Bok SK, Jeon Y, Hwang PS. Ultrasonographic Evaluation of the Effects of Progressive Resistive Exercise in Breast Cancer-Related Lymphedema[J]. *Lymphat Res Biol*, 2016, 14(1): 18-24
- [24] Çelebi F, Pilancı KN, Ordu Ç, et al. The role of ultrasonographic findings to predict molecular subtype, histologic grade, and hormone receptor status of breast cancer [J]. *Diagn Interv Radiol*, 2015, 21(6): 448-453
- [25] Xiao J, Zhou Y, Zhu W. Association of ultrasonographic features with NGX6 expression and prognosis in invasive ductal breast carcinoma[J]. *Int J Clin Exp Pathol*, 2015, 8(6): 6458-6465
- [26] Tenhagen M, Klarenbeek S, Braumuller TM, et al. p120-Catenin Is Critical for the Development of Invasive Lobular Carcinoma in Mice [J]. *J Mammary Gland Biol Neoplasia*, 2016, 21(3-4): 81-88
- [27] Kourtidis A, Yanagisawa M, Huveltdt D, et al. Pro-Tumorigenic Phosphorylation of p120 Catenin in Renal and Breast Cancer[J]. *PLoS One*, 2015, 10(6): e0129964
- [28] Figueira AC, Gomes C, Vilhena H, et al. Characterization of α - and p120-Catenin Expression in Feline Mammary Tissues and their Relation with E- and P-Cadherin [J]. *Anticancer Res*, 2015, 35(6): 3361-3369
- [29] Arab A, Behravan J, Razazan A, et al. A nano-liposome vaccine carrying E75, a HER-2/neu-derived peptide, exhibits significant antitumour activity in mice[J]. *J Drug Target*, 2018, 26(4): 365-372
- [30] Ramteke P, Seenu V, Prashad R, et al. Alteration in steroid hormone and Her-2/neu receptor status following neoadjuvant chemotherapy in locally advanced breast cancer: Experience at a tertiary care centre in India[J]. *Indian J Cancer*, 2016, 53(3): 366-371

(上接第 460 页)

- [17] Iankova I, Thompson-Leduc P, Kirson NY, et al. Efficacy and Safety of Procalcitonin Guidance in Patients With Suspected or Confirmed Sepsis: A Systematic Review and Meta-Analysis [J]. *Crit Care Med*. 2018, 46(5): 691-698
- [18] Hu C, Zhou Y, Liu C, et al. Pentraxin-3, procalcitonin and lactate as prognostic markers in patients with sepsis and septic shock [J]. *Oncotarget*, 2018, 9(4): 5125-5136
- [19] 张依,朱凤雪,杜维桓,等.中介素对老年脓毒症患者病情进展及预后的评估作用[J]. *中华危重病急救医学*, 2017, 29(8): 679-683
Zhang Yi, Zhu Feng-xue, Du Wei-huan, et al. Evaluation function of intermedin on prognosis of elderly patients with sepsis [J]. *Chinese Critical Care Medicine*, 2017, 29(8): 679-683
- [20] 詹文丽,苏显都.血清降钙素原和 C 反应蛋白在脓毒性休克患者中的变化及对预后的评估 [J]. *中国感染控制杂志*, 2017, 16(2): 160-165
- [21] 赵蓉,董士民.血清 endocan 和降钙素原对脓毒症早期诊断及预后评估的临床价值[J]. *中华危重病急救医学*, 2017, 29(4): 321-326
- [22] Schlapbach LJ, Straney L, Bellomo R, et al. Prognostic accuracy of age-adapted SOFA, SIRS, PELOD-2, and qSOFA for in-hospital mortality among children with suspected infection admitted to the intensive care unit[J]. *Intensive Care Med*, 2018, 44(2): 179-188
- [23] Kim S, Lee K, Kim I, et al. Red cell distribution width and early mortality in elderly patients with severe sepsis and septic shock [J]. *Clin Exp Emerg Med*, 2015, 2(3): 155-161
- [24] 盛博,陈炜,甄洁,等.入院时 APACHE II 评分、SOFA 评分及 ALB 水平对严重脓症患者预后结局的影响[J]. *热带医学杂志*, 2017, 17(12): 1648-1651
- [25] Godinjak A, Iglica A, Rama A, et al. Predictive value of SAPS II and APACHE II scoring systems for patient outcome in a medical intensive care unit[J]. *Acta Med Acad*, 2016, 45(2): 97-103