· 临床病理讨论 ·
Clinicopathological Conference

A 78-year-old female patient with acute multiple organ failure induced by pneumonia related sepsis

(the 26th case)

Institute of Geriatric Cardiology, Chinese PLA General Hospital

Case presentation

A 78-year-old female patient was admitted on July 16, 2007 because of cough, intermitted fever for 1 month and dyspnea for 1 d. The patient had dry cough and fever with body temperature lower than 38℃ after catching cold in early June, 2007. She was treated in several clinics with many kinds of antibiotics. The symptoms were never fully relieved. On July 15, 2007, the patient experienced sudden onset of palpitation and dyspnea after defecation. Palpitation and dyspnea were alleviated after she sat in bed and rested for over 1 h. In the morning of the next day, the patient had palpitation and dyspnea again after defecation. She was then transferred to the emergency room of Chinese PLA General Hospital. An ECG on admission showed that she had atrial fibrillation with ventricular rate of 140. She was treated with intravenous amiodarone and nitroglycerol. Her heart rhythm was restored to sinus rhythm after 1 h and she was transferred to our department for further treatment.

She was diagnosed to have hypertension and diabetes for over 20 years. Both her blood pressure and blood glucose were poorly controlled especially after she caught cold a month before admission.

Physical examination on admission:

Vital signs: T: 36.7℃, P: 72bpm, R: 26/min; BP: 140/60mmHg.

She was alert and afebrile, with a respiratory rate of 26 breaths per minute and labored breathing. The results of examination of the head, eye, ear, nose and throat were normal. Auscultation of the lungs found diminished breath sounds of lower lobes in both lungs. Moderate amount of rales were heard at both lungs. The heart border expanded to the left. The heart rate was 72 bpm with diminished heart sounds. A2>P2, no murmur was heard during auscultation of the heart. The examination of abdomen revealed no abnormal. Moderate edema was found at both lower extremities.

Examination on the day of admission:

Blood routine examination: WBC 13.6 × 10^9/L; Neut 85.2%; RBC 3.31×10^{12}/L. Hepatic and renal function test: GOT 23U/L, GPT 15U/L, Cr 65mol/L. Blood gas: pH 7.33, PaO_2 75mmHg, $PaCO_2$ 52mmHg, SaO_2 0.92, BE−4.5.

Treatment:

After hospitalization, the patient was treated with intravenous nitrates for blood pressure control and cefminox sodium for pneumonia. Other medications such as aspirin, digoxin, furosemide and insulin were also administrated. Her condition was deteriorated after 5 d of treatment. Her body temperature rose to 38.1℃. The respiratory rate rose to over 33/min and her breathing obviously labored. She could not lie in bed for rest. Her urine output gradually decreased to less than 400ml/d. The patient was drowsy and complained extremely fatigue and weakness. On July 21, 2007, she was in coma, her breathing was shallow and dropped to

收稿日期:2007-11-28

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10－16/min. The oxygen saturation was 75% to 86% while she was inhaling oxygen(3－5ml/min). Physical examination showed as follows: the breath sounds were diminished bilaterally, with large amount of rales and crackles. HR 110/min, S3 gallop and a grade 2/6 holosystolic murmur that radiated from the apex to the axilla were heard. No urine output was found for 12 h. Then an emergency blood gas and blood routine examination were performed. The results were: WBC 15.1 × 10^9/L, Neut 88.2%; pH 7.08, PaO_2 47.5mmHg, $PaCO_2$ 99.9mmHg, SaO_2 77%, BE－6.8. The diagnosis of pulmonary encephalopathy was confirmed. She was given continuous intravenous dripping of nikethamide, balloon mask assisting ventilation and continuous expiratory phase chest-abdomen compression to help her restore ventilation for over 30 h until relatives of the patient finally gave consent of mechanical ventilation. Ice compress and $NaHCO_3$ was also administrated. The patient awaked 1 h after she was intubated and mechanically ventilated. A clinical discussion was carried out on the next day.

Clinical discussion

Doctor of UCG Department: I will introduce the brief result of the patient's UCG. Septal thickness 12mm, LV posterior wall thickness 11mm, diameter of LV 46mm, EF 0.62, no stenosis and regurgitation of valves were found, part of anterior-septal wall movement was limited a little. Impression: a recently small area of myocardial infarction could not be ruled out, the whole LV function was not impaired.

Dr. Wang Liwan: This is an advance-aged female patient. She had a one-month respiratory tract infection history before admission. The infection was refractory to cephalosporin. The original pathogens might be virus, mycoplasma and chlamydia, etc. If the cephalosporin was not effective in controlling the infection, other kinds of antibiotics such as erythromycin should be considered in this case. The patient was given cefminox sodium which is effective in controlling non-zymocyte and non-resistent *Psedomonasaeruginosa*. However, her condition deteriorated and acute respiratory failure developed 5 d after cefminox sodium was administrated. The reason of respiratory failure might be pulmonary edema or pneumonia. Her chest X-ray showed the area of opacity that was predominantly right sided and not like the character of edema which should exhibit pulmonary diffuse, bilateral and symmetric opacity. So I think her chest radiography suggests underlying pulmonary infection. Her serologic test results for atypical pathogens of pneumonia were negative. The diagnosis of pneumonia due to atypical pathogen (virus, mycoplasma and chlamydia, etc) is also unlikely. She had a long history of diabetes with poorly controlled glucose level, and might be an immunocompromised host for fungus infection, especially after a long period of antibiotics administration. In short, this patient might already have combined infection of multiple-drug-resistant bacteria and fungus. It is important to change her current antibiotics strategy to carbapenems plus antifungal agent. Then we can observe the results of her blood routine and sputum culture and replace carbapenems by sensitive narrow-spectrum cephalosporins. The blood gas analysis suggested the diagnosis of type 2 respiratory failure and pulmonary encephalopathy. The patient was able to restore her brain function after 30 h of encephalopathy and severe acidosis. This was due to the following aspects: (1) She had long-term pulmonary infection, so her brain was relatively accustomed to the environment of hypoxia and highcarbondioxide. (2) When the diagnosis of type 2 respiratory failure and pulmonary encephalopathy were confirmed, the medical staff gave her continuous expiratory phase chest-abdomen compression and assisting ventilation with balloon-mask for over 30 h before her relative gave consent of intubation and mechanical ventilation. These helped the patient to maintain basic ventilatory capacity that fulfilled essential demand of brain tissue. (3) Continuous hypothermia of head with ice compress which significantly reduced oxygen consumption of the brain. Although the patient devel-

oped acute multiple organ failure, inferring from the rehabilitating process of the brain, the failure of other organs should be reversible. Her multiple organ failure(MOF) could be recovered if we can control sepsis and give adequate protection of various organs. On the whole, this case provides us precious experience of salvaging and handling patients with respiratory failure when mechanical ventilation is not available.

Dr Zhang Yuxiao: The diagnosis of MOF is unquestionable. But it is worthy of note that the patient had abnormal test results of cardiac enzymes. The elevation of CK was remarkable, while the elevation of CK-MB and cTnT was not so obvious. This did not resemble the typical changes of CK, CK-MB, cTnT in ordinary acute myocardial infarction. After comparing her ECGs on admission and today, I find that there is difference between two ECGs. The amplitudes of R waves in lead $V_{1\text{-}3}$ decreased by 0.1—0.2mV while no ST-T changes were found in all 12 leads. According to her today's UCG results, I think the diagnosis of NSTEMI is most likely in this case. She had abnormal elevation of CK compared with CK-MB and cTnT. I think this might be induced by muscle injury during continuous chest-abdomen compression and long lasting acidosis. I believe that sepsis related hyper-coagulation was a major motivation of NSTEMI in this case. Considering this, it is important to apply low molecular heparin to prevent re-infarction and infarction extension.

Dr Zhao Yusheng: This is a typical case of acute MOF induced by pneumonia-related sepsis. Her chest radiography on admission suggested pneumonia of right lung with no large lung opacity. But her sepsis developed rapidly and induced type2 respiratory failure and pulmonary encephalopathy without remarkable changes of chest radiography findings. This revealed a notable feature of severe lung infection in elderly: the degree of systemic inflammation is more severe than the severity of pulmonary inflammation. This suggests us that we should discover the clue of other organ involved in sepsis and make effort to prevent the development of MOF as early as possible. We also need to keep in mind that refractory community acquired pneumonia may imply the underlying combined drug-resistant bacteria infection. The choice of antibiotics should obey the guideline of descending step care. Carbopenems are the best option for these cases. If the patient is immunocompromised, the use of anti-fungus agents should also be taken into consideration if necessary. The results of intubation acquired sputum culture are very important for us to adjust antibiotics after use of carbopenems for 3—5 d. The patient is now anuric, I think her renal failure was induced by sepsis-related hypoperfusion and inflammatory cytokinemia. Adequate fluid is necessary for improving renal hypoperfusion. Effective control of sepsis is another key to restore her renal function. If anuria is persisting, continuous blood filtration therapy is recommended. CRRT can reduce water load, eliminate metabolic waste and filter harmful inflammatory cytokines to facilitate recovery of renal function. The treatment strategy of sepsis-related MOF is based on effective controlling infection, ensuring homeostasis and protecting involved corresponding organs. In short, the main diagnosis of this case is pneumonia, sepsis, MOF and acute NSTEMI. Treatment: repeating blood routine examination and pathogen culture, effective antibiotics, drugs of organ protection, adequate fluid, energy and protein supply, correcting MOF as soon as possible.

Clinical outcome of this patient: Her MOF was cured after 1 week. She was discharged after 1 month with full recovery.

(Translator: XU Qiang)

78岁老年女性肺炎相关脓毒症诱发急性多器官功能衰竭1例

1 病例摘要

患者，女性，78岁，主因间断咳嗽、低热1月，呼吸困难1 d，于2007年7月16日入院。患者自2007年6月起逐渐出现干咳、低热，就诊于多家诊所，给予多种抗生素治疗效果不佳。2007年7月15日，患者于大便后出现心慌，呼吸困难，休息约1 h后自行缓解，次日凌晨患者大便时再次出现上述症状，入解放军总医院急诊科，查心电图示"心房颤动"，给予静点胺碘酮，硝酸甘油等药物，转为窦性心律，为进一步治疗收入解放军总医院。

入院查体：发现高血压及糖尿病20余年，血压、血糖控制欠理想，近1个月感冒后尤差。体温36.7℃，脉搏72次/min，呼吸26次/min，血压140/60mmHg。神清，头颈部无异常体征，双下肺呼吸音减弱，双肺均可闻及中等量湿啰音。心率72次/min，律齐，各瓣膜区未闻及病理性杂音。腹部查体正常。双下肢中度水肿。化验检查：血象：WBC 13.6×10^9/L，Neut 85.2%，RBC：3.31×10^{12}/L。肝肾功：GOT 23U/L，GPT 15U/L，Cr 65mol/L。血气：pH 7.33，PaO_2 75mmHg，$PaCO_2$ 52mmHg，SaO_2 0.92，BE−4.5。

2 治疗过程

入院后给予静脉硝酸酯类药物降压，头孢米诺钠抗感染，并给予阿司匹林、地高辛、皮下胰岛素等药物治疗，治疗5 d过程中患者病情恶化，体温逐渐上升至38.1℃。呼吸频率增加至33次/min，呼吸明显费力。不能平卧休息，每日尿量逐渐减少至不足400ml，患者嗜睡，诉极度乏力、疲倦。2007年7月21日患者突发昏迷，呼吸变浅，频率降至10～16次/min，吸氧浓度为3～5L/min情况下，指氧饱和度波动于75%～86%。查体：双侧呼吸音减弱，双肺大量湿啰音及痰鸣音。心脏听诊：心率110次/min，可闻及第三心音奔马律及二尖瓣听诊区2/6SM，向腋下放散。持续12 h无尿、急查血象：WBC 15.1×10^9/L；Neut 88.2%；血气：pH 7.08，PaO_2 47.5mmHg，$PaCO_2$ 99.9mmHg，SaO_2 77%，BE−6.8。确诊2型呼吸衰竭合并肺性脑病。随后因患者家属不同意插管机械通气，给予长达30 h的呼气相胸腹联合压迫及面罩球囊辅助呼吸，持续静滴尼克刹米，冰敷头部降温，适当给碳酸氢钠静脉点滴，患者于30 h后经家属同意行气管插管机械通气。约1 h后神志恢复。次日对该病例进行了临床讨论。

3 临床病理讨论

超声科医师：简单介绍一下心脏超声情况，室间隔厚度：12mm，左室后壁：11mm，心脏各瓣膜运动良好，开闭正常。射血分数0.62，左室内径：46mm，左室前间壁运动幅度略减低。综合考虑近期可能发生过小面积心肌梗死，但未明显影响患者左室功能。

呼吸科王立万医师：患者老年女性，入院前长期呼吸道感染，持续未愈，干咳为主，考虑病原体可能为病毒、支原体、衣原体等，头孢类药物治疗效果不佳，应尽快调整抗生素为红霉素、喹诺酮类药物。入院后使用抗生素为头孢米诺钠，主要针对非发酵菌、非耐药绿脓杆菌等较有效。患者使用上述抗生素后呼吸衰竭进展迅速。呼吸衰竭原因考虑存在肺水肿或肺炎两种可能性，从胸片来看，患者肺部大片阴影，右肺为著，不同于心衰常见双侧、弥散对称性阴影，考虑肺炎可能性较大。根据血清学结果基本排除了不典型病原体肺炎的可能。患者2型糖尿病多年，血糖控制差，免疫功能受损，结合长期应用抗生素情况，考虑目前存在混合耐药细菌及真菌感染可能。应尽快换用碳青霉烯类合并抗真菌药物，应用3～5d后观察血象变化，然后再根据痰培养情况选用窄谱敏感头孢类抗生素。患者血气分析结果支持2型呼吸衰竭合并肺性脑病。此次肺性脑病、严重酸中毒长达30 h，患者脑功能迅速恢复。原因主要考虑以下几个方面：(1) 患者长期肺部感染，脑组织对低氧、高二氧化碳环境较为适应。(2) 呼吸衰竭合并肺性脑病确诊后，给予超过30 h的不间断呼气相胸腹挤压，以及球囊面罩辅助呼吸直至患者家属同意插管机械通气，确保患者保持了基本的通气量，满足了脑组织的基本需求。(3) 抢救过程中持续头部降温减少了脑组织耗氧量。该患者目前虽有多器官功能不全，从脑功能恢复情况推测，患者各器官功能衰竭仍处于可逆阶段，如感染得以控制、各器官功能保护良好，其多器官功能不全应可治愈。总之，此病例为我们将来在无机械通气支持条件下抢救并维

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护呼吸衰竭患者各器官功能提供了宝贵的经验。

张玉霄医师:该患者多器官功能不全诊断明确,值得注意的是,患者在 2 d 前发生明显心肌酶异常,表现为 CK 明显升高、CK-MB 及肌钙蛋白 T 轻度升高,这与常见的心肌梗死酶学变化特点不符。今日的心电图与入院时相比,无明显 ST-T 改变,但 V_{1-3} 导联 R 波振幅减低约 0.1～0.2mV,结合心脏超声,考虑存在非 ST 段抬高性心肌梗死。关于患者 CK 升高与 CK-MB 及肌钙蛋白 T 升高幅度不相称的原因,主要考虑与患者经过长达 30 h 的胸腹部呼气相挤压及严重酸中毒对肌肉组织的损伤有关。患者心肌梗死诱因与脓毒症相关的高凝状态有关,在未来的治疗中可使用低分子肝素,避免心肌梗死再发或延展。

赵玉生医师:该患者为肺部感染导致脓毒症,从而诱发多器官功能不全的典型病例。该患者入院后胸片表现为右肺肺炎,肺部阴影范围不大。但从病程来看,患者脓毒症发展迅速,2 型呼吸衰竭及肺性脑病出现后,患者胸片与入院时比较仍无明显加重。这表现了老年重症肺部感染患者的一大特点,全身炎症反应重于肺组织局部炎症反应。提示我们在救治老年难治性肺部感染时,要早期发现肺外组织受累迹象,及早干预,避免多器官功能不全的发生。其次,对于难治性老年社区性肺炎,要尽早想到存在混合耐药细菌感染的可能,抗生素选择要按照降阶梯治疗原则,首先使用对耐药菌疗效较好的碳青霉烯类,对免疫功能受损患者必要时联用抗真菌药,同时多次气管插管内吸痰培养,为 3～5 d 后调整抗生素方案提供依据。目前患者无尿,其肾衰原因与脓毒症性休克低灌注及脓毒症炎症细胞因子血症有关。改善其肾功能应首先保证每天充足入量,保证肾脏灌注压,另外有效抗感染,减轻脓毒症对肾脏的毒害作用。如患者持续无尿,可给予持续血滤治疗,一方面可以减轻体内水负荷、排出代谢废物,另一方面有助于滤过有害的炎症因子,促进肾脏功能恢复。关于其他器官功能不全的治疗原则,均是在纠正脓毒症的基础上,保证内环境稳定,给予相应器官保护药物。综上所述,患者目前主要诊断为:肺炎 脓毒症 多器官功能不全 急性非 ST 段抬高性心肌梗死。治疗方面,多次复查血象、细菌培养,有效抗感染、然后给予各器官保护药物,增加入量保证器官灌注压、增加热量及蛋白供应,尽快纠正患者多器官功能不全。

患者临床转归:经过上述治疗约 1 周后,患者多器官功能不全基本治愈,于 1 个月后痊愈出院。

(参加讨论医师:王立万、张玉霄、赵玉生)

(许强 整理)