Editorial

Current Clinical Management Status of Pulmonary Embolism in China

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Pulmonary embolism (PE) is a potentially life-threatening disease with high morbidity and mortality all over the world. PE and deep vein thrombosis (DVT), as two different forms of venous thromboembolism (VTE) on patients, cannot be separated apart in the management. After years of efforts, the management of PE has been comprehensively promoted in China. Medical authorities and staff have gained more awareness of the disease, standardized diagnosis and treatment has been extended, and varieties of clinical and basic researches have been conducted.

Enrichment of Epidemiological Data

No epidemiological data of PE in community of China were available for a long time; in recent years, a number of epidemiological investigations of PE among some specific diseases have been made and found that the incidence of PE in China is similar to that of Caucasian races. A prospective multicenter epidemiological study has shown that the prevalence of VTE in hospitalized elderly patients of internal medicine departments was 9.7%, morbidity of VTE in respiratory failure patients and in patients receiving mechanical ventilation was 16.4% and 23.5%, respectively, followed by acute cerebral infarction (15.6%) and acute infectious diseases (14.3%). The prevalence of VTE was extremely high in patients with VTE history, varicose veins, central venous catheterization, and permanent pacemaker implantation, with the occurrence of 34.8%, 20.5%, 18.9%, and 17.6%, respectively.[1] Six hundred and seventy-three patients from multicenter with newly diagnosed lung cancer were examined for VTE within 1 week after admission; the prevalence of VTE was 13.2%, through multiple regression analysis. Distant metastasis (odds ratio [*OR*], 2.2; 95% confidence interval [*CI*], 1.2–3.9) and leukocytosis (*OR*, 2.8; 95% *CI*, 1.5–5.4) were significantly associated with the occurrence of DVT. Adenocarcinoma (*OR*, 2.1; 95% *CI*, 1.1–4.4) and anemia (*OR*, 4.6; 95% *CI*, 1.4–14.5) were significantly associated with PE; elevated cancer embryo antigen had a linear relationship with PE.[2] These results are very similar to those reported in Europe and America.

A registration study of patients with symptomatic PE admitted to sixty teaching hospitals involved in the National Cooperative Project for the Prevention and Treatment of Venous Thromboembolism was conducted from January 1997 to December 2008. The annual incidence increased sharply from 0.0% (95% *CI*: 0–0.1%) in 1997 to 0.1% (95% *CI*: 0.1–0.2%) in 2003, then remained at 0.1% (95% *CI*: 0.1–0.2%). The overall incidence of PE in male patients (0.2% and 95% *CI*: 0.1–0.3%) was higher than that in female patients (0.1% and 95% *CI*: 0–0.1%).[3] The rise of the incidence of PE reflects the promoted level of awareness of PE and the improvement of imaging technology.

Improvement of Standardized Diagnosis and Treatment

Over the years, a series of promotional activities of standardization in the diagnosis and treatment of PE were conducted. Standardized medical imaging diagnosis

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procedures in pulmonary thromboembolism and DVT were published by Chinese Medical Association[4] including operation instruction procedures of computed tomography pulmonary angiography, pulmonary ventilation-perfusion scan, echocardiography, and lower extremity venous ultrasound, etc.

For treatment, it is acknowledged that reconstructive tissue plasminogen activator (rt-PA) and urokinase (UK) are recommended for acute high-risk PE patients. A prospective, randomized, multicenter trial by Wang *et al*.[5] was conducted to compare the efficacy and safety of rt-PA 50 mg intravenous drip of 2 h regimen with rt-PA 100 mg regimen in acute massive PE patients. The result suggested that the efficacy is similar and 50 mg regimen results in less bleeding tendency than 100 mg regimen, especially in patients with body weight lower than 65 kg (14.8% vs. 41.2%, $P = 0.049$). UK is widely used in China due to affordable price, the result of a prospective, multicenter study showed that a 20,000 U/kg intravenous drip of 2 h regimen produced similar improvements in right heart dysfunction and lung perfusion defects compared with traditional UK intravenous drip of 12 h regimen, and overall bleeding incidents were low.[6] Unfractionated heparin (UFH) and low molecular weight heparin (LMWH) as initial parenteral anticoagulation have similar efficacy and safety outcomes, but patients with small clot burdens receiving LMWH had higher bleeding rates (P trend = 0.048) than patients with big clot burdens, and there was no such trend for UFH recipients.[7] This study suggested that for PE patients with high bleeding risk, UFH may be safer if the clot burden is small.

Owing to such effort, the results of sixty medical centers for PE showed that the case fatality rate is apparently decreased: 25.1% (95% *CI*: 16.2–36.9%) in 1997 to 8.7% (95% *CI*: 3.5–15.8%) in 2008,[3] and initial results of a registry study with 7000 symptomatic PE patients admitted to hospitals from multicenter showed that the case fatality rate is only 1.63%. Surveys on the status of PE diagnosis and treatment in different hospitals in Beijing in 2012 found that the mortality during hospitalization is only 2.9%.[8]

Enhancement of Awareness of Prophylaxis

The foundation of PE prevention is to inhibit the happening of DVT. Overall, clinicians have no much consciousness of VTE prophylaxis. A survey research for 1861 medical staffs from 52 Intensive Care Units (ICUs) of 23 teaching hospitals during 5 months was conducted. In this research, only 36.5% physicians and 22.2% nurses were aware of the guideline of DVT prophylaxis for critically ill patients of China,[9] as a result, most of the patients who have a high risk of VTE did not receive VTE prophylaxis. Based on a multicenter retrospective study, a total of 636 hospitalized acute exacerbation of chronic obstructive pulmonary disease patients from 17 hospitals in Beijing were examined in 2012; the overall incidence of VTE was 14.5%, only 19.1% accepted the pharmacologic and/or mechanical methods for preventing VTE.[10] Another multicenter, cross-sectional, observational study was conducted in 2008, aiming to determine the VTE risk and the frequency of recommended VTE prophylaxis in hospitalized Chinese patients with acute medical conditions. It reported that 57.3% of the patients had more than two VTE risk factors and only 20.2% of them received American College of Chest Physicians-recommended VTE prophylaxis, even in ICU, the number was only 16.9%.[11]

Recent years, more and more attention to the prevention of VTE has been paid in China. The guideline of "establishment of venous thromboembolism prevention system within hospitals" was published by Chinese Medical Association in 2012.[12] From then on, many guidelines or consensus about VTE prevention including orthopedics, general surgery, and medical patients was published.[13-15] VTE prevention system was established in more than thirty hospitals, and many effective procedures have been carried out. It is expected to see the effect of domestic VTE prevention in the future years.

Development of Clinical Researches

Researches on VTE have been remarkable advanced, especially in the field of clinical study. A recent retrospective study[16] confirmed the value of Wells score, revised Geneva score and D-dimer in diagnosing elderly PE patients and another study[17] analyzed the incidence of pleural effusion in patients of PE. The evidence-based medicine based on randomized controlled studies was carried out on the early stage, optimizing diagnosis and treatment of PE. Multicenter China Pulmonary Embolism Registration has been in progress from 2009, which included 99 medical centers from 29 provinces and autonomous regions and nearly 8000 cases of PE were enrolled up to now. Through this research, the real-world situation of diagnosis and treatment of PE in China will be clear, the general pattern of PE occurrence and development will be identified, and clinical management strategy will be updated to suit for national conditions and Chinese patients. The PE researches of precision medicine based on the drug genomics will be carried out in the future so as to provide individualized diagnosis and treatment for patients with PE in China. With the comprehensive development of the above researches, we believe that they will provide total solution of the standard treatment, individualized treatment, and accurate treatment for PE patients.

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