Analysis of pathogenic bacteria and risk factors in emergency patients with cerebral apoplexy.

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Abstract

Objective: To investigate pathogen and risk factors of hospital infection in emergency patients with stroke.

Methods: The clinical data of 412 patients with acute stroke in the emergency from August of 2015 to March of 2017 were analysed to analyse main risk factors.

Results: Among 412 patients with acute stroke, 53 cases were hospital-acquired with an infection rate of 12.86%, of which gram-negative bacteria, gram-positive bacteria and fungi took a great proportion among infectious pathogens. Analysis of influence of risk factors for learned that emergency the influence factors of stroke patients hospital infection rates are high for: age 65 or higher, invasive operation, mechanical ventilation, diabetes, strength grade 3 or below level 3, the prophylactic use of antibiotics, etc. (P<0.05).

Conclusion: The incidence of hospital infection in patients with acute stroke was high, especially in patients with hemorrhagic cerebral apoplexy. We should enhance the cerebrovascular disease of primary and secondary prevention measures, reduce the risks of stroke, and intensify efforts to control the risk factors. For risk factors, clinical workers should strictly control the use of antimicrobial agents, as far as possible to decrease the frequency of using various invasive operations and catheter indwelling time, in order to reduce the incidence of hospital infection.

Introduction

The patients with cerebral apoplexy are characterized in urgent onset and severe conditions and the complication rate is high among the old patients, possibly because the old patients have decreasing resistibility due to deterioration of their organ functions, so that cerebral apoplexy, if any, easily weakens immunologic function of their bodies, there are relatively more complications and these patients are high-risk groups in hospitals [1]. Meanwhile, the organ reactivity of the aged patients have decreased, so that early infection cannot be discovered easily, resulting in inadequate treatment and worsened illness condition [2,3].

Most of the patients should be subject to rescue process and many of invasive operation. Therefore, the hospital infection for emergency treatment of stroke patients in hospital is an important complication. Researchers studied the effects of high concentrations β-endorphin on cellular immune, plasma β-endorphin of stroke patients compared with normal was significantly higher, excess body stroke after release of β-endorphin in stroke patients with immune ability was reduced, causes the hospital infection rate is on the high side [4,5], a hospital infection, not only affect the treatment and prognosis of the patient and increase the hospitalization time, also

aggravate the patient's economic load, consuming some originally not produce medical resources. Hospital infection rate each fell by 1%, according to the literature which gave the medical expenses can be used to pay 1% of the hospital infection monitoring employees' wages and the implementation of hospital infection study all the cost [6-8]. It is important to analyse the risk factors and pathogens which result in hospital infection, in order to improve the prognosis of acute cerebrovascular disease patients recovers, save the resources of the society and family. This paper review analysis in August of 2013 to March of 2015 in our hospital emergency cerebral apoplexy patients clinical data, analysis of pathogenic bacteria of hospital infection in patients with and affect the risk factors of hospital infection, discuss ways of prevention should be taken for the following report.

Materials and Methods

General information

Selecting for 412 cases of patients with cerebral apoplexy in the treatment of emergency treatment from August 2015 to March 2017, including male patients 228 cases, 184 cases of female patients, aged 41 to 89, the average (67.50 ± 9.87 y) of age, all patients after clinical, head CT or MRI diagnosis.

There were 53 concurrent hospital infections, 31 male patients and 22 female patients, including 39 cases of cerebral infarction and 14 cases of cerebral hemorrhage. The diagnosis of stroke in all patients was in line with the 2010 guide for diagnosis and treatment of acute ischemic stroke in China [4]. The diagnosis of hospital infection was consistent with the Hospital Infection Diagnosis Standard issued by the Ministry of Health [9]. All patients selected have been approved by the Ethics Committee of the Hospital and have signed the letter of consent.

Methods

Clinical data of 412 patients with emergency cerebral apoplexy between August of 2013 and March of 2015 were analysed. All patients were admitted to the hospital within 72 h after the onset of the disease. No infectious diseases were merged into the hospital, and the patients who were discharged within 48 h after treatment were excluded. All selected patients in hospital infection, analyzing the clinical data of 53 patients with hospital infection and dissecting the patient infected place and infected by pathogens. Then to sum up the site of infection, comparative analysis the proportion, and pathogen training results and prognosis of proportion, finding out the influencing factors of hospital infection, such as age, sex, disease type, invasive operation, physical strength, the prophylactic use of antibiotics, mechanical ventilation, diabetes and other factors.

Statistical method

Application of SPSS20.0 statistical software to process data, the counting data was expressed with percentage (%), and the difference between groups was tested by χ^2 test. When $P<0.05$, the difference was statistically significant.

Results

Hospital infection rate and fatality rate

The infection rate was 12.86% in 412 patients with acute stroke. Among them, 5 cases were killed, accounting for 9.43% of the total number of infections, while the infection rate of internal medicine patients was 2.23% (57/2549), and the difference between the two groups was statistically significant ($P<0.05$). The incidence of hospital infection in hemorrhagic stroke was 27.87% (34/122), 6.55% (19/290) for ischemic stroke, and statistically significant difference between the two groups ($P<0.05$).

Infection site and composition ratio

The infection site of 53 patients infected with hospital infection, respiratory tract infection, and infection cases were 26 cases, followed by urinary tract, skin soft tissue infection, etc., as shown in Table 1.

The distribution of pathogenic bacteria in the hospital

By examining bacteriology, pathogenic bacteria were separated from a total of 82 strains. The proportion of gram-negative bacterium was the largest, accounting for 58.5%, *Klebsiella pneumoniae* 18.3%, *Escherichia coli* 15.6%, *Enterobacter* 12.2%, and *Pseudomonas aeruginosa* 12.2%. The gram-positive bacteria accounted for 31.7%, with *Enterococcus* of 7.3%, fungus of 9.8%, both of which were *Candida* (Table 2).

Analysis of hospital infection factors

To the patient's age, gender, length of hospital stay, disease types, the application of antimicrobial agents, the existence of invasive operation (organ intubation and tracheotomy, urine tube, nasogastric gastric tube, venous indwelling catheter), and patients with diabetes were analysed. The results showed that the incidence of hospital infection was highest among patients aged over 65. The strength of muscle was less than or equal to level 3. Application of antimicrobial agents to those who do not apply antibiotics. Invasive operators were higher than non-invasive operators. People with diabetes were higher than those without diabetes. All the above differences were statistically significant (all $P<0.05$, Table 3).

Table 1. Constituent ratios of hospital infection sites of the patients with strokes (%).

Infection sites	Cases	Proportion (%)
Respiratory tract infection	29	54.7
Urinary tract	12	22.6
Skin soft tissue	5	9.4
Blood	3	5.7
others	4	7.5

Table 2. Distribution of the pathogens causing hospital infections (%).

Pathogenic bacteria	Numbers	Proportion (%)
Gram-negative bacterium	48	58.5
Klebsiella pneumoniae	15	18.3
Escherichia coli	13	15.6
Enterobacter	10	12.2
Pseudomonas aeruginosa	10	12.2
Gram-positive bacteria	26	31.7
Staphylococcus haemolyticus	8	9.8
Coagulase negative *staphylococcus*	7	8.5
Enterococcus	6	7.3
Staphylococcus aureus	5	6.1
Fungus	8	9.8

Candida	8	9.8

Table 3. Factors of hospital infections in patients with strokes and the infection rates (%).

Factors	Cases	Hospital infection	Infection rate (%)	χ^2	P
Age					<0.01
<65	143	9	6.29		
≥ 65	269	44	16.36	8.45	
Gender					>0.05
Male	229	32	13.97		
Female	183	21	11.48	0.56	
Ischemic ACVD	279	39	13.98		>0.05
Hemorrhagic ACVD	133	14	10.53	0.96	
Muscle strength					<0.01
>3	178	7	3.93		
≤ 3	234	46	19.66	22.32	
Invasive procedure					<0.01
With	80	18	22.5		
Without	332	35	10.54	8.23	
Mechanic ventilation					<0.01
With	48	23	47.92		
Without	364	30	8.24	59.57	
Diabetes					<0.05
With	119	23	19.33		
Without	293	30	10.24	6.24	
Prophylactic antibiotics					<0.01
With	106	28	26.42		
Without	306	25	8.17	23.39	

Note: ACVD: Acute Cerebrovascular Disease.

Discussion

Emergency cerebral apoplexy patients with hospital infection occur more easily, because the patient age, long duration and decreased activity. According to reports of emergency the incidence of hospital infection in patients with cerebral apoplexy can reach 10%~30% [10,11], about 50% of the hospital infection are actually able to prevent [12], in this study, 412 cases of cerebral apoplexy patients in hospital infection 53 cases, infection rate is 12.86%, pathogen and risk factors for infection patients.

Emergency hospital infection in patients with cerebral apoplexy position is mostly the respiratory tract, probably the stroke patients with disorder of consciousness, bulbar paralysis, a weak cough reflex, food and saliva regurgitation and aspiration extremely easy, causing aspiration pneumonia. The patient's trachea is cut open, the intubation tube frequently absorbs phlegm, the application of the respiratory machine and other invasive operation which can injure the respiratory tract mucosa and reduce the local barrier function. In addition, patients with cerebral apoplexy have more visitation and escort personnel, resulting in cleaner air and poor fluidity, which are more likely to cause the spread of respiratory diseases.

Pathogenic bacteria of hospital infection in patients with cerebral apoplexy were analysed, and the most common pathogenic bacteria in acute stroke patients were g-bacteria, followed by gram-positive bacteria and fungi. Proportion of pathogenic bacteria in fungi are small, but higher year by year, the reason may be, cerebral apoplexy patients is mostly the elderly, due to the tissues and organs in degenerative diseases and multiple viscera function abate, the thymosin and all sorts of lymphatic factor to reduce, circulating in the blood lymphocyte conversion rate is reduced and the lymphocyte function is low.

The main risk factors of stroke combined with hospital infection: Age: the incidence of hospital infection in patients with acute stroke in patients aged 65 and over was significantly higher, reaching 16.36% [13]. Because the age increases, the body function deteriorates, the immunity becomes low, easy to produce hospital infection. Invasive operation: invasive diagnosis and treatment methods can damage skin mucosal protection, human defense system and provide conditions for the invasion of pathogenic bacteria, and increase hospital infection [14]. For example, patients often have inhalation, sputum aspiration, insertion of a gastric tube and other invasive procedures which can cause the trachea and bronchial mucosal damage, thereby causing the increase of respiratory tract infection. Complicated with other diseases: stroke patients usually merged diabetes, high blood sugar can be conducive to *E. coli*, *Streptococcus*, *Pneumococcus*, such as the growth of bacteria, is also a major factor in the production of infection [15], Use of antimicrobial drugs: use of antimicrobials can prevent hospital infection, which can have the effect of prevention and treatment of infectious diseases. However, unreasonable application of antimicrobial agents can cause the disorder of the bacteria, which can easily occur in double infection, making hospital infection more dangerous. Therefore, abuse of antimicrobials is prohibited.

To sum up, the emergency incidence of hospital infection in patients with cerebral apoplexy is higher than general patients, the distribution of infection is mostly respiratory, pathogenic bacteria is mainly G- bacteria, the main risk factor is the patient's age, invasive operation, reasonable application of antibacterial drugs, complications, etc.. The medical staff should focus on the prevention and control, strengthening the management of nursing and disinfection isolation to decrease hospital infection and improve the cure rate.

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