Original Article
Study on the related risk factors and targeted nursing effects in multi-drug resistant bacteria infections in elderly patients with stroke-associated pneumonia

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Abstract: Purpose: to explore the related risk factors and targeted nursing effects in multi-drug resistant bacteria (MDRB) infection in elderly patients with stroke-associated pneumonia. Methods: We selected 100 elderly patients with MDRB who received SAP in the hospital encephalology department from May 2011 to November 2014, and pathogenic detection and drug susceptibility tests were performed on the specimens sent for inspection. In addition, we observed the pathogenic characteristics of MDRB, and carried out univariate and multivariate regression analysis of related risk factors. The infected patients were randomly divided into a control group and an intervention group, each with 50 cases. The control group received routine nursing care, and the intervention group received targeted nursing interventions, and the nursing effect of the two groups of patients was compared and analyzed. Results: A total of 112 drug-resistant bacteria were isolated from 100 SAP patients; gram-positive bacteria accounted for 22.3%, gram-negative bacteria accounted for 74.1%, fungi accounted for 3.6%. The multi-factor analysis showed that SAP type, ICU admission, gastric catheter retention, length of hospital stay, prophylactic use of antibiotics and disturbance of consciousness are risk factors associated with MDRB. The total effective rate of the control group was 50.0%, and the total effective rate of the intervention group was 74.0%, the difference between the two groups was statistically significant (P<0.05). Conclusion: The pathogens causing MDRB in elderly SAP patients are mainly gram-negative bacteria, and there are many risk factors for developing MDRB in SAP patients, and targeted nursing measures can significantly improve the prognosis of patients with MDRB infection.

Keywords: Stroke, associated pneumonia, multi-drug resistant, infection, risk factors, etiology

Introduction

Stroke is a rapid brain function decline caused by cerebral blood circulation disorder, and the incidence, morbidity rate and mortality rate of this disease are high. Elderly patients are very susceptible to stroke-associated pneumonia (SAP) due to a decline in immune capabilities and a decline in the defense function of the respiratory system [1, 2]. With the abuse of a large number of antimicrobial drugs, SAP patients often develop multi-drug resistant bacteria infection (MDRB), which complicates infections and increases the mortality of patients [3, 4]. Targeted nursing emphasizes specialization and individuation of nursing, and fully utilizes nursing resources, carrying out specific nursing services to different patients, which yields a positive effect in the treatment

of SLE [5]. Yet, targeted nursing is rarely reported on for the treatment of MDRB. This study explored the related risk factors and etiological characteristics of MDRB in SAP patients, investigated the effect of targeted nursing intervention on MDRB, and provided a basis for the treatment of stroke in elderly patients, the report is as follows.

Materials and methods

Clinical data

A total of 100 patients with MDRB and SAP from May 2011 to November 2014 in the Department of Cerebral Diseases of the hospital were selected, including 53 males and 47 females. The patients' ages ranged from 60 to 89 years old, with an average of (69.8±4.5)

Table 1. Comparison of the clinical data between the two groups of patients

Project		Control group (n=50)	Intervention group (n=50)	X^2/t	P
Gender (case)	Male	23	30	1.967	0.161
	Female	27	20		
Age		68.5±5.2	69.8±6.4	1.115	0.268
Cause of treatment (case)	Cerebral infarction	29	31		
	Cerebral hemorrhage	21	19	0.167	0.683

years old. Patients were randomly divided into a control group and an intervention group. There was no statistically significant difference between the two groups in gender, age and other data. Comparison of the clinical data between the two groups of patients is shown in **Table 1**.

Inclusion criteria: ① Patients with stroke associated pneumonia clearly diagnosed by imaging examination and laboratory examination, and met the relevant diagnostic criteria of Practical Internal Medicine [5]; ② The clinical data was complete; ③ The cognition and communication function was normal, and they could complete the questionnaire independently; ④ Confirmed by sputum specimen inspection and drug resistance experiment analysis. Patients in the observation group were complicated with MDRB infection, while those in the control group were not.

Exclusion criteria: ① Patients with severe chronic disease, hypertension, cardiopulmonary failure, primary liver and kidney insufficiency; ② Patients with infectious diseases prior to admission, or pneumonia occurring 1 month after the stroke occurred; ③ Patients who withdrew halfway; ④ Patients who were unconscious.

The study was approved by the ethics Committee of our hospital, and both groups of patients signed the informed consent.

Methods

Pathogen detection

Sputum samples of the patients were collected, and a VITEK-2 automatic bacterial identification instrument was used for strain identification. The paper diffusion method (K-B method) was used for drug sensitivity test, and the results were judged according to the 2010

standard of American institute of clinical laboratory standardization (CLSI).

Clinical nursing

The control group received conventional nursing methods, and the nursing intervention group received targeted nursing intervention, including basic nursing, environmental hygiene management, antibacterial drug use, psychological nursing and so on.

Prognostic evaluation criteria

Cure: Body temperature was normal, sputum volume significantly decreased, and peripheral blood white blood cell count was normal. Improved: Body temperature dropped to below 37.5°C, sputum volume decreased, and peripheral blood white blood cell count was close to normal. Ineffective: body temperature decreased, sputum volume decreased, and the number of white blood cells in peripheral blood was still abnormal. Total effectiveness = Cured +Improved.

Statistical analysis

SPSS 19.0 software was used for statistical analysis, and the counting data was expressed as a percentage, and χ^2 test was used; univariate and multivariate regression analysis of risk factors for MDRB infection in elderly stroke associated pneumonia was performed to assess the risk factors for the occurrence of MDRB infection. P<0.05 was considered statistically significant.

Results

General data results for the two groups

There was no difference between the general data in the two groups. Comparison of the clinical data between the two groups of patients is

Table 2. Constituent ratios of the MDRBs causing the infections in the elderly patients with SAP (%)

Pathogen	Number	Constituent ratio
Gram-positive bacteria	25	22.3
Coagulase negative staphylococcus	12	10.7
Staphylococcus aureus	5	4.5
Mycobacterium tuberculosis	3	2.7
Haemolytic staphylococcus	3	2.7
Others	2	1.7
Gram-negative bacteria	83	74.1
Pseudomonas aeruginosa	25	22.3
Escherichia coli	19	17.0
Acinetobacter baumannii	18	16.1
Klebsiella pneumoniae	14	12.5
Others	7	6.2
Fungi	4	3.6
Candida tropiana	2	1.8
Candida albicans	1	0.9
Candida glabrata	1	0.9
Total	112	100.0

shown in **Table 1**. A total of 112 drug-resistant bacteria were isolated from 100 SAP patients, gram-positive bacteria (25) accounted for 22.3%, gram-negative bacteria (83) accounted for 74.1%, fungi (4) account for 3.6%. Constituent ratios of the MDROs causing the infections in the elderly patients with SAP (%) are shown in **Table 2**.

Analysis of related factors of MDRB in elderly patients with SAP

Causes of disease, history of diabetes, SAP type, ICU admission, indwelling gastric tube, length of hospital stay, antibacterial drug prevention application and consciousness disturbance are related factors of MDRB in elderly patients with SAP (P<0.05), univariate analysis of the influencing factors for the MDROs infections in the elderly patients with SAP and the infection rates (%) are shown in **Table 3**.

Multi-factor analysis of MDRB in elderly patients with SAP

SAP type, ICU admission, indwelling gastric tube, length of hospital stay, antimicrobial preventive applications and disturbance of consciousness are risk factors related to the occurrence of MDRB, multivariate logistic analysis of

the factors for the MDROs infections in the elderly patients with SAP is shown in **Table 4**.

Evaluation of clinical nursing care effect

The total effective rate of treatment in the control group is 50.0%, and the rate of treatment in the intervention group is 74.0%, and the difference between the two groups is statistically significant (χ^2=12.568, P<0.05), the comparison of the effective rate (%) of treatment between the control group and the intervention group is shown in **Table 5**.

Discussion

Stroke is a kind of cerebral blood circulation disorder with sudden onset and multiple etiology [6], Stroke-associated pneumonia refers to the acute and sequelae phases of stroke patients without lung infections complicated by pulmonary parenchymal infection, the incidence rate is as high as 22%, which can further aggravate the condition of stroke patients, increase the mortality of patients, extend the length of hospitalization, and aggravate economic and social burden, and affect its prognosis [7-10]. However, elderly patients with apoplexy associated pneumonia have a poor constitution, and the function of each organ declines. In addition, due to the abuse of antibacterial drugs in clinical practice in recent years, the drug resistance of pathogenic bacteria of apoplexy associated pneumonia is increasing, and multi-drug resistant bacteria have appeared [11-13]. The risk coefficient of multi-drug resistance bacteria in stroke associated pneumonia in the elderly is significantly increased, which poses a threat to the health and life safety of patients.

The results show that a total of 112 drug-resistant bacteria were isolated from 100 SAP patients, gram-positive bacteria accounts for 22.3%, gram-negative bacteria accounts for 74.1%, fungi accounts for 3.6%. Gram-negative bacteria occupy the main position, and the top 4 gram-negative bacteria are pseudomonas aeruginosa, escherichia coli, acinetobacter baumannii and klebsiella pneumoniae, and the reason may be that the elderly patients often have a serious underlying disease, ant the immune ability of the body is then decreased,

Table 3. Univariate analysis of the influencing factors for the MDRBs infections in the elderly patients with SAP and the infection rates (%) 433

Influencing factrs		Number of investigations	Number of infections	Infection rate	X^2	P
Age	60-75	220	58	26.38	6.429	0.114
	>75	213	42	19.66		
Gender	Male	228	52	22.75	12.441	0.219
	Female	205	48	23.39		
Cause of treatment	Cerebral infarction	214	60	28.00	7.550	0.030
	Cerebral hemorrhage	219	40	18.28		
History of diabetes	Yes	206	59	28.29	13.530	0.036
	No	227	41	18.03		
History of hypertension	Yes	226	48	21.19	6.587	0.156
	No	207	52	25.08		
SAP type	Early onset	229	33	14.39	18.532	0.022
	Late onset	204	67	32.79		
Ward type	Ordinary	226	28	12.38	16.580	0.016
	ICU	207	72	34.76		
Indwelling gastric tube	Yes	212	68	32.08	8.344	0.025
	No	221	32	14.42		
Length of hospital stay	<2	219	39	17.75	11.470	0.027
	>2	214	61	28.43		
Antimicrobial preventive applications	Yes	212	76	35.72	15.678	0.010
	No	221	24	10.86		
Disturbance of consciousness	Yes	210	70	33.26	9.330	0.016
	No	223	30	13.41		

Table 4. Multivariate logistic analysis of the factors for the MDRBs infections in the elderly patients with SAP

Factor	OR	P	Wald	95% CI
Cause of treatment	0.865	0.770	1.229	0.501~2.102
History of diabetes	0.936	0.608	0.087	0.245~1.862
SAP type	2.125	0.015	10.114	1.387~5.471
Ward type	2.976	0.008	11.236	1.191~5.807
Indwelling gastric tube	3.401	0.021	9.778	1.224~4.578
Length of hospital stay	0.015	0.011	5.868	0.0914~4.906
Antimicrobial preventive applications	0.024	0.025	7.689	0.0947~5.860
Disturbance of consciousness	0.023	0.033	9.145	1.473~6.508

Table 5. Comparison of the effective rate (%) of treatment between the control group and the intervention group [n (%)]

Curative effect	Control group (n=50)	Intervention group (n=50)	X^2	P
Cure	6 (12.0)	14 (28.0)		
Improvement	19 (38.0)	23 (46.0)		
Invalid	25 (50.0)	13 (26)		
Total effectiveness	25 (50.0)	37 (74.0)	6.112	0.013

show that cause of treatment, history of diabetes, SAP type, ICU admission, indwelling gastric tube, length of hospital stay, antimicrobial preventive applications and disturbance of consciousness are the relevant factors for the occurrence of MDRB in elderly patients with SAP. Multi-factor analysis shows that SAP type, ICU admission, indwelling gastric tube, length of hospital stay, antimicrobial preventive applications and disturbance of con-

and the susceptibility to the above bacteria is increased. The results of single factor analysis

sciousness are the risk factors associated with the development of MDRB. For patients with late onset SAP, the pathogenic bacteria are multidirectionally resistant, and when the patient's condition is serious and endocrine disorders provide a good environment for the growth and reproduction of pathogenic bacteria. Patients with this disease often undergo multiple invasive procedures, which results in heterotopic colonization of the lower respiratory tract by multidrug-resistant bacteria. The patients admitted to the ICU are more serious and have received more invasive treatment, and the chance of introducing pathogenic bacteria is increased, and the frequency of application of antimicrobial drugs in ICU increases, the possibility of MDRB is greater. For patients with indwelling gastric tube nasal feeding, due to the intervention of the catheter, the probability of carrying pathogenic bacteria increases, and patients are prone to the reflux phenomenon of stomach contents, causing pathogenic bacteria to be brought into the lungs, which is prone to MDRB. As patients stay in the hospital longer, the risk of exposure to multidrug-resistant bacteria increases [14-16]. For patients who are treated with antibacterial drugs for prevention, the balance of the normal flora is destroyed, and the gram-negative bacteria in the airway can be parasitic, leading to the emergence of multi-drug resistant bacteria [17]. The main cause of stroke-related pneumonia caused by consciousness disorders is aspiration, which leads to a large number of secretions from oropharynx being mistakenly inhaled into the lung, causing the proliferation of drug-resistant bacteria. Patients with consciousness disorders need to receive invasive operations such as sputum aspiration and indwelling catheter, and then external pathogens enter the patient's body and cause pulmonary infection [18-22].

Clinicians should pay close attention to the above risk factors and take corresponding clinical nursing measures. Carrying out appropriate care for the patient's position, mouth and diet. During treatment and nursing, environmental hygiene should be strictly managed and disinfection and isolation systems need to be strictly implemented to prevent the occurrence of cross-infection. Using antibacterial drugs reasonably, results in a reasonable and effective antibacterial effect. Psychological nursing is also very important, which can relieve the psychological pressure of patients to improve the effective rate of treatment. The clinical nursing results of the two groups show that the clinical total effective rate of the control group is statistically significant compared with that of the nursing intervention group, which demonstrates the importance of clinical care in MDRB for elderly patients with SAP. This study sample was from a single hospital and the sample size was relatively small, as such our study results may have a regional bias to a certain extent which can lead to an altered conclusions. Thus further research involved with a larger sample size and multiple regions are still needed.

Disclosure of conflict of interest

None.

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