Analysis on the infections change and measures for the multiple drug-resistant bacteria of neurology

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Abstract: To analyze the bacterial infection situations and the separation situations of multiple drug-resistant bacteria of the neurology of Zhengzhou People's hospital from Feb. 2012 to Dec. 2014. The patients data of neurology were retrieved by means of the doctor workstation system. The infection sites, the classification and drug-resistant feature of bacteria were classified and summarized in Excel. Finally, Compared with the infection sites, the classification and drug-resistant feature of bacteria at different year. The data obtained use SPSS 19.0 software to do statistical analysis. The infection rate of bacteria in neurology from Year 2012 to 2014 declined from 4.99% to 3.41%. But the constitution of the infection sites of bacteria had no significant changes. *Staphylococcus aureus* still was the majority in the infections of gram-positive bacteria, and *Escherichia coli* was the majority in the infections of gram-negative bacteria, and there were no significant changes in the ranking of the past three years. The separation rate of *Acihetobacter baumanii and Pseudomonas aeruginosa* in gram-negative bacteria gradually escalated. There were definite efficiencies in the prevention and control of the bacterial infections in neurology in the past three years. But the situation of prevention and control was still severe at the same time.

Keywords: Neurology; bacterial infections; multiple drug-resistant bacteria.

INTRODUCTION

Neurology is one of the vital constituent parts in the medical department of hospital. The patients in neurology are mainly old people with hypo immunity. They generally suffer acroparalysis and disturbance of consciousness in different degrees at the same time and they need rest in bed and accept the hospitalization for a long time. Due to the above features, the neurology department has become the worst-hit area of nosocomial infection of bacteria (Chen *et al*., 2012; Wu *et al*., 2012; Cong *et al*., 2013). The multiple drug-resistant bacteria mainly refer to the bacteria, which are simultaneously drug-resistant to the antibacterial agents of three types or more types used in the clinic (Klein *et al*., 2013). In recent years, the appearing and popularization of multiple drug-resistant bacteria makes the prevention and control of nosocomial infection of bacteria in neurology face severe challenges (Hasan *et al*., 2013; Rong *et al*., 2014). Aiming to the severe situation of nosocomial infections, especially the infections of multiple drug-resistant bacteria, the neurology department of Zhengzhou People's hospital had been carrying out series of measures to prevent and control the infections since 2012, including standard the use of the antibacterial agents, enhancing the level of nursing and reinforcing the aseptic concept of patients. In order to provide the research basis for evaluating the measures of preventing and controlling the infections, this article aims to research the data of the situations of bacteria infections and multiple drug-resistant bacteria in neurology of Zhengzhou People's hospital summarized since Feb, 2012 to 2014.

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MATERIALS AND METHODS

General materials

The total inpatients in the neurology department of Zhengzhou People's hospital collected from Feb. 2012 to Dec. 2014 were 14497.

Methods

The infection sites, the strain identification and analysis results of the drug-resistant feature of bacteria were retrieved by means of the doctor workstation system. The data were classified and calculated by Excel. The judgment for the multiple drug-resistant bacteria was on the basis of the Technical Guides for preventing and controlling the Nosocomial Infections of Multiple Drug-resistant Bacteria issued by Ministry of Health.

STATISTICAL ANALYSIS

Use SPSS19.0 statistical software for data analysis. $P < 0.05$ was considered statistically significant.

RESULTS

The changes of bacteria infections and the distributions of infection sites

The total inpatients in the neurology department of Zhengzhou People's hospital collected from Feb. 2012 to Dec. 2014 were 14497. Among them, there were 4567 cases in 2012, 4769 in 2013 and 5161 in 2014. The infected patients and the infection rates of the past three years were separately 228 cases (4.99%), 165 cases (3.46%) and 176 cases (3.41%). According to the table 1,

there were no changes occurring in the infection sites for the past three years. The top one was the upper respiratory tract with constituent ratio of 63.60%, 59.39% and 59.66%. The second one was lower respiratory tract, urinary tract and digestive tract. The infections rates of the skin and soft tissues relatively low with the rates of 1.57%, 1.21% and 1.70%.

The strain distributions of the infected bacteria

After further analyzing on the constitution of the bacterial strain, it was found that there were no significant changes in the separation of the bacterial strain in the past three years and the top one of the infected bacteria was *Staphylococcus aureus* that the quantities and constituent ratios in the past three years respectively were 22(32.84%, 2012), 15(30.00%, 2013) and 17(33.33%, 2014). The subsequent ones were *Enterococcus, Streptococcus pneumoniae, Coagulase negative staphylococcus and Hemolytic streptococcus*. The specific quantities and constituent ratios of the bacterial strains were shown in table 2. table 3 summarized the separation rates of the gram negative bacteria. Similar with the gram-positive bacteria, there were no significant changes in the ranking of the constituent ratios of the gram-negative bacteria ($P > 0.05$). The top five bacteria were *Escherichia coli, Klebsiella pneumoniae, Acinetobacter baumanii, Paeudomonas aeruginosa and Enteric bacilli.* However, the separation rate of the *Escherichia coli* dramatically declined from 41.61% of 2012 to 38.40% of 2014. The separation rate of *Acinetobacter baumanii* escalated from 15.53% of 2012 up to 16.80% of 2014. And the separation rate of *Pseudomonas aeruginosa* obviously rose from 12.42% up to 14.40% (table 3) ($P<0.05$).

The separation of the multiple drug-resistant bacteria

The separation rate of the multiple drug-resistant bacteria obviously declined year by year according to the data showed in table 4 ($P<0.05$). The separated multiple drug-resistant bacteria mainly were gram-negative bacteria whose drug-resistant rates of the past three years were respectively 31.68%, 26.96% and 27.20%. Obviously, the downtrend was unconspicuous. Although the separation rates of gram positive multiple drug-resistant bacteria rose from 11.94% to 12.00% in 2013, it obviously declined to 9.80% in 2014($P<0.05$).

DISCUSSION

Nosocomial infection was one of the key indicators that influenced the prognostic recovery of the patients and reflected the management levels and nursing levels of hospitals (Li, 2012). Aiming to the severe situation of nosocomial infections, the neurology department of Zhengzhou People's hospital had been carrying out series of measures to prevent and control the infections since 2012, including standard the use of the antibacterial agents, strictly implementing the sterilization, perfecting the modes and management levels of nursing and reinforcing the aseptic concept of patients. In accordance with the statistical results of the past three years, although the quantities of patients were rising, the infection rates were obviously declining and so were the separation rates of the multiple drug-resistant bacteria (Lu *et al*., 2013). All the data indicated that the rising of the infected patients was caused by the rising of the quantities of patients. Meanwhile, the statistical results indicated that the measures effectively controlled the bacterial infections and the breeding of the multiple drug-resistant bacteria, so the long-term insistence and further optimizing were in need. The results of constituent ratios of different infection sites showed that the top 3 sites of the infection sites in neurology were upper respiratory tract, lower respiratory tract and urinary tract, which was no significant difference with neurology departments of other hospitals (Geng *et al*., 2012). The constituent ratios were closely related with the personal diseases characteristics of patients in neurology. Most neurology patients suffered disturbance of consciousness in varying degrees, physiological functional limitation in breathing, swallowing and urinating. Meanwhile, most patients needed to accept invasive treatments such as tracheotomy and trachea cannula and so on. In addition, patients in neurology usually were aged and suffering with bedsore and hypostatic pneumonia caused by hemiplegia and lying in bed. Therefore, the bacterial infections in neurology were mainly occurred in the respiratory tract and digestive tract (Ying, 2012; Yan *et al*., 2012). And the medical staff needed to take specific solutions for different patients. According to the constituent ratios of the bacteria, the gram-negative bacteria were main bacteria developing infection separations. The top three bacteria were *Escherichia coli, Acinetobacter baumanii and Klebsiella pneumoniae.* However, the main bacteria in the gram-positive bacteria were *Ataphylococcus and Streptococcus pneumoniae*. And there were no significant differences in the ranking of the constituent ratios compared with other hospitals. At the same time, the analysis showed that the constituent ratios had no significant regional specificities and may be closely related with the characteristics of neurology diseases (Yuan *et al*., 2012; Zang *et al*., 2012). In accordance with the separation of the drug-resistant bacteria, the drug-resistant bacteria which had developed the separation were mainly the *Acinetobacter baumanii, Klebsiella pneumoniae and Methicillin-resistant Staphylococcus aureus*, which had no significant differences with the data reported by CHINET (Hu *et al*., 2012; Ning *et al*., 2014).

The results indicate that it is necessary to further enhance the management of the use of the antibacterial agents, the reasonable selection for the environment disinfectant, the training and indoctrination for the aseptic concept and the nursing and management for the patients in neurology. It has been one of the medical challenges to be solved to control the development of the nosocomial bacteria especially the drug-resistant bacteria, which needs the

Table 1: The distributions of infections sites of the bacteria in neurology from Year 2012 to 2014 [n(%)]

Sequence	Separation sites	2012	2013	2014
1	Upper respiratory tract	145(63.60)	98(59.39)	105(59.66)
2	Lower respiratory tract	40(17.54)	28(16.97)	36(20.45)
3	Urinary tract	23(10.09)	22(13.33)	18(10.23)
4	Digestive tract	14(6.14)	12(7.27)	12(6.82)
5	The skin and soft tissues	4(1.75)	2(1.21)	3(1.70)
6	Others	2(0.88)	3(1.82)	2(1.14)
Total		228(100.00)	165(100.00)	176(100.00)

Table 2: The constitution of gram positive strains [n(%)]

Sequence	Names of bacterial strain	2012	2013	2014
1	*Staphylococcus aureus*	22(32.84)	15(30.00)	17(33.33)
2	*Enterococcus*	18(26.87)	16(32.00)	14(27.45)
3	*Streptococcus pneumoniae*	16(23.88)	12(24.00)	12(23.53)
4	*Coagulase negative staphylococcus*	5(7.46)	3(6.00)	4(7.84)
5	*Hemolytic streptococcus*	5(7.46)	3(6.00)	3(5.88)
6	Others	1(1.49)	1(2.00)	1(1.96)
Total		67(100.00)	50(100.00)	51(100.00)

Table 3: The constitution of gram negative strains [n(%)]

Sequence	Names of bacterial strain	2012	2013	2014
1	*Escherichia coli*	67(41.61)	44(38.26)*	48(38.40)*
2	*Klebsiellapneumoniae*	30(18.63)	21(18.26)	24(19.20)
3	*Acinetobacterbaumanii*	25(15.53)	20(17.39)	21(16.80)
4	*Pseudomonas aeruginosa*	20(12.42)	17(14.78)*	18(14.40)*
5	*Enteric bacilli*	11(6.83)	8(6.96)	9(7.20)
6	Others	8(4.97)	5(4.35)	5(4.00)
Total		161(100.00)	115(100.00)	125(100.00)

Table 4: The separation of the multiple drug-resistant bacteria in neurology [n(%)]

Names of bacterial strain	2012	2013	2014
Gram positive bacteria	8(11.94)	6(12.00)*	5(9.80)*
Gram negative bacteria	51(31.68)	31(26.96)	34(27.20)
Total	59(43.62)	37(38.96)	39(37.00)

Note: *represents the value of the corresponding variable comparison is greater than 0.05 and the difference was not statistically significant

cooperation of managers of hospital, clinical doctors, nurses and patients and their family members. This investigation summarizes the situations of the bacterial infections of the past three years in neurology and some experience in controlling the nosocomial infections. It would be great if this research could provide references for controlling in the nosocomial bacterial infections.

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