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ARTICLE

Comparison on Detection Results of Pathogen Nucleic Acids for Bronchoalveolar Lavage Fluid of Lung Infection Infants Between Uighur Nationality and Han Nationality

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ABSTRACT

Objective: To analyze the detection results of pathogen nucleic acids for bronchoalveolar lavage fluid (BALF) of lung infection infants from Uighur nationality and Han nationality. **Methods:** A retrospective analysis was performed on the 318 infants with lung infection who were admitted to the hospital from April 2018 to April 2019. According to their nationality, they were divided into Uighur nationality group (190 cases) and Han nationality group (128 cases). The BALF specimens were collected to test pathogen nucleic acid. The distribution and positive rates of [respiratory syncytial virus (RSV), adenovirus (ADV), influenza virus A (IFA), influenza virus B (IFB), parainfluenza virus type 1 (PIV I), parainfluenza virus type 2 (PIV II), parainfluenza virus type 3 (PIV III)], bacteria (Streptococcus pneumoniae, Haemophilus influenzae, staphylococcus aureus, Pseudomonas aeruginosa, klebsiella pneumoniae), Mycoplasma pneumoniae (MP) and Chlamydia pneumoniae (CP) in both groups were observed and compared. **Results:** The virus detection for RSV, ADV and PIV III were on the top three in BALF from the children in both groups. The total positive rate of virus examination in Uighur nationality group was higher than that in Han nationality group ($P<0.05$). BALF in both groups was mainly on Streptococcus pneumoniae. The total positive rate of bacteria, MP and detection rate of chlamydia were higher in Uighur nationality group were higher than those in Han nationality group ($P<0.05$). **Conclusion:** The pathogen nucleic acid examination for bronchoalveolar lavage fluid in infants with lung viral infection is in the majority, mainly on RSV virus infection. The positive rates of virus, bacteria, MP and CP of children in Uighur nationality are high than those in Han nationality.

1. Introduction

Lung infection, as one of the most common respiratory diseases in infants and young children, is a multi-infectious disease caused by viruses, bacteria, mycoplasma, chlamydia, etc. Its main clinical symptoms include wheezing, shortness of breath, cough, expectoration, etc. With the progression of disease, lung infection is easily to be turned into severe pneumonia, which is a serious threat to the health of infants [1]. Clinically, the virus test, bacteria test and other tests are mainly carried out by examining blood, sputum and nasopharyn-

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geal swabs of the sick children. In recent years, studies have found that clinically collected samples are easily contaminated, and the positive rate of isolated culture is low, limiting etiology diagnosis to a certain extent [2]. Bronchoalveolar lavage (BAL) is a pulmonary segment lavage measure through the use of fiber bronchoscope, and the examination and treatment are carried out by recycling the small airway and bronchoalveolar lavage fluid, and the analysis of bronchoalveolar lavage fluid (Bronchoalveolar) Lavage fluid, BALF) can help to understand the immune process of lung disease [3]. BAL has a higher application value in the pathogenic diagnosis of lung infection and can accurately reflect the pathogens of the lungs, because that it obtains more pathogens on the basis of the direct taking of lesion specimen and the reduction of oropharyngeal contamination specimen [4]. Based on this, this study compared the detection results of pathogen nucleic acids for bronchoalveolar lavage fluid of lung infection infants between Uighur nationality and Han nationality. The results of the study are reported below.

2. Data and Method

2.1 General data

With a retrospective analysis of 318 infants with lung infection admitted to our hospital from April 2018 to April 2019, the infants were divided into Uighur nationality group (190 cases) and Han nationality group (128 cases) according to their nationalities. There were 117 males and 73 females in the Uygur nationality group; the infants' ages ranged from 1 month to 12 months, and the average age was (6.35±3.12) months; there were 75 males and 53 males in the Han nationality group, the infants' ages ranged from 1 month to 12 months, and the average age was (6.77±3.30) months. There was no statistical difference in the general data of the patients in the two groups (P>0.05), which was comparable.

Inclusion criteria: ① consistent with the diagnostic criteria for infant lung infection in Obstetrics and Gynecology[5], and confirmed by X-ray chest radiography; ② 4in line with the indications for fiberoptic bronchoscopy, no contraindications for examination; ③ first bronchoalveolar lavage with fiber bronchoscope was performed with permission of infants' family members within 1-5 days after being hospitalized; ④ the guardians of the infants were informed and volunteered to participate in the study; ⑤ the study was approved by the Medical Ethics Committee of our hospital.

Exclusion criteria: ① synchronously suffered from severe organ dysfunction (such as hypohepatia, renal insufficiency, etc.), spontaneous hemorrhage, coagulopathy, etc.; ② there is a history of hormone use; ③ infants cannot cooperate to complete the work related to specimen collection; ④ clinical and examination data are incomplete.

2.2 Method

2.2.1 Specimen Collection

BAL was implemented in both groups. The instruments were produced by Olympus, a Japanese company, and the model numbers were BF-XP60 (outer diameter: 2.8mm, inner diameter: 1.2mm), BF-3C40 (outer diameter: 3.6mm, inner diameter: 1.2mm), and BF-MP60 (outside diameter: 4.0mm, inner diameter: 2.2mm). The specific operation is as follows: routine preoperative preparation (including blood routine examination, blood clotting time examination, prothrombin time examination, liver and kidney function tests, etc.), choosing the appropriate model for surgery based on the infant's condition, using nasal insertion method and performing airway local anaesthesia, examining non-lesioned site, and then performing lavage and examination for the diseased region and conducting alveolar lavage (3 times) with about 5 ml of normal saline (37 ℃), and then collecting and sealing the lavage fluid. Note that lidocaine should not be used before the lavage fluid is taken to avoid reducing the positive rate of bacterial culture in the lavage fluid.

2.2.2 Specimen Detection

The lavage fluid is stored in a refrigerator with temperature at 4 ℃, and the ice box is sent to the laboratory for inspection within 20 minutes. The Wright stain smear was conducted at first, and the specimen would be stored in a refrigerator with temperature at 4℃ after being qualified, and the inspection was completed within 48 hours. Standard: squamous epithelial cells <10/low power field, Leukocytes >10-25/low power field, or the ratio of the two is 1:25.

Qualified specimens were examined by real-time fluorescence quantification polymerase chain reaction (PCR). The instrument was produced Applied Biosystems, an American company, and the model number is 7300, including: Respiratory syncytial virus (RSV), Adenovirus (ADV), Influenza virus A (IFA), Influenza virus B (IFB), Parainfluenza virus 1 (PIV I), Parainfluenza virus 2 (PIV II), Parainfluenza virus 3 (PIV III), Mycoplasma pneumoniae (MP), Chlamydia pneumoniae (CP); and followed by bacterial inoculation and selection of dominant strains for pure culture, using the API system for strain identification, including streptococcus pneumoniae, haemophilus influenzae, staphylococcus aureus, pseudomonas aeruginosa,

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klebsiella pneumoniae.

2.3 Observation Index

The detection results of pathogen nucleic acid for bronchoalveolar lavage fluid of the two groups were observed and compared, and the positive rate of diagnosis was prepared according to the Chinese Expert Consensus for the Detection of Bronchoalveolar lavage Pathogens in Lung Infectious Diseases (2017 Edition)[6].

2.4 Statistical Method

All the data in this paper were entered into EXCEl form without exchange, and was processed by statistical software SPSS17.0. The measurement data was expressed by Mean±SD(±s), and when the data were consistent with normal distribution and equal variance, a t-test was used between the two groups. The enumeration data was expressed by the number of cases (%), and the unordered categorical data was analyzed by χ^2 test. All tests were two-sided tests, and the difference was statistically significant when P was less than 0.05 (P<0.05).

3. Results

3.1 Comparison of Detected Virus Component Ratio and Detection Rate Between the Two Groups

The virus detection for RSV, ADV and PIV III were on the top three in bronchoalveolar lavage fluid (BALF) from the children in both groups. The total positive rate of virus examination in Uighur nationality group was higher than that in Han nationality group (P<0.05), as shown in table 1.

3.2 Comparison of Component Ratio and Detection Rate of Bacteria, MP And Chlamydia Between the Two Groups

Bronchoalveolar lavage fluid (BALF) in both groups was mainly on Streptococcus pneumoniae. The total positive rate of bacteria, MP and detection rate of chlamydia in Uighur nationality group were higher than those in Han nationality group (P<0.05), as shown in table 2.

4. Discussion

It is easier for infants to suffer from lung infection for their narrow trachea and bronchial lumen, less mucus secretion, poor ciliary movement ability, stunted lung elastic tissue, rich and easily congestive pulmonary blood vessels, vigorous pulmonary interstitial development, less number of pulmonary alveoli and less Lung Qi concentration, susceptible to mucus choke, and incomplete-developed immunity, and lung infection can be turned into pneumonia and severe pneumonia, etc., which seriously threaten the health of infants[7]. With the continuous development of medical technology, the cure rate of lung infection in children is greatly improved, and the patients mainly are cured by clearing airway secretions, preventing airway obstruction and hypoxia caused by airway obstruction, and simultaneously administering local drug-targeted lavage, etc. [8]. Therefore, a reasonable and effective analysis of the composition of the lavage fluid is helpful to diagnose the cause of the disease, confirm the pathogen, and choose the drug properly.

Table 1. Comparison of virus component ratio and detection rate between the two groups [case (%)]

Groups	RSV	ADV	IFA	IFB	PIV I	PIV II	PIV III	Total positive rate
Uighur nationality group(n=190)	46 (24.21)	23 (12.10)	5 (2.63)	2 (1.05)	2 (1.05)	5 (2.63)	10 (5.26)	93 (48.95)
Han nationality group	23 (17.97)	11 (8.59)	3 (2.34)	1 (0.78)	1 (0.78)	3 (2.34)	6 (4.69)	48 (37.50)
χ^2	1.753	0.988	0.026	0.060	0.060	0.025	0.053	4.061
P	0.185	0.320	0.872	0.806	0.806	0.872	0.818	0.044

Table 2. Comparison of component ratio and detection rate of bacteria, MP and chlamydia between the two groups [case (%)]

Groups	Bacteria						MP	CP
	Streptococcus pneumoniae	Haemophilus influenzae	staphylococcus aureus	Pseudomonas aeruginosa	klebsiella pneumoniae	Total positive rate		
Uighur nationality group(n=190)	10(5.26)	8(4.21)	4(2.10)	3(1.58)	6(3.16)	31(16.32)	33(17.37)	25(13.16)
Han nationality group(n=128)	3(2.34)	3(2.34)	1(0.78)	1(0.78)	3(2.34)	11(8.59)	12(9.38)	8(6.28)
χ2	1.662	0.337	0.222	0.013	0.007	3.978	4.022	3.924
P	0.197	0.562	0.637	0.910	0.933	0.046	0.045	0.048

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BAL is one of the most effective methods for the diagnosis and treatment of lung infection in infants and young children in recent years. The method is to inject saline into the bronchoalveolar of infants through fiber bronchoscope, and then collect the surface fluid of alveoli for diagnosis and remove impurities in the alveoli [9]. BAL can effectively obtain the cells and biochemical components from the lower respiratory tract (mainly alveoli), and then know the characteristics and activity of the lower respiratory tract lesions, and effectively analyze and explore the lung lesions [10]. BAL can directly obtain lavage specimens from the lung infection site. The sampling range is wide, and it can accurately reflect the lung infection lesions. But it is an invasive operation, a strict safety evaluation should be performed on the infant in the actual operation for that there are more surgical contraindications and preoperative and postoperative complications in the BAL operation [11].

At present, there are different reports on the causes of lung infection in young children. The causes of the disease are closely related to viruses, bacteria, mycoplasma and chlamydia infections, etc., of which, the common virus include RSV, IFV, PIV, ADV, etc., and the bacteria mainly include Streptococcus pneumoniae, Haemophilus influenzae, Staphylococcus aureus, Pseudomonas aeruginosa, Klebsiella pneumoniae, etc. Virus is a common cause of lung infection, and the infection is mainly related to immune function status, patient's age, route of infection, etc., and the incidence of lung infection of young children is slightly higher than that of adults [12]. Bacteria are an important cause of pneumonia in infants and young children, the incidence of pneumonia is closely related to the pathogen and patient's status. Clinically, pneumonia can be properly treated through pathogenic diagnosis and selection of sensitive drugs [13]. MP and CP, widely distributed in nature, can be spread by droplets, and they both are pathogens of respiratory tract infection, which have certain destructive effects on respiratory ciliated epithelial cells and respiratory mucosa, and can cause respiratory diseases such as pneumonia and bronchitis [14].

According to the results of this study, pathogen nucleic acids examination for bronchoalveolar lavage fluid of lung infection infants found that the lung infection was mainly caused by virus and was mainly infected with RSV virus, and the study result is similar to that of severe pneumonia (written by Ding Lin et al [15]). RSV is the most common cause of bronchiolitis and pneumonia for infants who are less than 12 months old, and the infection is related to patient's age, season and climate, etc., e.g. in northern China, the incidence is higher in the season when autumn and winter alternates. This research also studied the lung infection conditions of infants of Han nationality and Uygur nationality, the results showed that the infection rates of virus, bacteria, MP and CP of children in Uighur nationality are high than those in Han nationality, this may have a certain relationship with their growth environment. Compared with the Han nationality, the geographical environment and living environment of Uygur nationality are relatively poor, the infectious factors are more and the level of education and attention to disease are relatively low.

5. Conclusion

In summary, the detection of pathogen nucleic acids for bronchoalveolar lavage fluid of lung infection infants found that virus is the majority cause of lung infection, and RSV virus infection is common. Through the comparison of detection results of the Uyghur nationality group and the Han nationality group, it is found that the infection rate of virus, bacteria, MP, CP in the Uyghur infants are higher than those of Han infants. Therefore, more attention should be payed to the Uyghur infants in the diagnosis and treatment of lung infection in the later stage, and diagnosis and cure rate of pathogens should be effectively improved.

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