

*Review Article*

## Research on prevention methods of nosocomial infection in neurosurgery

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**Abstract:** The proportion of critically ill patients from neurosurgery wards in hospitals is significantly higher than that from other departments. These patients suffer from low immune. At the same time, because of the severe trauma after surgery and the complexity of pathogens in patients, antibiotics are frequently used. However, the of bacterial drug resistance is relatively high because of the particularity of hospitals, which is a major reason for the high infection rate of neurosurgery patients. Therefore, regarding to these risk factors, intervention measures should be actively explored in hospitals, so as to control the infection rate, reduce the possibility of infection in neurosurgery patients, improve the rehabilitation efficiency of patients, and reduce unnecessary suffering of patients caused by infection. This is also an effective means to improve the quality of hospital medical care.

**Keywords:** Neurosurgery; nosocomial infection; prevention methods; risk factors

**Received:** January 12, 2020 **Accepted:** February 25, 2020 **Published:** March 9, 2020

### 1. Overview of nosocomial infection in neurosurgery

The investigation showed that the infection rate of patients in neurosurgery hospital was significantly higher than that in other departments during the same period. In particular, there were many invasive medical operations in intensive care units, which were more prone to infection.

Invasive operation is the most high-risk infection factors in neurosurgery, followed by advanced age and long hospitalization time. In addition, some operations and environmental pollution during diagnosis, treatment and rescue also increase the infection rate of neurosurgery patients from different aspects.

Therefore, the neurosurgical infection from multiple perspectives should be analyzed in the hospital, as well

as effective means to reduce its rate be found, so as to improve the rehabilitation efficiency of patients, thus achieving the purpose of improving the medical quality.

### 2. Risk factors of nosocomial infection in neurosurgery

The risk factors of nosocomial infection in neurosurgery mainly include:

#### 2.1 Invasive operation infection

Most neurosurgery patients need surgical treatment, in which process, there are many invasive operations which may cause patient infection.

#### 2.2 Consciousness disorder infection

There are many causes of consciousness disorders, mainly related to nervous system diseases, trauma and

severe infection, as well as severe health problems. Once the state of consciousness is poor, the patient's condition is also serious, suggesting that the nervous system is violated or consciousness disorders caused by mental and psychological problems occur.

### **2.3 Aged infection**

There are many elderly patients in neurosurgery whose body function and immunity have gradually declined compared with other patients. They are less resistant to external infection factors and vulnerable to infection.

### **2.4 Long hospitalization infection**

It is widely known that hospitals are places for curing diseases, but also places with the highest survival rate of bacteria. The longer the hospitalization is, the longer patients expose to these pathogens, and the more vulnerable they are to infection. In addition, during the treatment of neurosurgery patients, surgery is common, in which process, there are many factors prolonging the hospitalization time of patients, resulting in high infection rate.

## **3. Prevention measures of nosocomial infection in neurosurgery**

### **3.1 Pay attention to environmental cleanliness**

Ward hygiene and cleanliness are very important for patients, especially critically ill patients in neurosurgery. The proliferation of pathogens will greatly impact the recovery and even health of patients. It is necessary to regularly carry out effective management and disinfection of wards and articles in them. Particularly, the surface of articles should be wiped and disinfected to minimize bacterial infection. Neurosurgery clinical medical staff should ventilate the ward twice a day for at least one hour, and disinfect the air once a day with ultraviolet rays.

### **3.2 Follow aseptic operation**

Because of the particularity of clinical treatment in neurosurgery, invasive operation methods are often used. Therefore, during the operation, it is necessary to improve the aseptic operation awareness of clinical

medical staff to ensure that the invasive operation during diagnosis, treatment and rescue can reach the standard of aseptic operation. They should also strictly follow the hygiene guidelines and use disposable medical supplies as required when contacting patients and performing invasive operations.

### **3.3 Standardize catheter care**

Neurosurgery clinical medical staff need to conduct a comprehensive evaluation of the catheter indwelling in patients every day. It must be pulled out in time when reaching the standard. For example, the tracheal intubation time cannot exceed two weeks. Once the standard of extubation is reached, the catheter should be removed as early as possible to reduce the probability of infection.

### **3.4 Reduce intracranial infection**

In neurosurgery, the number of craniotomy accounts for a high proportion, and the risk of infection after craniotomy is also high. Therefore, special attention should be paid to craniotomy when intervening the postoperative infection of neurosurgery. Because there are many irresistible factors such as age, emergency and complications in craniotomy, special attention should be paid to the improvement of patients' physique and exploration of effective measures to prevent infection. First of all, for craniotomy, clinical medical staff can reduce the risk of infection in patients during surgery through adopting antibacterial materials, aseptic invasive operations, and effectively and reasonably applying minimally invasive techniques, *etc.* Secondly, in the process of craniotomy, clinical medical staff need to completely remove intracranial foreign bodies and tightly stop bleeding to ensure effective protection of intracranial tissues and blood supply of patients. Finally, they need to strictly control the catheter indwelling for craniotomy and strictly follow the operating rules of aseptic technique when performing extubation operation, so as to reduce comprehensive infection.

### **3.5 Strictly select antibacterial drugs**

As Gram-negative bacilli and Gram-positive cocci are the main pathogens causing post-neurosurgery infection, it is necessary to select antibiotics that can pass through the blood-brain barrier and effectively remove

them for clinical treatment. For example, *vancomycin* can be selected to reduce the risk of infection during surgery, while the third generation *cephalosporin* can be selected to reduce the postoperative infection risk. It should be noted that clinical medical personnel need to select targeted antibiotics according to different infection sites. In addition, in the process of treatment, clinical medical staff also need to adjust the types and doses so as to improve the recovery efficiency of patients.

### 3.6 Control use of hormone

Glucocorticoid has been widely used in medical treatment because it can effectively improve the immune mechanism and physical condition of human body. In neurosurgery, it also plays an important role in clinical treatment such as cerebral fat embolism, hypertensive cerebral hemorrhage and intracranial infection. It should be noted that adverse reactions caused by glucocorticoids in clinical treatment depend to a large extent on the number of medication days. Therefore, the clinical medical staff should strictly control the use time. Studies have shown that it can effectively reduce the incidence of infection by gradually decreasing the dose after 3-5 days of its application.

## 4. Set up special prevention groups for nosocomial infection in neurosurgery

In hospitals, doctors examine, diagnose and treat patients, while nurses mainly provide effective care for patients. Their respective performance and cooperation with each other will improve patients' rehabilitation efficiency. However, there is possibility of neurosurgical infection no matter how close their cooperation is. Especially when the number of patients is large, the infection prevention for patients through communication between doctors and nurses is far from ideal in actual operation. Then, it is necessary for the hospital to set up a special prevention group for preventing nosocomial infection in neurosurgery patients based on the treatment and nursing. Only when all measures to prevent infection of patients are specially assigned and specified can the possible infection of neurosurgery patients be effectively prevented.

In the actual operation, the main responsibilities of

the special prevention group for nosocomial infection in neurosurgery are as follows.

### 4.1 Develop prevention management system

Effective work cannot be separated from strict work system. Only by incorporating all work processes, contents and responsibilities into the prevention and management system, can the management personnel better carry out effective management according to the system, thus improving the infection prevention efficiency of neurosurgery patients. The specific work system includes:

(1) Carry out disinfection in departments, wards and other areas, detect the quality and propose rectification measures proposed for unqualified disinfection work.

(2) Supervise disinfection before treatment and nursing, and aseptic operation during surgery, thus reducing the occurrence of intraoperative cross infection.

(3) Members in the infection prevention group need to organize medical staff to learn advanced infection prevention measures regularly on the premise of self-improvement. At the same time, they also need to analyze and summarize the incidence of nosocomial infection, and explore the prevention measures.

### 4.2 Prevent external infection

In hospitals, doctors and nurses are not the only ones who can contact patients. Therefore, members in the infection prevention group also need to find out all possible ways to cause infection in neurosurgery patients, educate health workers, cleaners and patients' families, and carry out strict monitoring and management in daily work to prevent the possibility of infection in patients other than treatment and nursing, so as to successfully reduce infection rate.

### 4.3 Timely respond to emergencies

Among the nosocomial infection, there will be infection outbreaks and mutual infection. No matter how low the probability of this unexpected situation is, the hospital needs to prepare for dealing with it. Therefore, the special prevention and management group must take active actions and report it immediately, and actively cooperate with the investigation work of the hospital infection department personnel to prevent further spread of infection.

## 5. Conclusion

On account of the characteristics of neurosurgery patients such as more critically ill patients, longer hospitalization time and more invasive operations, hospital personnel need to pay attention to disinfecting medical environment, standardizing aseptic operation, strengthening catheter care standards, reducing the risk of intracranial infection, strictly controlling the selection of antibiotics and the use time of glucocorticoid. Intervention to neurosurgery infection should be carried out from multiple perspectives including setting up special prevention group for nosocomial infection, so as to promote the rehabilitation of patients and improve the quality of medical care.

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