

# TREATMENT AND NURSING STRATEGY OF PREOPERATIVE PREDICTABILITY OF POSTOPERATIVE CEREBROSPINAL FLUID LEAKAGE OF IN ELDERLY PATIENTS WITH CERVICAL SPINAL CORD INJURY

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**Abstract:** **Objective:** To explore the treatment and nursing strategy of cerebrospinal fluid leakage in the elderly patients with cervical spinal cord injury after spinal dural incision decompression. **Methods:** a retrospective analysis of 34 elderly ( $\geq 60$  years old) patients with cervical spinal cord injury who received posterior cervical surgery in our department from September 2009 to September 2018. 16 patients in the experimental group received conventional posterior decompression and fixation and spinal dural incision decompression (preoperative prediction of postoperative Cerebrospinal fluid leakage); 18 patients in the control group received only posterior cervical decompression and fixation; the patients in both groups were given preoperative education, close observation after operation, timely adjustment of body position, timely medical care and communication between doctors and patients, wound cleaning, anti-infection and other nursing measures. Through observation and comparison, the patients in the two groups had cerebrospinal fluid leakage combined with infection, reoperation rate, wound healing time, postoperative hospital stay, etc. **Results:** among the patients in the test group, there was 1 case with CSF leakage and infection, which needed reoperation, and other patients' incision healed at the same time; in the control group, the incision healed at the same time, without infection and reoperation; compared with the two groups, the time of incision healing and postoperative hospitalization did not increase because of CSF leakage; **Conclusion:** Through proper treatment and nursing, there was no difference in preoperative predictability of postoperative cerebrospinal fluid leakage between the incision healing and the routine operation. The risk of postoperative infection, reoperation and postoperative hospital stay did not increase.

**Keyword:** the elderly, spinal cord injury, preoperative predictability, cerebrospinal fluid leakage

## 1. INTRODUCTION

Cervical spinal cord injury is a common disease in spinal surgery, which often leads to permanent limb motor sensory function and sphincter dysfunction, which brings heavy burden to society, family and patients [1]. With the development of aging population, spinal cord injury is

characterized by an increasing age of onset. The physical function and communication ability of the elderly are different from those of the young [3-4], which brings great challenges to the clinical treatment and nursing work. Cervical spinal cord injury often needs surgical decompression, but the effect is not good. In the clinical treatment of

spinal cord injury in our department, it was found that the incision and decompression of spinal duralr under the microscope can improve the circulation of cerebrospinal fluid, the blood supply of spinal cord and reduce the local inflammatory response caused by the injury, so as to bring better postoperative effect than the conventional operation [5-7]. But after the spinal dural incision, it will inevitably lead to the leakage of cerebrospinal fluid, which may lead to wound infection and even reoperation. Since 2009, we began to use the spinal duralr incision under the microscope to treat spinal cord diseases. Most of the patients have the wound dressing repeatedly seeped wet and drainage fluid increased significantly, but there are few complications such as incision infection and reoperation. Even for the elderly ( $\geq 60$  years old) patients with spinal cord injury who have multiple medical diseases, there are also few complications such as infection, delayed healing or nonunion of incision due to cerebrospinal fluid leakage. For the treatment of the predictable postoperative cerebrospinal fluid leakage caused by the incision of spinal dural, in addition to the timely and appropriate repair of spinal dural after the incision of spinal dural during the operation, the proper treatment and nursing after the operation are also very important [8]. In this paper, 34 elderly patients with spinal cord injury undergoing spinal dural incision decompression were observed and summarized, which is reported as follows:

## OBJECTS AND METHODS

Participants: from September 2009 to September 2018, 34 elderly patients ( $\geq 60$  years old) who underwent posterior cervical decompression due to spinal cord injury in our department were divided into experimental group and control group according to the operation mode, among them, the experimental group underwent posterior cervical decompression and fixation + spinal dural incision decompression (predictable postoperative cerebrospinal fluid leakage) and the control group conventional posterior cervical decompression and fixation. There were 16

cases in the experimental group, 11 males and 5 females, with an average age of 63.2 years, including 13 cases of falling injury and 3 cases of traffic accident injury. There were 18 cases in the control group, 14 males and 4 females, with an average age of 64.7 years, including 14 cases of falling injury and 4 cases of traffic accident injury. There was no difference in age, gender and preoperative injury grading between the two groups.

Inclusion criteria: (1) sensory disturbance of limbs or trunk caused by trauma; (2) imaging examination suggests cervical spinal cord injury; (3) age  $\geq 60$  years old;

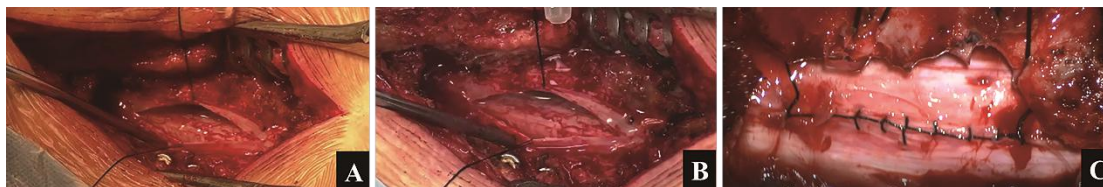
Exclusion criteria: (1) sensory impairment of limb or trunk activity before injury; (2) previous history of brain or spinal cord related diseases; (3) combined with other system injuries; (4) mental disorders or other reasons unable to cooperate with effective communication;

## METHODS

***Experimental group: integrated medical and nursing treatment mode, the whole treatment runs through the patient's admission to hospital and discharge.***

Preoperative: routine treatment and nursing. After the improvement of relevant examination and preoperative preparation, for the patients who decide to perform posterior cervical decompression and fixation + spinal dural incision and decompression, start to educate the patients and their families about the operation, especially the foreseen cerebrospinal fluid leakage, and explain in detail to the patients about the increase of induced flow, the need for high head and feet, the increase of dressing change and other matters until the patients fully understand;

Intraoperative: after the necessary decompression of bone structure is completed, the spinal dural is cut to subarachnoid cavity under the microscope and the adhesion is loosened, and the spinal dural is tightly sutured after a large amount of normal saline irrigation (as shown in Figure 1). After the drainage tube is retained, the incision is closed routinely.



**Figure 1:** A. spinal dural incision during operation; B. Incision of spinal dural to subarachnoid space and release adhesion, and irrigation with plenty of normal saline; C. spinal dural suture after spinal dural decompression during operation

Postoperative: after returning to the ward from the anesthesia recovery room, the patient began to place the head low and feet high, the drainage bag at a plane 10-20cm lower than the right atrium, observe the nature of the drainage fluid, record the amount of the drainage fluid, turn over the axis every 2 hours and observe the dressing of the surgical incision, timely inform the medical students to replace the dressing and pressure bandage after the dressing is wet, pull out the drainage tube and stop using antibiotics after the CSF leakage disappears; and When the operation is performed, psychological guidance should be given to calm the patient's anxiety, worry and other adverse emotions, and the patient should be repeatedly informed that the increase of postoperative drainage and the repeated infiltration of dressing are the predictable phenomena brought by the operation, which will not affect the clinical effect after proper treatment. At the same time, prevention of constipation, lower extremity deep vein thrombosis and other routine nursing should be provided. Other nutrition, acupuncture, analgesia and rehabilitation treatment should be decided by the team of competent doctors. All patients were observed to be discharged from the hospital after incision healing.

***Control group: Using the integrated medical and nursing treatment mode.***

Routine nursing care for spinal cord injury and posterior cervical operation before and after operation shall be provided by the doctor in charge according to the specific situation of the patient, and treatment schemes such as nutritional nerve, acupuncture, analgesia, rehabilitation and anti-infection shall be provided.

Criteria for disappearance of CSF leakage: the total amount of drainage fluid within 24 hours of incision is  $\leq 50$ ml, the patient has no

symptoms such as fever, dizziness and headache, and the incision has no signs of infection.

Incision healing standard: the patient did not complain of incision pain, primary grade a healing of the incision, there was no swelling, tenderness and fluctuation around the incision, and the patient had no systemic infection symptoms.

***Evaluating indicator***

To compare the difference of CSF leakage with infection, reoperation rate, incision healing time and postoperative hospital stay between the two groups.

***Statistical analysis***

SPSS 20.0 software was used for statistical analysis. The measurement data were expressed by means of mean  $\pm$  standard deviation, and the comparison between groups was tested by independent samples t. The difference was statistically significant when  $P < 0.05$ . The number and percentage of cases were used for counting data, and  $\chi^2$  test was used for comparison between groups. Inspection level  $\alpha = 0.05$ . TP

**RESULTS**

All patients were followed up until the incision healed and the suture was removed. One patient in the experimental group needed reoperation because of cerebrospinal fluid leakage and infection. The incision of other patients healed in one stage. Compared the reoperation of the two groups by  $X^2$  test,  $P = 0.469$ , according to the level of  $\alpha = 0.05$ , the difference was not statistically significant, as shown in Table 1. Independent sample t test was used to compare: the drainage tube removal time of the test group and the control group was  $3.43 \pm 0.22$ ,  $1.78 \pm 0.22$  days,  $P = 0.000$ , the difference was statistically significant; the incision healing time of the test group and the control group

was  $9.88 \pm 0.46$ ,  $9.44 \pm 0.47$  days,  $P= 0.351$ , the difference was not statistically significant; the postoperative hospitalization time of the test group and the control group were  $9.62 \pm$

$0.31$ ,  $9.50 \pm 0.31$  days,  $P= 0.692$ , respectively. The difference was not statistically significant, as shown in Table 2.

**Table 1** reoperation of cerebrospinal fluid leakage infection in two groups

group	Number of one-stage healing cases	Number of reoperation cases	Total	Reoperation rate (%)
Test group	15	1	16	6.25
control group	18	0	18	0
Total	33	1	34	2.94

**Table 2** Comparison of postoperative healing between the two groups

	The time of drawing drainage tube(days)	Wound healing time (days)	Postoperative hospital stay (days)
Test group	$3.43 + 0.22$	$9.88 + 0.46$	$9.62 + 0.31$
control group	$1.78 + 0.22$	$9.44 + 0.47$	$9.50 + 0.31$
<i>P</i> value	0.000	0.351	0.691

## DISCUSSION

Cerebrospinal fluid leakage (CSF) is an uncommon but tricky complication of spinal surgery. After sustained CSF leakage, the risk of surgical site infection and wound delayed healing increases greatly, and even some patients need secondary surgery [9-11]. Cerebrospinal fluid leakage combined with infection is bound to further affect spinal cord function, increase patients' pain, length of stay and cost of hospitalization. The prevention of CSF leakage is the most important. From the medical point of view, careful operation during the operation to avoid injury by mistake is the most effective way to prevent CSF leakage [12-14]. Our department carried out the routine spinal canal decompression + spinal dural incision decompression earlier in China to treat spinal cord injury, and repaired the spinal dural during the operation, using the continuous lockstitch recommended by Eismont et al. [12]. For patients with severe spinal dural calcification and too much tension in dura sac, we will choose the methods of fascia and muscle transplantation [14-16]. Cerebrospinal fluid leakage may lead to the re compression of spinal cord, the accumulation of cerebrospinal fluid in local areas may increase the probability of infection, even the formation of cystic cavity or sinus. Therefore, effective fascial drainage must be retained, and strictly lie in bed after

operation until the cerebrospinal fluid leakage disappears, and the drainage tube should be pulled out

Incision of spinal dural during operation will inevitably lead to cerebrospinal fluid leakage. For this predictable CSF leakage, it is also not uncommon in spinal cord tumors and other operations that must invade the spinal dural [18-19]. From the point of view of nursing, it is our goal to give proper nursing, reduce the surgical site infection caused by cerebrospinal fluid leakage, promote the physical and mental recovery of patients, and discharge early [20-21]. In this paper, we select the elderly patients as the observation object, because the number of elderly patients with spinal cord injury is increasing year by year, the elderly are more complicated with hypertension, diabetes and other basic diseases, and the ability of healing and communication is lower than that of young people [3-4]. It can give us a lot of inspiration and help us to treat and nurse other unforeseen iatrogenic cerebrospinal fluid leakage patients.

In our trial group, because of the need to cut the spinal dural of the injured area, postoperative cerebrospinal fluid leakage will still occur after precise repair. Although we will inform patients of this predictable CSF leakage before surgery, a considerable number of patients will have anxiety or depression due to the excessive drainage

after surgery. Even if the patients were told repeatedly that cerebrospinal fluid leakage was predicted in the medical treatment, it could not completely alleviate the patients' concerns. Therefore, the nurses should preset psychological stem in a very important position and throughout the treatment. For the elderly patients in this article, this is particularly important. The elderly's ability of understanding and communication has declined, and their psychological changes have become very obvious after spinal cord injury [22-24]. They often worry about paralysis after surgery and have a negative desire for treatment, or even give up treatment or even commit suicide [25-26]. After the surgery, the patients with this kind of foreseen cerebrospinal fluid leakage showed more obvious anxiety and even despair, worrying about whether the operation failed or not. For such special patients, we should know the family background and education level of the patients in detail, cooperate with doctors and patients' families to provide psychological guidance to the patients in "Trinity", so that the patients can receive "predictive cerebrospinal fluid leakage" without affecting the operation effect.

In addition to psychological treatment, professional medical management and nursing management are still the key to the treatment of foreseen cerebrospinal fluid leakage. As for the treatment of conventional cervical iatrogenic cerebrospinal fluid leakage, we will reduce the cerebrospinal fluid leakage by reducing the pressure in the dura and increasing the pressure outside the dura [27], that is to say, the routine use of "head low foot high position" [28] and surgical incision pressure binding (the binding pressure is controlled at about 2kg) [29]. In addition, we still need to closely observe the exudation of the surgical dressing in order to change the dressing in time to reduce the risk of infection. Record the nature and quantity of cerebrospinal fluid leakage, and properly control the speed of cerebrospinal fluid leakage, so as to avoid the symptoms of low intracranial pressure caused by too fast loss of cerebrospinal fluid []; at the same time, the nursing staff should strengthen the inspection of patients, pay attention to whether the drainage tube is unobstructed in daily care, and avoid

excessive pulling of the drainage tube, so as to prevent the risk of poor wound drainage or accidental pulling out of the drainage tube. At the same time, we should do a good job in cleaning the ward, guide the patients to eat reasonably, do a good job in routine nursing such as turning over and clapping the back, so as to reduce the infection after cerebrospinal fluid leakage operation and promote the patients to recover as soon as possible. On the other hand, doctors should strengthen the use of anti-infective drugs, timely change wound dressing, timely guide patients to carry out appropriate functional exercise, so as to promote the early recovery of patients.

It is a special case of iatrogenic cerebrospinal fluid leakage to foresee postoperative cerebrospinal fluid leakage before operation. As for the treatment of complications of cervical spine surgery, the early rehabilitation of patients can be promoted by the integration of medical care and the "trinity" mode, timely communication and appropriate medical, nursing and psychological management.

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