



# Evaluation of the Effectiveness of Extracorporeal Drainage Systems in Patients with Postoperative Intracranial Infections

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**Abstract:** Objective: To compare the clinical effectiveness and safety of extracorporeal drainage system and lumbar puncture therapy in the treatment of patients with intracranial infection after intracranial aneurysm clamping. Methods: Patients with postoperative intracranial infections were randomly divided into a test group and a control group. Patients in the test group were treated with anti-adhesion lubrication extracorporeal drainage system, and patients in the control group were treated with lumbar puncture. Compare the time of improvement of conscious state, the time of improvement of cerebrospinal fluid indexes, and the difference in the incidence of hydrocephalus and morbidity and mortality rates between the two groups of patients. Results: The extracorporeal drainage system can continuously drain the cerebrospinal fluid, effectively reduce the intracranial pressure, and also can avoid the pain caused by repeated lumbar puncture to the patients, dynamically observe the cerebrospinal fluid properties, monitor the intracranial pressure, and reduce the workload of clinicians. Conclusion: The extracorporeal drainage system has good effectiveness and safety in the treatment of patients with intracranial infection after intracranial aneurysm clipping.

**Keywords:** intracranial aneurysm; intracranial infection; cerebrospinal fluid drainage

## 1. Introduction

Intracranial infection is one of the most common postoperative complications in neurosurgery, and if not properly controlled, it often brings serious consequences and profoundly affects the prognosis and regression of patients. Patients with intracranial aneurysm often have different degrees of preoperative consciousness disorder, and subarachnoid hemorrhage can lead to a series of serious intracranial and extracranial pathophysiological changes, and if combined with intracranial infection in the postoperative period often bring more serious consequences, not only increase the physical and mental pain and economic burden of the patients, but also seriously affect the prognosis of the patients[1-2]. From June 2024 to November 2024, 180 patients with intracranial infections after intracranial aneurysm clamping were randomized, and the test group (90 patients) was treated with the anti-adhesion lubrication extracorporeal drainage system produced by Tianjin Plastics Research Institute Co. The patients in the control group (90 cases) were treated with lumbar puncture. anti-inflammatory treatment was carried out simultaneously in both groups. The patients in the two groups were compared in terms of the time of improvement of conscious state, the time of improvement of cerebrospinal fluid indexes, and the differences in the incidence of hydrocephalus and the morbidity and mortality rates.

## 2. General information

One hundred and eighty patients who developed intracranial infections after intracranial aneurysm clamping in our hospital from June 2024 to November 2024 were randomized into groups, including 91 males and 89 females; age 33-68 years old, mean age 56 years old.

Diagnostic criteria for intracranial infection: (1) positive signs of meningeal irritation, combined with clinical manifestations such as fever, headache, vomiting, and poor mental performance; (2) routine biochemical examination of cerebrospinal fluid: turbid appearance, low sugar, low chloride, elevated WBC, and high protein content; (3) positive results of bacterial culture of cerebrospinal fluid, which is the gold standard for diagnosis.

## 3. Methodology

### 3.1 Treatment method

In the experimental group, the doctor in charge of the test group immediately used the anti-adhesion lubrication extracorporeal drainage system (Tianjin Plastics Research Institute Co., Ltd., Tianjin Equipment Registration 20242140139) for drainage after the diagnosis was clarified, and cerebrospinal fluid was drained 250-300 mL per day, and the tube was

removed after the temperature was normalized for 6 d, and the cerebrospinal fluid leukocytes were reduced to normal or mononuclear cells, and the cerebrospinal fluid sugar content was normalized. In the control group, after clear diagnosis, the treating doctor performed lumbar puncture to release inflammatory cerebrospinal fluid every day, and the cerebrospinal fluid replaced was about 40-60 mL each time, and we observed the time of improvement of the state of consciousness, the time of significant improvement of cerebrospinal fluid indexes, and the incidence of hydrocephalus in the two groups.

### 3.2 Data collection and analysis methods

Statistical methods include t-test for comparison of measurement data and chi-square test for count data, with  $P < 0.05$  as statistically significant difference.

## 4. Results

### 4.1 Comparison of general information

There was no significant difference in the comparison of the basic characteristics of age and gender between the test group and the control group ( $P > 0.05$ ).

**Table 1. Gender distribution of subjects in the two groups**

Groups	N	Male (%)	Female (%)	$X^2$	p-value
Test group	90	46 (51.11)	44 (48.89)	0.820	0.365
Control group	90	45 (50.00)	45 (50.00)		

Note: N represents the number of sample cases

**Table 2. Comparison of age between the two groups**

	Control group (n=90)	Test group (n=90)	t	p
Age	51.70±13.94	56.52±12.71	1.942	0.055

Note: \*  $p < 0.05$ ; \*\*  $p < 0.01$

### 4.2 Comparison of improvement of conscious state

The number of cases in which conscious state changed from hazy to awake or from coma to hazy after 1 week of treatment was 72 cases in the treatment group, accounting for 80%, and 36 cases in the control group, accounting for 40%. The improvement of the state of consciousness in the treatment group was significantly better than that in the control group ( $P < 0.05$ ).

### 4.3 Cerebrospinal fluid indexes significantly improved time situation

Cerebrospinal fluid inflammatory indexes improved in both groups after treatment, the time needed for leukocytes to decrease to 0-5/high magnification field of view was 8d in the treatment group on average, and 14d in the control group on average. the control group had a significant advantage in the time of improvement of cerebrospinal fluid indexes ( $P < 0.05$ ).

### 4.4 Incidence of hydrocephalus

At 6 months of postoperative follow-up, there were 5 cases of hydrocephalus in the treatment group, accounting for 5.6%, and 8 cases of hydrocephalus in the control group, accounting for 8.9%. The difference between the incidence of hydrocephalus in the control group and the treatment group was not statistically significant ( $P > 0.05$ ).

### 4.5 Comparison of clinical prognosis between the two groups

3 patients in the treatment group died of neurological center failure, with a morbidity and mortality rate of 3.3%. In the control group, 5 cases died due to aggravation of cerebral edema and cerebral herniation, with a case fatality rate of 5.6%. There was no statistically significant difference in clinical prognosis between the 2 groups ( $P > 0.05$ ).

## 5. Discussion and conclusions

Intracranial infection is a common and serious complication after craniotomy and is an important factor leading to postoperative readmission of neurosurgical patients. It has been reported in the literature that the overall incidence of intracranial infection after craniotomy in China is 2.6% to 5.43%[3-4]. Intracranial infections, if not handled timely and appropriately, can have a serious impact on the patient's life safety and prognosis, which not only increases the economic burden of the patient, but also increases the death and disability rate[5-6]. Cerebrospinal fluid drainage can effectively remove

pathogenic bacteria from the subarachnoid space and cerebral ventricles at an early stage and reduce local inflammatory reaction, thus shortening the infection control time and improving the infection control effect. Cerebrospinal fluid drainage includes extraventricular drainage, lumbar puncture, lumbar pool drainage, and in some cases, local intrathecal drug administration can be used to increase the concentration of drugs in the cerebrospinal fluid, thus improving the effect of anti-infective treatment[7-8].

The results of this study show that compared with lumbar puncture, the extracorporeal drainage system has obvious advantages, with a strong role in draining inflammatory substances, and at the same time, it can continuously drain cerebrospinal fluid, control the speed of drainage, and effectively reduce the intracranial pressure, and it can also avoid the pain caused by repeated lumbar puncture to the patient, and it can dynamically observe the cerebrospinal fluid properties, monitor the intracranial pressure, and reduce the clinician's workload, and its effectiveness and safety of its clinical application have been confirmed. The effectiveness and safety of its clinical application have been confirmed. Cerebrospinal fluid examination should be performed as early as possible to exclude intracranial infection when repeated fever is encountered after neurosurgery, and once the diagnosis is confirmed, timely, standardized and effective antibiotic treatment together with cerebrospinal fluid drainage is the key to the treatment of intracranial infection.

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