

## Clinical features and prevention of acute encephalocele in severe craniocerebral injury surgery

Yang Sun

Department of Neurosurgery, Jilin University No1 hospital Branch 2

sunyang130031@126.com

**Keywords:** Severe craniocerebral injury; Acute encephalocele; Clinical features

**Abstract:** To investigate the clinical features and prevention of acute encephalocele in patients with severe craniocerebral injury. The clinical features, treatment and prognosis of acute encephalocele in severe craniocerebral injury in recent years were analyzed retrospectively, and the prevention and treatment methods of acute encephalocele were discussed. Among the patients with intraoperative encephalocele, 24 cases (55.8%) had delayed intracranial hematoma, including 12 cases of ipsilateral intracranial hematoma, 6 cases of epidural hematoma, 4 cases of contralateral epidural hematoma, and 2 cases of subdural hematoma. And there were 11 cases (25.6%) of acute diffuse brain swelling, also 5 cases (11.6%) of traumatic large area cerebral infarction, as well as 3 cases (6.98%) of intraoperative hypotension or hypoxemia. Patients with acute encephalocele during severe craniocerebral injury surgery are mostly caused by delayed/diffuse intracranial hematoma or large area cerebral infarction, and intraoperative hypoxemia. Therefore, it is necessary to effectively determine the risk of intraoperative encephalocele, actively deal with it, reduce the incidence of acute encephalocele, and improve the prognosis of patients.

The prevention of Craniocerebral injury is caused by the direct or indirect effects of violence on the head. Craniocerebral injury is manifested as disturbance of consciousness, headache, nausea, vomiting, epileptic seizure, paralysis of limbs, sensory disturbance, aphasia and partial blindness. Skull base fracture can appear cerebrospinal fluid ear leakage, nasal leakage. Brain stem injury occurs consciousness disorder, respiratory circulation disorder, to the brain tetanus, serious brain hernia life-threatening. As a common clinical critical and severe disease, severe craniocerebral injury is characterized by rapid onset and rapid change, and complicated condition, which may lead to acute brain injury due to the combined action of multiple factors in the process of surgical treatment. This paper discusses the clinical features and prevention of acute encephalocele in patients with severe craniocerebral injury. The specific report is as follows.

### 1. Materials and methods

#### 1.1 General information

43 patients with severe craniocerebral injury in our hospital who underwent surgery for acute encephalocele were selected as the research objects. All patients had a clear history of head trauma upon admission. The causes of injury included traffic accident, high fall, fall injury, combat injury, and so on, with 24 cases, 9 cases, 7 cases and 3 cases respectively. Among the patients, 27 males and 16 females were aged 28 to 73 years, with an average age of  $48.6 \pm 3.5$  years. All the patients had serious consciousness disturbance before operation, including 12 patients with GCS score of 3-4, 24 patients with GCS score of 5-6, and 7 patients with GCS score of 7-8. Unilateral pupil dilation was observed in 28 cases and bilateral pupil dilation in 15 cases. There were 14 cases with fracture of limbs and other parts, 9 cases with disturbance of respiratory rhythm, and 7 cases with hemorrhagic shock. Thirty-two patients showed positive unilateral pathological signs and 11 patients showed positive bilateral pathological signs.

## 1.2 Imaging data

Preoperative head CT showed that all the 43 patients had intracranial hemorrhage and midline displacement of varying degrees, including 9 cases of hematoma in the affected area, 28 cases of hematoma at the hedging site, 6 cases of hematoma on both sides, 38 cases of midline displacement of >1cm, and 5 cases of <1 cm. According to the location of hematoma, there were 30 cases of subdural hematoma with brain contusion, 8 cases of epidural hematoma and 8 cases of intracerebral hematoma, and 5 cases of mixed hematoma.

## 1.3 Methods

34 of the 43 patients were treated with standard large traumatic bone flap craniotomy and decompression. During the operation, the patient was placed in the supine position, and the shoulders were raised to the top of the head and lowered to the healthy side by 45°. The surgical incision was made with the upper edge of the zygomatic arch as the starting point, through the anterior tragus (1 cm), the top nodule, the midpoint of the sagittal line, and the scalp of the forehead hairline. The patient's subperiosteal cutaneous muscle flap was treated with routine dissection and turnover before fixation. During the operation, the average size of the bone window should be about 12cm x 15cm, and the dura mater (the size range is basically the same as the bone window) should be cut open to radiate. After the hematoma is completely removed, the necrotic brain tissue should be cleaned and hemostasis should be done. The anterior/middle cranial fossa and superior sagittal sinus bridge vein of the patient were routinely explored during the operation, and after the complete hemostasis was confirmed, the superficial temporal fascia and dura were sutured successively to remove the bone flap, and the drainage tube was retained under the dura and skin flap. The remaining 13 patients were treated with bone flap craniotomy and decompression, and the operating procedures were basically the same as above. However, in the choice of surgical incision, the hematoma site of the patient should be taken as the basis for judgment, and the average size of the operative bone flap was 8cm x 12cm. Severe craniocerebral injury patients during the operation of acute encephalocele can be through degree ventilation, dehydrating agent, hormone application, reduce or eliminate encephalocele as far as possible.

## 1.4 Observation indicators

Retrospective statistics were conducted on the death of patients after treatment, and the survival of patients was followed up, and the prognostic effects of patients under different treatment methods were recorded (GOS 1 was classified as death, GOS 1 was classified as poor prognosis, GOS 2 ~ 3 was classified as poor prognosis, and GOS 4 ~ 5 was classified as good prognosis).

### 1.5 Statistical methods

SPSS12.0 software was used for statistical analysis of the experimental data. T-test was used for comparison of measurement data, and chi-square test was used for comparison of counting data.  $P < 0.05$  was considered statistically significant.

## 2. Results

CT diagnosis of patients with severe craniocerebral injury during operation showed diffuse brain swelling, delayed intracranial hematoma, large area cerebral infarction and intraoperative hypoxemia in 22 cases, 13 cases, 5 cases and 3 cases, respectively, accounting for 51.2%, 30.2%, 11.6% and 7.0%, as shown in table 1. The prognosis rate of patients treated with standard large trauma craniotomy and decompression craniotomy and those treated with standard large trauma craniotomy and decompression craniotomy was as follows, and the difference was statistically significant ( $P < 0.05$ ).

Table 1 Comparison of prognostic effect between the two groups (n)

Items	n	Good	No good	Dead
Diffuse cerebral swelling	30	16	7	7
Delayed traumatic intracranial hematoma	18	10	5	3
Massive cerebral infarction	7	3	3	1
Hypoxemia during operation	5	3	1	1

### 3. Discussion

Encephalocele in severe craniocerebral injury is one of the most common acute and severe cases in neurosurgery. Once it happens, it would progress rapidly, which is likely to cause incarceration of the extruded brain tissue, resulting in insufficient blood supply to the local brain tissue, aggravating the symptoms of hypoxia and edema, thus further aggravating the encephalocele and forming a malignant chain reaction. Therefore, in severe craniocerebral injury surgery, the correct preoperative judgment of the potential risk factors for encephalocele, and appropriate and effective treatment, are the key to the treatment.

In the process of surgical treatment for patients with severe craniocerebral injury, the pressure outside the cerebral blood vessels may disappear while the hematoma is cleared, which may cause acute dilation of cerebral blood vessels and blood flow/blood in the brain of the patients. In this paper, we observed the rapid increase of patients' volume and CT signs of acute brain tissue swelling. We found that delayed/diffuse intracranial hematoma, encephaloma or massive cerebral infarction and intraoperative hypoxemia were the main inducing factors, especially the occurrence of delayed intracranial hematoma and encephaloma. Considering the frequent occurrence of fracture in the skull of the affected part of the patient, which leads to dural artery rupture and hemorrhage, intracranial small vessel injury and hemorrhage, but in the case of intracranial hematoma, brain edema and other causes of intracranial hypertension, blood vessel hemorrhage has not yet formed or only a small amount of hemorrhage. Once removing bone flaps to remove hematoma during operation, the pressure of cranial hypertension will be relieved, which will lead to the rapid increase of the amount of bleeding of injured epidural arteries and intracranial small vessels, and the drastic change of intracranial small vessels pressure will lead to bleeding.

In view of the severity of craniocoele during severe craniocerebral surgery, it is important to predict the occurrence of craniocerebral encephalocele accurately and timely before surgery. If the head CT examination of the patients before operation found that: (1) The median displacement of brain tissue exceeded 10 mm; (2) Serious contusion and laceration occurred, and intracerebral hematoma had been formed; (3) The contralateral skull fracture occurred, the range exceeded 30 mm, and the fracture area intersected with the dural artery; (4) There was contralateral subdural or epidural hematoma; (5) There was obvious median line. Displacement, but no obvious intracerebral hematoma or contusion and laceration were found. (6) The potential and risk of intraoperative encephalocele should be fully considered when the basal cistern, cistern, third ventricle and lateral ventricle were compressed or disappeared. Active and effective management is critical when intraoperative encephalocele occurs. Firstly, all kinds of extracranial factors should be excluded immediately, and then the pupil of the patient should be observed immediately. If the pupil of the opposite side is dilated, the delayed hematoma of the opposite side should be considered, and the suspicious site of the hematoma can be explored immediately. If the hematoma is found, hematoma clearance or bone flap removal should be performed according to the specific situation. In case of ipsilateral pupil dilation, the secondary hematoma of ipsilateral brain tissue and epidural may be fully examined. Intraoperative b-ultrasonography is feasible to detect hematoma in distant and deep parts. If no obvious hematoma is found in the above exploration, dehydration, diuresis and other

treatments can be given due to the swelling of brain tissue itself, and the blood pressure can be reduced appropriately when conditions permit. For patients with negative intraoperative exploration results and decompression surgery, postoperative CT examination should be conducted in time to find the missing hematoma.

The effect of standard large traumatic craniotomy and conventional craniotomy in the treatment of severe brain injury patients with acute swelling was also compared. It was found that the mortality rate and prognosis of patients with standard large traumatic craniotomy and decompression were lower and better, which were related to the large bone window, high clearance rate of intracerebral hematoma and necrotic tissue. It was also important for patients with acute encephalocele to choose appropriate treatment methods to improve the prognosis of patients.

## References

- [1] Fu X H. Cause analysis and treatment of acute encephalocele during severe craniocerebral injury surgery [J]. Journal of stereotactic and functional neurosurgery, 2013,26 (6) : 356-357. (in Chinese)
- [2] Yan Xigang, Xu Jianlin. Surgical treatment analysis of acute encephalocele during severe craniocerebral offset injury [J]. Medical information, 2011,14 (1) : 25-26.
- [3] Shao H, Zhong X J, et al. Surgical management of acute encephalocele during severe craniocerebral injury [J]. Journal of clinical neurosurgery, 2014,11 (5) : 370-372. (in Chinese)
- [4] CHITTIBOINA P, CUELLAR-SAENZ H, NOTARIANNI C, et al. Head and spinal cord injury: diagnosis and management[J]. Neurol Clin, 2012, 30(1): 241-276.
- [5] CHEN B, BIAN XX, WANG YQ, et al. Reason and countermeasure analysis of acute intraoperative encephalocele by brain injury[J]. Journal of Clinical and Experimental Medicine, 2008, 7(2): 144-145.
- [6] QIAN W, LIU XS, WANG SC, et al. Bedside drilling hematoma drainage in the treatment of severe traumatic brain injury patients [J]. Chinese Journal of Clinical Department of Neurosurgery, 2008, 13(7): 447.