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Case Report

A Case Report of Progressive Language Disorder Caused by Complex Isolated Fourth Ventricle

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Abstract...

Isolated fourth ventricle is rare in clinical practice, mostly acquired. Acquired isolated fourth ventricle mostly occurs secondary to ventriculo-peritoneal shunt, ventriculitis, intraventricular hemorrhage, traumatic brain injury and so on. A case of the isolated fourth ventricle with cerebellar contusion and iaceration is reported. The fourth ventricle-abdominal shunt was performed by neuronavigation and the patient recovered well after the operation.

Keywords: Trapped fourth ventricle; Ventriculo-peritoneal shunt; Neuronavigation.

Introduction

The isolated fourth ventricle is also called hydrocephalus of the fourth ventricle, and the median foramen and lateral foramen of the fourth ventricle are atresias. The aqueduct is also closed, resulting in isolated enlargement of the fourth ventricle, the third ventricle and the subarachnoid space. A few are congenital, most are acquired. The acquired isolated fourth ventricle is mostly secondary to lateral ventriculoperitoneal shunt, ventriculitis, ventricular hemorrhage, brain trauma and so on. Its clinical manifestations are as follows: Ataxia, neurological impairment, visual impairment, somnolence and intracranial hypertension caused by a cerebellar tonsillar hernia, headache, vomiting and other discomfort, rarely complicated with disturbance of consciousness caused by brain edema around the fourth ventricle [3]. The treatment of isolated fourth ventricle includes: fourth ventriculoperitoneal shunts [4], microgeneration of the outlet of the fourth ventricle [5,6], cerebral aqueductoplasty [7], endoscope-assisted mesencephalic aqueductoplasty + stent implantation [8], endoscope-assisted transfrontal and midbrain aqueduct shunting to the fourth ventricle [9] and so on. This paper introduces a case of cerebellar contusion and laceration complicated with isolated fourth ventricle treated in the Department of Neurosurgery of Shenzhen Hospital of Southern Medical University in September 2020. The patient with severe craniocerebral injury underwent fourth ventricle-

left jugular vein shunt 3 years after the operation, but the symptoms did not improve obviously, and the disturbance of speech and motor coordination worsened 17 years after the operation. After evaluation, the posterior fossa shunt was performed again,and the speech function and motor coordination function of the patients were significantly improved after the operation.

Case summary

The patient, a 38-year-old male, was admitted to hospital on September 10, 2020 because of "17 years after severe craniocerebral injury and progressive aggravation of speech and motor coordination disorder for 2 years". The patient suffered from severe craniocerebral injury caused by a car accident in July 2003. Cranial CT examination revealed hemorrhage in the fourth ventricle and subdural hematoma in the left posterior fossa (Figure 1A). Craniotomy was performed to remove hematoma and posterior fossa bone flap decompression, and recovered after operation. In March 2004, lateral ventriculoperitoneal shunt was performed because of hydrocephalus, and the patient recovered gradually. CT examination showed that the isolated fourth ventricle (Figure 1C-E) was performed, and the fourth ventricle-left jugular vein shunt was performed.

There was no significant improvement in postoperative language and motor coordination. The disorder of speech and motor coordination worsened progressively from May 2018 to July 2020, and the patient suffered another trauma in July 2020. Cranial CT examination showed that the left frontotemporal parietal subdural hematoma was removed by craniotomy under emergency general anesthesia. After the operation, the patient was conscious, but his speech was ambiguous, the function of limb coordination was impaired, and the patient could stand unsteadily with help. Physical examination: scar healing after median operation of head, chest, abdomen and neck, GCS E4V4M6, partial cooperation of physical examination, ambiguous speech, dull expression, equal circle of bilateral pupils, 3.0mm in diameter, sensitive to direct and indirect light reflex, shallower left nasolabial sulcus, and tongue extension to the right. Grade V of muscle strength of both upper limbs, IV grade of muscle strength of both lower limbs, high muscle tension, different degrees of abnormal contracture of metacarpophalangeal joint and metacarpophalangeal joint of extremities, existence of physiological reflex, positive bilateral Pap sign. Bilateral finger nose test and calcaneus tibia test (+). After admission, lumbar puncture was performed to measure the pressure as 50mm-H2O, and the flow rate was slow. Imaging examination was performed to consider the progressive enlargement of the fourth ventricle from 2003 to 2010. Diagnosis: After of isolated fourth ventricular shunt; After lateral ventriculoperitoneal shunt; after severe craniocerebral injury. Therefore, surgical treatment of the fourth ventriculoperitoneal shunt was performed.

Preoperative discussion

The clinical manifestations of isolated fourth ventricle are complex and diverse, such as headache, vomiting, cranial nerve defect, ataxia, coma and cerebellar tonsillar hernia. In this case, in addition to ataxia, there is a slow and indifferent speech speed, which is considered to be related to high intracranial pressure and brainstem compression, but the patient also has cerebellar contusion, so it is difficult to make differential diagnosis. The intracranial pressure measured by lumbar puncture before operation was 50mm H2O, which was considered to be related to the fact that the outlet of the fourth ventricle was not unobstructed and the true intracranial pressure could not be measured. After discussion, surgical treatment should be arranged as soon as possible, and the fourth ventriculoperitoneal shunt should be combined with neuronavigation system.

Surgical treatment

The patient underwent fourth ventriculoperitoneal shunt on October 14, 2020. Operation method: After successful general anesthesia, the patient took the prone position, fixed the head with three nails, and used neuronavigation to plan the operation path before operation (Figure 2A-B). The original length of occipital 5cm vertical incision and 4 cm vertical incision behind left ear were selected. Routine disinfectant drape, first cut the occipital scalp and subcutaneous tissue according to the pre-marked line, separate the muscle, see the original posterior cranial fossa shunt tube, so it is difficult to remove, then retain the ventricular end of the original shunt tube, electric burn and cross cut the dura, puncture the fourth ventricle with a guide core at the end of the shunt tube according to navigation guidance, enter the needle about 4 cm, remove the puncture guide core, see the rapid outflow of cerebrospinal fluid, clamp the blood vessels and fix the shunt tube. Gelatin sponge seals the puncture port (Figure 2C). Then cut the scalp and subcutaneous tissue behind the left ear according to the pre-line. The subcutaneous tunnel needle led the ventricular end of the shunt tube to the incision behind the left ear and ligated the tip. The subcutaneous and scalp tissues of the occipital were sutured layer by layer, the incision behind the left ear was sutured with 4 stitches, and the wound was bandaged with aseptic dressing. Then take the supine position, raise the left shoulder, tilt the head to the right, and fix the head. The transverse incision of subumbilical 3 cm arc-shaped xiphoid process was selected. The length of subxiphoid process was about 1 cm. Routinely disinfect towels, first remove the suture of the left ear and then the incision under the xiphoid process, the tunnel needle leads the abdominal part of the shunt tube from the left ear back to the subxiphoid process incision, the shunt tube at the end of the ventricle takes the appropriate length, the shunt valve is respectively connected to the ventricular end and the abdominal end of the shunt tube and fixed, buried in the incision behind the left ear, the incision behind the left ear is sutured layer by layer, and the wound dressing is bandaged. The subumbilical incision was cut layer by layer, and the abdominal end of the shunt tube was led from the subxiphoid incision to the abdominal cavity, and was placed in the right lower abdomen together with the original ventriculoperitoneal shunt tube, and the abdominal muscle, subcutaneous tissue and skin were sutured layer by layer. The wound was bandaged with aseptic dressing to end the operation.

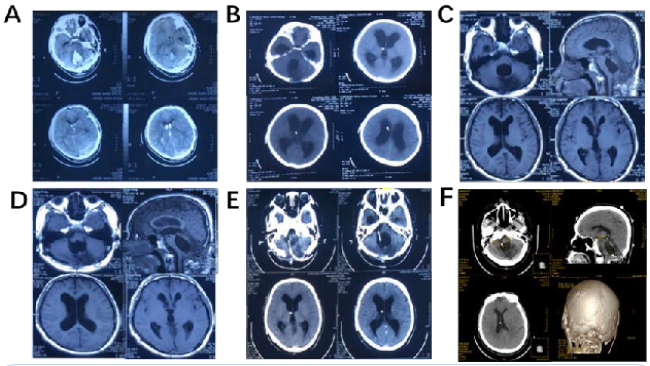

Figure 1: On the day of the car accident injury in July 2003, the CT film showed that the cerebellar vermis hemorrhage broke into the fourth ventricle, the left posterior fossa subdural hematoma, the third ventricle, the fourth ventricle hemorrhage.
(1B): In December 2003, CT films after right lateral ventriculoperitoneal shunt: Bilateral ventricles, third ventricle and fourth ventricle were all dilated.
(1C): MRI film after right ventriculoperitoneal shunt in November 2005: Bilateral ventricles and the third ventricle were smaller than before, the fourth ventricle was still dilated, and the size of the fourth ventricle was 3cm* 2cm.
(1D): February 2006 MRI showed that the bilateral ventricles and the third ventricle were the same as the anterior, the fourth ventricle was dilated, and the size of the fourth ventricle was 3. 5 cm*3 cm.
(1E): The CT film after the fourth ventricular shunt in March 2006 showed that the bilateral ventricles and the third ventricle were the same as before, the fourth ventricle was dilated, and the size of the fourth ventricle was 3. 5cm* 3 cm, which had no significant change compared with that before operation.
(1F): CT scan of the head on October 10, 2020 shows that the fourth ventricle is still dilated and the fourth ventricle is the size of 4. 5 *3. 5cm. The left posterior fossa shunt and the right ventricular shunt can be seen clearly.

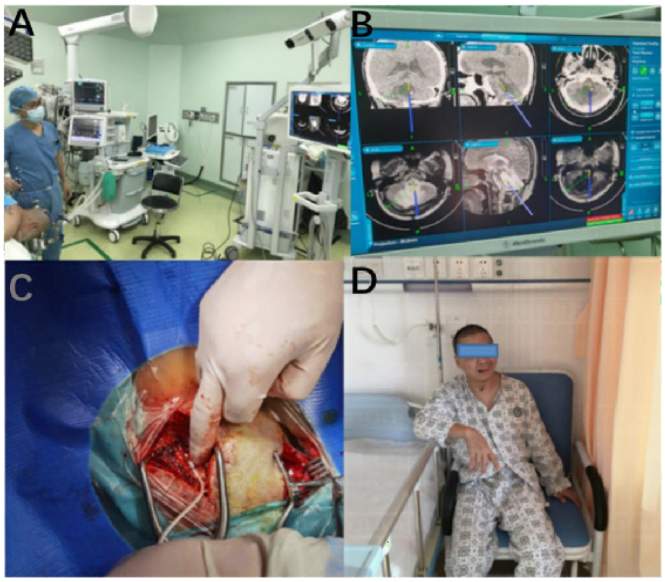

Figure 2 (A,B): Intraoperative navigation
(2C): During the operation, the posterior median incision was performed, and the ventricular end of the shunt tube was fixed to the epidural.
(2D): Postoperative recovery of patients

Postoperative recovery

After operation, the speech and motor coordination of the patients were significantly improved. On October 15, 2020, the head CT showed that the bilateral ventricles and the third ventricle were smaller than before, the expansion of the fourth ventricle decreased, and the size of the fourth ventricle 4.4 x 3.1 cm (Figure 2D, 3).

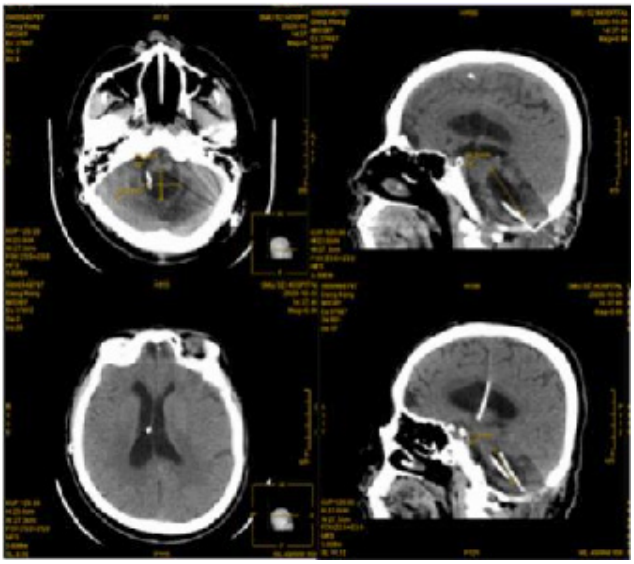

Figure 3: On October 15, 2020, the CT film showed that the bilateral ventricle and the third ventricle were smaller than before, the dilation of the fourth ventricle was smaller than before, and the size of the fourth ventricle was 4. 4 x 3.1 cm. The picture shows two drainage tubes in the fourth ventricle.

Discussion

This case has a history of 17 years, experienced two severe craniocerebral injuries, complicated with cerebellar contusion, the symptoms were once improved and aggravated again, and the symptoms caused by cerebellar compression and cerebellar contusion were difficult to distinguish, resulting in difficult diagnosis. For some cases that are difficult to diagnose, we should: 1. Ask for a detailed medical history to see if the symptoms continue to progress or worsen again after they improve. 2. Make a careful physical examination to determine whether the brain malacia focus of contusion and laceration is consistent with the physical signs. 3. Carefully study the contrast magnetic resonance imaging and CT imaging examination to find out whether the dilatation of the fourth ventricle is progressively aggravated. 4. Lumbar puncture should not be used as an indication of the need for treatment of isolated fourth ventricular hydrops. 5. The isolated fourth ventricle can also have a certain resting period, and it can become progressive hydrocephalus in some external conditions. This is consistent with the Josephine Hillan report that static hydrocephalus may also evolve into progressive hydrocephalus while CT does not show an increase in ICP. When the clinical manifestations are not obvious and the disease is highly suspected, MRI or infusion examination is of diagnostic significance [10].

Isolated fourth ventricle is a rare disease, which may be relatively static in adults and relatively difficult to diagnose. Magnetic resonance imaging and CT imaging examination of the progressive enlargement of the size of the fourth ventricle can be used as strong evidence [11,12]. Ventriculoperitonea shunt can be used as an effective method for the treatment of isolated fourth ventricle. The application of neuronavigation and

laparoscopy can reduce the probability of shunt blockage and cranial nerve paralysis complications.

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