International Journal of Neurosurgery
2021; 5(2): 57-61
http://www.sciencepublishinggroup.com/j/ijn
doi: 10.11648/j.ijn.20210502.11
ISSN: 2640-1940 (Print); ISSN: 2640-1959 (Online)

To Investigate the Effect of Catheter Drainage and Urokinase Dissolution for Severe Ventricular System Hemorrhage

Zhang Yanping[1, *], Zhang Pan[3], Zhang Wei[2], Wu Tiejun[2], Zhu Guanglin[2], Duan Qifeng[2]

[1]Department of Neurosurgery, Center Hospital of Zi Mining Group, Zibo City, China

[2]Department of Surgery, Central Hospital of Zibo Mining Group, Zibo City, China

[3]Department of Emergency, Linzi Qidu Hospital, Zibo City, China

Email address:

zkzhyp@163.com (Zhang Yanping)

[*]Corresponding author

To cite this article:

Zhang Yanping, Zhang Pan, Zhang Wei, Wu Tiejun, Zhu Guanglin, Duan Qifeng. To Investigate the Effect of Catheter Drainage and Urokinase Dissolution for Severe Ventricular System Hemorrhage. *International Journal of Neurosurgery.* Vol. 5, No. 2, 2021, pp. 57-61.
doi: 10.11648/j.ijn.20210502.11

Received: June 15, 2021; **Accepted**: July 2, 2021; **Published**: July 15, 2021

Abstract: Objective: To investigate the decrease of mortality and disability rate of severe ventricular system hemorrhage by catheter drainage and UK dissolution. Methods: From January 2015 to January 2020, 78 cases of primary severe ventricular hemorrhage and 47 cases of thalamic hematoma had broken into the ventricular system by admitted, all of which were caused by hypertension arteriosclerosis. A respectively adopt the double eminence F10 silicone tube line hemorrhage or hemorrhage drainage, drain and intraoperative all press automatic drainage device, and at the same time CT directional line thalamic hematoma drainage, pipe emptying and postoperative introcerebral hematoma and interior cavity at different times each injection urokinase solute 30000-50000 units, and lumbar puncture or with lumbar cistem catheter drainage, large cavity of thalamic hematoma and the original secondary intraventricular hemorrhage drainage time respectively for 3-4 d and 4-5 d, an average of 4.5 d extubation time. Results: After 6 months of follow-up, GOS and ADL grading were used to evaluate the recovery and self-care ability. GOS grading was 5points in 72 cases, 4 points in 41 cases, 3 points in 12 cases. ADL grading was Grade I in 69 cases, Grade II in 40 cases, Grade III in 5 cases, Grade IV in 6 cases, and Grade V in 5 cases (including 3 deaths). Among the 3 cases who died after operation, either 2 case suffered from primary whole ventricular hemorrhage combined with cerebral hernia, 1 case suffered from secondary hemorrhage combined with respiratory and circulatory failure caused by dilated hemocast of four ventricles. Sometime whith association communicating hydrocephalus in 3 cases that is underwent brain-peritoneal cerebrospinal fluid shunt. Conclusion: Empty and drainage of ventricular system hemorrhage and paraventricular thalamic hematoma which is can significantly reduce the morbidity and mortality.

Keywords: Severe Intraventricular Hemorrhage, Original Position Replcement, External Drainage, Clinical Effction

1. Introduction

Primary and secondary intraventricular hemorrhage is a common clinical disease in whole world which were characterized by high mortality and disability rates [1]. There were many thrarepy methods of operatived for intraventricular hemorrhage. Among drilling drainage, endoscopic emptying and hematoma evacuation of small bon window et all. However external ventricular drainage is still a commonly used treatment method in recent years. From January 2015 to January 2020, a total of 125 cases of severe primary and secondary ventricular system hemorrhage or hematocele form hypertensive disease which were admitted to our department. Three-tube or four-tube emptying and drainage were performed by bare-hand drilling, and a significant effect was obtained. The report is as follows:

2. Materials and Methods

Clincal date: In this study, there were 78 males and 47 females, ranging in age from 15y to 82y, with an average age of 45y; There were78 cases of primary ventricular system hemorrhage and 47 cases of ventricular system hematocele secondary to thalamic hemorrhage. According to GCS 49 cases were scored 3-5 points, 71 cases were scored 6-8 points, and 5 cases were scored 9-11 points, among which 53 cases were complicated with central cerebral hernia.

Ventricular hemorrhage and CT density: among the 78 cases of primary intraventricular hemorrhage examined by head CT scan when in emergency time before admitted to hospital, 30 cases had bilateral ventricular filling ≥60%, accompanied by hemocele of the third and fourth ventricles without casting; There were40 cases of bilateral non-perfusion hematocele with obstructive dilation caused by casting of the third ventricle and hematocele of the fourth ventricle. There were 8 cases of unilateral perfusion of the lateral ventricle with hematocele and dilation of the third ventricle. 47cases suffered from thalamic hemorrhage of 15-20ml, which was broken into the ventricle system and hematocele ≥50%. Acute obstructive hydrocephalus was secondary, among which 23 cases had cast type of the third ventricle with hematocele of the fourth ventricle, 9 cases had cast and dilated type of the fourth ventricle, and 15 cases had hematocele of the ventricle system without casting type. CT values were high density, uniform density, limited density and mixed density, respectively. The volume of each ventricle was calculated by Sakata method and added, and the volume was 40mL-55ml ±3ml.

Surgical indications: (1). Primary bilateral or unilateral perfusion of lateral ventricles ≥60% or non-perfusion hemorrhage accompanied by progressive dilation with hematocele of the third and fourth ventricles secondary to central cerebral hernia, CT examination of the high density of the lateral ventricles and mixed density of the third and fourth ventricles; (2). 15-20ml thalamic hematoma was broken into the third and fourth ventricles with casting and retrograde bilateral ventricle hematocele ≥50%, accompanied by central cerebral hernia secondary to acute obstructive hydrocephalus, mixed density of the lateral ventricles, high density of the third and fourth ventricles and high density of the paraventricular in CT. (3) Primary or secondary bilateral ventricular hemorrhage, casting and dilation of the fourth ventricle, mixed density of the lateral ventricle, the third ventricle and the high density of the fourth ventricle were examined by CT.

Surgical treatment: All the 125 cases in this group underwent the evacuation and drainage of intracerebral ventricle hemorrhage by hand drilling and catheterization in the frontal horn under emergency condition, among which 47 cases underwent CT directed thalamic hematoma and the casting of ventricle hemorrhage respectively. F10 silicone ventricular drainage tubes were drilled into the temporal and suboccipital parts and bilateral frontal angles which is CT location under local anesthesia, with a depth of about 5cm-5.5cm. A moderate amount of paraventricular hematoma and ventricular hemorrhage or hematocele were slowly aspirated. The tubes were indwailed and connected with a controlled sterile drainage device.

Postoperative management: after this group of ventricle low drainage 2-3 d according to the flow rate increasing, to keep the height of 10, respectively in double lateral ventricle and thalamus of postoperative hematoma and four ventricle drainage tube injection urokinase 30000-50000 units, and inject a in 3-4 h, 2 h after bilateral and clip the alternating injection tube, clip 2 h after each injection to drainage, repeat 3-5 times. 8cm-10cm-15cmThe drainage volume of unilateral drainage bag was 80mL-90ml per day, and the drainage bag and the scalp catheterization site were changed once every 2 days to prevent tube plugging. Timely lumbar puncture or lumbar cisterna catheterization was performed for drainage. The catheter was clamped 48 hours before extubation for CT examination, and the drainage tube was removed 4-5.5 days respectively. For the postoperative hydrocephalus and ventricular infection were equally affected by lumbar puncture which were selected effective antibiotics for ventricular infection. And timely intubation and tracheotomy were found in 69 cases and 21 cases, respectively. In addition, 5 cases needed ventilator to support breathing after the casting of hemorrhage in the fourth ventricle.

3. Results

The results of this group 125 cases of surgical treatment were successful, after 6 months follow-up and GOS and ADL grading evaluation were used respectively to recovery and life self-care ability: 125 cases of GOS score 5 points in72 cases, 41 cases of 4 points, and 12 cases of 3 points; ADL grading: class I 69 cases, 32 class II, 4 class III, 4class IV 4 cases and 5 class V (including 3cases of death). Among the 3 patients who died after operated, 2 patient suffered from primary whole ventricular hemorrhage with cerebral hernia, and 1 patient suffered from secondary hemorrhage with dilated hematocele of four ventricles with casting and respiratory and circulatory failure. Three cases of communicating hydrocephalus shunt recovered well.

4. Discussion

Hypertensive intraventricular hemorrhage has a high incidence, accounting for about 68.09% [2], among which the mortality rate of severe intraventricular hemorrhage is as high as over 75% [3]. Timely treatment is the key to reduce the mortality rate. This group included primary and secondary types, all of whom had a long history of hypertension, and atherosclerosis and persistent high blood pressure were the main causes of intraventricular hemorrhage. Due to the large amount of bleeding in the primary lateral ventricle and the rapid entry into the third and fourth ventricles, the hematocele of the whole ventricle system was formed. However, thalamic hematoma broke into the third and fourth ventricles and then retrograde into the single or bilateral ventricles. In the group of patients with ventricular system filling, hematocele or

casting in different locations and degrees may occur, and some patients may develop central hernia. In recent years, severe ventricular system hemorrhage or hematocele, or accompanied by casting, has been found to cause acute obstructive ventricular dilatation. Craniotomy is rarely used to clear intracerebral ventricular hemorrhage due to the greater trauma, so minimally invasive approach is chosen [4]. However the external ventricular drainage is used the most commonly method [5]. Although it is one of the innovative minimally invasive surgical methods, and has a certain curative effect on the treatment of severe intraventricular hemorrhage [6]. Groups are heavy bleeding or hemorrhage in patients with ventricular system, hemorrhage amount is larger, adopts the double lateral ventricle or four intraventricular and expansion of the mould directly drain tube and a moderate amount of volumizing urokinase using drainage method, and the catheter rapid emptying hemorrhage or hematocele to relieve acute obstructed ventricle and cerebral hernia, relieve the compression of the brain stem, restore respiratory circulation central failure plays an important role, reduce the complications and achieved significant results. However for the ventricular residual hematoceles in continuous drainage, the solution was promoted by biological lysase agent and the blood was completely emptied. When ventricle catheter with automatic drainage device, timely observation of drainage tube in cerebrospinal fluid level range, keep the change of intracranial pressure gradient, in accordance with intracranial pressure changes in a timely manner to adjust the tube position, which is conducive to timely and avoid the intraventricular hemorrhage emptying large pressure difference fluctuation caused by cerebral perfusion damage, and prevent excessive drainage or drainage not free, is to keep the patients recovered well one of the main factors of daily activity.

Hypertensive thalamic hemorrhage is easily broken into the ventricle system to filling meanwhile association hemorrhage or cast in three or four ventricle. Depend on for lateral ventricle catheter alone makes its emptying hemorrhage which a short time is difficult. The main factor is the amount of choroid plexus secretion of cerebrospinal fluid in the hemorrhage casting more reduction, promote effect significantly reduce the dissolution of hemorrhage, reduces the effect of cerebrospinal fluid washout. In addition, the catheter can not enter the hematocele site of the third and fourth ventricles and can directly empty the hematocele. However, anterior wall of the third ventricle was incision more traumatic and was not used. Moreover, the third and fourth ventricles dilate and block the cerebrospinal fluid channel with casting, so lumbar puncture or lumbar cistern catheterization for drainage is not the first choice. Therefore, the cerebrospinal fluid circulation pathway cannot be communicated in a timely manner, leading to hemorrhage or delayed hemorrhage and emptying time of the third and fourth ventricles. Therefore, we used suboccipital CT positioning to perform microaspiration with an internal tube in the fourth ventricle and inject urokinase to make it residual hematocele was dissolved and drained, which unblocked the lateral foramen cerebrospinal fluid outflow tract and entered the subpomentum circulation, shortened the hemorrhage or hematocele emptying time, timely relieved the secondary damage of the fourth ventricle floor and its adjacent important life-supporting nerve structures, and prevented the occurrence of ventriculitis caused by too long time of keeping the tube.

CT density of intraventricular system hemorrhage and hematocele were change and its progressive expansion degree and duration of cerebral hernia that is the key to influence the curative effect of minimally invasive surgery. Because of intraventricular density change were determinanted concern catheter emptying time length. However the hemorrhage uniform density with expansion to the transit time is longer, and parts high density or mixed density with expansion emptying time was significantly shortened. Patients in this group often had secondary central cerebral hernia or tentorial hernia, which could occur either primary or secondary hemorrhage. Cerebral hernia was caused by the sharp increase of hemorrhage or hematocele in the ventricle system or by acute obstructive hydrocephalus. Such emergency changes could be quickly resolved after catheterization in the patients of mixed densities of bilateral ventricles. However the thalamus hemorrhage secondary intraventricular hemorrhage by this group of patients in the clinical treatment to observe more dangerous than primary intraventricular hemorrhage onset that is easy to cause acute obstructed hydrocephalus accumulation and expansion which is can high incidence of rapidly emerging center hernia. But there were the highest fatality rate of 53% [6]. Meawhiln association restore the disability rate is also high and seriously affect the prognosis. Its basic reason is that the thalamic hematoma broken into the ventricle with road damage of important anatomical structures. Among the first rapid expansion into three or four ventricle and make it a short time, and the most easy to mold and coagulability is strong, not only to the thalamus and the bottom and the bottom of the fourth ventricle damage is serious. Meanwhile also is one of the important roles in the acute progressive hydrocephalus. Early CT examination found mixed density and progressive expansion of the ventricles, three or four ventricle uniform density, midline shift and the line through thalamic hematoma etc. Use double round three different anatomical parts emptying respectively and drainage surgery, can make the transition to mixed filling density of bilateral intraventricular hemorrhage effectively and timely emptying, acute obstructive ventricular dilatation was relieved more quickly and the purpose of relieving central hernia or tentorial hernia was achieved. Patients with high density hematocele in the third and fourth ventricles can be directly emptied and drained by placing a tube in the fourth ventricle, so that the patient's consciousness can be quickly improved or fully conscious, which is one of the important measures to reduce the disability rate and mortality rate in the early stage of this group. It should be noted that in the process of drainage, if no high density was found in the reexamination of CT, the patient with coma or cerebral hernia caused by acute obstructive hydrocephalus occurred again once the catheter was extubated may die if not treated in time. It is important to improve the quality of life and reduce the fatality rate to

improve the ventricular drainage and perform lumbar puncture as soon as possible.

All patients in this group suffered from severe ventricular system hemorrhage, in which the hemorrhage volume of bilateral ventricular filling was ≥60%, resulting in acute obstructive hydrocephalus. At the same time, the incidence of combined casting and dilation of the third and fourth ventricles was high. However, the incidence of thalamic hemorrhage breaking into the third and fourth ventricles is higher, and it is difficult to complete emptying in time with proper amount of suction and drainage by mere catheterization. Found in CT examination according to the clinical treatment of uniform density of intraventricular hemorrhage or casting with expansion, and the remarkable increase of coagulability and dissolve and natural, and therefore must use intraventricular injection of urokinase repeatedly, the perfusion number 3 or 6 times, can promote coagulation clot quickly dissolve emptying [7], shortening the time of left ventricle coagulation clot significantly. Therefore, injecting it into the lateral ventricle through the frontal drainage tube is effective for hemolysis or hemorrhage. However, in the patients with dilated hematocele or partial casting and mixed density, although the volume of the patients exceeded the normal volume value, urokinase injection was also more beneficial to the evacuation of the patients. Because the drug has significant catalytic, ablation and liquefaction effects on high density hemoceles or casting, and the effect of mixed density is more effective, both of which can significantly shorten the tube retention time after draining the drainage tube. Urokinase is necessary not only for the evacuation of residual thalamic hematoma or intracaventricular hemorrhage, but also for the dissolution of intracaventricular fibrin, microclots, thrombin and other substances when exclude, prevent late occurrence of communications hydrocephalus is not negligible measures. However, by observing the appropriate timing of lumbar puncture or lumbar cistern drainage, communicating the circulation of cerebrospinal fluid, it is more conducive to the re-emptying and absorption of residual hemorrhage in the ventricular system, and can reduce the incidence of complications. Therefore a good clinical effect has been achieved. Ventricular drainage tube is the only way to drain hemorrhage and hematoceles. The quality and inner diameter of the tube or the time of leaving the tube are very important for emptying and preventing infection. However, for a few patients with hemorrhage in the ventricle system and casting, the idea of pulling out the drainage tube within 5-7 days was supported [8], while in this group, the longest time of catheterization was 5d and no more than 5d [9]. Although the time of external ventricular drainage is not a risk factor for intracranial infection [10], it is an important factor to prevent infection by emptying most patients as soon as possible to shorten the drainage time. Therefore, in this group, the average drainage for 4.5 days and clamping for 24 or 48 hours showed no high density and no clinical symptoms after CT reexamination. Removal of the indwelling tube significantly reduced the infection rate of ventriculitis or ventracular.

System Graeb (1982) ventricle hemorrhage CT score is often used as the surgical indications and prognosis evaluation methods, according to this group of patients observed Greab score did not include ventricular hemorrhage or hemocecle in computed tomography (CT) with different density and whether the mold problem [11], because of the density and whether cast for treatment selection and prognostic evaluation is very important, so the prognosis evaluation error is obvious. In this group, minimally invasive surgery was used according to the actual conditions of the patients, and GOS was used to evaluate the recovery and ADL (daily living ability) after surgery. After long-term follow-up, significant curative effect was obtained.

5. Conclusion

The 105 cases of severe primary and secondary ventricular haemorrhage were treated by ventricular drainage and biolysin (UK) dissolve. It was proved that the technique was reliable and safe. And significantly reduced the complication of hydrocephalus and mortality. Defects in the preoperative assessment of the Graeb classification were also corrected.

References

[1] Lin Chao, Wang Qiao, et al. Comparison of clinical characteristics of primary and secondary intraventricular hemorrhage [J]. Journal of Clinical Neurology, 2015, 28 (4) 308.

[2] Wang Shaofei, Guo Jinguang, et al. Effect of urokinase perfusion with different retention time on coagulation and fibrous system in severe ventricular hemorrhage [J]. Trauma and Acute Care Medicine, 2018, 6 (4): 416.

[3] Abuzergungor, MD, Serhat Baydin, MD, Erikh. Middebrooks, MD; et al: The white matter tracts of the cerebrum in ventricular surgery and hydrocephalus. [J]. Neurosurg 2017, 126, 955.

[4] Zhou GZ, Yang F, TONG MF, et al. Clinical characteristics and prognostic factors of 41 patients with primary ventricular hemorrhage [J]. Chinese Journal of General Practitioners, 2018, 16 (11): 1804-1.

[5] Wei Jianhui, Tian Yanan, Zhao Wangsen, et al. Neuroendoscopic hematoma removal was performed for severe cases Clinical study of ventricular hemorrhage [J]. Chin J Neurosurgery, 19, 35 (4): 349-350.

[6] ZHang Wei, Song Yanjie, Liu Xuchang, et al. Effect of bilateral ventricular catheterization hematoma aspiration and ventricular perfusion on severe intraventricular hemorrhage [J]. Shandong Pharmaceutical 2018 58 (26): 51.

[7] Chen XJ, Ni Zhihong, Effect of two-needle minimally invasive treatment of hypertensive ventricular hemorrhage [J]. Chin J Geriatr, 2015, 35 (6): 1679.

[8] Yang Ping Lai, Zhang Yuanyuan, Zhou Litian, et al. Minimally invasive external ventricular drainage in the treatment of 39 cases of intraventricular hemorrhage [J], Chinese Journal of Clinical Neurosurgery, 2015, 12 (5): 378.

[9] Binghui Qiu, Songtao Qi. Discussion on prevention of infection associated with external ventricular drainage [J]. Chinese Journal of Trauma, 2019, 35 (3): 205.

[10] Shen Yunlong, Liu Jiajin, QI Songtao, et al. Risk factors of intracranial infection after external drainage for ventricular hemorrhage [J]. Chinese Journal of Neuropsychiatric Diseases, 2015, 41 (12): 708.

[11] Zhang Yanping, Zhu Shugan, et al. Surgical treatment of intracranial hemorrhage [M]. Beijing People's Military Medical Publishing House. 2010 67.