



The Safety and Efficacy of Eliminating Acute Subdural Hematoma by Means of Gradual Decompression

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Abstract

Background and Objective: Acute subdural hematoma is a common emergency in department of neurosurgery, and its fatality rate and disability rate have been high. However, in clinical practice, the standard large trauma craniotomy has encountered many clinical problems. To discuss the practicability and security of gradual decompression to remove acute subdural hematoma.

Method: 72 patients with acute subdural hematoma treated by gradual decompression were reviewed. The preoperative situation, postoperative CT findings, operative complications, GOS score and cause of death were analyzed and compared.

Results: There were 24 cases of death, including 19 cases of hernia, 3 cases of sepsis, and 2 cases of pulmonary embolism. There were no acute encephalocele in the operation, 2 cases with residual hematoma after operation >20%, and 2 cases with secondary epidural hematoma. There were no postoperative complications such as delayed intracerebral hematoma, cerebral infarction, cerebrospinal fluid leakage and meningitis, the result is superior to traditional surgery.

Conclusion: The method of step by step decompression to remove acute subdural hematoma is simple and feasible. The method not only can effectively eliminate hematoma and control intracranial pressure and also can effectively prevent a series of complications of standard large trauma craniotomy; the utility model is especially suitable for patients with closed brain injuries, and CT shows obvious midline shift.

Keywords: Acute subdural hematoma; Standard large trauma craniotomy; Gradual decompression; Postoperative complications

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Clinical Data

Acute subdural hematoma is a common emergency in department of neurosurgery, and its fatality rate and disability rate have been high [1,2]. However, in clinical practice, the standard large trauma craniotomy has encountered many clinical problems [3]. Therefore, on the basis of standard large trauma craniotomy, the technique of stepwise decompression for removal of acute subdural hematoma is satisfactory, and is hereby reported as follows.

General data

From January 2002 to June 2017, cases were treated by surgery, and 72 cases were treated with progressive decompression surgery. There were 56 males (77.8%) and 16 females (22.2%). The age was 16~83 years; mean (34.5+14.5) years old; 66 cases were closed brain injuries, 4 cases were open injuries, and 2 cases were spontaneous intracranial hemorrhage; 43 cases were traffic injuries, 20 were high fall injuries, 7 were violent injuries; 58 cases had simple head injuries, and 12 cases had extra cranial injuries; Preoperative GCS score: 3~5 points, 41 cases, 6~8 points, 21 cases, 9~12 points, 10 cases; 47 cases had abnormal pupillary light reflex, the eyes scattered in 27 cases, 20 cases of mydriasis. Other findings: Epidural hematoma in 5 cases, diffuse axonal injury 12 cases, subarachnoid hemorrhage 18 cases, contusion and laceration of brain in 14 cases, intraventricular hemorrhage occurred in 6 cases.

Method

All patients underwent routine cranial CT examination after admission to the hospital. The patients with definite surgical instructions were treated with craniotomy and hematoma evacuation under general anesthesia of trachea intubation. The method of progressive decompression was used to remove subdural hematoma. That is, the first step is to cut the skin and the subcutaneous part of the

temporal incision, drill the skull, cut the dura, release some subdural hematoma, and perform preliminary decompression. In the second step, routine standard large trauma craniotomy was performed, and the dura around the bone flap was suspended and decompressed again. The third step is to cut the dura mater in many directions along the vertical side of the lateral fissure, so that the subdural haematoma is automatically removed from the incision of the dura mater, the blood clot can be removed by incision, and further decompression is achieved. Fourth steps, if there is active bleeding or contusion of local brain tissue or intracerebral hematoma, the dura mater incision can be extended at the corresponding site to remove the hematoma and contusion of the brain tissue, and completely hemostasis, thereby reducing stress again. Fifth steps, if intracranial pressure control is satisfactory, the dura incision can be sutured appropriately, after the plasma drainage tube is placed at the dura closed cranial cavity. If intracranial pressure remains high, decompression of the temporal pole can be performed by an extended dural incision, further decompression of the frontal pole can be done. Thus, intracranial pressure control is still unsatisfactory; finally, dura reduction suture and decompressive craniectomy can be performed.

Outcome

Surgical outcome of 72 patients: no intra operative acute encephalocele occurred, after 6 to 48 h, the head CT was examined regularly, only 2 of the hematoma remained in excess of 20%, but the intracranial pressure control was satisfactory and the occupying sign was not obvious. No reoperation was needed; there were 2 patients with secondary epidural hematoma, 1 of which were located on the contra lateral side and needed reoperation. 1 cases of hematoma were located on the posterior side of the ipsilateral bone window and were treated conservatively; 10 cases showed enlargement of brain contusion, but it didn't need surgical removal; local cerebral infarction was found in 9 cases, but there was no massive infarction; non delayed intracerebral hematoma and local brain fungus formation; after half a year, GOS score: 24 patients died (1 points), 19 of them died of cerebral hernia, 3 died of septicemia, 2 died of acute respiratory and circulatory failure (mostly caused by pulmonary embolism); 2 points: 5 cases, 3 points: 8 cases, 4 points: 16 cases, 5 points: 19 cases. There were no intraoperative complications such as acute encephalocele, incision infection, cerebrospinal fluid leakage, meningitis and hydrocephalus; the extracranial complications mainly included 48 cases of pneumonia, 6 cases of sepsis and 2 cases of pulmonary embolism.

Discussion

Standard large trauma craniotomy can achieve the following surgical purposes: Removal of epidural, subdural, and intracerebral hematomas at the front temporal tops; brain tissue that clears the frontal, anterior of temporal, and orbital regions; to control the sagittal sinus and the bridging vein, the transverse sinus and petrosal sinus hemorrhage; control of hemorrhage in anterior cranial fossa and middle cranial fossa; repair the torn dura mater to prevent cerebrospinal fluid leaks. Clinical practice has proved that standard craniotomy with large trauma craniotomy can remove about 95% of intracranial hematoma, therefore, since the surgical approach was proposed, it has been widely used in clinic, and it hasn't changed much [4-6].

With the deepening of clinical practice, it is found that there are many advantages in this operation, but there are some shortcomings

[7-9], such as: 1st: Because of the wide range, greater damage, time-consuming, increasing the patient's surgical risk; 2nd: Because of the extensive resection of skull, cranial volume expanded rapidly, to protect the contents of the cranium lost normal cranial cavity, cranial contents can easily transposition, which can cause bleeding dural stripping, cerebral vascular rupture, acute encephalocele; 3rd: Because of extensive incision of dura mater, the brain tissue loses the protection of dura mater, and the intracranial pressure drops rapidly, which leads to the breakthrough of cerebral perfusion pressure, and increases the risk of intraoperative acute encephalocele; 4th: As dural suture removal, bone flap decompression, due to destruction of the normal anatomic structure of the cranial cavity, intracranial contents lost normal protection, prone to local encephalocele after operation, even the local formation of mushroom, aggravating postoperative brain damage, brain tissue displacement, the great vessels of the skull base are pulled and pulled and it is easy to develop large area cerebral infarction; 5th: The close suture of dura mater is helpful to prevent cerebrospinal fluid leakage, but it is not conducive to the drainage of bloody cerebrospinal fluid, which leads to complications such as cerebral vasospasm and hydrocephalus.

On the basis of standard large trauma craniotomy, the acute subdural hematoma was removed by progressive decompression; this method utilizes the advantages of standard craniotomy with large trauma craniotomy and avoids its shortcomings. The advantages are: 1st: Gradual and slow release of intracranial pressure, avoid dramatic changes in intracranial pressure, it is beneficial to prevent the obvious shift of brain tissue, as well as the dissection of dura mater and the breakthrough of cerebral perfusion pressure, to avoid intraoperative acute encephalocele and intraoperative and postoperative rebleeding; 2nd: Because the epidural and cranial cavity structure is relatively complete, the cranial contents get better protection, can avoid the obvious shift of brain tissue, thereby preventing the occurrence of local brain fungus formation and large area cerebral infarction; 3rd: Because there are some meshes on the dura mater, the bloody cerebrospinal fluid under the dura can be infiltrated through the mesh into the scalp, it is beneficial for postoperative drainage and resorption of the scalp, thereby reducing intracranial pressure, at the same time, the bloody cerebrospinal fluid can be drained in time to prevent the occurrence of hydrocephalus. The data showed that the method is simple and feasible, which can effectively remove the hematoma and control intracranial pressure, it can also effectively prevent the complications of standard craniotomy with large trauma craniotomy, and is superior to the traditional surgical method, and has stronger practicability and safety.

Precautions for using this surgical procedure: 1st: This operation is the further improving for standard trauma craniotomy, rather than deny it. 2nd: Emergency decompression of the temporalis muscle incision must be on a predesigned flap rather than a straight incision alone. 3rd: Intracranial pressure is gradually reduced and when the intracranial pressure control is satisfactory, the operation can be terminated without completing each decompression step. 4th: Decompressive craniectomy is the last step, only after the decompression step is completed and the intracranial pressure control is not satisfactory, because decompressive craniectomy may lead to a series of postoperative complications. 5th: Incision of the dura may damage the subdural vessels and brain tissue, in the hematoma thicker place, careful oblique incision of dura mater, help to avoid. 6th: The direction of the incision should be perpendicular to the lateral fissure, which is helpful for releasing dura mater and reducing intracranial

pressure. 7th: The removal of blood clots may damage the subdural vessels and brain tissue, with less attractive and small drainage tube irrigation, help to avoid. 8th: For subdural contusion of brain tissue, brain hematoma, active bleeding, through the smaller dural incision may be difficult to handle, at this time, the dura incision can be appropriately enlarge; after the treatment of the above problems, the extended dura incision can be sutured properly, but the small incision should be kept open. 9th: At the end of the operation, both intradural and epidural should be completely hemostatic, if there is a larger residual cavity below the dura, the drainage tube should be placed under the dural and epidural, if there is no larger residual cavity below the dura, the drainage tube only needs to be placed outside the dura mater. 10th: Strict surgical procedures can reduce postoperative complications, reduce mortality and disability, and cannot ignore the careful postoperative treatment; good postoperative treatment includes a series of symptomatic treatment, rehabilitation therapy, mild hypothermia [10], and traditional Chinese medicine treatment.

Conclusion

The method of stepwise decompression for removal of acute subdural hematoma can not only effectively remove the hematoma, but also can effectively prevent a series of operative complications. The method is especially suitable for closed brain injuries with obvious midline shift. For this operation, further clinical comparisons and studies are needed to assess its clinical value and its impact on mortality and disability.

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