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REVIEW ARTICLE

Clinical Study of Lumbar and Leg Pain Injury Caused by Subarachnoid Hemorrhage

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ABSTRACT **Objective:** To study the application of lumbar puncture cerebrospinal fluid (CSF) aspiration in the treatment of subarachnoid hemorrhage (SAH) induced by lumbosacral nerve neuralgia. **Methods:** CSF from 313 patients after craniotomy, brain contusion and laceration, and lumbosacral nerve pain were withdrawn via lumbar puncture. 10–20 mL hemorrhagic CSF was withdrawn 1–3 times except when contraindicated, to promote spinal nerve stimulation while relieving the effects of lumbosacral nerve pain symptoms. **Results:** Lumbar puncture CSF treatment application of hemorrhagic traumatic SAH induced by lumbosacral nerve pain was a success except in 3 patients with low intracranial pressure symptoms. **Conclusion:** Lumbar puncture to remove CSF was successfully applied to treat hemorrhagic traumatic SAH induced by lumbosacral nerve pain effect.

KEYWORDS
Lumbar
Hemorrhagic CSF
Lumbosacral nerve pain

1. Introduction

Craniocerebral injury is very common and hospitals would carry out craniotomy as treatment. Sometimes, a small part of the brain might get injured and post craniotomy, patients would experience intense waist, hip, sacrococcygeal, thighs, back, buttocks, lumbar and leg pain. Because of its low incidence, it is often ignored and not much is known about this phenomenon. Acupuncture, physical therapy, massage, etc., are normally prescribed but its effect are usually unsatisfactory [1]. From 1989 to 2015, our department treated 747 cases of brain injury. 313 cases of severe pain at the waist, hips, buttocks, sacroiliac, thigh, lumbar and leg were treated by lumbar puncture and the pain subsided after hemorrhagic CSF aspiration therapy (1 to 3 times). The results were summarized and analyzed.

2. Pro bed material

2.1. General information

A total of 313 patients were observed consisting of 234 male and 79 female aged 9–78 years, with an average age of 38.5 years. 88 of the total patients were cases of intracranial hematoma, hematoma aspiration or surgical decompression caused by car accidents and injuries with a pain rating of about 11.7%. 97 patients experienced a variety of craniocerebral injuries consisting varying degrees of brain contusions, treated non-surgically with a pain rating of about 4.18%. All of the cases were confirmed by clinical diagnosis, CT and CAT scans. Brain injuries were not statistically associated with the lumbar injuries.

2.2. Method

Hemorrhagic CSF was aspirated from lumbar vertebrae L4–L5 or L5–S1. Intracranial pressure was measured before CSF aspiration. If intracranial pressure was normal, 10–20 mL of CSF was withdrawn. When a high intracranial pressure was suspected, 20 mL of 20% mannitol was given to patients half an hour before lumbar puncture. The lumbar puncture procedure was done on a daily basis, until a clear release of the CSF was achieved. Discharge of blood in the CSF is an indication of intracranial pressure. As a safety precaution, only a maximum 20 mL of hemorrhagic CSF can be aspirated per day. To avoid the risk of infection, lumbar puncture could not be executed in patients with high intracranial pressure. Infections were treated and intracranial pressure was continually reduced to normal. If lumbar puncture could not be performed, a CSF rhinorrhea or otorrhea was administered instead. An infection of the lumbosacral tail would also prevent

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lumbar puncture. Transcranial Doppler (TCD) was used for lumbocrural pain diagnosis: TCD in 1 or more than 1 middle cerebral artery (MCA) mean velocity (VmMCA) 120 cm/s, and ipsilateral VmMCA/VmICA 3 (Lindegaard index); accompanied by clinical symptoms (hemiplegia, aphasia, visual field defect, etc.), or the deepening of consciousness, Glasgow coma scale (GCS) rating dropped to 2 points according to the value of the VmMCA. Cerebral vasospasms (CVS) were divided into the mild group (120–139 cm/s), the moderate group (140–199 cm/s) and the severe group (more than or equal to 200 cm/s).

2.3. Diagnostic equipment

Trans-Link 9900 TCD (Rimed Ltd., Israel) was used to determine cerebral vasospasm diagnosis and spasticity. 64-slice spiral CT scan and SOMATOM Sensation CAT scan (Siemens Healthcare Diagnostics, Sweden) were used to detect cerebral vasospasms and to exclude other diseases of the SAH patients.

2.4. Statistical processing

All the data in this study were processed using SPSS 17.0 statistical software and the data were expressed by means of standard deviation (*s*).

3. Results

3.1. Analysis of curative effect

Lumbar puncture was used to release hemorrhagic CSF in 313 patients. Pain in the waist, hips, buttocks, sacroiliac, thigh, lumbar and legs disappeared in 42 cases (about 13.41%), and their CSF became clear. In the second lumbar puncture involving 271 patients, after hemorrhagic CSF was removed, the pain disappeared in 183 cases (about 58.46%) and the CSF cleared. After the third lumbar puncture procedure, the pain disappeared in 88 cases (about 28.11%), and their CSF cleared. Patients reported feeling relieved and relaxed after hemorrhagic CSF aspiration. 3 patients exhibited low intracranial pressure response after hemorrhagic CSF aspiration and were given 1000-1500 mL saline per day. Intracranial pressure reaction disappeared 2–3 days later. No cases of infection or serious complications occurred.

3.2. Comparison of patients with lumbocrural pain

In the 313 patients, the degrees of spastic lumbocrural pain were different. TCD was used to monitor cerebral blood flow velocity. The spasmodic degree was divided into three kinds: 1 for mild cramps (183 cases, accounted for 58.47%), 2 for moderate spasms (90 cases, accounted for 28.75%), and 3 for severe spasms (40 cases, accounted for 12.77%).

3.3. Analysis of the duration of patients with spastic pain

All 313 patients were monitored with TCD and CAT scans between 1 to 25 days. Among them, 80 patients exhibited traumatic vascular spasms for 5 to 8 days. 10 to 15 days after clinical treatment, the spasms gradually relieved. The remaining 233 cases exhibited cerebral vasospasms for 8 to 15 days and it gradually eased 16 to 25 days after clinical treatment.

4. Discussion

Cerebral vascular spasm is a common secondary injury in the Department of Neurosurgery. Patients are considered having high complications, which could lead to the occurrence of cerebral tissue and cell ischemia, hypoxia, and infarction. Once cerebral vascular spasm symptoms appear, it would affect the prognosis of the patients [2]. Currently, there are many studies on cerebral vasospasms which are based on TCD monitoring and treatment methods would be administered according to its results [3]. However, cerebral vasospasms and the degree of spontaneous SAH has some relevance which would lead to early brain injury, resulting in patients having lower back and leg pain along with other symptoms. This would escalate with severe craniocerebral trauma. Hence, an efficient clinical treatment needed to be suggested.

Brain injury especially after severe cerebral contusion often causes increased blood flow to the subarachnoid space. Intracranial surgery and clearing hematoma after resection of large tumors causes compression of microvascular, microveins and capillary walls due to ischemia and hypoxia, producing varying degrees of damage. During reperfusion, there is often microvascular rupture and bleeding, causing blood to flow into the subarachnoid space. Hemorrhagic CSF would be circulated, causing a slow flow to the spinal subarachnoid space deposition and lumbar spinal canal, especially when patients are reclining or sitting. In a standing position, blood flow is accelerated causing a sinking of the subarachnoid space [4–6]. Hemolysis would cause blood macromolecules and hemoglobin to combine with the CSF, leading to nerve irritation of the sacral nerve root or cauda equina and lumbosacral pain. Its clinical manifestations would include pain in the waist and hips, sacroiliac, thighs, lumbar and leg. Hemorrhagic CSF discharge would also lead to inflammation of the arachnoid membrane causing lumbar spinal nerve adhesion and the patient will experience long-term lumbosacral nerve discomfort [7].

This study believes that lumbar puncture to remove hemorrhagic CSF and induce stimulation of the lumbar and sacral nerve root or cauda equina should first be considered to treat any unexplained waist, hip, sacral tail, and leg pain resulting from any brain damage or following intracranial surgery. Lumbar puncture would be prescribed several times to remove hemorrhagic CSF and relieve the pain. For the 313 cases in this group, 10–20 mL of CSF was removed during each lumbar puncture procedure. In 42 cases, CSF was light yellow at the start and gradually cleared up with the pain disappearing. For 183 cases, reddish light CSF was observed during the first puncture. A

second procedure was done the next day, CSF was light yellow, gradually cleared and the pain disappeared [8]. For 88 cases, the first puncture procedure released hemorrhagic CSF (initially red and turned light red). On the second day, CSF was reddish light initially, becoming pale yellow at the end of the procedure. A third procedure was carried out, releasing a light yellow CSF which gradually cleared and the pain disappeared. Patients were allowed to rest on supine pillows for 6–8 hours after every lumbar puncture procedure.

3 patients experienced low intracranial pressure reaction after the lumbar puncture procedure. Patients were given bed rest and a daily infusion of 1000–1500 mL saline. Intracranial pressure response disappeared 2–3 days later. No cases of infections or serious complications occurred. The most effective method to treat lumbar and sacral pain is to treat cerebral injuries caused by brain trauma. At the same time, CSF circulation can be promoted, reducing arachnoiditis caused by intracranial arachnoid adhesions.

In summary, the application of lumbar puncture by draining the CSF for treating lumbar and sacral nerve pain caused by traumatic SAH was observed in this study. It had a therapeutic effect in controlling the degree and duration of spasms in patients with brain injury. Thus, this procedure with its practical and significant effects could be adopted as a clinical therapeutic practice and should be widely promoted.

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