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## Surgical management of Chiari I malformation based on different cerebrospinal fluid flow patterns at the cranial-vertebral junction

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Chiari I malformation has been shown to present different cerebrospinal fluid (CSF) flow patterns at the cranial-vertebral junction (CVJ). Posterior fossa decompression is the first-line treatment for symptomatic Chiari I malformation. However, there is still controversy on the indication and selection of decompression procedures. This research aims to investigate the clinical indications, outcomes, and complications of the decompression procedures as alternative treatments for Chiari I malformation, based on the different CSF flow patterns at the cranial-vertebral junction. In this study, 126 Chiari I malformation patients treated with the two decompression procedures were analyzed. According to the pre-operative findings obtained by using cine phase-contrast MRI (cine PC-MRI), the abnormal CSF flow dynamics at the CVJ in Chiari I malformation were classified into three patterns. After a pre-operative evaluation and an intraoperative ultrasound after craniectomy, two procedures were alternatively selected to treat the Chiari I malformation. The indication and selection of the two surgical procedures, as well as their outcomes and complications, are reported in detail in this work. Forty-eight patients underwent subdural decompression (SDD), and 78 received subarachnoid manipulation (SAM). Ninety patients were diagnosed as having Chiari I malformation with a syrinx. Two weeks after the operation, the modified Japanese Orthopedic Association (mJOA) scores increased from the preoperative value of  $10.67 \pm 1.61$  to  $12.74 \pm 2.01$  ( $P < 0.01$ ). The mean duration of follow-up was 24.8 months; the mJOA scores increased from the postoperative value of  $12.74 \pm 2.01$  to  $12.79 \pm 1.91$  at the end of the follow-up ( $P = 0.48$ ). More complications occurred in the patients who underwent SAM than in those who received SDD (SAM: 11 of 78 (9.5%) vs. SDD: two of 48 (3.5%)). The abnormal CSF flow dynamics at the CVJ in Chiari I malformation can be classified into three patterns. A SAM procedure is more feasible in Chiari I malformation (CM1) patients with pattern III CSF flow dynamics, whereas a SDD procedure is more suitable for CM1 patients with pattern I CSF flow dynamics. In CM1 patients with pattern II CSF flow dynamics, an intraoperative ultrasound after craniectomy could play an important role in the selection of an effective decompression procedure.

### Biography

Tao Fan is Professor and Director of Spinal Cord and Spine Program, Capital Medical University, Sanbo Brain Hospital. He is a Member of the Spine and Spinal Cord Experts Committee and Neurosurgery Branch of Beijing Medical Association of Chinese Neurological Surgeon Society, Executive Trustee of Chinese Neurospine Society and Vice Director of World Chinese Minimal Invasive Precise Spine Surgery Society. He was awarded as one of the best medical doctors in Beijing 2012 by the Beijing Medical Doctor Association. He is the winner of the Beijing Science & Technology Award and second place holder of Chinese Science & Technology Developing Award. He performs at least 500 various spine and spinal cord surgeries every year.

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