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Results of Surgical Treatment of Chiari Anomaly Type 1

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Abstract: Introduction. Chiari malformation type 1 (CM1) is a congenital disorder whose clinical manifestations typically occur in young individuals of working age. The disease is characterized by a wide range of clinical manifestations, including CM1-associated headaches, syringomyelia, otoneurological disorders, and ataxia, primarily caused by impaired cerebrospinal fluid flow at the cerebrospinal junction. However, asymptomatic carriage of the posterior cranial fossa phenotype characteristic of CM1 is also possible. CM1 leads to a decrease in quality of life and difficulty in everyday and professional activities in more than 90% of clinically symptomatic patients, and also causes disability [1-3]. The literature primarily presents data on disability associated with CM1-associated syringomyelia. The relationship between isolated CM1 and the development of disability has been insufficiently addressed. The potentially disabling effect of MC1, combined with the presence of areas with a high prevalence of this pathology, including the Volga-Kama region [1, 4-6], all this testifies to the important social significance of the pathology in question and the relevance of studying disability in MC1. According to the literature, syringomyelia is detected in Chiari malformation with a frequency of 43 to 87% [1, 2]. The relationship between Chiari malformation and syringomyelia has been discussed by specialists since the 1950s [3, 4]. Chiari malformation is a displacement of the cerebellar tonsils (ectopia) through the foramen magnum to the level of the C1, sometimes C2I-C3I vertebrae. Many authors believe that this is the only pathological condition in such pathology, while at the same time there are studies that claim that the initial cause is the small volume of the posterior cranial fossa (PCF), which causes the displacement of the cerebellar tonsils downwards through the foramen magnum [5, 6].

Keywords: anomaly, chiari, syringomyelia, surgery.

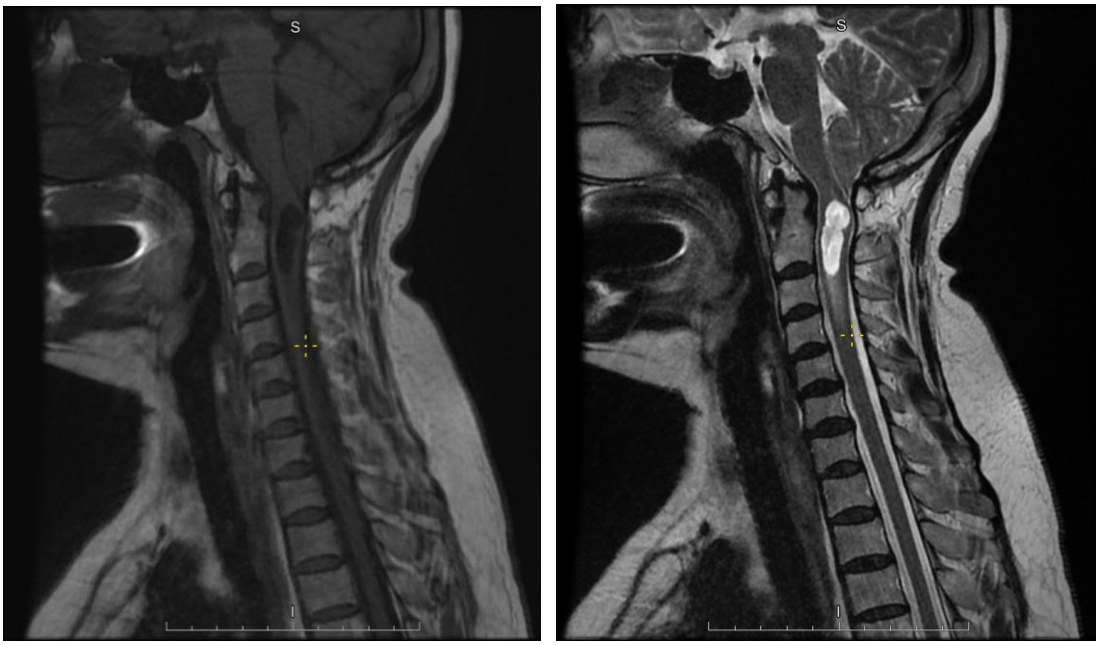
Aim. Demonstrating a surgical results of Chiari malformation type 1.

Material and methods of research. A retrospective analysis of data from medical visits to the Department of Neurosurgery of Samarkand State Medical University for the period from 2023 to 2025 was conducted among adult patients with MRI-verified MK 1, isolated or combined with syringomyelia, living in the Republic of Uzbekistan. The study group included patients with both "classic MK1" and pathogenetically similar forms of MK1, including MK1.5 and MK0 [7-9]. The study did not include patients with secondary cerebellar ectopia or syringomyelia caused by various space-occupying lesions, inflammation, or myelomalacia. In total, data from 221 patients with MK 1 met the study conditions, of whom 35 were diagnosed with disability. Of the 211 patients with MC1, concomitant syringomyelia was present in 35% of the examined patients. These patients were older than those with isolated MC1, had a high proportion of disabilities, and also included patients engaged in heavy labor. Disabled individuals constituted 14% of the total population of patients with MC1. Among patients with established disabilities in the subgroup with isolated MC1 (30%), women with disability group III predominated, while in the subgroup with combined syringomyelia (70%), men predominated, 37% of whom had disability

groups I or II. According to our study, disability was established in 14% of patients with MC1, including 7% with isolated MC1. Disability groups I and II account for 33%. In addition, 22% of patients with MC1 who are unemployed or have an uncertain professional status may potentially require medical and social support. Regional variations in the prevalence of MC 1 and the proportion of patients with disabilities were noted. It was found that, with an equal age at initial examination and duration of observation, in the subgroup of patients with MC 1 with the development of disability, there were more men, MC 1-associated syringomyelia, and workers engaged in heavy and moderate labor. Analysis of literature data indicates a decrease in the proportion of disability due to syringomyelia in the structure of disability due to diseases of the nervous system from 3% to 0.8% [1, 10]. The main methods of medical and social support and prevention of disability in MC 1 are early diagnosis of the disease, timely surgical decompression of the posterior cranial fossa, and rational employment.

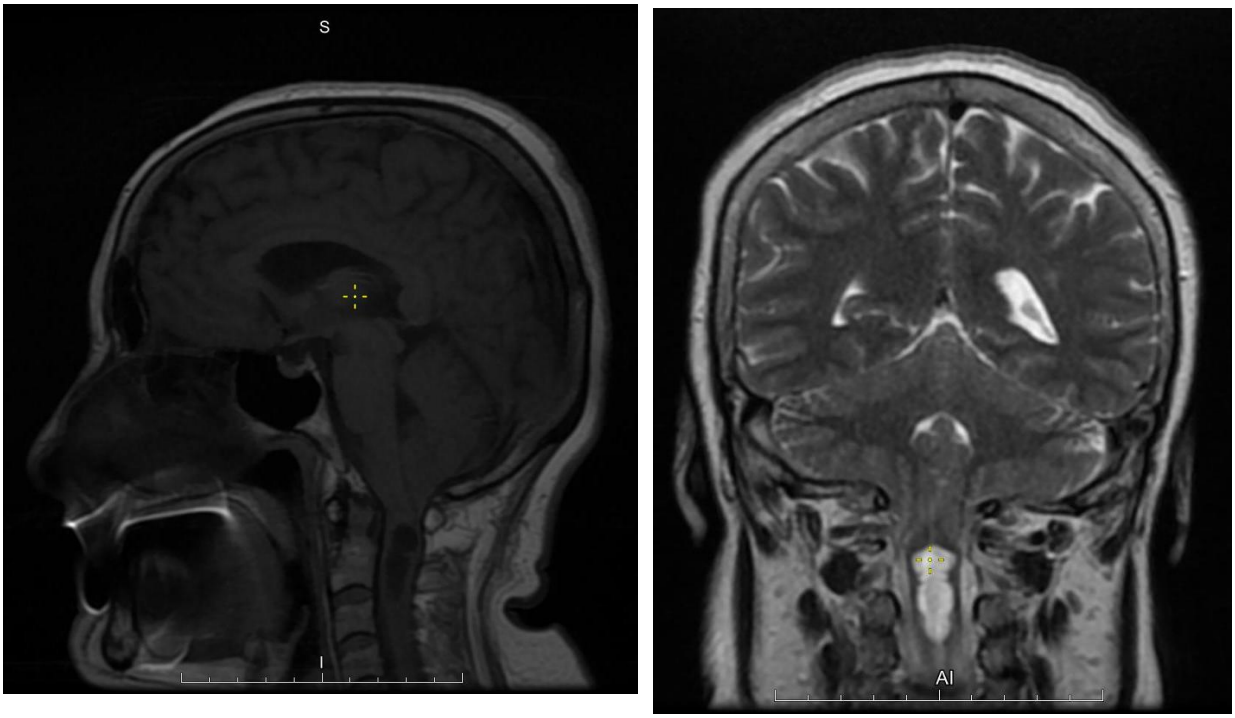
The main group consisted of 42 operated patients, 90 patients who received conservative therapy were included in the control group. Complaints and objective symptoms were quantitatively assessed using the clinical neurological symptomatology scale (Bindal AK, Stewart BD et al., 1995). The average score was 123.8±3.9 in the main group and 80.2±3.5 in the control group. The clinical picture of type I AC was represented by hypertensive-hydrocephalic (72.3%), bulbar-pyramidal (64.5%), cerebellar (76.7%), radicular (91.2%) syndromes, vertebrobasilar insufficiency syndrome (55.4%), syringomyelia syndrome (31.5%) and diencephalic syndrome (40.6%). In some patients, pain was a consequence of intracranial hypertension, while in the majority of patients (68.6%) it resulted from compression of the cranial and upper cervical nerve roots. Patients in the study group underwent surgery using a uniform technique, including resection trepanation of the posterior cranial fossa, dissection of scars and adhesions in the surgical area, subpial resection of two-thirds of the cerebellar tonsils, and plasty of the dura mater defect with a fragment of the occipital aponeurosis to reconstruct the cisterna magna.

Fig. 1. Congenital malformation of the brain and craniovertebral junction – Arnold-Chiari malformation type I. Intracranial hypertension. Basilar impression. Syringomyelia of spinal cord zones VC1-2-3-4.



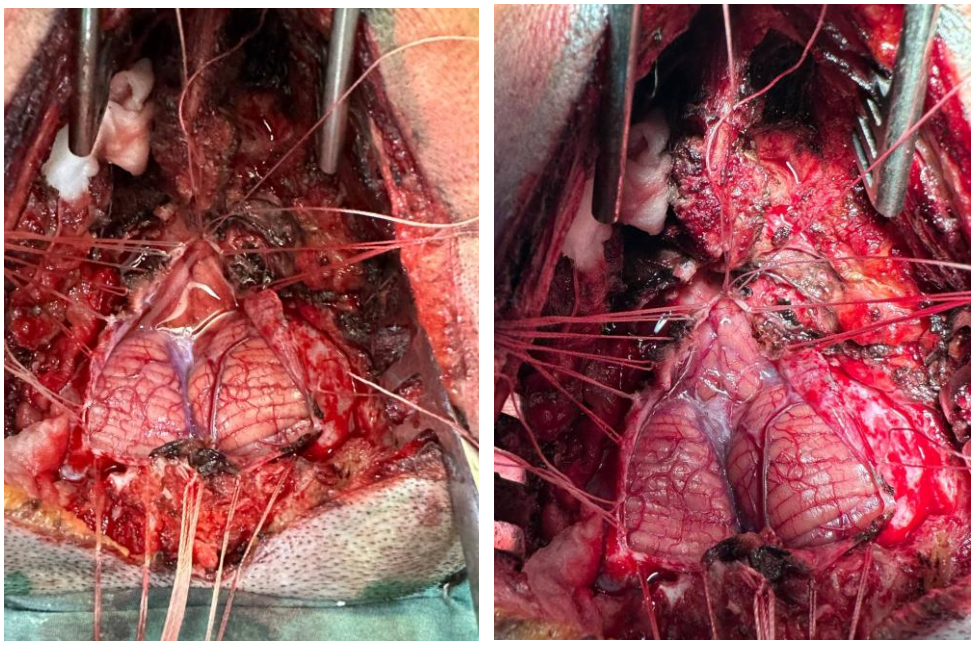
Results. Positive treatment results were achieved in all operated patients. After the operation, regression of intracranial hypertension manifestations, reduction of bulbar-pyramidal (59.2%), cerebellar (64.5%), radicular syndromes (63.7%), manifestations of syringomyelia (74.5%), vertebrobasilar insufficiency (38.6%) and diencephalic syndrome (34.9%) were noted. In the control group, the dynamics of the main syndromes were significantly worse. In the late period, the average score on the clinical neurological symptomatology scale decreased in the main group

to 38.1±3.6 points. In the conservative therapy group, positive dynamics was not noted; on the contrary, this indicator increased to 82.3±4.7 points. The Karnofsky index in the study group increased postoperatively from 58.7±2.7 points to 88.4±2.1 points. In the control group, the index remained unchanged. Work adaptation in the study group also showed positive dynamics compared to the control group.



Volume of the operation performed: Median method of decompressive-resection trepanation of the posterior cranial fossa, resection of the posterior arch of VC1, saccular autoplasty of the dura mater with the broad fascia of the thigh, osteodural decompression of the Arnold-Chiari malformation.

Figure 3. Intraoperative drawings



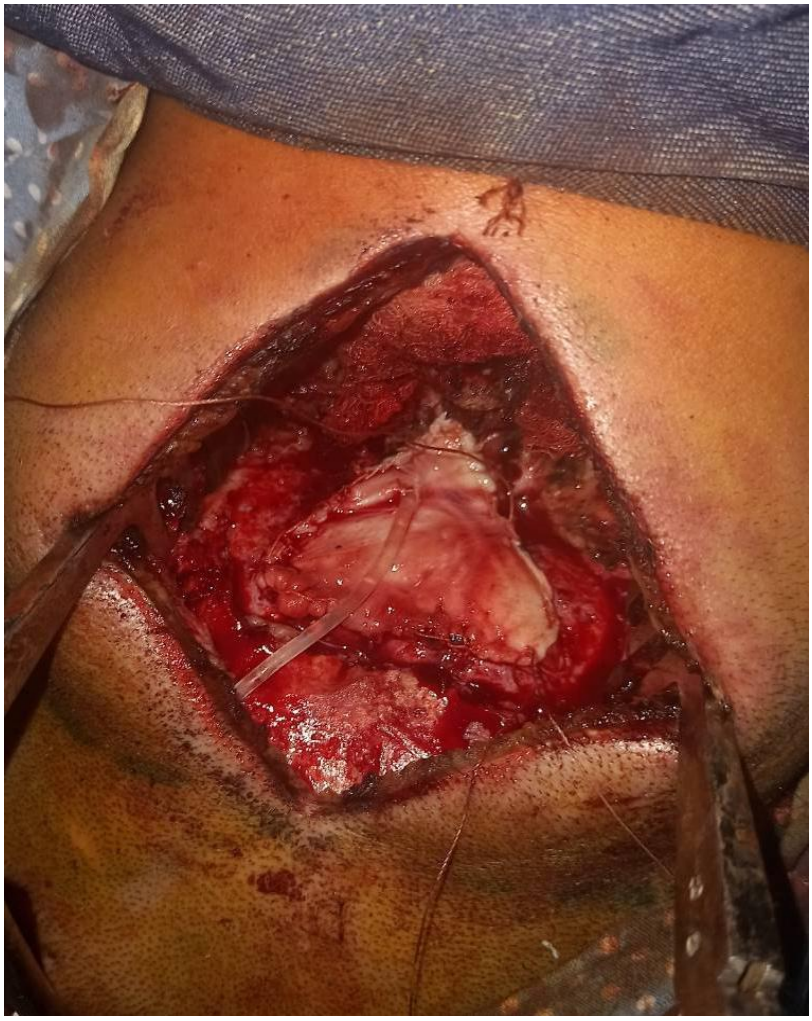
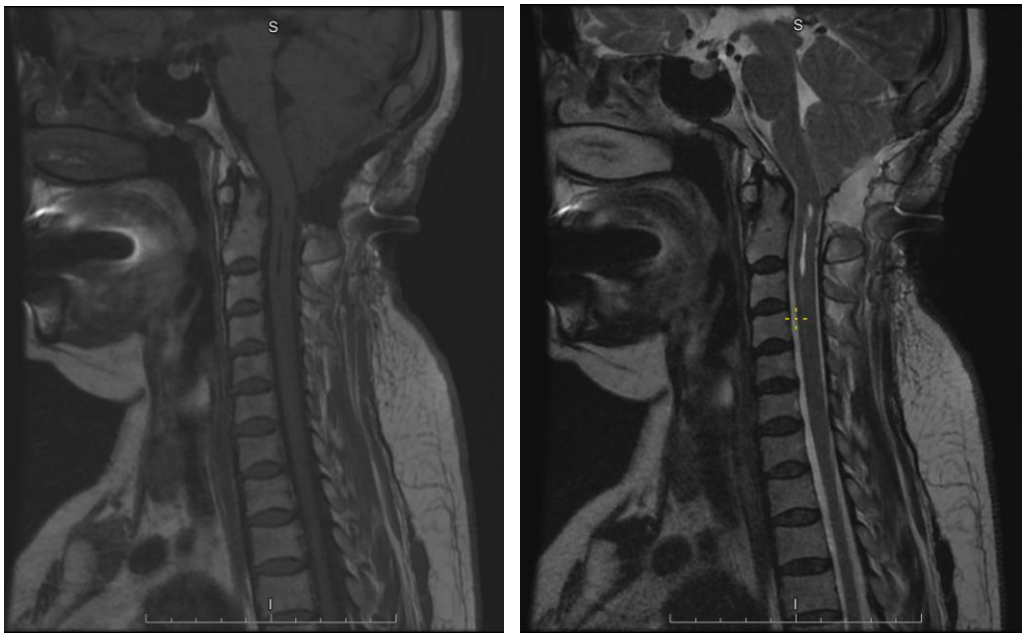


Figure 2. Postoperative MRI. Osteodural decompression was performed, and an artificial dura patch was used. Cerebellar ptosis was corrected. Syringomyelia regressed.



Conclusion: The data obtained indicate that the smaller the size of the PCF, the greater the degree of cerebellar tonsil dislocation, the larger the syringomyelic cyst, and the shorter the disease duration before surgical treatment, from the onset of the first symptoms to the full clinical picture. Surgical treatment of Chiari I malformation using this surgical technique

eliminates the main pathogenetic aspects of the anomaly, significantly reducing its neurological manifestations and improving the quality of life of patients.

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