

## 3D segmentation for neurosurgical preoperative planning: case series report

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### Abstract

**Background:** In Neurosurgery, 3D technology has emerged as a technique with the potential to provide detailed information on the three-dimensional orientation of objects within the surgical site before surgery. These models can be used for preoperative planning, such as finding the best cranial approach and avoiding eloquent areas of the brain. The aim of the study was to determine the impact of 3D technology on neurosurgery development.

**Material and methods:** Fused MRI and Angio-CT images of 6 patients, treated in the Institute of Neurology and Neurosurgery, with various cerebrovascular diseases were used. Their final images were used for picture reconstruction, 3D segmentation, which were eventually used for planning of the optimal surgical approach.

**Results:** A detailed technique for picture acquisition, 3D reconstruction and visualization of the clinical cases was reported. For 2 patients with brain tumors, the 3D models were exported in Virtual Reality environment to choose most optimal approach by avoiding eloquent areas. In other 2 patients with brain aneurysm, the 3D their cerebral vessels were printed to acquire its real sizes and most optimal clipping sizes and angles. For last 2 patients with skull defects, special molds were 3D printed for creating symmetrical implant, to avoid modeling them by hand.

**Conclusions:** The case series prove that using 3D technology in neurosurgical planning shortens the length of surgery, offers more flexible surgical approaches with less intra- and postoperative complications and serves as perfect environment for teaching younger neurosurgeons and residents advanced neurosurgical techniques.

**Key words:** 3D, segmentation, planning, neurosurgery.

## The evolution peculiarities of neural axis congenital malformations: clinical case

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### Abstract

**Background:** The development of malformation of the Central Nervous System and Spinal Neural Axis are some of the most common congenital malformations of the nervous system, usually with a progressive evolution and require a complex attitude in their management. The aim of the study was to present a clinical case of a patient diagnosed with an abnormality of CNS and of spinal neural axis, associated with active congenital hydrocephalus and spina bifida.

**Material and methods:** a girl with anomaly of CNS and of spinal neural axis, associated with active congenital hydrocephalus and spina bifida was admitted in the Hospital of Mother and Child Health Care in 2019.

**Results:** The malformations were not established during the intrauterine period at the ultrasonic examination. After birth a neurosonography and the cerebral CT determined the active advanced communicating hydrocephaly. Also, it was found spina bifida and erupted thoraco-lumbar meningo-radiculocystocel associated with deep paraparesis and sphincterian disorders. The spinal column radiography determined the absence of the vertebral arches, level L1 – S1. Because the hernia bag was broken with CSF eliminations, the patient was taken to be operated in two stages simultaneously, in 24 hours after birth. Under the ultrasonic guidance a ventriculo-peritoneal shunt was applied. The postoperative period followed without particularities with antibiotic therapy.

**Conclusions:** The use in complex of all diagnostic methods led to an adequate, optimal address of both development anomalies. The electroneurography, and the pre-, intra- and postoperative electromyography could be good methods of choice in the diagnosis and treatment of patients with spina bifida.

**Key words:** malformations, neural axis, neurosurgery, electroneurography.