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Application of 3D printing and hybrid reality surgical planning real-time navigation system in neurotumor surgery

Authors：Lv JianTao, LUO Lin
Institution：Department of Neurosurgery, Yunnan Cancer Hospital

Background &Objective
To construct a three-dimensional visual model of nerve tumor by using 3D technology, carry out surgical planning, and realize real-time monitoring combined with hybrid reality navigation system, so as to explore the application of 3D printing and hybrid reality surgical planning real-time navigation system in nerve tumor surgery.
Methods
This study collected 10 patients hospitalized in the Department of Neurosurgery of the Third Affiliated Hospital of Kunming Medical University from September 2018 to September 2020, aged 32-66 years, with an average age of 49.8 years, 6 males and 4 females. All patients were completed blood routine, liver and kidney function electrolyte, coagulation, abdominal ultrasound, chest X-ray, thin-layer CT plain scan and enhancement, Mr plain scan and enhancement and fiber bundle imaging before operation. According to the preoperative examination and evaluation, there were 6 cases of glioma, 2 cases of metastasis and 2 cases of meningioma. The patients were divided into experimental group and control group. In the experimental group, 3D printing and hybrid reality technology were used to reconstruct the skull model on the computer, perform operation planning, and navigate the operation in real time; The control group underwent routine surgical planning according to imaging examination. By comparing the bone flap size, operation time, intraoperative bleeding, postoperative neurological function and KPS score between the two groups, the application value of this technique in neurotumor surgery was evaluated.
Results
There were 3 cases of astrocytoma who II, 1 case of anaplastic astrocytoma who III, 2 cases of glioblastoma who IV, 2 cases of metastatic tumor and 2 cases of meningioma who I. The bone flap size, operation time and intraoperative bleeding in the experimental group were less than those in the control group, and the postoperative neurological protection and KPS score were higher than those in the control group. There was no significant difference in postoperative hospital stay and postoperative infection index between the two groups.
Conclusion
Using 3D technology to build a three-dimensional visualization model of the skull can accurately plan the operation from multiple dimensions such as tumor location and neurovascular proximity. Combined with the hybrid reality navigation system, it can realize real-time monitoring and guide the operation, reduce the size of bone flap, operation time and intraoperative blood output, increase the protection of nerve function and improve the safety of operation. It is worthy of clinical promotion.