Intraoperative contrast enhanced ultrasound (iCEUS)

Intraoperative Contrast enhanced ultrasound (CEUS) is a dynamic and continuous modality providing real-time view of vascularization and flow distribution patterns of different organs and tumors.

Seven patients with brain tumours of different histologic types were subjected to contrast-enhanced ultrasonography during surgery. Tissue differentiation with contrast agent was superior to conventional B-mode ultrasound imaging. Intraoperative contrast-enhanced ultrasonography enabled visualisation of cerebral tumours in high spatial resolution [1)].

The study of Prada et al.is the first large-scale implementation of iCEUS in neurosurgery as a dynamic and continuous real-time imaging tool for brain surgery and provides the first iCEUS characterization of different brain neoplasms. The ability of CEUS to highlight and characterize brain tumor will possibly provide the neurosurgeon with important information anytime during a surgical procedure [2)].

Glioma

Navigable 3D-US and ALA-induced fluorescence provide information regarding different aspects of tumor extent and combined together enhance the extent of resection. Fluorescence-guided resection may be sufficient for enhancing tumors, but nonenhancing tumors are better resected with navigable 3D-US [3)].

In an off-label setting in 69 patients undergoing surgery for cerebral glioma. An intraoperative qualitative analysis was performed comparing iCEUS with B-mode imaging. A postprocedural semiquantitative analysis was then performed for each case, according to EFSUMB criteria. Results were related to histopathology.

Prada et al. observed different CE patterns: LGG show a mild, dotted CE with diffuse appearance and slower, delayed arterial and venous phase. HGG have a high CE with a more nodular, nonhomogeneous appearance and fast perfusion patterns.

This study characterizes for the first time human brain glioma with CEUS, providing further insight regarding these tumors' biology. CEUS is a fast, safe, dynamic, real-time, and economic tool that might be helpful during surgery in differentiating malignant and benign gliomas and refining surgical strategy [4)].

Intraoperative contrast-enhanced ultrasound is quite useful for determining the position and border of tumors. And it is also excellent in detecting the residual tumor tissues post-operatively. And it can improve the resection accuracy and operative precision, especially for Grade IV glioma with internal necrosis, cyst and surrounding brain edema [5)].

Arteriovenous malformation

In a limited group of patients with AVMs, contrast-enhanced intraoperative Doppler sonography was a less sensitive but useful and simple method for the detection of AVMs in contrast to angiography. No specific untoward effects were attributed to the use of “SonoVue” as a contrast-enhancing substance [6)].

Head trauma

Contrast-enhanced ultrasonography has potential for the intraoperative and bedside assessment of cerebral perfusion in patients with TBI. The technique may be appropriate for evaluating responses to therapies aimed at preventing secondary ischemia and for assessing regional perfusion abnormalities [7]

1)

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2)

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4)

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5)

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7)

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