

Evolution Of Intraoperative Ultrasound In Neuro-Oncology

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Intraoperative US has been one of the earliest adjuncts introduced into the neurosurgical operating room. 2DUS (real-time, gray scale imaging) was the commonest mode of use. Initial efforts and attention were focused on understanding normal and pathological features using this form of imaging. As confidence and experience accumulated efforts shifted towards objectively assessing tumor delineation and comparative examinations with other imaging modalities (CT and MR). Suboptimal image resolution and lack of orientation, continued to hamper the effective use of IOUS as a reliable intraoperative guide, especially as rapid strides in CT and MR imaging provided a much more useful alternative. With focused efforts on improving transducer features, superior image resolution is now possible. Further, combination with navigation technology has provided a very powerful real-time imaging tool especially during tumor and vascular neurosurgery. Features like navigated US (especially 3D) and coregistered multimodal (US-MR) image navigation have greatly eased image orientation and allowed rapid traversing of the learning curve in the use of IOUS. The maximum impact of IOUS has probably been felt in the realm of tumor surgery. Use of IOUS has shown to improve tumor delineation (particularly gliomas – both low- and high-grade), allow more complete and radical resections and thereby improve outcomes. Besides, use of complementary US modalities like Power Doppler and Color flow imaging have shown to be very useful in vascular surgery. Further, the scope of application of IOUS is limited only by its ability to insonate the object of interest (tumor, vessels, cyst, ventricles, etc). Considering the ease of use, widespread accessibility and low-cost nature, IOUS can be a potentially useful adjunct during a range of neurosurgical procedures. This talk follows the evolution of IOUS as an intraoperative adjunct and its current state of use in contemporary neurosurgical practice.