

Ultrasound & Neuronavigation in-one - a more superior option in tumour surgery?

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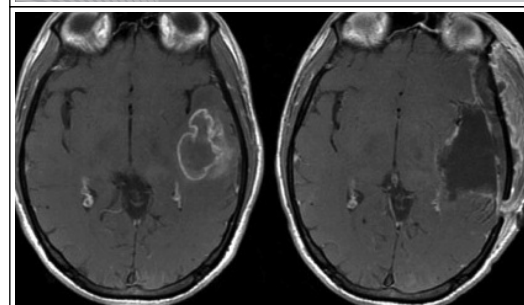
Introduction

Sonowand is a neuronavigation console with real-time 3D intra-operative ultrasound. We have studied the volume of tumour resected in patients with high grade glioma using this operative aid and the survival time of the patients.



Methods

We have used the sonowand extensively within our unit for high-grade tumour resection, amongst many other tumour types. A pre-operative and post-operative MRI was obtained on 20 patients operated with the aid of Sonowand Vs 20 patients operated with an alternative standard neuronavigation module without ultrasound integration. These images were placed into a specialised program that allows for calculation of tumour volume resection based on the contrast volume seen pre and post operatively.

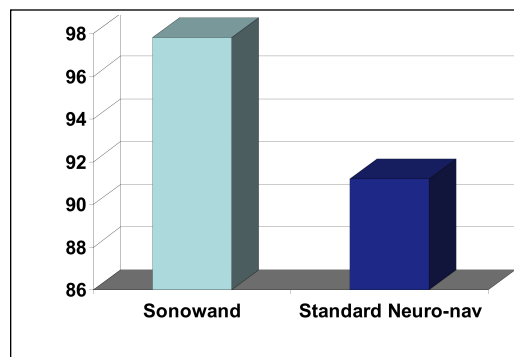


Pre and post operative MRI (T1 with Gadolinium) of one of the sonowand group patients.

Results

The groups were matched for age, sex & histology. In our data, we found that when pre and post operative volumes were examined for both groups, the sonowand group had better, more complete volume resections than the group operated with standard neuronavigation (97.8% Vs 91.6%) and this was significant ($p=0.034$). There was no significant difference in operative times or complication rates, although there were significantly less permanent neurological deficits with the Sonowand group (1 Vs 4). This is thought to be due to the angio-doppler real-time facility to visualise vessels with the sonowand as demonstrated in the images in columns 1 and 2. There is also the ability to allow for visualisation of any brain shift.

Graph - Resection volume %



Conclusions

The use of neuronavigation has proved invaluable over the last decade in Neurosurgery and intra-operative ultrasound is increasingly proving fashionable too. Intra-operative ultrasound is a very useful adjunct in neuro-oncological surgery, moreso in this case with the use of the Sonowand module as it is optimised with the integration of neuronavigation and provides the ability to up-date the 'road-map' intra-operatively. We have shown through volumetric MRI analysis that you can achieve better resection volumes which may lead to increased survival time. There is however a learning curve to acquire operator experience with ultrasound. Also image quality may also be degraded by blood in the cavity; and slightly larger craniotomies maybe required to allow for probe size.

Learning Objectives

- 1) appreciate the use of intra-operative ultrasound and compare its usefulness to other aids such as intra-op MRI.
- 2) More extensive high-grade tumour resection allows for increased life-span.

References

1. Rasmussen IA et al. Functional neuronavigation with intra-operative 3D ultrasound: Initial experiences during surgical resections close to eloquent brain areas and future directions in automatic brain shift compensation. Acta Neurochir (Wien) 149:365-378. (2007).
2. Unsgaard G, et al. Ability of navigated 3D ultrasound to delineate gliomas and metastases - comparison of image interpretations with histopathology. Acta Neurochir (Wien). (2005)

