Intraoperative stimulation mapping (ISM)

Intraoperative mapping and neuromonitoring is an established technique to maximise tumor resection while minimising the risk of inducing permanent postoperative deficit. However, very little is known on how many patients require brain mapping within a general adult neurooncology service of the King's College Hospital. A prospective study of all neuro-oncology patients operated over a 12 months' period (January-December 2017) was performed. All patients were seen in a dedicated neuro-oncology pre-assessment clinic after discussion in a neuro-oncology multidisciplinary team meeting. Inclusion criteria for brain mapping were age more than 18, performance status less than 2, tumour location in an eloquent area. Age, sex, histology, surgical technique, extent of resection and operative complications were analysed. Two hundred thirty-five craniotomies were performed in the study period. Intraoperative mapping was used for 57 (24%) cases. There were 22 females and 35 males; median age was 52 years (22-73).17 (30%) patients were operated awake for speech and 40 (70%) asleep for motor mapping. One hundred fifteen patients had a diagnosis of glioma; of these, 48 (42%) were operated with intraoperative mapping. Age (48.92 ± 2.18versus 58.43 ± 1.63, $p = 0.001$) and WHO grading were significantly lower in the mapping group and the extent of resection was significantly higher (GTR-81.25% versus 37.3%, $p < .001$). Within the mapping group, the awake subgroup had a better performance status ($p = 0.039$), less glioblastomas as histological diagnosis ($p < 0.05$) and an increased proportion of tumours in both temporal and insular locations ($p < 0.05$). Intraoperative mapping was employed in almost one quarter of our general adult neuro-oncology population. Four in 10 gliomas were operated with intraoperative mapping. This percentage reflects the need for specialised training in brain mapping and budget allocation within the neuro-oncology department [1)].

Costs

Despite the growing use of intraoperative electrical stimulation (IES) mapping for resection of WHO grade II gliomas (GIIG) located within eloquent areas, some authors claim that this is a complex, time-consuming and expensive approach, and not well tolerated by patients, so they rely on other mapping techniques. Here we analyze the health related quality of life, direct and indirect costs of surgeries with and without intraoperative electrical stimulation (IES) mapping for resection of GIIG within eloquent areas. METHODS: A cohort of 11 subjects with GIIG within eloquent areas who had IES while awake (group A) was matched by tumor side and location to a cohort of 11 subjects who had general anesthesia without IES (group B). Direct and indirect costs (measured as loss of labor productivity) and utility (measured in quality adjusted life years, QALYs), were compared between groups. RESULTS: Total mean direct costs per patient were $38,662.70 (range $19,950.70 to $61,626.40) in group A, and $32,116.10 (range $22,764.50 to $46,222.50) in group B ($p = 0.279$). Total mean indirect costs per patient were $10,640.10 (range $3,010.10 to $86,940.70) in group A, and $48,804.70 (range $3,340.10 to $98,400.60) in group B ($p = 0.035$). Mean costs per QALY were $12,222.30 (range $3,801.10 to $47,422.90) in group A, and $31,927.10 (range $6,642.90 to $64,196.50) in group B ($p = 0.023$). CONCLUSIONS: Asleep-awake-asleep craniotomies with IES are associated with an increase in direct costs. However, these initial expenses are ultimately offset by medium and long-term costs averted from a decrease in morbidity and preservation of the patient's professional life. The present study emphasizes the importance to switch to an aggressive and safer surgical strategy in GIIG within eloquent areas [2)].

Indications

see Intraoperative stimulation mapping indications.

Case series

Intraoperative stimulation mapping case series.

Metaanalysis

Intraoperative Stimulation Mapping Metaanalysis.

References

1)
Giamouriadis A, Lavrador JP, Bhangoo R, Ashkan K, Vergani F. How many patients require brain mapping in an adult neuro-oncology service? Neurosurg Rev. 2019 May 19. doi: 10.1007/s10143-019-01112-5. [Epub ahead of print] PubMed PMID: 31104183.
2)
Martino J, Gomez E, Bilbao JL, Dueñas JC, Vázquez-Barquero A. Cost-utility of maximal safe resection of WHO grade II gliomas within eloquent areas. Acta Neurochir (Wien). 2013 Jan;155(1):41-50. doi: 10.1007/s00701-012-1541-8. PubMed PMID: 23132374.