Awake Versus Asleep Craniotomy for Brain Tumor Surgery: a Systematic Review and Meta-Analysis

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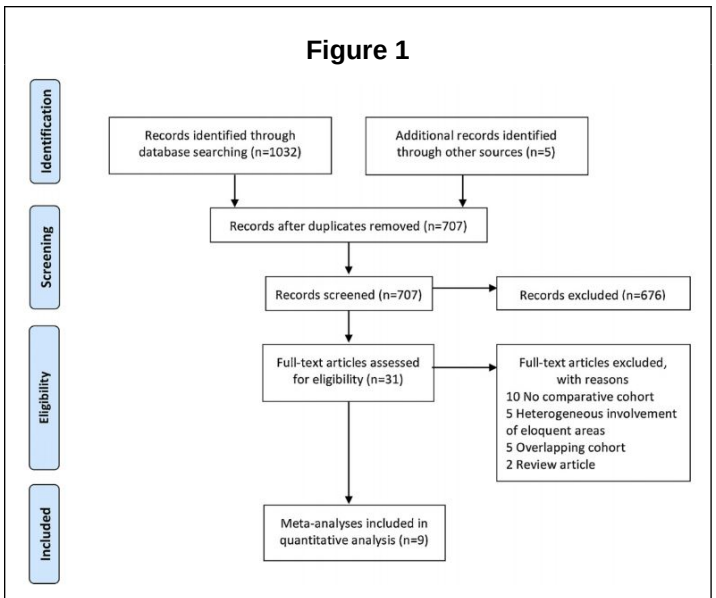
Introduction

Surgical resection of intracerebral tumor can be achieved under general anesthesia (GA) or awake anesthesia (AA). The appeal of AA is that it facilitates intraoperative identification and avoidance of eloquent areas, thus preventing potential functional compromise. The aim of this meta-analysis was to compare the clinical outcomes of intracerebral tumor resection with AA versus GA.

Methods

Searches of seven electronic databases from inception to December 2017 were conducted following Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA) guidelines (Figure 1). There were 1037 articles identified for screening. Data were extracted and analyzed using meta-analysis of proportions.

Figure 1



PRISMA guidelines search strategy

Figure 2

Meta-analysis results of all outcomes. AA, awake anesthesia; GA, general anesthesia; MD, mean difference; OR, odds ratio; CI, confidence interval; KPS, Karnofsky Performance Score.

		Meta-analysis					Pooled mean/incidence	
Outcome	Studies	Summary statistic	Statistic Value[b]	95% CI	I^2 (%)	P	AA	GA
Intraoperative								
Blood loss (mL)	3	MD	110.27	−39.24, 253.49	80	0.13	493.2	309.8
Operation time (mins)	6	MD	22.85	−15.80, 61.50	96	0.25	226.6	230.0
Intraoperative seizures	4	OR	1.29	0.43, 3.86	5	0.65	6/123(5%)	5/135 (4%)
Resection								
Extent of resection (%)	6	MD	7.28	−8.65, 23.22	94	0.37	83.2	78.6
Gross total resection	6	OR	1.79	0.64, 5.02	64	0.27	60/125 (48%)	39/113 (35%)
Postoperative								
Complications	5	OR	0.55	0.20, 1.54	57	0.26	21/141 (15%)	35/156 (22%)
Nausea and vomiting	4	OR	0.15	0.06, 0.35	0	< 0.001[a]	7/121 (6%)	37/136 (27%)
Length of stay (days)	6	MD	−2.40	−4.42, -0.39	82	0.02[a]	5.2	9.0
Follow-up KPS	3	MD	9.31	−6.23, 24.48	94	0.24	89.4	82.4
Neurological								
Worse overall status, short-term[c]	4	OR	0.98	0.20, 4.75	79	0.98	37/81 (46%)	39/86 (45%)
Worse overall status, long-term[c]	6	OR	0.55	0.19, 1.59	60	0.27	28/123 (23%)	35/112 (31%)
Motor deficits, transient	3	OR	2.31	0.97, 5.51	24	0.06	21/73 (29%)	14/78 (18%)
Motor deficits, permanent	4	OR	0.55	0.27, 1.13	7	0.10	13/195 (7%)	21/178 (12%)
Language deficits, transient	3	OR	0.83	0.21, 3.25	0	0.79	3/73 (4%)	4/78 (5%)
Language deficits, permanent	3	OR	1.24	0.43, 3.58	5	0.69	8/73 (11%)	7/78 (9%)

[a] Statistically significant.
[b] AA vs GA, where GA is reference cohort.
[c] Short-term was < 1 week, long-term was > 3 months.

Outcomes of the meta-analysis

Results

A total of 14 comparative studies were included for analysis. Compared to GA, resection performed under AA demonstrated significantly lower incidence of postoperative nausea and vomiting (PONV, OR, 0.17; 95% CI, 0.09 to 0.33; p<0.001; I2=0%) and shorter length of stay (LOS, MD, -1.76 days; 95% CI, -3.24 to -0.27 days; p=0.02; I2=95%). In terms of operative outcomes, resection outcomes, complications, and short- and long-term deficits, there was no statistically significant trend in favor of either approach.

Conclusions

AA is a feasible approach to resect intracerebral tumors. All reported clinical outcomes under AA were non-inferior, at the least, when compared to those performed under GA. Future studies that are larger, prospective, randomized, and include quality of life metrics will be helpful to delineate the role of AA in the management of patients with brain tumors.

Learning Objectives

After this presentation, participants will be able to:

1. Describe evidence supporting awake anesthetic option for cranial neurosurgery

2. Understand the biases inherent in a meta-analysis