Assessment of Cost Drivers for Open Microsurgery or Stereotactic Radiosurgery for Intracranial Meningiomas

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Introduction

Understanding the costs of open surgical or radiosurgical treatment of intracranial meningioma, can be potentially performed using the Value Driven Outcome (VDO) database, which identifies true care cost over time.

Methods

We retrospectively performed a cohort study of cost drivers and clinical characteristics patients undergoing microsurgical or radiosurgical treatment of intracranial meningiomas from July 2011 to April 2017.

Results

Of the 268 intracranial meningiomas treated, 198 were managed microsurgically and 70 with stereotactic radiosurgery (SRS). While no difference in patient age (p=0.2) or size (p=0.07) was observed, there were differences in tumor location (p=0.0001) and gender (p=0.03) suggesting different indications between open surgery and SRS. Facility costs were the most significant contributor to the total costs in the microsurgical group (59.7%), whereas imaging costs were the most significant contributor to the costs in the SRS group (98.2%). Multivariate analysis for the open surgical group showed that LOS and maximal tumor size contributed significantly to the total costs, whereas age was a significant cost contributor to the total costs for radiosurgery group (p<0.05).

Conclusions

Facility utilization and imaging costs constitute the majority of total costs in intracranial meningioma treatment strategies. Protocols to reduce facility and imaging costs should be

Table 1: Open surgery and radiosurgery for the treatment of meningiomas

Variable	Open Surgery N=198	Radiosurgery N=70
Age (years)	53.9±14.7	57.0±15.3
Sex (male)	60 (30.3%)	31 (44.3%)
ASA		
1. Healthy	3 (1.5%)	N/A
2. Mild	81 (40.9%)	
3. Severe	100 (50.5%)	
4. Incapacitating	12 (6.0%)	
Missing	2 (1.0%)	
LOS (days)	5.1±4.6	1.0
Discharge disposition		
Home/self-care	138 (70.0%)	69 (98.6%)
Home health	8 (4.0%)	0 (0.0%)
SNF	4 (2.0%)	0 (0.0%)
Acute rehab	45 (22.7%)	0 (0.0%)
Other facility	0 (0.0%)	1 (1.4%)
Death	3 (1.5%)	0 (0.0%)
Tumor side		
None	22 (11.1%)	4 (6.1%)
Midline	77 (38.9%)	30 (45.5%)
Left	88 (44.4%)	30 (45.5%)
Right	8 (4.0%)	0 (0.0%)
Multiple	1 (0.5%)	2 (3.0%)
Unknown	2 (1.0%)	4 (5.7%)
Tumor location	n = 198	n = 66
Cavernous sinus	1 (0.5%)	3 (4.3%)
Clinoidal	3 (1.5%)	0 (0.0%)
Convexity	84 (42.4%)	18 (25.7%)
CPA	7 (3.5%)	16 (22.9%)
Foramen magnum	1 (0.5%)	0 (0.0%)
Multiple	9 (4.5%)	2 (2.9%)
Olfactory groove	4 (2.0%)	1 (1.4%)
Parafalcine	53 (26.8%)	12 (17.1%)
Petroclival	4 (2.0%)	1 (1.4%)
Pineal	2 (1.0%)	0 (0.0%)
Planum sphenoidale	2 (1.0%)	0 (0.0%)
Posterior fossa	8 (4.0%)	4 (5.7%)
Sphenoid wing	10 (5.1%)	6 (8.6%)
Suprasellar	1 (0.5%)	0 (0.0%)
Tentorial	8 (4.0%)	0 (0.0%)
Ventricular	1 (0.5%)	3 (4.3%)
Maximum tumor size (cm)	3.6±1.8	3.1±1.8

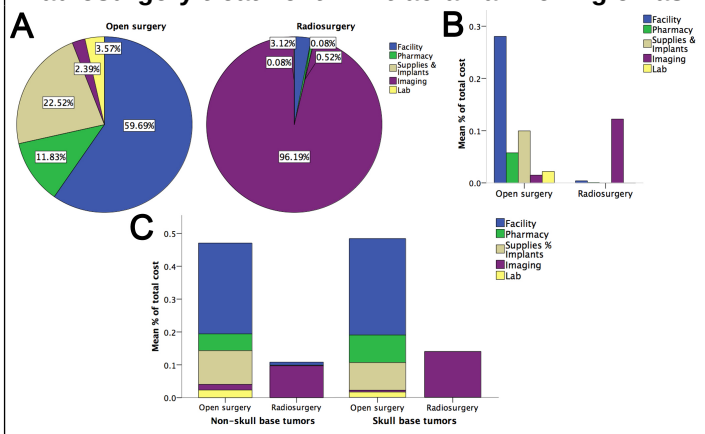
LOS, length of stay; SNF, skilled nursing facility; CPA, cerebellopontine angle

Table 2: Univariable and multivariate analysis of cost contributors in the treatment of meningiomas for open surgery

Variable	Univariable		Multivariate	
	Standardized β	P-value	Standardized β	P-value
Age	-0.052	0.5		
Sex (male)	0.07	0.3		
ASA status	0.3	0.0001	0.02	0.67
LOS	0.8	0.0001	0.8	**0.0001**
Discharge disposition	0.5	0.0001	0.02	0.6
Maximal tumor size	0.3	0.0001	0.1	**0.01**
Skull base lesion	0.02	0.8		

ASA, American Society of Anesthesiologists; LOS, length of stay
Boldface font indicates significant values.

Figure 1: Cost distribution for microsurgery and radiosurgery treatment in intracranial meningiomas



A) Subtotal cost breakdown is shown. B) The mean % of total cost is presented showing higher average costs for microsurgery. C) Comparison of non-skull base and skull base tumor costs is performed.

Conclusions

- The overall differences in cost distributions showed that facility costs were predominant cost driver in the open microsurgical group (59.7%), followed by supplies and implants (22.5%), pharmacy (11.8%), laboratory (3.6%), and imaging (2.4%).
- For the SRS group, imaging costs were the major cost driver (96.2%), followed by facility costs (3.1%), while supplies and implants, pharmacy, and laboratory costs collectively contributed to only 0.7% of the total costs.

Table 3: Univariable and multivariate analysis of cost contributors in the treatment of meningiomas for radiosurgery

Variable	Univariable		Multivariate	
	Standardized β	P-value	Standardized β	P-value
Age	**-0.6**	**0.001**	**-0.6**	**0.003**
Sex (male)	0.08	0.7		
Discharge disposition	-0.009	0.97		
Maximal tumor size	-0.2	0.4		
Skull base lesion	0.4	0.08	0.3	0.2