

Table S1. Reliability analysis for tumour volumes at diagnosis. Intra- and Inter-rater ICC values are included and demonstrate agreeability between independent researchers. 95% confidence intervals for the values are included.

Inter- and Intra-rater Reliability Analysis		
	Correlation Coefficient	95% Confidence Interval
Inter-Class	0.93	0.86-0.97
Intra-Class	0.97	0.93-0.98

Table S2. Definitions of Landriel-Ibañez classification of post-neurosurgical complications [14].

Landriel-Ibañez Classification Grades	
Grade 1	Non-life-threatening deviation from normal post-op course, not requiring invasive treatment
Grade 1a	Complication requiring no drug treatment
Grade 1b	Complication requiring drug treatment
Grade 2	Complication requiring invasive treatment such as surgical, endoscopic, or endovascular interventions
Grade 2a	Complication requiring intervention without general anaesthesia (Local anaesthetic)
Grade 2b	Complication requiring intervention with general anaesthetic
Grade 3	Life-threatening complications requiring management in ICU
Grade 3a	Complication involving single organ failure
Grade 3b	Complication involving multiple organ failure
Grade 4	Complication resulting in death

Table S3. Definitions of Clavien-Dindo classification of post-surgical complications [15].

Clavien-Dindo Classification	
Grade 1	Any deviation from the normal postoperative course without the need for pharmacological treatment or surgical, endoscopic, and radiological interventions Allowed therapeutic regimens are: drugs as antiemetics, antipyretics, analgesics, diuretics, electrolytes, and physiotherapy. This grade also includes wound infections opened at the bedside
Grade 2	Requiring pharmacological treatment with drugs other than such allowed for grade I complications Blood transfusions and total parenteral nutrition are also included
Grade 3	Requiring surgical, endoscopic or radiological intervention
Grade 3a	Intervention not under general anaesthesia
Grade 3b	Intervention under general anaesthesia
Grade 4	Life-threatening complication (including CNS complications) requiring IC/ICU management
Grade 4a	Single organ dysfunction (including dialysis)
Grade 4b	Multiorgan dysfunction
Grade 5	Death of a patient

Table S4. Showing univariate and multivariate analysis steps. Values highlighted in green are ≤ 0.2 for univariate, or ≤ 0.05 for multivariate analysis. ‡ Continuous variable. † Binary variable, reference category for these variables is always no. • Where multiple categories exist for a variable the lowest P value within the set has been included.

Variable Name (Reference Category)	Univariate P Value (≤ 0.2)	Multivariate P Value (≤ 0.05)
Age at Re-Operation‡	0.606	
Sex (Female)	0.902	
Radiation Induced Meningioma†	0.999	
ACCI at Diagnosis (ACCI 0)	0.691•	
ICOM Classification (Convexity)	0.325•	
Skull Base†	0.629	
Oedema†	0.341	
Hyperintensity†	0.703	
Tumour Volume at Presentation‡	0.971	
Simpson Grade at Initial Operation (Grade 1)	0.337•	
Residual Tumour Volume at Initial Operation‡	0.873	
WHO Grade at Initial Operation (Grade 1)	0.228•	
Worsened Performance Status Following Initial Operation†	0.999	
Adjuvant Radiation After Initial Operation†	0.999	
Post-Operative Complication after Initial Operation†	0.445	
Pre-Operative Performance Status at Re-Operation (Performance Status 0)	0.999•	
Simpson Grade at Re-Operation (Grade 1)	0.487•	
Adjuvant Radiation After Re-Operation†	0.309	
WHO Grade at Re-Operation (Grade 1)	0.847•	
Number of Complications After Re-Operation‡	0.013	0.029
Time to First Recurrence‡	0.022	0.044
Volume at First Recurrence‡	0.475	
Incidental at First Recurrence†	0.343	
Headache at First Recurrence†	0.200	0.437
Seizure at First Recurrence†	1.0	
Limb Weakness at First Recurrence†	1.0	
Limb Sensory Change at First Recurrence†	0.554	
Cranial Nerve Deficit at First Recurrence†	0.707	
Cognitive Deficit at First Recurrence†	1.0	
Psychiatric Manifestation at First Recurrence †	1.0	