Retrospective Study of Long-Term Tumor Control & Quality of Life in Low-Grade Glioma Patients Treated with Gamma Knife Radiosurgery

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1 BACKGROUND & OBJECTIVES

LGGs (WHO Grades I-II) account for 17-22% of primary brain tumors, with >70% risk of malignant transformation within a decade.

Aim: Assess GKRS efficacy as *first-line* treatment for LGGs and impact on QoL using KPS.

- Standard therapy: surgery → RT/chemo | SRS: tumor control, prevent malignant transformation
- Prior studies used SRS as adjuvant; **limited first-line data**

2 METHODOLOGY

Inclusion: Biopsy-proven LGG; GKRS as **primary treatment** (no prior surgery/RT/chemo)

Technique: Leksell Gamma Knife Icon (Elekta, 2023) | 1.5T MRI, 1mm T1±contrast, T2, FLAIR

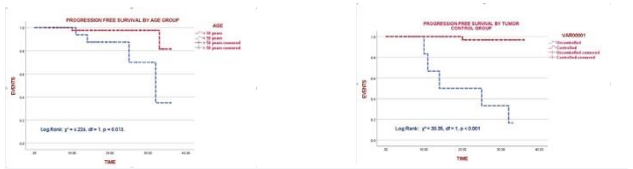
- **Planning:** GammaPlan® software; individualized dose | **Immobilization:** Thermoplastic mask

Follow-up: MRI q3mo → q6mo (Yr 2) → Annually | Clinical: KPS, symptoms, toxicity

3 PATIENT CHARACTERISTICS

36.5	63%
Mean Age (yr)	Male
93	**13**
Total Lesions	Multifocal

Histopathology	n	%
Astrocytoma Grade II	57	61.%
Pilocytic Astrocytoma	13	16.3%
Oligodendroglioma Gr II	13	16.3%
Diffuse Astrocytoma	10	12.5%
Total Treated Lesions	93	100%



Progression-Free Survival (PFS) by Age Group

4 TUMOR RESPONSE & VOLUME

Volume Change

- Decreased: **72.5%** (58/80) | Stable: 20% | Increased: 7.5%

Volume Data (cm^3)

- Pre-GKRS: 35.31 ± 25.66 cm^3 (range 0.15-126.9)
- Post-GKRS: 14.59 ± 20.72 cm^3 (range 0.0-84.6)
- Mean Δ: **-20.28 cm^3**
- Max Dose: 47.8 Gy (14-62)

$t_{79} = 6.591$, $p < 0.001$, $d = 0.737$

5 CLINICAL & FUNCTIONAL OUTCOMES

78.8%	11.3%	7.5%	2.5%
Improved	Stable	Worsened	Deaths

Symptom Response: Controlled 33 (41.3%) | Controlled+meds 12 (15%) | Fits controlled+recovery 9 (11.3%) | Static 9 (11.3%) | Resolved 3 (3.8%)

Quality of Life (KPS):

Post-GKRS KPS: Improved 22.2% | Stable 66.7% | Worsened 7.4%

Category	n (%)
Controlled symptoms	33 (41.3%)
Controlled with medication	12 (15.0%)
Static symptoms	9 (11.3%)

6 SURVIVAL OUTCOMES

Overall Survival

98.8%	97.5%
1-Year OS	2-Year OS

Progression-Free Survival

34.9	29.7
mo (<50 yr)	mo (≥50 yr)

Age < 50 yr: **93.3%** OS at 14-25 mo

Age ≥ 50 yr: **74.7%** OS at 14-25 mo

Log-rank $\chi^2 = 5.78$, $p = 0.016$

Median PFS: **32.0 months**

Tumor control strongly associated with improved PFS & OS:

PFS: $\chi^2 = 42.26$, $p < 0.001$ | OS: $\chi^2 = 17.12$, $p < 0.001$

7 PREDICTIVE FACTORS (COX)

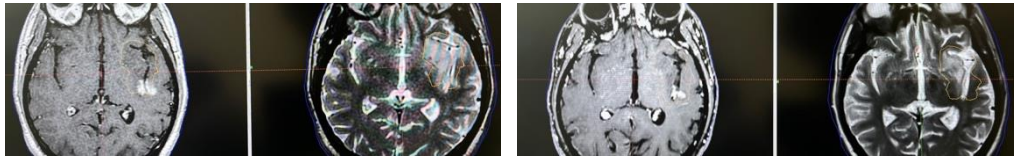
Factor	HR	95% CI	p-value
Multifocal tumors	3.32	1.10-9.98	0.034
Single focal tumors	0.175	0.035-0.874	0.034
Dose ~50 Gy	1.36	0.94-1.98	0.106 (trend)

Dose removal significantly reduced model fit ($\chi^2 = 4.65$, $p = 0.031$).

Key Associations: Tumor control associated with **age** ($\chi^2 = 7.995$, $p = 0.005$) | **Gender** not associated ($p = 0.877$) | **Dose** not different between groups ($p = 0.382$)

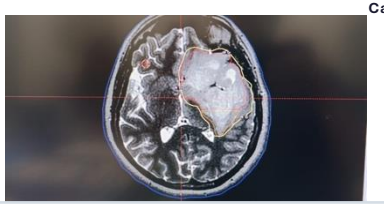
8 REPRESENTATIVE CASES

Case 1: Astrocytoma Grade II

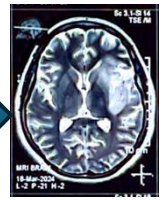


PREGKRS — One year POST GKRS

Case 4: Astrocytoma Grade II



One year post GK →



9 LIMITATIONS

- Single-center **retrospective** design
- Relatively **small sample** size (n=80)
- Subject to **selection bias** and treatment bias
- Mean follow-up **22 months** — longer follow-up needed

CONCLUSION

GKRS is an effective **primary treatment** for LGGs, achieving:

- High tumor control (**72.5%**) with significant volume reduction
- Excellent survival (**97.5%** 2-year OS, **100%** at 3 years)
- Marked clinical improvement (**78.8%**) and QoL preservation
- Superior outcomes in **younger patients** (<50 yr)

Tumor control and age are key predictors of PFS and OS.

GKRS represents a safe, **minimally invasive** therapeutic option for selected LGG

References: Ostrom et al. CBTRUS 2014; Gagliardi et al. World Neurosurg 2017; Kida et al. J Neurosurg 2000; Hadjipanayis et al. Stereotact Funct Neurosurg 2002; Simonova et al. J Neurosurg Pediatr 2016 | SPSS v26.0 | ISRS 2026, Sydney, 31 May - 3 June

E-POSTER