

## 5-ALA Fluorescence, Neuromonitoring and Intraoperative Image Guidance for Surgical Treatment of Glioblastoma in Elderly Population: State of Art or Overtreatment?

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### Introduction

The role of surgery in the management of glioblastoma patients aging > 65 years is controversial. This study describes our institutional experience in treating glioblastomas in elderly population, highlighting the impact of 5-aminolevulinic acid (5-ALA) guidance and of supportive intraoperative tools (neuromonitoring, intra-operative CT) on surgical and clinical results.

### Methods

52 patients (29 males, 23 females, mean age 72, range 65-83) suffering from glioblastoma and aging over 65 year old have been included in this study. 31 patients (Group A) underwent 5-ALA fluorescence guided surgical resection; intraoperative CT scan and electrophysiological mapping of eloquent areas were also used in selected cases. An historical cohort of 21 patients (Group B) surgically treated before the introduction of 5-ALA at our Institution with conventional microneurosurgery and neuronavigation were used as control group. Pre- and post-operative Karnofsky performance score (KPS), Temozolomyde cycles, Radiotherapy doses and extent of tumor resection (EOTR) were measured in both groups.

### Results

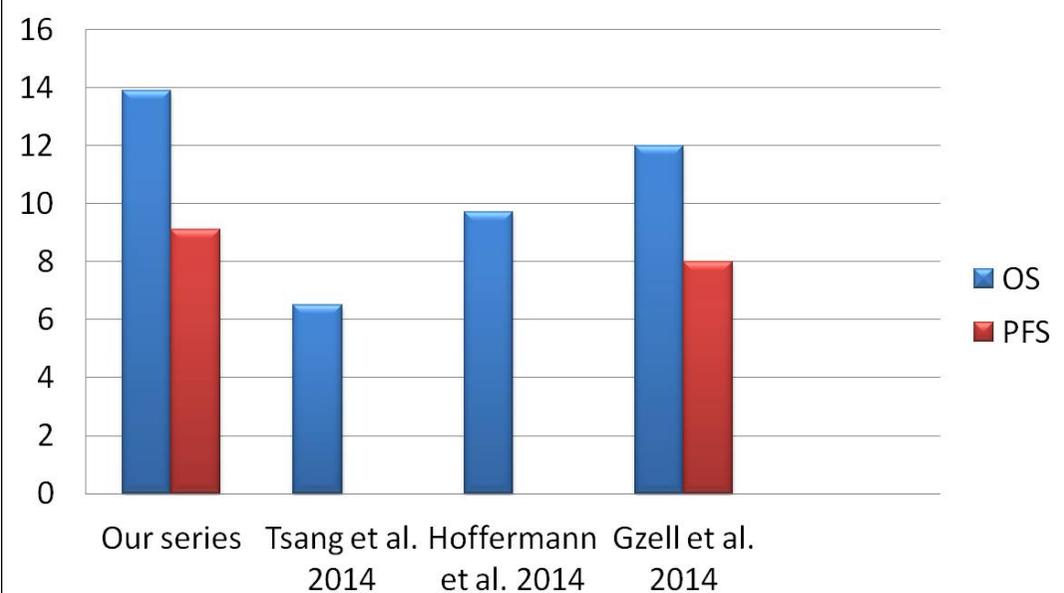
Mean KPS varied from 69.67 to 70.69 and from 58 to 63, mean temozolomyde cycles were 7.03 and 6, mean radiotherapy doses 52.51 and 57.0 in Group A and B respectively. Gross total resection has been achieved in 30/31 and in 19/21 patients in Group A and B respectively. Overall survival (OS) was 13.87 and 11 months respectively, whereas progression free survival (PFS) was 9.13 and 7.38 months respectively.

### Conclusions

Aggressive surgical treatment, helped by 5-ALA fluorescence and application of supportive technologies such as i-CT or neuromonitoring, may guarantee an extended but still safe resection of glioblastoma even in elderly patients. Maintenance of a good performance status in the elderly population is essential to allow the adequate administration of adjuvant therapies after surgery and to improve survival parameters.

### References

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Comparative analysis with literature demonstrates advantages in clinical outcomes; note that Gzell's series includes over-60 patients, differently from the other series, which include only over-65 patients.

	Group A - 5-ALA (n=31)	Group B - NO 5-ALA (n=21)
Mean age (range)	71.9 (65-82)	72 (65-83)
<b>KPS</b>		
Mean (range) pre-op	69.67 (50-100)	58 (10-80)
Mean (range) post-op	70.69 (40-100)	63 (10-90)
<b>Techniques</b>		
Computed tomography (CT)	8	1
Neuromonitoring	13	—
Neuronavigation	31	19
<b>Surgery</b>		
Biopsy	—	1
STR	1	1
GTR	30	19
<b>Adjuvant treatments</b>		
RT dosage - Mean (range)	52.51(30-60)	57(30-66)
TMZ cycles - Mean (range)	7.03 (2-16)	6(3-18)
<b>Outcome</b>		
OS - Mean (range)	13.87 (5-45)	11.0 (4-30)
PFS - Mean (range)	9.13 (2-26)	7.38 (2-14)
KPS: Karnofsky performance status; STR: sub-total resection; GTR: gross-total resection; OS: overall survival; PFS: progression-free survival.		

Results of comparative analysis of 5-ALA group with historical cohort