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Associations between recurrence patterns and outcome in glioblastoma patients undergoing re-resection: A complementary report of the RANO *resect* group

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Extract

Progression of glioblastoma inevitably occurs, and re-resection of recurrent glioblastoma represents a viable salvage therapy. Here, re-resection translates into more favorable outcomes when minimal residual contrast-enhancing (CE) tumor is achieved.[1,2] Whether patterns of recurrence affect the maximal safe extent of re-resection and therefore overall outcome is unclear. To delineate associations between recurrence patterns and postoperative outcomes, we retrospectively collected clinical data from patients with first recurrence from a previously resected *IDH*-wild-type glioblastoma undergoing re-resection at 8 neuro-oncological centers in Europe and the United States.[1,3] Tumor volumetrics were determined, and patients were stratified according to recurrence patterns on preoperative imaging (Figure 1A).

Among 309 patients with a previously resected glioblastoma, the median time to first recurrence was 10 ± 0.4 months. Recurrences were either progression of residual CE tumor (50 patients, 16.1%), bordered the prior resection cavity (187 patients, 60.5%), distant recurrences (45 patients, 14.6%), or synchronous occurrence of more than 1 recurrence pattern (27 patients, 8.7%) (Figure 1B). With a median time to first progression of 6 ± 0.7 months, progression of residual CE tumors occurred earlier than the other recurrence patterns (P = .001 comparing all groups; "residual CE progression" vs. "distant recurrence": HR 1.86, CI 1.2–2.8). At re-resection, the lowest postoperative CE tumor volumes (0.2 ± 0.1 cm^3) were achieved in distant recurrences while higher postoperative tumor volumes were found in progressive CE tumors (1.9 ± 0.5 cm^3), recurrences bordering the resection cavity (2.0 ± 0.3 cm^3), or multiple recurrence patterns (2.5 ± 0.8 cm^3) (P = .001). This might be due to less eloquent structures allowing more extensive resection in distant recurrences as characterized by a lower frequency of the dominant hemisphere being involved (19/45 patients, 42.2%). In line with this assumption, the highest postoperative Karnofsky performance status scores (KPS) were found in patients with distant recurrences (median KPS: 90 ± 2.3; P = .013) while there was no difference in non-surgical second-line therapies between patients with different recurrence patterns (Figure 1C). Median overall survival following re-resection was 10 ± 0.6 months, and the better clinical status and low postoperative CE tumor volumes of distant recurrences together with potential biological differences might have translated into the most favorable outcome (median overall survival: 16 ± 3.2 months; P = .017 comparing all groups) (Figure 1D). In turn, the least favorable outcome was observed for patients with multiple recurrence patterns who also had the highest postoperative CE tumor and the lowest KPS scores (median overall survival: 8 ± 1.3 months; "multiple patterns"

vs. “distant recurrence”: HR 2.15, CI 1.2–3.8).

Issue Section: Letter to the Editor