Radiologic progression of glioblastoma under therapy - an exploratory analysis of AVAglio.


BACKGROUND: In this exploratory analysis of AVAglio, a randomized phase III clinical study that investigated the addition of bevacizumab (Bev) to radiotherapy/temozolomide in newly diagnosed glioblastoma, we aim to radiologically characterize glioblastoma on therapy until progression and investigate whether the type of radiologic progression differs between treatment arms and is related to survival and molecular data.

METHODS: Five progression types (PTs) were categorized using an adapted algorithm according to MRI contrast enhancement behavior in T1 and T2-weighted images in 621 patients (Bev, n=299; placebo, n=322). Frequencies of PTs (designated as cT1 relapse, classic T1, T2 diffuse, T2 circumscribed and primary non-responder), time to progression (PFS) and overall survival (OS) were assessed within each treatment arm and compared to molecular subtypes and O6-methylguanine DNA methyltransferase (MGMT) promoter methylation status.

RESULTS: PT frequencies differed between the Bev and placebo arm, except for "T2 diffuse" (12.4% and 7.1%, respectively). PTs showed differences in PFS and OS; with "T2 diffuse" being associated with longest survival. Complete disappearance of contrast enhancement during treatment ("cT1 relapse") showed longer survival than only partial contrast enhancement decrease ("classic T1"). "T2 diffuse" was more commonly MGMT hypermethylated. Only weak correlations to molecular subtypes from primary tissue were detected.

CONCLUSIONS: Progression of glioblastoma under therapy can be characterized radiologically. These radiologic phenotypes are influenced by treatment and develop differently over time with differential outcomes. Complete resolution of contrast enhancement during treatment is a favorable factor for outcome.

KEYWORDS: MRI; bevacizumab; radiologic phenotypes; treatment resistance

PMID: 29016943 DOI: 10.1093/neuonc/nox162