Purpose:
Large anterior-venous malformations (AVM) with average diameter of the lesion larger than 3 cm are often treated with staged-volume or spatially fractionated radiosurgery to decrease the incidence of radiation necrosis. However, even a most recent release of the Gamma Plan version 9.0 only can project the previous treatments but doesn’t support the composite plans of adding dose distributions that were delivered to the same patient in more than one session.

Methods:
The procedure was retrospectively implemented in 10 patients with large AVM and prescription range of 10 – 14 Gy. MR MPRAGE image sets with the dose distributions and drawn volumes of the target and critical organs were exported from Gamma Plan to the third party software. The workflow was created to fuse both sets and DVH’s of the imported structures were cross-checked against Gamma Plan calculations. The fusion was done in two ways: rigid and deformable modes using box-based assisted alignment. Addition dose distributions were analyzed using different dose indexes and compared with actual treated plans.

Results:
In all 10 cases the dose distribution and corresponding conformality and gradient indexes were improved in the 10 – 30 % range decreasing the amount of irradiated health tissue and removing cold spots in the target. 10-Gy non-AVM volumes were decreased on composite plans in the range of 10 – 20%. In 40% of the cases it was shown that the traditional planning gave excessive dose to the critical organs.

Conclusions:
A method was developed to create composite planning for the Gamma Knife patients which was shown can improve the treatment planning for the staged-volume large AVM radiosurgery patients. That technique can be especially useful for the lesions that are positioned in close vicinity to the critical organs like brain stem and optical apparatus.