

Introduction

Cavernous malformations (CV) are benign vascular malformations of low-flow sinusoidal origin. The location of these lesions within the brainstem may lead to devastating neurological complications related to direct compression and hemorrhage. In the past two decades, several treatment options for these lesions have evolved, including surgical resection, radiosurgery, and conservation treatment.

Methods

A systematic search and meta-analysis for all studies reporting treatment of brainstem CM was conducted using the major scientific databases. All studies published between 2000 and 2015 and including 10 or more cases were included.

Learning Objectives

To compare the safety and efficacy of different treatment options for brain stem cavernous malformation.

Results

A total of 44 studies (2527 patients, mean age 37 years, male-to-female ratio is 1:1) fulfilled the inclusion criteria. Thirty-four studies reported surgical treatment (1810 patients), 7 studies reported radiosurgery (264 patients), and 3 studies reported conservative treatment (453 patients). A majority of lesions were located within the Pons (51.4%), followed by Midbrain (18.8%), and Medulla (12.9%). There was no significant difference in age, gender, and CM location between the different treatment groups. The mean size was 17.3 mm, 12 mm, and 16 mm for surgery, radiosurgery, and conservative group, respectively ($p = 0.22$). Pretreatment annual hemorrhage rate (AHR) was 8.1%, 3%, and 3% in the surgery, radiosurgery, and conservative group, respectively ($p = 0.735$). Pretreatment annual rebleeding rate was 34.7% and 34.3% in the surgery and radiosurgery group, respectively ($p = 0.705$) reflecting the activity of the lesion. Complete resection was achieved in 94.6% of surgically treated CM. Within the radiosurgery and conservative group, the CM regressed in size in 39.8% and 18.9% respectively, and grew in size in 0% and 16.2%, respectively.

Clinical outcome improved or remained unchanged in 83.4% of cases in the surgery group, compared to 87.6% in radiosurgery group, and 89.2% in conservative group ($p = 0.658$). Posttreatment AHR was 1.7% in the surgery group, almost all related to residuals, compared to 3.9% and 8.7% in the radiosurgery and conservative group, respectively ($p = 0.001$). Treatment-related mortality rate was 0.2%, 1.1%, and 0.3% in the surgery, radiosurgery, and conservative group, respectively ($p = 0.318$).

Conclusions

Due to their eloquent location, treatment of brainstem CM can be associated with significant morbidity and mortality. In this meta-analysis, although surgical group had relatively larger CM and higher pretreatment AHR compared to radiosurgery and conservative group, the difference was not statistically significant. Posttreatment, surgery was associated with significantly lower AHR, while conservative treatment had a significantly higher rate. There was no significant difference in peri-treatment morbidity and mortality between different groups.