Emboliculation of Intracranial Arteriovenous Malformations. Is it the answer?

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Aims and objectives

1. To describe the epidemiology and characteristics of the intracranial arteriovenous malformations and their clinical evolution over the years of the patients treated with embolization in our hospital.

2. To describe the principals techniques and materials used to embolize the intracranial arteriovenous malformations, talking about arterial access and vascular closure devices.
Methods and materials

We selected all patients with embolized arteriovenous malformations (AVMs) in our hospital.

Patients with only fistulas were excluded.

Subsequently variables were analyzed to describe the age of the patients, gender, number of sessions, type and location of AVM, clinical manifestations, material used, results and complications.
Results

A total of 32 AVMs were embolized. 42% (fifteen) were women and (seventeen) 53.2% men, (Table 1).

The patients were grouped in a range of ages. The largest group is between 50 and 70 years old, which comprises 40.6% (13) of the treated patients. Followed by the group with ages between 20 to 50 years, being 37.5% (12) of all patients. Patients younger than 20 years old were 12.5% (4) and those older than 70 years old were 9.4% (3) of the total patients treated, (Table 2).

Four patients also associated some other type of malformation, such as aneurysms due to hyper afflux. 68.6% of the AVMs were supratentorial and 31.4% infratentorial.

A 28.9% (nine) of the patients presented with some type of intracranial bleeding, and the same number and percentage (28.9%) with seizures. A 21.5% (seven) of the patients presented headache as a symptom of onset, and 15.6% (five) some type of neurological deficit.

59.4% (nineteen) of the patients needed only one session of embolization. The remaining 40.6% needed more than one session of embolization. Nine patients required two sessions, one patient five and one patient eight sessions of embolization.

Regarding the embolic agents used, there are different subgroups. All of the patients were treated with liquid embolic agents (LEA), either with or without reinforcement with other material.

Onyx was the most used embolic agent, being used in twenty-two occasions, which represents 68.6% of all procedures, followed by histoacryl, which was used in 15.6% of patients.

62.5% of patients were treated with only one embolic agent, all liquids. 12.5% (4) of the patients required two, and 12.5% three embolic agents. The most frequent combination was Onyx with Coils, in three cases (9.4%) of the cases.
In ten patients (31.3%) coils were used as the second embolization agent, being the most used material after Onyx, and the material of choice to reinforce the procedure, since in no case was it used as the only embolizing material.

It is important to emphasize the use of PHIL, a new LEA, which although only was used as the only material in a patient, is, after the coils, the second material of choice to reinforce the treatment in the 12.5% of all the treatments.

Other less frequent combinations were Onyx with coils and histoacryl in 6.3% of times (two patients) and PHIL, colis and histoacryl, also in 6.3% of patients.

The combination of glue with coils, Onyx, glue and coils, Onyx, PHIL and coils, Onyx and PHIL and the combination of Onyx and glue were only once used.

**The 40.6% (13) of all patients are asymptomatic after treatment.** 18.7% (6) needed another treatment (radiosurgery), due to different conditions that made it impossible to continue with the endovascular treatment.

12.5% (4) patients report headache and 9.4% (3) have some type of seizure. 12.5% (4) of the patients have some partial posttreatment neurological deficit.

One patient developed brain death immediately after treatment, although it should be noted that this patient was treated in the context of a FISHER IV subarachnoid hemorrhage.

A patient did not follow the indicated controls, so there are no results.

The place of puncture was mainly the right femoral artery in 40.6% of the cases, secondly, the puncture of both femoral arteries in 37.5% and in 12.5% of the cases the puncture site was the left femoral access. On one occasion, the femoral artery and the carotid artery were used, on one occasion only the carotid artery and once the jugular vein was used to access the malformation.

In 65.6% of patients, vascular closure was used in the puncture site and in 34.4% of patients the puncture site was manually compressed.
Fig. 1: Gender of treated patients

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Fig. 2: Age of treated patients
**Fig. 3:** Number of Sessions of treated patients

**Fig. 4:** Number of embolic agents used per session
**Fig. 5:** Used embolic agents as a single material.

**Fig. 6:** Most used combinations of embolic agents
**Fig. 7:** Type of vascular closure of treated patients

**Fig. 8:** Type of vascular access of treated patients
**Fig. 9:** Final results of treated patients

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**Fig. 10:** Patient with partial seizures. A CT was performed in which an AVM was observed, with early venous enhancement, "on passage" and dilated veins and calcifications. The nidus affects practically the entire right hemisphere. Due to various factors, it is decided to embolize.

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Conclusion

• After treatment, 40.6% of the patients are asymptomatic, do not present any associated symptoms or require another treatment to complete the embolization.

• 59.4 % of the patients needed more than one treatment session to try to complete the embolization and 18.6 % of the patients needed radiosurgery to finish the treatment.

• Onyx is the most frequently used embolic agent (68.6 %), both as only agent and in combination with others. It is worth to notice the use of PHIL, which although it is a new embolic agent, is increasingly used. Also, coils are the most frequent embolic material to reinforce the embolization.

• More studies are needed to assess and compare the embolization of AVMs with other treatments, but new techniques and materials emphasize this technique over others.
References


