Journal of Cancer Research and Advanced Therapeutics
Volume 1 | Issue 1

HELICS GROUP LLC
Scientific Networks

Research Article Open Access

Safety and Efficacy of Preoperative Embolization in Patients with Hypervascularized Meningioma

Angelani Pablo[1*], Avataneo Daniela[2] and Giannotti Pedro[3]

[1]Radiologist and Neuroradiologist of Cemuva. Ciudad Autonoma de Buenos Aires, Argentina.
[2]Neuroradiologist and Neurosurgeon of Cemuva. Ciudad Autónoma de Buenos Aires, Argentina.
[3]Neurosurgeon of Clínica de La Esperanza. Ciudad Autónoma de Buenos Aires, Argentina.

***Corresponding author:** Angelani Pablo, Radiologist and Neuroradiologist of Cemuva. Ciudad Autónoma de Buenos Aires, Argentina. Email:pangelani@cemuva.com*

Citation: Angelani P, Avataneo D, Giannotti P (2020) Safety and Efficacy of Preoperative Embolization in Patients with Hypervascularized Meningioma J Can Res Adv Ther 1(1): 9-12.

Received Date: June 10, 2020; **Accepted Date:** June 15, 2020; **Published Date:** June 20, 2020

Abstract

Objective: Preoperative embolization of meningiomas can facilitate their resection when they are difficult to remove. In this study, we retrospectively reviewed our experience of embolization using particulate embolic material and coil to clarify the therapeutic efficacy, safety, and risk of complication.

Methods: We reviewed 50 patients who underwent embolization with particulate embolic material or with N-butyl cyanoacrylate (NBCA)followed by surgical resection. For a total of 50 procedures of preoperative embolization. We analyzed the following clinical data: age, sex, tumor size pathology, complications related to embolization, and surgeon's opinion on the intraoperative ease of debulking and blood transfusion. Embolization was performed mainly from the branches of the external carotid artery and branches of the vertebral artery.

Results: No allogenic blood transfusions were needed for any patients. The surgeon had the opinion that whitening and softening of the tumor allowed for easy debulking during decompression of the tumor in most of the patients.

Transient cranial nerve palsy was seen in one patient. One allergic complication occurred.

Conclusion: Preoperative embolization could give us an advantage in surgery for meningioma. The procedure reduces intraoperative blood loss and operating time by softening the tumor consistency. However, we must pay attention to the possibility of embolic complications and keep the preparation of emergency craniotomy, particularly in patients with large meningiomas.

Keywords: Meningioma; Embolization; Resection; Endovascular treatment; Preoperative embolization;

Introduction

Surgery for hypervascular meningioma is still challenging because of encountering significant intraoperative bleeding. Preoperative embolization of the feeding vessels may be one of the solutions to reduce such bleeding, facilitate resection, and shorten operating time. [1, 2]However, risk of complications following this adjuvant preoperative embolization has been reported by several authors. [3, 4, 5] Therefore, meticulous endovascular manipulation with full understanding of the potential risks is essential.

Polyvinyl alcohol (PVA) particles are the most commonly used embolic agent in Western countries. [2, 6] Yet, several authors have reported the risks of preoperative embolization using PVA particles, [7, 8]whereas the other authors have stressed the usefulness of n-butyl cyanoacrylate (NBCA) and then ONIX [9, 10, 11].

In this study, we reviewed our experience with preoperative embolization using particulate embolic materials for meningioma.

Material and Methods

Fifty patients with meningioma received embolization before surgical treatment in our institute between January 2009 and December 2019. A total of 50 procedures were performed. The characteristics of the patients and their tumors are shown in Table 1. The indications for preoperative embolization were carefully discussed by the attending neurosurgeons, Table 2. Subsequent tumor resection was performed in most of the patients on the next day after embolization. We collected the following clinical data: age, sex, tumor size and pathology, complications related to embolization, and surgeon's impression. The degree of embolization, surgically evaluated was classified into three groups: "good" as comfortable operating field whitened and softened more than 80% of the tumor, "moderate" as encountering a little bit bleeding without any trouble (20–80%), and "poor" as less than 20%. All patients consented to the use of all clinical information including images and other clinical data for this study.

Table 1: Patients and tumor location.

N° of cases.		**50**
Mean age (years)		66.2
Sex	Male	31
	Female	19
Tumor location	Sphenoid ridge	16 (32%)
	Convexity	14 (28%)
	Parasagittal region	9 (18%)
	Tentorium	6 (12%)
	Middle fossa	1 (2%)
	Clinoidal region	1 (2%)
	Cavernous Sinus	1 (2%)
	Falx	2 (4%)

Table 2: Inclusion and exclusion criteria.

Inclusion criteria
Informed consent
Older than 18 years-old
MRI with and without contrast
Meningioma hipervascularized
Middle or posterior meningeal artery
feeders
Absence of bulbar carotid disease
Exclusion criteria
Iodine allergy
Peritumoral edema
Vascularity predominantly pial

Endovascular Procedure

The target vessels for embolization were selected based on diagnostic angiography, which usually included the middle meningeal artery (MMA) and occasionally another feeding artery arising from the external carotid artery (ECA) or the posterior meningeal artery. Critical vessels such as the ophthalmic artery, meningohypophyseal trunk, inferolateral trunk of the internal carotid artery (ICA), and pial vessels were not embolized. Most procedures were performed through the transfemoral route under local anesthesia. Heparin 5000-10000 UI was injected intravenously, and the activated clotting time was maintained at twice compared with control level. A 5- or 6-Fr guiding catheter was placed in the ECA or the vertebral artery. A 1.7- to 2.6-Fr microcatheter was advanced into the feeder vessel as close to the dural attachment of the tumor as possible. Particles were injected rhythmically with ventricular systole until we observed reduction of the tumor staining. In those tumors associated with AVF, the selective injection of NBCA or ONIX was performed.

Results

In the 50 patients (mean age 66.2 years: range 44–89 years; 31 men, 19 women) who underwent preoperative embolization followed by surgical resection. The tumors were located in the sphenoid ridge (16 [32%]), convexity (14 [28%]) (Figure: 1-2), parasagittal region (9 [18%]), tentorium (6 [12%]), middle fossa (1 [2%]), clinoidal region (1 [2%]), cavernous sinus (1 [2%]), and falx (2 [4%]).

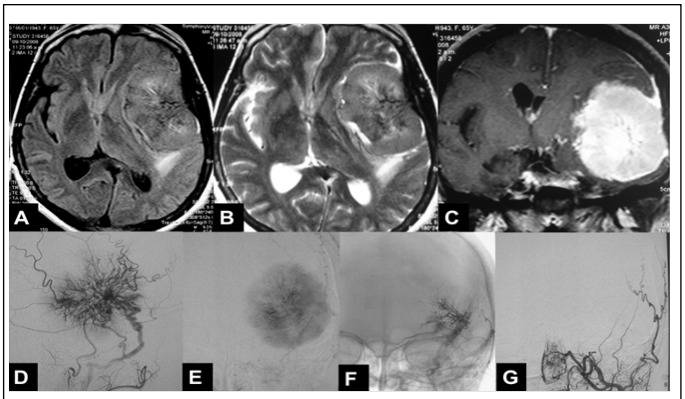

Figure 1: A 71-year-old female presented with a three-month history of headache and 1 week of right hemiparesis and aphasia. (A) Axial T1-weighted magnetic resonance imaging (MRI) showing a large meningioma of frontal operculum. The mass directly compresses the primary language area. Displacement of the midline, and the edema is hyperintense peritumoral. (B) Axial T2-weighted MRI. (C) Coronal view, contrast-enhanced MRI showing strongly enhances. (D) Selective angiography (DSA) of Carotid external artery, showing big meningeal medial artery and hiypervascularized tumoral. (E) DSA parenquimatoso time. (F) Rx showing hypervascularized tumoral. (G) External carotid artery DSA post selective embolization.

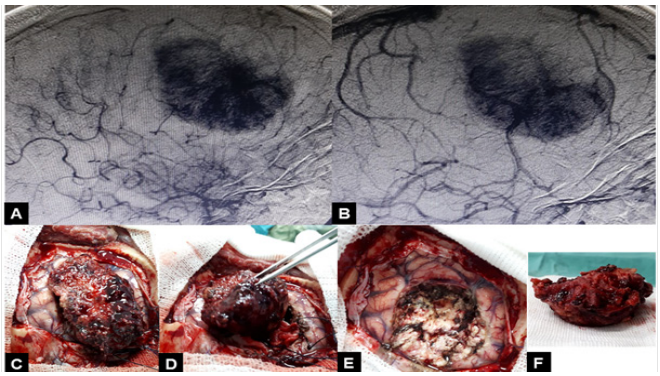

Figure 2: (A) DSA arterial time, showing a hypervascularized meningioma. (B) DSA venousus time, showing partial occlusion of superior sinus venosus. (C, D, E,F) dissection tumoral, showing necrosis post selective embolization.

The degree of embolization was classified into three groups: good, moderate, and poor. The good group was seen in 38 patients (76%), the moderate group in 9 (18%) patients, and the poor group in 3 (6%) patient. In most of the operations, the surgeons felt comfortable during the internal decompression of the tumor because the tumor was whitened and softened as a result of embolization effect.

We experienced two (4%) cases of embolization-related complications. The details of the patients are shown in Table 3. Perforation in one patient, of the meningeal artery with the microguide during the microcatheterism requiring injection of NBCA, transient abducens nerve palsy in one patient. Symptomatic complications occurred in 1 (2%) patient.

Table 3: Morbi-mortality of endovascular procedure

Morbility	2 (4%)
Perforation of the MMA	1
Nerve palsy	1
Mortality	0(0%)

Discussion

The aim of preoperative embolization for intracranial meningioma is the reduction of its vascularity to reduce intraoperative blood loss, shorten operating time, and improve patient's quality of life. [1, 6] Effective reduction of vascularity could require embolization of intratumoral vessels rather than proximal ligation, for which small particles and liquid embolic material are both possibly suitable. In this study, good or moderate embolization was performed in most of the patients. Even moderate embolization could reduce surgeon's stress during surgery. Several authors have stressed the validity of preoperative embolization using NBCA as the embolic material rather than particulate material due to a decreased frequency of major complication. [9, 10] However, NBCA has a strong affinity for the intimal walls of vessels, and it adheres to and hardens the network of abnormal vessels surrounding a tumor, thereby increasing the hardness of the tumor.

To prevent the intratumoral hemorrhage, we choose relatively large-sized particles, inject gently as possible, and avoid inserting microcatheters too distally. In addition, recanalization of the feeders could result in intratumoral hemorrhage or peritumoral edema. It is possible that early surgical resection after embolization can reduce development of abnormal collateral flow. Therefore, we usually planned surgical resection on the next day after embolization.

Preoperative embolization does not always achieve complete obliteration of the tumor because feeders of meningioma include vessels that would be dangerous to embolize, such as the dural branches of the ICA and the pial arteries. Embolization of these dangerous arteries would likely result in symptomatic complications. Incomplete obliteration might cause a shift in the blood supply to a meningioma, with multiple feeders that included branches from the ICA and ECA. [12,13, 14] In this study, complete embolization was angiographically achieved in only 38 (76%) patients. Even so, preoperative embolization may contribute to reduced blood loss during the surgery.

As endovascular techniques and instruments continue to be developed, risks involved in these procedures are gradually declining. However, a small risk of complications still exists, and the indication for preoperative embolization remains controversial, that is, whether it should be considered a standard practice or should it be performed only in the specific setting of large hypervascular tumors. To support the rationale for preoperative embolization in patients with a large meningioma, its benefits would need to outweigh its disadvantages. A large prospective study would provide more precise data on the overall risk–benefit balance regarding this procedure [15,16, 17].

Conclusion

We performed preoperative embolization using appropriate size of PVA or Embosphere associated with NBCA or ONIX. Preoperative embolization could give us an advantage in surgery for meningioma. The procedure in experimented hands reduces intraoperative blood loss and operating time because it causes softening of tumor consistency.

References

1. Gruber A, Killer M, Mazal P, Bavinzski G, Richling B.Preoperative embolization of intracranial meningiomas: a 17-years single center experience. Minim Invasive Neurosurg. 2000;43(1):18–29.

2. Raper D M, Starke R M, Henderson F, Jr et al. Preoperative embolization of intracranial meningiomas: efficacy, technical considerations, and complications. AJNR Am J Neuroradiol.

2014;35(09):1798–1804.

3. Law-ye B, Clarençon F, Sourour N A et al. Risks of presurgical embolization of feeding arteries in 137 intracranial meningeal tumors. Acta Neurochir (Wien). 2013;155(04):707–714.

4. Lazzaro MA, Badruddin A, Zaidat OO, Darkhabani Z, Pandya DJ and Lynch JR. Endovascular embolization of head and neck tumors. Front Neurol. 2011;17(02):64.

5. Singla A, Deshaies EM, Melnyk V et al. Controversies in the role of preoperative embolization in meningioma management. Neurosurg Focus. 2013;35(06): E17.

6. ShahAH, Patel N, Raper DM, et al. The role of preoperative embolization for intracranial meningiomas. J Neurosurg. 2013;119(02):364–372.

7. Yu SC, Boet R, Wong GK, Lam WW, Poon W S. Postembolization hemorrhage of a large and necrotic meningioma. AJNR Am J Neuroradiol. 2004;25(03):506–508.

8. Carli DF, Sluzewski M, Beute GN, van Rooij WJ. Complications of particle embolization of meningiomas: frequency, risk factors, and outcome. AJNR Am J Neuroradiol. 2010;31(01):152–154.

9. Ishihara H, Ishihara S, Niimi J, et al. The safety and efficacy of preoperative embolization of meningioma with N-butyl cyanoacrylate. Interv Neuroradiol. 2015;21(05):624–630.

10. Aihara M, Naito I, Shimizu T, et al. Preoperative embolization of intracranial meningiomas using n-butyl cyanoacrylate. Neuroradiology. 2015;57(07):713–719.

11. Rowdier SO, Stölzle A, Lumenta ChB. Preoperative embolization of intracranial meningiomas with Embosphere microspheres. Minim Invasive Neurosurg. 2004;47(05):299–305.

12. Arai S, Shimizu K, Mizutani T, et al. Preoperative embolization of meningioma: differences in surgical operability and histopathological changes between Embosphere® and NBCA. World Neurosurg. 2017;111:113–119.

13. Sluzewski M, van Rooij W J, Lohle P N, Beute G Nand Peluso J P. Embolization of meningiomas: comparison of safety between calibrated microspheres and polyvinyl-alcohol particles as embolic agents. AJNR Am J Neuroradiol. 2013;34(04):727–729.

14. Wang HH, Luo C B, Guo W Y et al. Preoperative embolization of hypervascular pediatric brain tumors: evaluation of technical safety and outcome. Childs Nerv Syst. 2013;29(11):2043–2049.

15. Bendszus M, Klein R, Burger R, Warmuth-Metz M, Hofmann E and Solymosi L. Efficacy of trisacryl gelatin icrospheres versus polyvinyl alcohol particles in the preoperative embolization of meningiomas. AJNR Am J Neuroradiol. 2000;21(2):255–261.

16. Bendszus M, Rao G, Burger R, Schaller C, Scheinemann K and Warmuth-Metz M, et al. Is there a benefit of preoperative meningioma embolization? Neurosurgery. 2000;47(6):1306–1312.

17. Dubel GJ, Ahn SH, Soares GM. Contemporary endovascular embolotherapy for meningioma. Semin Intervent Radiol. 2013;30(3):263–277.