

First European Completed Case with *iht*Obtura[®], a Novel Liquid Embolic Agent with Radiopacity Loss

CASE REPORT

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ABSTRACT

A middle-aged patient with an intracranial hemorrhage was diagnosed with parieto-occipital arteriovenous malformation (AVM). After decompressive surgery, the patient was scheduled for delayed embolization with curative intent. *iht*Obtura[®], a novel liquid embolic agent with radiopacity loss, was selected as the optimal treatment to avoid multi-stage radiopacity cast residues that hinder visualization and 3D vasculature reconstruction. AVM was occluded after three endovascular sessions without treatment-related side effects. The potential extensive use of this novel material with radiopacity loss will probably enhance the knowledge of intravascular embolization of complex lesions with curative intent.

KEYWORDS

arteriovenous malformations, embolization, liquid embolic agent

BACKGROUND

Current liquid embolic agents have associated drawbacks that hinder understanding and treatment of arteriovenous malformations (AVMs). A lack of visibility and interpretation of successive AVM embolization sessions are among the most limiting aspects of liquid embolic materials used in intravascular embolization.¹⁻³

In this context, *iht*Obtura[®] (Iberhospitex; Spain) is a novel liquid embolic agent composed of EVOH and iodinated compound dissolved in dimethyl sulfoxide (DMSO), intended to be used for the embolization of vascular lesions, including brain AVMs and hypervascular tumors. The main innovative feature of *iht*Obtura[®] is the progressive radiopacity loss, which eliminates artifacts and allows complete visualization of AVM angioarchitecture in each new embolization session.⁴

Under the authors' experience, *iht*Obtura[®] initiates a promising new era in the endovascular treatment of AVMs. This case shows the first completed case in Europe using a promising tool to improve curative endovascular treatment of AVMs.

CASE PRESENTATION

A middle-aged female patient presented with symptoms of nausea, vomiting, and loss of consciousness. Radiological examination revealed an intraparenchymal hemorrhage in the parieto-occipital region. Subsequent CT angiography confirmed the presence of a high-grade AVM located in the left occipital lobe.

The patient underwent decompressive surgery, which led to a positive recovery. However, she experienced a significant neurological deficit, resulting in a moderate disability (mRS = 3). She underwent delayed endovascular treatment with the intention of a curative approach.

Diagnostic angiography showed a cortical-subcortical AVM with mixed plexiform-fistulous nidus, measuring 5.2 × 4.7 × 4.8 cm. The main feeders were the left posterior cerebral artery and the angular artery, with enlargement in arterial feeders, and a high-flow direct arteriovenous fistula. AVM had both superficial and deep venous drainage, with venous hypertension, venous ectasia, and a giant venous aneurysm.

The patient was given informed consent and specific information about the product. Institutional procedures from both the hospital and the Spanish Agency of Medicines and Medical Devices were followed to use *iht*Obtura[®] under special compassionate circumstances (1070-AE-23). The patient was treated during three embolization sessions with curative intent.

Standard femoral access was obtained. Flow-guided microcatheters and detachable-tip microcatheters compatible with DMSO were used to selectively catheterize the feeding artery. Flow coils and 1:1 dilution of glue were used to prepare the pressure cooker technique.⁵ DMSO was slowly injected into the microcatheter lumen to fill dead space; then, *iht*Obtura[®] was meticulously injected. During the whole treatment, a total of 18.5 mL of *iht*Obtura[®] was used. Several viscosities ranging from 12 to 20 mPa·s were used, depending on the penetration requirements. Acute occlusion was accomplished after the third session. No complications during the procedures were encountered.

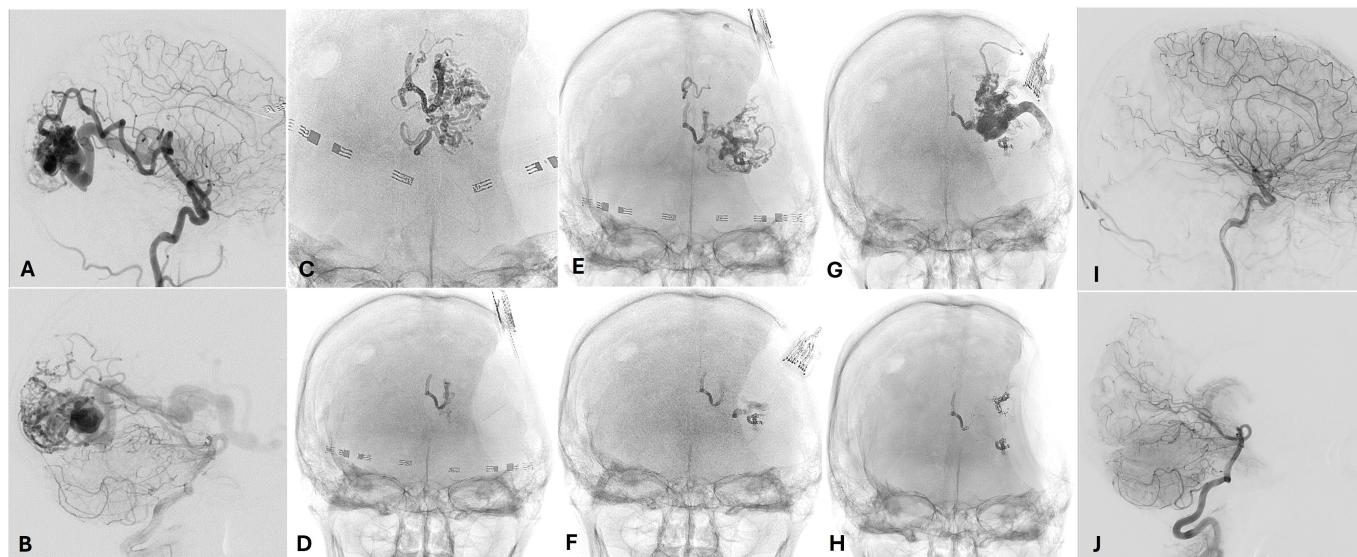


FIGURE 1. Treatment of a high-grade AVM with ihtObtura®. (A and B) Internal carotid and vertebral angiograms before embolization. (C, E, and G) ihtObtura® cast after each of the three embolization sessions. (D and F) ihtObtura® cast at the 6-week follow-up. (H) ihtObtura® cast at the one-year follow-up. (I and J) Final angiographic result at the one-year.

After each embolization session, the patient was admitted to the intensive care unit for close observation and strict blood pressure control for 24 hours. Dexamethasone (4 mg) was intravenously administered for 24 hours and orally for 5 days.

ihtObtura® cast was almost completely absorbed 6 weeks after the initial injections. It has been observed that radiopacity loss seems to depend on vessel diameter and total injected volume. During the case progress, organic iodine present in blood was evaluated, showing an equivalent trend to radiopacity loss observed by angiography.

AVM total obliteration was completed after three embolization sessions (Figure 1). At the one-year follow-up, no angiographic recurrences were observed. Neither systemic nor local side effects related to the embolic agent were detected, and the mRS remained without changes after 12 months.

During the treatment and follow-up, hepatic, renal, and thyroid markers were evaluated without noticeable alterations.

DISCUSSION

Conventional non-adhesive liquid embolic agents, progress in device technology, and new embolization techniques have been associated with improved results in endovascular treatment of AVMs, increased cure rate, and reduced complications and morbimortality.^{3,6,7}

However, substantial efforts are required in the development of new embolic agents with characteristics that allow their extensive use to enhance embolization results and decrease complication incidences.⁸

In this case report, a novel liquid embolic agent with excellent radiopacity loss properties is presented. ihtObtura® provided almost the total loss of radiopacity 6 weeks post-embolization, showing minor artifacts in CT and magnetic resonance imaging. Furthermore, AVM total obliteration was achieved after three embolization procedures, and no recurrences were detected at the one-year follow-up (Figure 1). These results are in line with previously published data, where ihtObtura® achieved progressive radiopacity loss during follow-up.⁴

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Patient consent

Informed consent was obtained from the patient.

Contributors

JCL and MC performed the endovascular treatment and patient follow-up. JCL wrote the original draft and the final manuscript. All authors revised and approved the final version of the manuscript.

Conflicts of interest

JCL reports consultancy for Iberhospitex and Medtronic. AG reports consultancy for Balt, Medtronic, and Iberhospitex.

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REFERENCES

1. Baharvahdat H, Blanc R, Termechi R, et al. Hemorrhagic complications after endovascular treatment of cerebral arteriovenous malformations. *AJNR* American Journal of Neuroradiology. May 2014; 35(5): 978–983. DOI: <https://doi.org/10.3174/ajnr.A3906>.
2. Pop R, Mertz L, Ilyes A, et al. Beam hardening artifacts of liquid embolic agents: comparison between Squid and Onyx. *Journal of Neurointerventional Surgery*. Jul 2019; 11(7): 706–709. DOI: <https://doi.org/10.1136/neurintsurg-2018-014542>.

3. Vollherbst DF, Chapot R, Bendszus M, Möhlenbruch MA. Glue, Onyx, Squid or PHIL? Liquid embolic agents for the embolization of cerebral arteriovenous malformations and dural arteriovenous fistulas. *Clinical Neuroradiology*. Mar 2022; 32(1): 25–38. DOI: <https://doi.org/10.1007/s00062-021-01066-6>.
4. Llibre-Guerra JC, Guimaraens L, Kadziolka KB, et al. ihtObtura: A novel liquid embolic agent with post-embolization radiopacity loss, in endovascular treatment of brain arteriovenous malformations, dural arteriovenous fistulas, and tumors: CLARIDAD trial. *Journal of Neurointerventional Surgery*. 30 Jul 2024: jnis-2023-021442 DOI: <https://doi.org/10.1136/jnis-2023-021442>.
5. Chapot R, Stracke P, Velasco A, et al. The pressure cooker technique for the treatment of brain AVMs. *Journal of Neuroradiology*. Mar 2014; 41(1): 87–91. DOI: <https://doi.org/10.1016/j.neurad.2013.10.001>.
6. Crowley RW, Ducruet AF, Kalani MYS, et al. Neurological morbidity and mortality associated with the endovascular treatment of cerebral arteriovenous malformations before and during the Onyx era. *Journal of Neurosurgery*. Jun 2015; 122(6): 1492–1497. DOI: <https://doi.org/10.3171/2015.2.JNS131368>.
7. Elsenousi A, Aletich VA, Alaraj A. Neurological outcomes and cure rates of embolization of brain arteriovenous malformations with N-butyl cyanoacrylate or Onyx: a meta-analysis. *Journal of Neurointerventional Surgery*. Mar 2016; 8(3): 265–272. DOI: <https://doi.org/10.1136/neurintsurg-2014-011427>.
8. Katsaridis V, Papagiannaki C, Aimar E. Curative embolization of cerebral arteriovenous malformations (AVMs) with Onyx in 101 patients. *Neuroradiology*. Jul 2008; 50(7): 589–597. DOI: <https://doi.org/10.1007/s00234-008-0382-x>.