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## Case Report

# Use of a mixture of Lipiodol and Cyanoacrylate in percutaneous embolization treatment of symptomatic renal Angiomyolipomas: Our experience

Simona Caloggero, MD<sup>a</sup>, Francesca Catanzariti, MD<sup>b</sup>, Alberto Stagno, MD<sup>b</sup>, Salvatore Silipigni, MD<sup>b</sup>, Antonio Bottari, MD<sup>b,\*</sup>

<sup>a</sup> Department of Diagnostic Imaging and Radiotherapy, University Hospital “G. Martino”, Messina, Italy

<sup>b</sup> Department of Biomedical and Dental Sciences and Morphofunctional Imaging, University of Messina, Via S. Camillo 8, 98122 Messina, Italy

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## ABSTRACT

Purpose of this report is to describe safety and effectiveness of selective artery embolization in the treatment of bleeding angiomyolipomas (AMLs) of the kidney using a mixture of Lipiodol and Cyanoacrylate.

Two patients with bleeding AMLs underwent to superselective embolization of the lesions using microcatheter and Lipiodol mixed with Cyanoacrylate in the ratio 3:1.

Primary bleeding control rate was 100% with no major complications. Follow-up CT (mean time 18 months) demonstrated a significant reduction in size (about 50%) of the lesions.

In conclusion, selective artery embolization with Lipiodol and Cyanoacrylate appear to be safe and effective in the treatment of bleeding AMLs.

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## Introduction

Angiomyolipomas (AMLs) are benign mesenchymal tumors of the kidney, with an incidence of about 0.3%-3%. They are composed of adipose tissue, abnormal vessels, and smooth muscle cells, in various amounts.

They can be found as sporadic (80%) or in association with other disorders (eg, tuberous sclerosis, lymphangioleiomyomatosis) [1].

Sporadic AMLs show preference for female gender (F:M = 4:1) and they are usually diagnosed in asymptomatic patients during radiological examinations performed for

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\* Corresponding author.

E-mail address: [bottaria@unime.it](mailto:bottaria@unime.it) (A. Bottari).

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other reasons or in patients with nonspecific symptoms (eg, flank pain).

Commonly patients with tuberous sclerosis have multiple, bilateral, and large lesions which can easily bleed. Although most of AMLs are asymptomatic, they can cause hematuria, abdominal, and retroperitoneal bleeding, resulting in spontaneous pain [2].

In asymptomatic patients with incidental finding of AML, the predictive bleeding factors that require a preventive treatment are: tumor size more than 4 cm, presence of intralesional aneurysms larger than 5 mm, and association with tuberous sclerosis [3,4].

Treatment of AMLs includes radical nephrectomy, nephron-sparing techniques (surgical intervention, percutaneous RF ablation, cryoablation, or microwave ablation), or percutaneous embolization, the latter is currently considered the treatment of choice [4,5].

The aim of this paper is to report our experience in the treatment of bleeding AMLs of the kidney using a mixture of Lipiodol and Cyanoacrylate.

### Case report 1

A 39-year-old woman presented to the Emergency Department of our institution with severe abdominal pain, hematuria, and hypovolemic shock.

After preliminary examination of the abdomen with fast ultrasound, the patient underwent computed tomography angiography (CTA), which demonstrated the presence of a high-attenuation fluid collection (mean HU: 47) surrounding the right kidney due to acute bleeding and multiple bilateral renal lesions characterized by the presence of low attenuation areas of fat tissue ( $-20$  UH or less), typical appearance of AMLs. One of them, located at the upper pole, had an intralesional hyperdense spot compatible with pseudoaneurysm (Fig. 1).

After evaluation of renal function through blood laboratory tests (GFR, creatinine) and hemodynamic stabilization, endovascular treatment was decided in order to achieve selective devascularization of the lesion.

Vascular access was obtained through femoral approach with an angiographic catheter 5 Fr (Cordis, Fremont, CA); after selective kidney angiography, superselective catheterization of the arterial branch afferent to the target lesions was performed with a 2.5 Fr microcatheter (Cook, Bloomington, IN) [6].

Digital subtraction angiography was obtained to evaluate the blood flow of the intralesional arterial branches and then it was decided to proceed with embolization using a mixture of Lipiodol and Cyanoacrylate (Glubran, GEM, Italy) in the ratio 3:1.

Angiography control after embolization mixture deployment was performed (Fig. 2).

Technical success was reached preventing nontarget embolization or the need of reintervention.

Nor intra or periprocedural complications were reported.

Renal function tests were performed after 48 hours. Patient was discharged after 10 days without renal dysfunction.



**Fig. 1 – Case report 1. Coronal CTA reconstruction. (a) Arterial phase. High-attenuation (mean HU: 47.3) fluid collection surrounding the right kidney due to acute bleeding (circle). At the upper pole is visible a hyperdense spot compatible with intralesional aneurysm (white arrow). (b) Delayed phase. The bleeding lesion is well-defined in close relationship with hematoma at upper pole (white arrowhead). Another AML, with a considerable amount of fat tissue, is visible at the upper pole of the left kidney (black arrows). AML, Angiomyolipomas.**

No more episodes of bleeding were reported during the observation time.

### Case report 2

A 21-year-old man affected by tuberous sclerosis was referred to our Department with flank pain.

The patient underwent MRI which demonstrated the presence of multiple and bilateral renal lesions, with size ranging from 10 to 50 mm and typical appearance for AMLs.

One of them caused compression on ipsilateral psoas muscle.

According with the patient and after evaluation of renal function was decided to embolize the lesion.

Preliminary CTA clearly showed arterial vascularization of the kidney and of the target lesion (Fig. 3).

The procedure was performed with the same technique and materials of the previous case and was technically successful.



**Fig. 2 – Case report 1. (a) Selective renal angiography revealing active bleeding at the upper lobe of the right kidney (white arrowhead). (b) Superselective angiography from the feeding artery. (c) Single control showing Lipiodol and Cyanoacrylate distribution (white arrowhead). (d) Final DSA demonstrating complete devascularization of the AML and normal angiographic pattern of the surrounding renal parenchyma.**

**AML, Angiomyolipomas; DSA, digital subtraction angiography.**

The patient developed postembolization syndrome with nausea, flank pain, and vomit after the procedure, however postprocedure CT scan did not show any complication.

Postembolization syndrome was successfully treated with intravenous administration of analgesics, antibiotics, and antiemetic.

Patients had a hospitalization time of 2 days and renal function tests were performed after 48 hours. None of the patients had renal dysfunction.

At follow-up CT scan a significant reduction in size (mean 50%) of the treated lesions was reported, which then remained stable during several controls (Fig. 4).

## Discussion

AMLs are the most common benign kidney tumors, composed of abnormal blood vessels, smooth muscle, and adipose tissue. Spontaneous bleeding, their main complication, is caused by the low-elastin content in the vessel walls that can lead to aneurysmal degeneration. The bleeding is particularly common in large lesions (more than 4 cm); in these cases a preventive treatment is often necessary [7].

Several treatment options are available: nephrectomy, nephron sparing techniques, or percutaneous embolization.



**Fig. 3 – Case report 2. Maximum intensity projection (MIP) reconstruction showing a small artery (white arrow) feeding the target lesion which compressed psoas muscle (black arrowheads).**

Nowadays the latter option is assuming a significant role in the treatment of AMLs because its minimally-invasiveness and guarantees a quick approach in acute bleeding and allows a good prophylaxis for large lesions.

Moreover, in patients with bilateral involvement of the kidneys, thanks to the superselective catheterization of the vascular branches afferent to the lesions, it offers the great chance to spare as much normal renal parenchyma as possible [8].

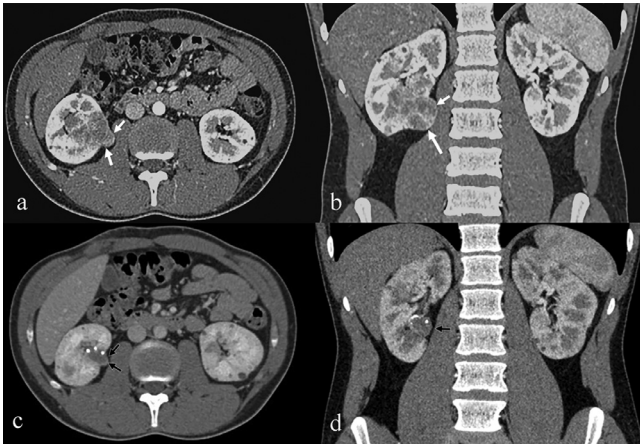
Indeed the 2 patients reported in this paper had bilateral lesions, therefore total or partial nephrectomy was not the best option to preserve an optimal renal function.

A high-quality percutaneous embolization requires a careful choice of embolic materials, which is mainly based on operator's experience, considered the lack of comparative studies between different embolic agents for AMLs treatment [4,9].

Although many embolic materials are nowadays available, the main ones are polyvinyl alcohol (PVA), absolute alcohol and spirals [1,9].

Recently some preliminary experiences with ethylene vinyl alcohol (EVOH) copolymer (Onyx; Medtronic, Minneapolis, MN) were also reported with excellent success rate [5].





**Fig. 4 – Case report 2. (a, b) Axial and coronal CTA images before embolization showing a low-attenuation mass in the right kidney which compresses the psoas muscle causing flank pain (white arrows). (c, d) Axial and coronal CT scans 3 months after treatment demonstrating significant shrinkage of the AML with no more muscular compression (black arrows). AML, Angiomyolipomas.**

However, even Lipiodol (Guerbet, Villepinte, France), commonly used in the treatment of hepatocellular carcinoma, may have a role as an embolic agent for the renal AMLs, though such use is still not so common up to now [10].

Each embolic material has its own advantages and disadvantages. Some authors have shown that the particles of PVA cannot pass through the capillary walls within the lesion, causing only partial occlusion, whereas the use of spirals can lead to the formation of collateral vascular branches. Furthermore these are high-cost materials [11,12].

To the best of our knowledge no cases have been described in literature treated with Cyanoacrylate and Lipiodol.

In our experience the use of this mixture had shown a satisfactory capacity of diffusion and perfusion resulting in the interruption of the blood flow within the AMLs.

Unlike others embolizing materials, Lipiodol is a radiopaque contrast medium, detectable under fluoroscopy, providing a better awareness of the procedure to the radiologist [13].

The use of systems of microcatheters and the possibility of observing the mixture of Lipiodol and Cyanoacrylate under fluoroscopy make possible the achievement of the target vascular districts (with a great percentage of spared renal tissue) and permit to identify any reflux that might affect the final success of the procedure.

In addition Lipiodol showed its usefulness in the follow-up of the patients, helping in identifying the treated lesions because of its high affinity for the tumor vessels and its long persistence, associated with lower streak artifact than other radiopaque embolizing materials (eg, coils or EVOH) [5] (Fig. 5).

In our experience, percutaneous embolization of renal AML with a mixture of Cyanoacrylate and Lipiodol has proved to be a safe and effective method in the treatment of symp-



**Fig. 5 – Case report 2. Axial MIP. Presence of radiopaque material 3 months after embolization demonstrating long persistence of Lipiodol inside the lesion (black arrows). Absence of any significant streak artifact allows good evaluation of AML enhancement (also perceptible in Fig. 4c and d). AML, Angiomyolipomas.**

tomatic patients, even critical, preserving the healthy renal parenchyma.

This is extremely important for critical patients with multiple lesions, often large and bilateral, wherein surgery would be too demolitive.

In particular, the embolization with the mixture of Cyanoacrylate and Lipiodol, injected by experienced operators, allows rapid embolization of the vessels with decreased operating time and radiation dose to the patient and lower costs compared to other embolization materials (spirals, PVA, EVOH).

In conclusion, Cyanoacrylate and Lipiodol could be considered as another embolic option for the treatment of AML, not only for immediate bleeding control but also for long-term prevention of rebleeding.

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