



# Transarterial Embolization in Renal and Adrenal Tumors

Embolización transarterial en tumores renales y suprarrenales



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Kidney neoplasms  
Adrenal gland neoplasms  
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## Palabras clave (DeCS)

Neoplasias renales  
Neoplasias de las  
glándulas suprarrenales  
Procedimientos  
endovasculares

## Summary

Evaluate the safety and feasibility of transarterial embolization as a preoperative adjunct or palliative treatment. Between May 2005 and June 2013, 32 transarterial embolization procedures for renal and adrenal pathology were performed (30 renal carcinoma, 2 tumors of adrenal glands). The efficacy of the procedure was determined based on whether the goal for which it was indicated was achieved or not. Patients were divided into 2 groups: 1) preoperative embolization in the combined treatment of renal carcinomas and 2) embolization as the only palliative treatment in inoperable tumors. 36 procedures in 32 patients were included: 30 patients with renal cell carcinoma and 2 patients with adrenal tumors. No intra-procedural complications. Technical success was 100%. In 28 (87.5%) patients, devascularization of 100% was achieved. In our experience, tumor embolization was safe and effective. Current indications of transarterial embolization for tumors are: 1. Pre-operative in the combined treatment of renal cell carcinomas, with the aim of diminishing the morbid-mortality of surgical procedures. 2. As the only treatment, with palliative aim in inoperable tumors.

## Resumen

Evaluar la seguridad y factibilidad de la embolización transarterial como tratamiento coadyuvante prequirúrgico o paliativo. Entre mayo de 2005 y junio de 2013 se realizaron 32 procedimientos de embolización transarterial por patología renal y suprarrenal (30 carcinomas renales, 2 tumores de glándulas suprarrenales). La eficacia del método fue evaluada según el logro del objetivo que motivó la indicación. Los pacientes se dividieron en 2 grupos: Embolización prequirúrgica en el tratamiento combinado de carcinomas renales y embolización como único tratamiento paliativo en tumores inoperables. Se incluyeron 36 procedimientos en 32 pacientes: 30 con carcinoma renal y 2 con tumores en las glándulas suprarrenales. No se presentaron complicaciones intraprocedimiento. El éxito fue del 100 %. En 28 (87,5 %) pacientes se logró la devascularización del 100 %. En nuestra experiencia, la embolización tumoral fue segura y eficaz. Las indicaciones actuales de la embolización transarterial para tumores son: 1. Prequirúrgica, en el tratamiento combinado de carcinomas renales, con el objetivo de disminuir la morbimortalidad del acto quirúrgico. 2. Como único tratamiento, con objetivo paliativo en tumores inoperables.

## Introduction

En 1969 Lalli y en 1973 Almgard, introdujeron el In 1969 Lalli and in 1973 Almgard introduced renal angio-infarction as a therapeutic modality in selected cases of renal carcinoma (1,2). The idea was to achieve the interruption of the arterial blood

flow of all, or a sector, of the diseased kidney. These authors suggested that the resulting tissue necrosis caused the reduction of blast mass volume, decreased intraoperative bleeding, achieved a better cleavage plane of the affected organ and a lower rate of vascular complications. Embolization was initially



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used as an adjunct to surgery, to facilitate radical nephrectomy and to reduce blood loss and surgical time. Subsequently, it was used as a palliative technique in patients with unresectable tumors or with incohercible hematurias.

In the last years, the greater knowledge of the functional vascular anatomy of the kidney and the technological advance have allowed the development of the therapeutic angiography and, with it, selective transarterial embolization as a minimally invasive endovascular procedure. The technique of percutaneous transcatheter embolization consists of the intentional reduction of tumor vascular flow by mechanical occlusion of the vascular territory selected by occlusive agents introduced by the endovascular approach. The area that will become ischemic is predictable, which makes it a selective and controlled procedure (3). The global experience shows that transarterial embolization is an effective and minimal morbimortality method for selected cases of renal neoplastic disease.

The objectives of this procedure are to alleviate or prevent possible vascular complications, such as intraoperative hemorrhage. Undoubtedly, this method requires a multidisciplinary team (endovascular interventionists and urologists) and sophisticated equipment, which can only be performed in centers of high medical complexity (4).

## Objectives

To evaluate the safety and feasibility of transarterial embolization as preoperative or palliative adjuvant treatment.

## Materials and methods

Thirty-two transarterial embolization procedures for renal and adrenal pathology were performed between May 2005 and June 2013 in 32 patients, 22 men and 10 women, mean age  $59 \pm 11$  years. The method was evaluated taking into account whether or not the objective was achieved. In the patient registry, a prospective model was used with index cards at the time of the procedure. All tumors were diagnosed and staged prior to the procedure by renal ultrasonography, computed tomography (CT) scan or MRI of the abdomen and thorax, bone scintigraphy in cases where a malignant origin was suspected. For this study, the patients were divided into two groups, according to the indication of the procedure: 1) Presurgical embolization in the combined treatment of renal carcinomas and 2) Embolization as the only palliative treatment in inoperable tumors.

## Procedures

Transarterial embolization was performed in a hemodynamic room with digital angiography, under sedation and radioscopic control. Prior to intraarterial embolization, aortography and selective renal arteriography were performed to determine anatomy and eventual vascular involvement. All procedures were performed by percutaneous puncture of the right femoral artery and selective catheterization. To access the vascular lesions, 5 Fr. catheters or 3 Fr. microcatheters were used when a peripheral renal artery catheterization was necessary. Different embolic

agents were used, such as Gelfoam® absorbent gelatin sponge (Pfizer, USA), polyvinylalcohol (PVA) microparticles, Contour® (Boston Scientific, USA), Coils (Boston Scientific, USA), Embosphere® embospheres), Onyx® (eV3-MTI, Irvine, CA, USA), N-butyl-2 cyanoacrylate NBCA® (TruFill, Cordis, Miami Lakes, Fl. Glubran 2, Gem, Viareggio, Lucca, Italy) or absolute alcohol (table 1). The selection criteria were angioarchitecture of the lesion, the feasibility of supraseductive catheterization, the therapeutic objective and the medical indication of the procedure.

Table 1. Indications of procedure and embolic agent used

#	Indication	Embolic agent
4	Preoperative	PVA
18	Preoperative or palliative	PVA + espirlas
2	Pre-surgical	PVA + onyx
2	Palliative	Embospheres
6	Palliative	Others

## Results

We included 32 procedures in 32 patients: 30 patients with renal carcinomas, 2 patients with tumors in the adrenal glands. There were no intra-procedural complications. Embolization was performed successfully in all patients (100%). In 28 (87.5%) patients a devascularization of 100% was achieved (figure 1).

*Presurgical embolization in the combined treatment of renal carcinomas:* To this end, 18 procedures were performed. The sex distribution was 10 men and 8 women, with a mean age of 60 years (r: 40-71). In routine preoperative studies, normal renal function parameters were verified in all cases. During the embolization / surgery interval, no complications were observed in this group, nor during surgery. Mean embolization / surgery interval time was 7.5 days (r: 1-15) depending on the treating urologist. In the assessment of the surgical procedure and according to the surgeon's criteria, operative bleeding was mild to moderate; In one case, intraoperative blood transfusion was required. Histological diagnosis of all cases was renal adenocarcinoma; The tumors were organ-confined or locally advanced (T1, T2 or T3 with N0 or N1 and M0). The mean follow-up time was 46 months (r: 4-67). There were no signs of local or distant recurrence until the date of this study (figure 2).

*Embolization as a single treatment, with a palliative objective in inoperable tumors:* This group was represented by 14 patients, 12 (85.7%) men and 2 (14.3%) women with a mean age of 46 years (r: 21-77). Complications were divided into 2 groups: a) derived from the tumor itself (14 cases, 92.9%) and b) as a consequence of previous procedures (1 patient, 7.1%). There were no complications from the procedure. In all cases, satisfactory controls were obtained, meeting previous

expectations. The mean hospitalization was 36 hours (r: 21-50). The analgesic used was tramadol with an average dose of 150 mg / day (R: 100-250) (figure 3). All patients reversed the clinical picture by which they were embolized. In cases of hematuria,

patients were serially controlled with hematocrit value, without post-embolization. No progression of the disease or relapse of the embolization motif was observed. One patient was lost during follow-up.

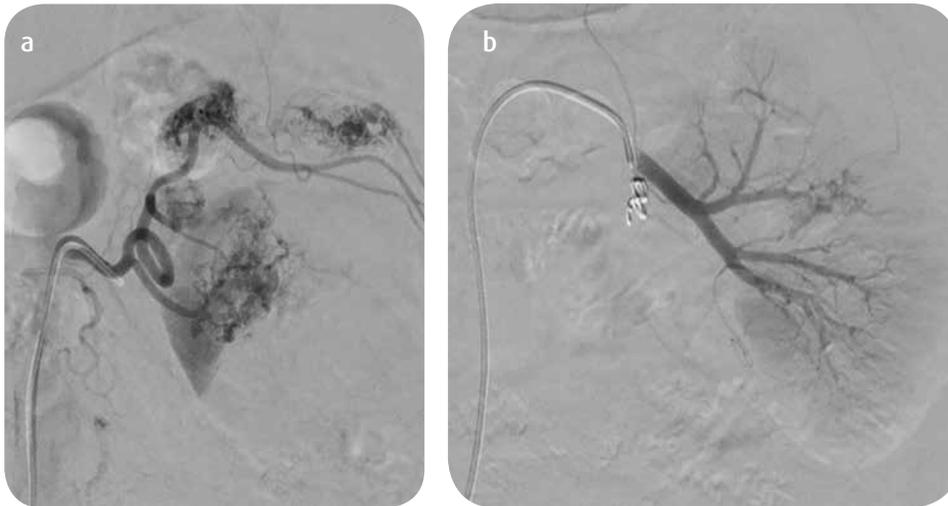


Figure 1. a and b) Embolization of renal tumor as pre-surgical treatment. 37-year-old patient with left renal carcinoma. Selective left renal digital angiography: hypervascularized lesion in the upper pole. PVA embolization + spirals (coils). Tumor devascularization secondary to embolization.

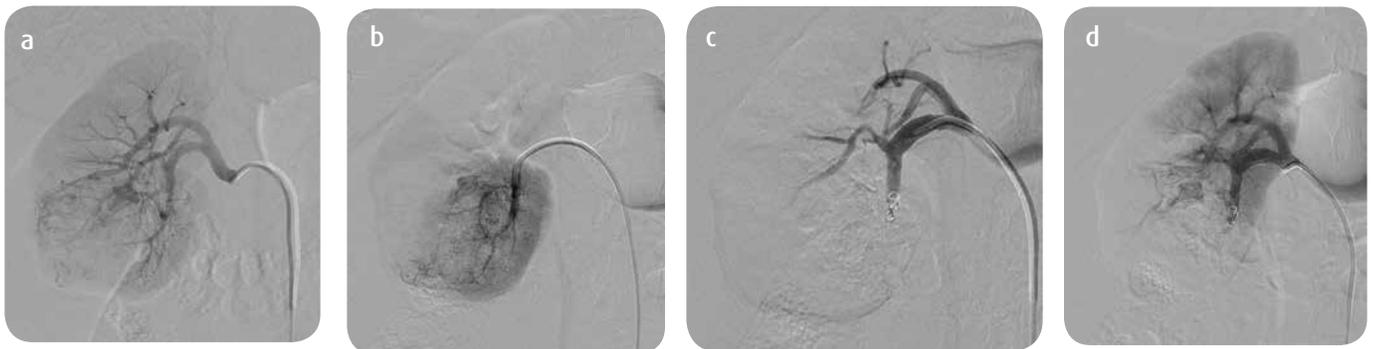


Figure 2. a-d). Embolization of renal tumor as preoperative treatment. A 52-year-old patient with right renal carcinoma. Selective right renal digital angiography: hypervascularized lesion at the lower pole. Selective angiography in the renal artery Inferior that demonstrates injury. Embolization with PVA + spirals. Tumor devascularization secondary to embolization



Figure 3. a, b and c). Embolization of renal tumor as a palliative treatment. A 63-year-old patient with right renal carcinoma. Selective right renal digital angiography: hypervascularized lesion in the middle third. Embolization with PVA + spirals. 100% devascularization.

## Discussion

In 1969, Lalli, using synthetic particles as an embolic agent in a canine model, was the first to describe the concept of therapeutic renal embolization (1). In 1973, Almgard, reported the application of renal embolic infarction to patients with metastatic neoplastic disease; half of them were associated with radical nephrectomy, in which he reported that the procedure was technically simpler and of shorter time (2-4). From these works guidelines began to be established for the use of this endovascular technique in renal oncology pathology for selected cases.

The contribution of transarterial embolization to the treatment of renal and adrenal neoplastic disease is from palliative therapy in advanced malignant disease. Numerous authors have emphasized the increased survival of patients with metastatic renal carcinoma treated with transarterial embolization with or without consistent nephrectomy. They point out that the benefit of this technique is based on the fact that it causes tumor lysis, and greater immunological stimulation with intense immunogenic response (5-7).

When the technique of transarterial embolization is evaluated, the embolic material used should be considered. Its choice depends on the size of the vessel to be occluded, the diameter of the catheter to be used, the indication of the procedure and the time considered (temporary or permanent). The agents that offer temporary (days or weeks), spontaneous (resorbable) dissolution are the absorbent gelatin sponge and the polyvinyl alcohol particles (PVA). Spirals, cyanoacrylate (histoacryl), ethylene-vinyl alcohol (onyx) and ethanol are permanent occlusion materials.

Important is the role of transarterial embolization in the treatment of tumor-specific complications (pain and hematuria) that alter the patient's quality of life, in those with inoperable renal carcinoma, in which this minimally invasive technique manages to reduce symptoms with little impact on the general condition. This concept described by most authors agrees with what was found in this review (8-10).

The use of transarterial embolization as a pre-surgical procedure is based on the creation of a better plane of peritumoral cleavage by peri-infarction edema and less intraoperative bleeding, which facilitates the surgical technique and reduces operative time (11-14).

In this work the advantages of embolization as a pre-surgical indication can be observed. The reports on the optimal time between embolization and surgery are contradictory: Singaas (15) reports an optimal embolization / surgery period of less than 24 hours, in contrast, Wallace (16) reports that this period should be greater than 72 hours, to facilitate the reduction of collateral circulation. In this series the best results were achieved when the surgery was performed 24 hours after the procedure.

## Conclusions

In our experience, tumor embolization was safe and effective. The current indications of transarterial embolization for tumors are: 1. Preoperative in the combined treatment of renal carcinomas, with the aim of reducing the morbidity and mortality of the surgical procedure. 2. As a single treatment, with a palliative objective in inoperable tumors.

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