

# High success rate after arterial renal embolisation

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## ABSTRACT

**INTRODUCTION:** The objective of this study was to present patients who underwent either elective or acute renal embolisation in a single centre where embolisation was available at all hours.

**METHODS:** The records of all patients who underwent transcatheter arterial embolisation (TAE) at Odense University Hospital from October 2010 to July 2013 were extracted retrospectively and examined to determine the indication for treatment, procedural details and complications. Patients were divided into four groups: renal cancer, trauma, angiomyolipoma (AML) and others. When there was indication for embolisation, a renal angiography was performed and followed by embolisation, if possible. The procedure was performed in local analgesia via the common femoral artery and as a super-selective procedure to save as many viable nephrons as possible. The most commonly used embolisation materials were coils.

**RESULTS:** In total, 35 patients were included; their mean age was 64 years (range: 17-95 years): eight females and 27 males. A total of 15 patients underwent embolisation due to renal cancer; nine elective and six acute procedures. Seven traumas were embolised. Five AML patients underwent embolisation of which three were treated acutely. Finally, eight patients were treated because of spontaneous bleeding, arteriovenous malformation (AVM) or aneurisms; three elective, five acute. The post-embolisation syndrome occurred in 22 patients (63%) and six patients (17%) were re-embolised. One patient had persistent infection (3%). Post-embolisation nephrectomy was performed in four patients (11%).

**CONCLUSION:** The most common reason for TAE was renal cancer. TAE is a safe modality with few complications both when performed acutely and electively.

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Transcatheter arterial embolisation (TAE) is an effective, minimally invasive treatment, which is associated with low morbidity and mortality [1]. Thus, TAE can be performed in patients with a low performance status [2]. TAE is well-established as an endovascular treatment of urological vascular emergencies such as iatrogenic, traumatic or spontaneous emergencies with or without an underlying pathology [3]. Furthermore, TAE can be used as a prophylactic measurement in high-risk patient with

renal angiomyolipoma (AML) and in renal cancer patients pre-operatively to facilitate nephrectomy or as a palliative treatment [2, 4-7]. Previous studies have limitations, i.e. small sample sizes and selection to only one of the mentioned patient groups. The present descriptive study aimed to present the demographics of the patients who underwent renal TAE performed either electively or urgently in a single centre where a dedicated interventional radiology team was on call with 24 hours a day.

## METHODS

### Patients

The patient cohort consisted of all consecutive patients who underwent renal TAE at Odense University Hospital, Denmark, from October 2010 to July 2013 (34 months). The patients were identified retrospectively from the records at the Department of Radiology (RIS/PACS systems). Furthermore, the patients' medical records were examined to determine demographic data (gender, age), indications to treat, procedural details, complications and side effects during and after TAE. The patients, who either underwent elective and emergency management, were divided into four groups: renal cancer, trauma, AML and others (i.e. spontaneous bleeding from a renal artery, renal artery aneurism and arteriovenous malformation (AVM)). Computed tomography (CT) with intravenous contrast confirmed the indication to embolise in all cases. Prior to elective TAE, selective kidney function was determined by renography with <sup>99m</sup>Tc-mercaptoacetyltriglycin.

### Embolisation technique and set-up

Trained interventional radiologists performed TAE in local analgesia via the common femoral artery. An initial renal angiography was obtained for identification of bleeding vessels and followed by embolisation if indicated and possible. The embolisation was performed super-selectively to save as many nephrons as possible. The most common embolisation materials used were coils and vascular plugs; but in some cases of coagulopathy or patients on anticoagulation treatment, liquid embolisation materials were used. After TAE, the patients' vitals was monitored closely and blood tests was taken specifically for post-embolisation complications at the Department of Urology. In elective cases, the pa-

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tients' co-morbidities and polypharmacy were optimised several days before the procedure. In the acute cases, all patients went directly to the theater without delay.

*Trial registration:* not relevant.

## RESULTS

A total of 35 urological patients had TAE performed and were included. There were eight females (23%) and 27 males (77%) with a mean age 64 years, range: 17-95 years (**Table 1**). Fifteen patients (43%) underwent embolisation because of renal cancer (Table 1). Nine patients were electively embolised; seven due to ongoing bleeding and two were unsuited for nephrectomy. They underwent TAE to reduce tumour bulk and tumour pressure symptoms. Six patients (17%) with renal cancer

were embolised due to heavy, persistent or acute bleeding. Seven traumas (20%) were embolised acutely, five after blunt and two after penetrating traumas. Five patients (14%) with AML underwent TAE. Three patients were embolised acutely because of spontaneous bleeding and two were embolised in elective phase because the tumours exceeded 4 cm and therefore carried a high risk of haemorrhage. Finally, eight patients (23%) were treated for of other reasons. Five patients were embolised in acute phase; one because of spontaneous bleeding from a polycystic kidney, one had a bleeding renal artery aneurism, one patient had spontaneous bleeding without known coagulopathy and two patients were embolised due to bleeding from AVM. Three patients were electively embolised; one due to an oozing kidney bleeding and two due to a high risk of spontaneous bleeding, of whom one patient had a pseudoaneurism after cryoablation of a kidney tumour and one had an AVM. The technical success, i.e. with embolisation of the bleeding vessel as intended, was without peri- or post-procedural complications related to TAE.

A total of 22 patients (63%) experienced adverse effects of the embolisation. These effects included post-embolisation syndrome presenting with new fever ( $n = 3$ ), flank pain ( $n = 9$ ) or both ( $n = 10$ ) (**Table 2**). In the elective group, post-embolisation syndrome was observed in 64% ( $n = 9$ ); the corresponding share in the emergency group was 59% ( $n = 14$ ). Six patients (17%) underwent re-embolisation due to ongoing bleeding/re-bleeding, of whom one was an elective and five were emergency patients. Four renal cancer patients (11%) underwent nephrectomy after embolisation because tumour shrinkage made this second procedure possible. One of the renal cancer patients (3%) developed infection two days after embolisation and had the abscess drained at the same procedure. Few days later, he was nephrectomised due to an ongoing bleeding. One patient (3%) died on day 5 after the embolisation for reasons not related to the embolisation procedure. Thus, the clinical success defined as stoppage of the bleeding without any further need for transfusion or re-intervention was 80%.

**TABLE 1**

Demographics and reason for embolisation of the patients.

	Men	Women	Total
Sex, n (%)	27 (77)	8 (23)	35 (100)
Age, yrs, mean (range)	64 (17-95)	64 (34-92)	64 (17-95)
<i>Reason for embolisation, n (%)</i>			
Renal cancer:			
Elective	7	2	9
Emergency	4	2	6
Total	11	4	15 (43)
Trauma:			
Elective	0	0	0
Emergency	7	0	7
Total	7	0	7 (20)
Angiomyolipoma:			
Elective	0	2	2
Emergency	1	2	3
Total	1	4	5 (14)
Other:			
Elective	3	0	3
Emergency	5	0	5
Total	8	0	8 (23)

**TABLE 2**

Post-embolisation complications in the patients. The values are n (%)

	Elective	Emergency	Total
Procedures	14 (40)	21 (60)	35 (100)
Post-embolisation syndrome	9 (26)	13 (37)	22 (63)
Re-embolisation	1 (3)	5 (14)	6 (17)
Post-embolisation nephrectomy	0 (0)	4 (11)	4 (11)
Infection	0 (0)	1 (3)	1 (3)
Dead	0 (0)	1 (3)	1 (3)

## DISCUSSION

This study reveals overall successful TAE in 29 cases (83%) whereof 16 patients were acute. Renal cancer was the most common reason for embolisation. There were no procedure complications in either elective or emergency patients, but post-embolisation syndrome was seen in 63% of the patients. Post-embolisation syndrome is a well-known and rather frequently seen side effect to transarterial embolisation. It consists of a slight rise in temperature accompanied by nausea/vomiting and/or flank pain beginning 1-3 days after embolisation.



Transcatheter arterial embolisation with coil.

Treatment is symptomatic and consists of antipyretics, antiemetics and analgesics; and spontaneous resolution occurs in a matter of a few days. Previous studies have shown the same incidence of this syndrome after kidney embolisation (64-69%) [8, 9]. Even though a large percentage of patients undergoing TAE experience post-embolisation syndrome, the condition is often mild and therefore the procedure can even be performed in poorly performing patients, i.e. a high WHO performance status score [10].

In this study, four cancer patients were nephrectomised after embolisation. The following pathological examination showed fibrosis only in the embolised area of the kidney, whereas the remaining parts of the kidney tissue were intact. When super-selective embolisation is performed, the procedure is nephron-sparing, and unaffected areas of the kidney will be preserved. Previous studies have shown that there is no significant reduction in kidney function after super-selective embolisation of AML and traumatic kidney injuries [11-14]. Therefore, it is not currently recommended to perform renography to determine kidney function pre- and post-embolisation. Furthermore, if acute, TAE can be performed both electively and acutely in patients with reduction of the kidney function [11].

With the possibility of super-selective renal artery embolisation, a classic surgical approach with partial or total nephrectomy is no longer indicated in most cases of renal bleeding. An alternative is TAE, which is a minimally invasive procedure with low mortality and morbidity. However, therapeutic embolisation is not free of risk but, as demonstrated in this study, complications are few. Endovascular treatment demands short hospitalisation, recovery is rapid and there is no need for general anaesthesia [2, 15]. However, an alternative to embolisation is surgery with hemi- or total nephrectomy; and, following loss of kidney function, alternatively no action which will have a lethal outcome.

In this single-centre study, 60% of the embolisations were performed as emergency and 40% as elective procedures. The overall technical success rate was 83% of

which 16 cases were acute (76% success rate) and 13 cases were elective (93% success rate). Unsurprisingly, this shows a higher incidence of technically successful procedures in elective patients ( $p > 0.05$ ). When embolisation is performed electively, it is possible to optimise the patient's performance status by taking blood samples and doing re-nutrition, rehydration, blood transfusion and other factors that may influence the complication rate such as proper perioperative correction of anti-coagulating drugs and blood pressure. Therefore, it is recommended to perform as many embolisations as possible as elective procedures to minimise the number of potential complications. Emergency embolisation, however, is a safe and nephron-sparing procedure, which may be life-saving.

## CONCLUSION

Renal TAE was performed in a diverse patient group as a safe procedure associated with low rate of morbidity and mortality both when performed as an elective and an emergency procedure.

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