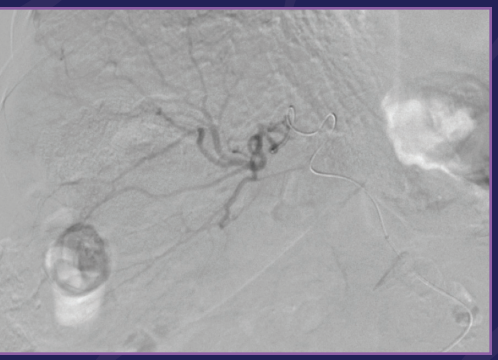
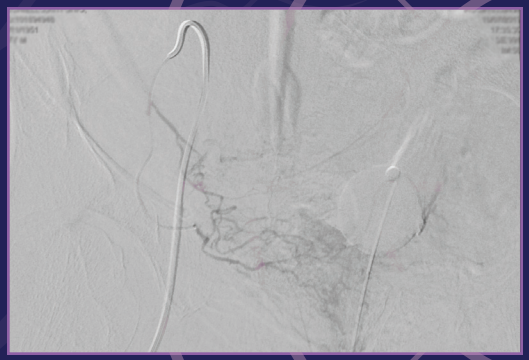
Supplement to

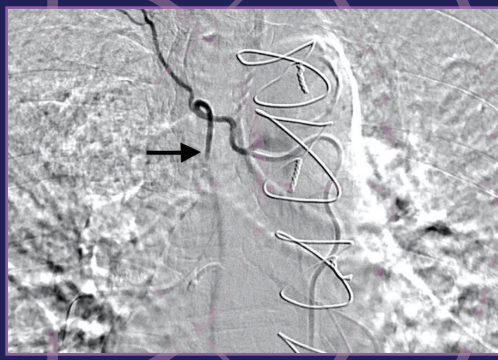
Sponsored by Guerbet

Endovascular TODAY

April 2020







# TARGETED EMBOLIZATION

## Using the SeQure® Microcatheters

# SEQURE®

Reflux Control Microcatheter

## Reduce microspheres reflux[1].
## Go with the flow.

Flow dynamics based technology. Contrast media fluid barrier.

Guerbet

GU03201085 - P19 081 SEQ - March 2020 - Photo: Guerbet

**1.** Vessel Flow Dynamic Indication (Beads Reflux) Bench Test report TR-002.

# Table of CONTENTS


4 **Selective Liver Embolization in Unresectable, Multifocal Hepatocellular Carcinoma**
By Sachin Modi, BSc (Hons), MBBS, FRCR, FRCR (IR)

6 **Transarterial Chemoembolization With the SeQure® Microcatheter***
By Pedro Pardo Moreno, MD, PhD; Gonzalo Ruíz Villaverde, MD, PhD; and Juan José Ciampi-Dopazo, MD, EBIR

8 **Chemoembolization Via Intrahepatic Collateral Arteries**
By Daniel Y. Sze, MD, PhD

11 **Prostate Artery Embolization**
By Simone Bongiovanni, MD; Alberto Balderi, MD; Enrico Peano, MD; and Maurizio Grosso, MD

13 **Prostate Artery Embolization***
By Ari J. Isaacson, MD

15 **Uterine Artery Embolization**
By Aaron Rohr, MD, MS

17 **Use of the SeQure® Microcatheter in Bronchial Embolization Procedures***
By Gonzalo Ruíz Villaverde, MD, PhD; Pedro Pardo Moreno, MD, PhD; and Juan José Ciampi-Dopazo, MD, EBIR

*Sponsored by Guerbet*

# Selective Liver Embolization in Unresectable, Multifocal Hepatocellular Carcinoma

**BY SACHIN MODI, BSc (Hons), MBBS, FRCR, FRCR (IR)**

## CASE SUMMARY

A 64-year-old man was referred to the hepatobiliary multidisciplinary team (MDT). He had a known diagnosis of liver cirrhosis and presented with right upper quadrant pain, Child-Pugh A, and an ECOG (Eastern Cooperative Oncology Group) score of 1. His past medical history included type 2 diabetes mellitus, hypertensive heart disease, myocardial infarction, and multiple other comorbidities, including anemia. Initial investigations included abdominal ultrasound (US), liver function tests, and alpha-fetoprotein tests, followed by contrast-enhanced CT and US-guided liver biopsy.

After completing the investigations, CT revealed multifocal hepatocellular carcinoma (HCC) with two lesions in the right lobe of the liver (Figures 1 and 2). The largest lesion in segment 8 measured 6.8 cm, and a second smaller lesion in segment 6 measured 4.3 cm. Both lesions showed avid arterial enhancement and washout. Biopsy of the largest lesion confirmed a diagnosis of HCC.

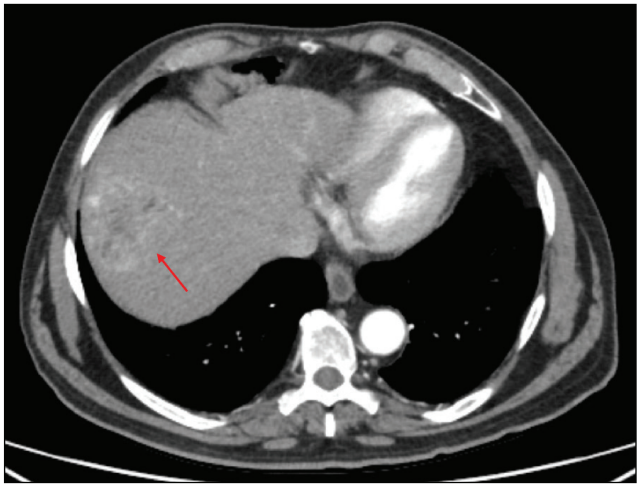


**Figure 1. Enhancing HCC in segment 8, measuring 6.8 cm (arrow).**

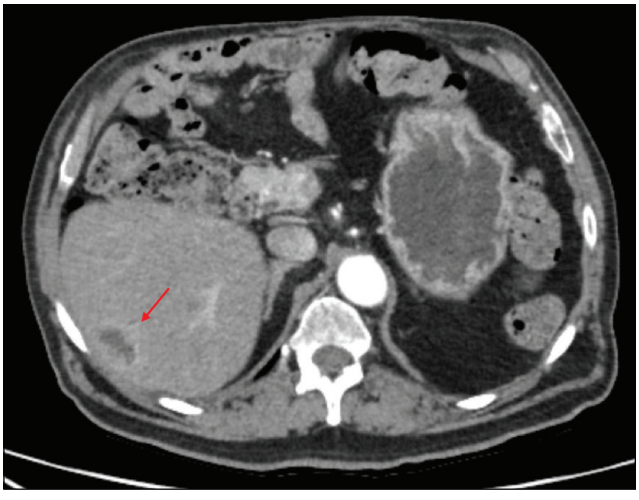


**Figure 2. Enhancing HCC in segment 6, measuring 4.3 cm (arrow).**

## DIAGNOSIS

Multifocal HCC

## TREATMENT OPTIONS

The patient was not suitable for surgical resection due to the location of the lesions, concerns over future liver volume, and significant comorbidities. Microwave ablation was considered but excluded due to the lesion size. Per our normal institutional policy and the MDT discussion, the patient was referred for transarterial chemoembolization (TACE).

## COURSE OF TREATMENT

After the MDT meeting, the patient was scheduled for TACE within 4 weeks. After written informed consent, he was brought into the interventional radiology suite and placed in a supine position. The right groin was prepped and draped, and 10 mL of lidocaine (1%) was administered. US-guided puncture of the right common

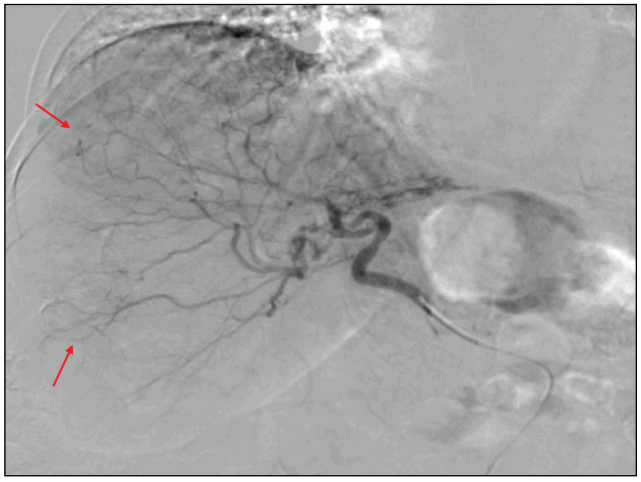


**Figure 3. Angiogram showing a C2 Cobra catheter in the replaced hepatic artery and a faint enhancement of the HCCs (arrows).**

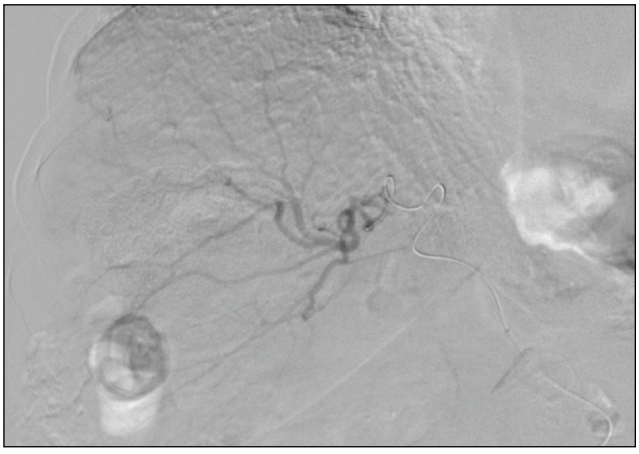


**Figure 4. Angiogram showing the SeQure® microcatheter through the tortuous right hepatic artery branches in a distal branch, which was shown to supply both HCCs on rotational CT.**

femoral artery was performed using an 18-gauge needle. A wire was placed, followed by a 4-Fr vascular sheath. The hepatic artery was replaced off the superior mesenteric artery and accessed using a 4-Fr C2 Cobra catheter (Cordis, a Cardinal Health Company). Angiography was performed, showing faintly enhanced areas corresponding to the HCCs (Figure 3). A 2.4-Fr SeQure® microcatheter (Guerbet) and a Fathom 0.016-inch guidewire (Boston Scientific Corporation) were used to navigate a tortuous right hepatic artery into the branch supplying both HCCs (Figure 4). Rotational CT was performed, confirming satisfactory coverage of both tumors. The vessel was then embolized to stasis using 75-mg doxorubicin loaded onto 100–300-µm DC Beads (Boston Scientific Corporation) mixed with contrast. Flow-directed embolization was observed with no reflux seen.

Hemostasis was achieved using manual compression, and the patient was discharged home the next day.

## RESULTS

The patient had an uneventful recovery period and was followed-up per institutional policy with contrast-enhanced CT at 4 weeks, followed by a review in clinic. The CT showed a complete response in both lesions. No further enhancement of the two HCCs was seen; the segment 8 lesion decreased in size to 3.8 cm and the segment 6 lesion decreased to 1.8 cm (Figure 5). Normal appearance of the liver was observed, with no evidence of any treatment complications and, specifically, no evidence of any nontarget embolization.

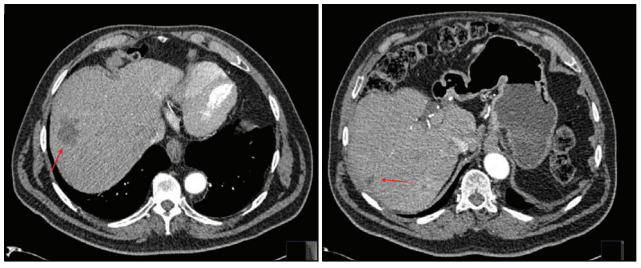


**Figure 5. CT showing complete response in both lesions, with no arterial enhancement and significant reduction in size. No evidence of nontarget embolization is noted.**

## DISCUSSION

Microcatheters designed for embolization in the liver must have the flexibility and pushability to navigate often tortuous hepatic vessels to obtain distal positions and treat lesions as selectively as possible. The SeQure® microcatheter tip design allows reflux control and reduces the risk of nontarget embolization and potential significant complications (eg, cholecystitis, gastric/duodenal injury, biliary ischemia). SeQure® lumen diameters are adequate to allow administration of microspheres and varying sizes containing chemotherapy without blockage This case highlights these important features and shows good safety and usability of the SeQure® microcatheter in liver embolization. Further studies will be required to test the microcatheter in other settings and indications. ■

Results from case studies are not necessarily predictive of results in other cases. Results in other cases may vary.

**Sachin Modi, BSc (Hons), MBBS, FRCR, FRCR (IR)**
Consultant Interventional Radiologist
University Hospital Southampton
Southampton, Hampshire, United Kingdom
*Disclosures: Consultant to Boston Scientific Corporation and Delcath Systems.*

P20000019

*Sponsored by Guerbet*

# Transarterial Chemoembolization With the SeQure® Microcatheter*

**BY PEDRO PARDO MORENO, MD, PhD; GONZALO RUÍZ VILLAVERDE, MD, PhD; AND JUAN JOSÉ CIAMPI-DOPAZO, MD, EBIR**

## CASE PRESENTATION

A 61-year-old man with a medical history of ethylic cirrhosis underwent routine surveillance in the hepatology clinic. He had a microwave ablation 4 months previously for a 3.1-cm focal hepatocellular carcinoma.

Further workup revealed an aspartate aminotransferase level of 65 U/L (normal, 0–39 U/L), an alanine aminotransferase level of 60 U/L (normal, 7–41 U/L), an alkaline phosphatase level of 85 U/L, a total bilirubin level of 1.2 mg/dL, negative hepatitis serology, normal renal function, and an alpha-fetoprotein level of 11 µg/L. Abdominal CT and MRI demonstrated multiple liver lesions, with a dominant 55-mm lesion in segment 6 showing significant growth.

The multidisciplinary liver tumor board consensus was a recommendation for transarterial chemoembolization (intermediate-stage patient, according to Barcelona Clinic Liver Cancer stage B) to limit disease progression, with the potential for downstaging and consideration of liver transplant in the future.

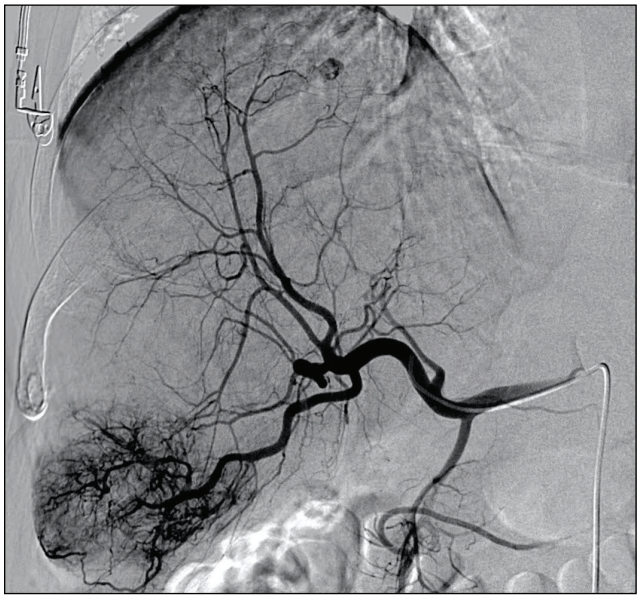


**Figure 1. Hepatic artery angiogram demonstrating the dominant hepatocellular carcinoma lesion in segment 6.**

## PROCEDURAL OVERVIEW

Right femoral access was achieved through a 5-Fr introducer sheath. Using a combination of a 5-Fr C2 Glidecath catheter (Terumo Europe) and a 0.035-inch hydrophilic guidewire, the celiac trunk and the proper hepatic artery were catheterized. Angiography was then performed, and the nutrient vessels of the dominant lesion in segment 6 were visualized (Figure 1). Subsequently, a 2.8-Fr SeQure® microcatheter (Guerbet) was advanced to the right hepatic artery branch over a 0.014-inch guidewire, irrigating the target lesion in segment 6. Mixed preparation of embolic materials consisted of 7 mL of iodinated contrast

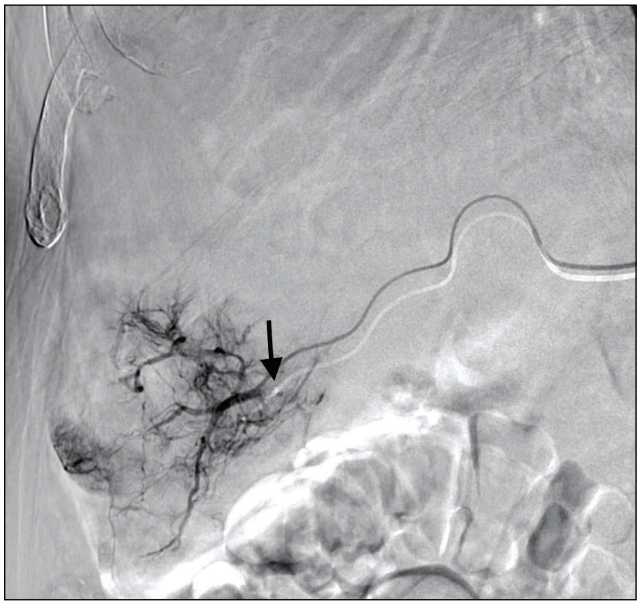


**Figure 2. A 2.8-Fr SeQure® microcatheter was advanced to the feeding tumoral artery, and embolization was performed without occlusion of the other right segmental arteries. The black arrow shows the microcatheter's proximal radiopaque mark.**

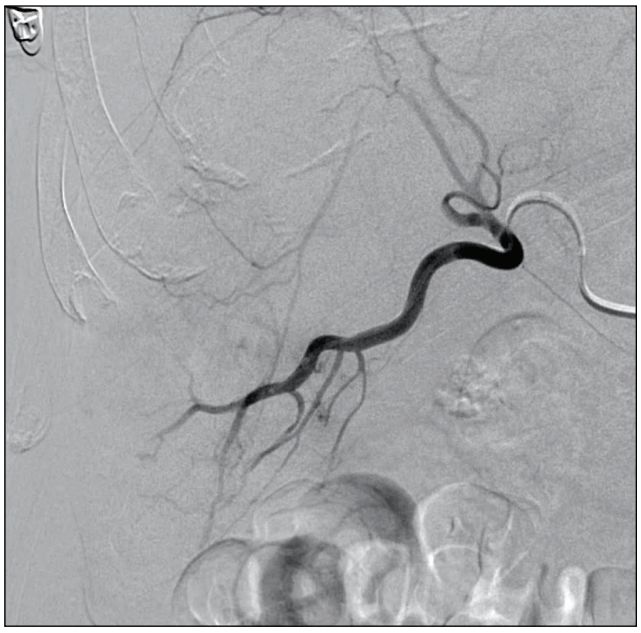


**Figure 3. After embolization, there was no further flow into the tumoral branch vessel, and arterial flow into other segmental nontarget branches was preserved.**

and 5 mL of saline loaded with 100–300-µm and 300–500-µm DC Beads (Boston Scientific Corporation). The total amount of administered doxorubicin was 150 mg. The target artery was embolized with approximately 11 mL of the DC Bead mixture until blood stasis was observed. The DC Beads/contrast mixture injection could be controlled by observing the contrast reflux with the proximal radiopaque marker of the SeQure® microcatheter (Figure 2). Complete occlusion of the branches responsible for tumor irrigation was achieved (Figure 3).

There were no immediate complications and no inadvertent/nontarget embolization of other right segmental arteries. The patient was discharged after 48 hours, without postembolization syndrome.

## DISCUSSION

The radiopaque marker located at the tip allows for the correct positioning of the SeQure® microcatheter. The side holes, which are located proximal to the radiopaque marker, allow for reflux of only iodinated contrast, not embolic beads. This reduces the risk of reflux and avoids embolization of undesired vascular territories.

Our experience with this device demonstrates the correct target embolization and helps decrease inadvertent complications. ■

*As per IFU, for guiding catheters, the SeQure® microcatheter is recommended for use with minimum 0.038-inch guidewire compatible.
Results from case studies are not necessarily predictive of results in other cases. Results in other cases may vary.

**Pedro Pardo Moreno, MD, PhD**
Interventional Radiology Unit
H.U. Virgen de las Nieves
Granada, Spain
pedropardomoreno@gmail.com
*Disclosures: Received compensation from Guerbet for this article.*

**Gonzalo Ruíz Villaverde, MD, PhD**
Interventional Radiology Unit
H.U. Virgen de las Nieves
Granada, Spain
*Disclosures: Received compensation from Guerbet for this article.*

**Juan José Ciampi-Dopazo, MD, EBIR**
Interventional Radiology Unit
H.U. Virgen de las Nieves
Granada, Spain
*Disclosures: Received compensation from Guerbet for this article.*

P20000020

*Sponsored by Guerbet*

# Chemoembolization Via Intrahepatic Collateral Arteries

**BY DANIEL Y. SZE, MD, PHD**

## CASE SUMMARY

A 53-year-old man with chronic hepatitis B presented with elevated transaminases while taking herbal supplements, but was otherwise asymptomatic, Child-Pugh A5, and ECOG performance status 0. Workup included nonreactive hepatitis B surface antigen, negative hepatitis C antibody, negative colonoscopy except for small hemorrhoids, negative antinuclear antibody, negative alpha-1 antitrypsin, and ceruloplasmin tests. He transferred his care to a second hospital and underwent hepatic ultrasonography, revealing a 16-cm mass, confirmed on multiphasic CT scan to be a hepatocellular carcinoma (Figure 1). He then transferred his care to a tertiary care hospital, where he underwent a trisegmentectomy.

One year after "curative" resection, follow-up imaging revealed a hypervascular lesion in segment 3 measuring 2.1 cm, indicative of recurrence (Figure 2). A second possible lesion in the fissure of the ligamentum venosum was measured at 0.8 cm and was felt to be inaccessible for ablation (Figure 2). The patient's liver function remained Child-Pugh A5, but his performance status had deteriorated mildly to status 1 after surgery. He was referred for hepatic angiography and chemoembolization.

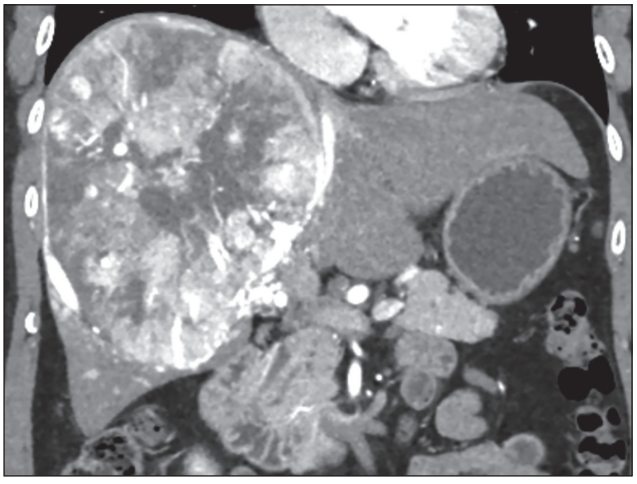


**Figure 1. Coronal reformat of arterial-phase CT shows replacement of the right lobe with a large hepatocellular carcinoma, extending into segments 1 and 4.**

## IMAGING FINDINGS

Initial hepatic angiography revealed postsurgical distortion of the arterial anatomy, with proximal occlusion of the segment 2 and segment 3 arteries with distal reconstitution from intrahepatic collateral vessels (Figure 3). Parenchymal phase imaging confirmed two hypervascular lesions (Figure 3).

Although the collateral vessels appeared too small in diameter and too tortuous to accommodate standard

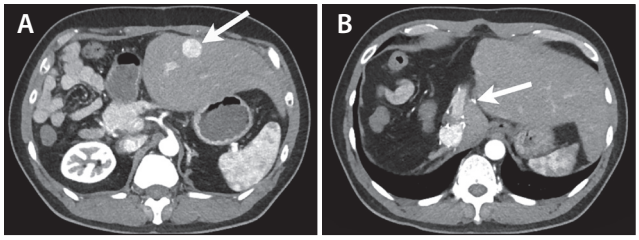



**Figure 2. Arterial-phase CT image of the remnant liver 1 year after resection shows a new 2.1-cm lesion in segment 3 (arrow). Washout and pseudocapsule confirmed recurrent hepatocellular carcinoma (A). A second small nodule of hypervascularity is seen in the fissure of the ligamentum venosum adjacent to the left portal vein (arrow) but is too small to characterize further (B).**

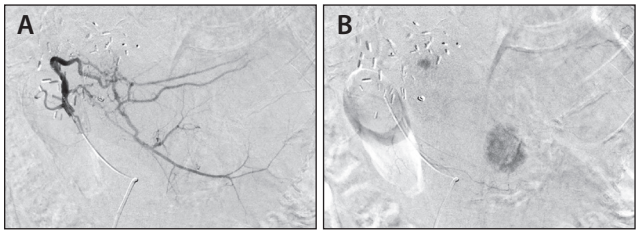



**Figure 3. Left hepatic arteriogram revealed occlusion of the proximal segment 2 and segment 3 branches, with reconstitution of distal branches via intrahepatic collateral vessels at the cut surface (A). Parenchymal phase image from the same arteriogram confirmed two hypervascular lesions (B).**



Reprinted with permission from *Applied Radiology* Vol. 48, No. 6.

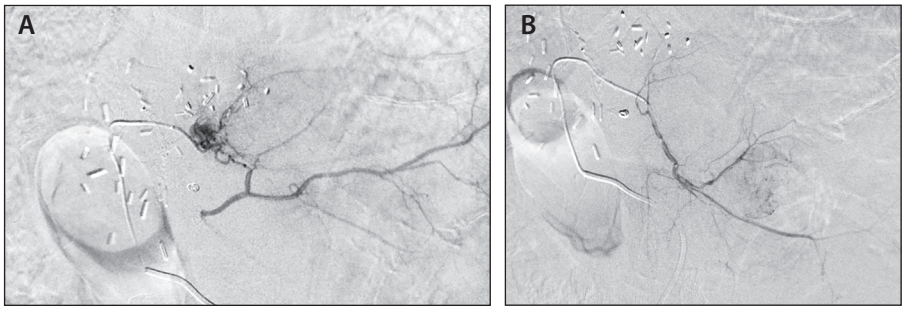



**Figure 4. Selective arteriogram of the most cranial segment 2 collateral branch confirmed supply to the smaller lesion. A 2.8-Fr SeQure® catheter was wedged into this submillimeter vessel, and harder injection showed additional collateralization reconstituting distal segment 2 vessels (A). Selective arteriogram of the largest but most tortuous collateral vessel reached the reconstituted segment 3 vessel, supplying the larger tumor (B).**

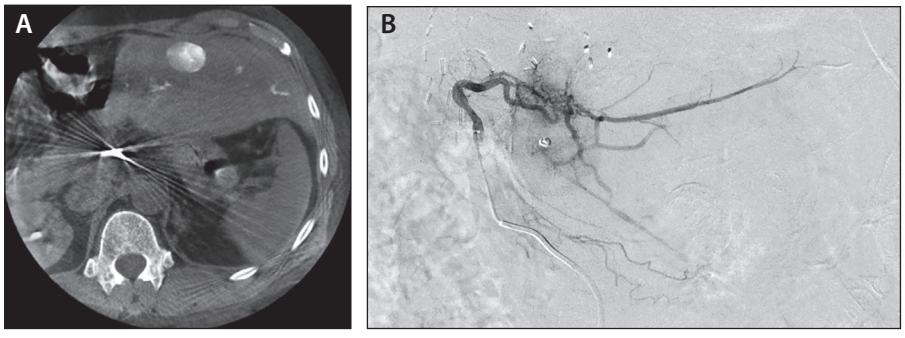



**Figure 5. After administration of 100–300-µm doxorubicin-eluting microspheres at both sites, the final arteriogram showed resolution of tumor blushes and retained patency of the collateral network, segment 2 artery, and proximal segment 3 artery (A). Unenhanced cone-beam CT showed retention of iodinated contrast medium in the tumors, as well as in some peripheral arteries (B).**

microcatheters, treatment was attempted using a Fathom 0.014-inch guidewire (Boston Scientific Corporation) and a 2.8-Fr SeQure® microcatheter (Guerbet). (At the time, smaller-diameter SeQure® microcatheters had not yet been released.)

The submillimeter branch supplying the falciform cleft was successfully selected, and the lesion was treated with doxorubicin-loaded LC beads 100–300 µm (BTG) until stasis of the tumor-feeding branch (Figure 4) was achieved. Likewise, the tortuous intrahepatic collateral vessel to segment 3 was selected and the segment 3 lesion was also treated with drug-eluting LC beads (Figure 4). Completion angiography confirmed disappearance of tumor blushes but maintenance of flow in nontarget vessels (Figure 5), and unenhanced cone-beam CT confirmed retention of contrast medium in the treated lesions (Figure 5).

Follow-up MRI at 3 months revealed complete response of the ligamentum venosum lesion and partial response of the segment 3 lesion. Residual disease was treated with percutaneous microwave ablation.

## DISCUSSION

Microcatheter design must balance the demands of: (1) adequate lumen to accommodate viscous or particle-containing injected fluids; (2) flexibility to navigate tortuosities without causing vessel injury; and (3) longitudinal stiffness to allow pushability. Additional features may include shaped tips, torqueability, and characteristics that help reduce reflux.

## CONCLUSION

Selectivity of catheterization and treatment has a substantial impact on outcomes of transarterial chemoembolization. Navigation of small, tortuous vessels is possible using the SeQure® microcatheter, even using the large 2.8-Fr version. Although this case cannot demonstrate the reflux reduction features of the SeQure® microcatheter, it demonstrates the flexibility and pushability that allowed selection of small, tortuous vessels. Future studies using radiopaque microspheres may be performed to test the controlled reflux feature. ■

Recommended Reading

1. Miyayama S, Mitsui T, Zen Y, et al. Histopathological findings after ultraselective transcatheter arterial chemoembolization for hepatocellular carcinoma. Hepatol Res. 2009;39:374-381.
2. Mokin M, Waqas M, Setlur Nagesh SV, et al. Assessment of distal access catheter performance during neuroendovascular procedures: measuring force in three-dimensional patient specific phantoms. J Neurointerv Surg. 2019;11:619-622.
3. Ogata N, Goto K, Uda K. An evaluation of the physical properties of current microcatheters and guidewires. The development of the "catheter-glide approach" in response to weaknesses of current materials. Interv Neuroradiol. 1997;3:65-80.
4. Zoarski GH, Mathis JM, Hebel JR. Performance characteristics of microcatheter systems in a standardized tortuous pathway. AJNR Am J Neuroradiol. 1998;19:1571-1576.



**Daniel Y. Sze, MD, PhD**
Professor of Vascular and Interventional Radiology
Stanford University
Stanford, California
*Disclosures: Consultant to Guerbet; received compensation from Guerbet for this article.*

P20000082

# SEQURE®

Reflux Control Microcatheter

## Deliver more[1]. Reduce the risk of nontarget embolization[2,3].

The only fluid-barrier reflux control microcatheter enabling flow directed embolization

Guerbet

GU03201086 - P20000098 - March 2020 - Photo: Guerbet

**1.** Beads accumulation reports DR_18_00178_RAP & TR-026. Data-on-file Guerbet.
**2.** Vessel Flow Dynamic Indication (Beads Reflux) Bench Test report TR-002. Data-on-file Accurate Medical Therapeutics Ltd.
**3.** Usability, Safety and Efficacy of a Novel Microcatheter for Reducing Non-Target Embolization. Michael Tal et al. WCIO 2018 Poster. Animal study.

*Sponsored by Guerbet*

# Prostate Artery Embolization

**BY SIMONE BONGIOVANNI, MD; ALBERTO BALDERI, MD; ENRICO PEANO, MD; AND MAURIZIO GROSSO, MD**

## CASE PRESENTATION

A 68-year-old man with a medical history of hypertension and paraplegia after a car accident at a young age presented with benign prostatic hyperplasia (BPH) and lower urinary tract symptoms (LUTS), including incomplete emptying, frequency, urgency, weak stream, and nocturia. The patient presented to our center because he was not responsive to medical therapy with α-blockers and refused transurethral resection of the prostate. Therefore, diagnostic investigations were performed so he could undergo prostate artery embolization (PAE).

## DIAGNOSTIC TESTING AND PROCEDURAL APPROACH

An ultrasound demonstrated enlargement of the prostate with a 70-mL volume and a bladder without lesions protruding into the lumen. Uroflowmetry demonstrated a pathologic emptying curve with a maximum flow of 10.8 mL/second. Results of blood testing showed a prostate-specific antigen (PSA) level of 3.33 ng/mL, with normal coagulation, platelet count, and creatinine. Scores on the International Index of Erectile Function (IIEF-5), International Prostate Symptoms Score (IPSS), and quality-of-life (QOL) questionnaires were 5, 22, and 5 points, respectively, demonstrating an impaired sexual function, severe LUTS symptoms, and a poor QOL.

PAE was performed via 5-Fr right femoral access, and digital subtraction angiography (DSA) of the iliac axes and the internal iliac arteries showed the origin of the left prostatic artery from the obturator artery and the origin of the right prostatic artery from the internal pudendal artery, which were respectively classified as type III and type IV anatomy, according to the classification system described by de Assis et al (Figure 1A–C).[1] Embolization was carried out using the 2.4-Fr SeQure® microcatheter (Guerbet) with 300–500-µm Embosphere microspheres (Merit Medical Systems, Inc.) (Figure 1D). Bilaterally, the PErFecTED technique was used, in which the prostatic artery was embolized proximally to near stasis after passing all collateral arteries; subsequently, the microcatheter tip was advanced deeper into the parenchymal branches, which were then embolized to complete stasis.[2]

## CASE SUMMARY

The patient was discharged the day after the procedure, after catheter removal. No periprocedural complications were observed. At 1-month follow-up, his PSA decreased to 1.17 ng/mL (from 3.33 ng/mL). At 3-month follow-up, the patient's IPSS score decreased to 14, the QOL score improved to 2, and the IIEF-5 score improved to 22.

## DISCUSSION

PAE is a technique that is best performed by highly experienced interventional radiologists due to the complexity of the arterial pelvic anatomy. Periprostatic organs and structures such as the bladder, rectum, penis, seminal vesicle, pelvis, bones, and skin may be damaged by nontarget embolization, especially due to the misidentification of normal vascular anatomy and variants or due to inadvertent embolic reflux. Indeed, cases of nontarget embolization are described in the literature, including bladder ischemia, transient ischemic proctitis,

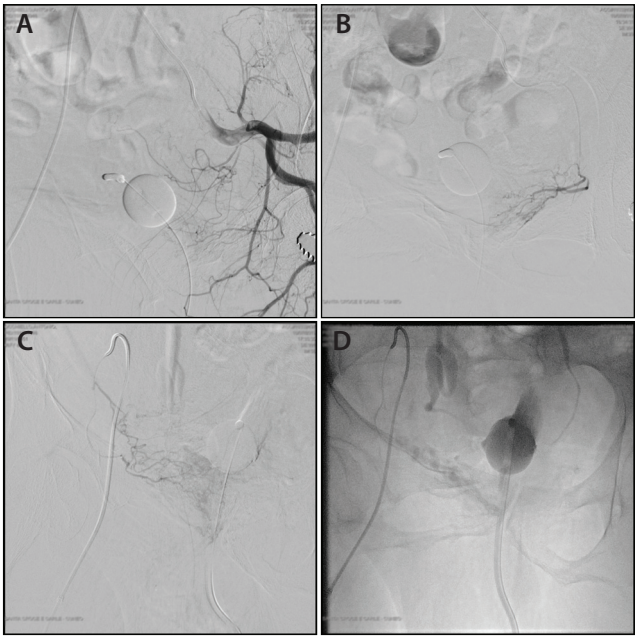



**Figure 1. DSA of left internal iliac artery (A). Selective DSA of the left prostatic artery (B). Selective DSA of right prostatic artery (C). DSA showing embolization of right prostatic artery (D).**

rectal ulcers, transient rectal bleeding, penile ulcers, and pubic bone ischemia.

The 2.4-Fr SeQure® microcatheter is a technology with side holes localized proximally to the tip that radially filter contrast media during embolization, creating a fluid barrier around the microcatheter, which allows the delivery of more microspheres and also reduces the risk of nontarget embolization. In this case, the SeQure® microcatheter was used successfully to manage LUTS caused by BPH. ■

1. de Assis AM, Moreira AM, de Paula Rodrigues VC, et al. Pelvic arterial anatomy relevant to prostatic artery embolization and proposal for angiographic classification. Cardiovasc Intervent Radiol. 2015;38:855-861.
2. Carnevale FC, Moreira AM, Antunes AA. The "PErFecTED technique": proximal embolization first, then embolize distal for benign prostatic hyperplasia. Cardiovasc Intervent Radiol. 2014;37:1602-1605.



**Simone Bongiovanni, MD**
Interventional Radiology
S. Croce e Carle Hospital
Cuneo, Italy
*Disclosures: None.*

**Alberto Balderi, MD**
Interventional Radiology
S. Croce e Carle Hospital
Cuneo, Italy
*Disclosures: None.*

**Enrico Peano, MD**
Interventional Radiology
S. Croce e Carle Hospital
Cuneo, Italy
*Disclosures: None.*

**Maurizio Grosso, MD**
Interventional Radiology
S. Croce e Carle Hospital
Cuneo, Italy
*Disclosures: None.*

P20000018

*Sponsored by Guerbet*

# Prostate Artery Embolization*

**BY ARI J. ISAACSON, MD**

## CASE SUMMARY

A 61-year-old man presented with a 15-year history of urinary symptoms secondary to benign prostatic hyperplasia (BPH). He had a known prostate size of 70 g (normal, 20–30 g), and his chief complaint was hesitancy and intermittency of urination. Initially, he was treated with medications for his symptoms (tamsulosin and finasteride), but treatment was discontinued due to sexual side effects. After failure to improve using herbal/holistic supplements to relieve his symptoms, he found his symptoms were having a significant negative effect on his quality of life (QOL). However, he was wary of pursuing a surgical solution such as transurethral resection of the prostate, because of the potential side effects associated with the procedure. Instead, he decided to undergo prostate artery embolization (PAE).

## DIAGNOSIS

Urinary symptoms secondary to BPH

## IMAGING FINDINGS/RESULTS

The patient underwent PAE from a femoral artery approach (as he was too tall for a radial artery approach). To begin, a 5-Fr catheter was placed into his left internal iliac artery, and angiography demonstrated that his prostatic artery arose from the internal pudendal artery. (Note: the patient also had a history of bilateral hip arthroplasty, as is evident on the images.) Prior to embolization, an arterial anastomosis to the rectum was coil-embolized with a 3/2-mm Tornado® Embolization Coil (Cook Medical). Additionally, an arterial anastomosis to the internal pudendal artery was embolized with a similar coil.

At that point, a 2.4-Fr SeQure® microcatheter (Guerbet) was inserted into the left prostatic artery, and the left hemi-prostate was embolized with 250 µm Embozene™ Microspheres (Boston Scientific Corporation) until flow was sluggish, at which point, embolization was completed with a gelfoam slurry. When using the SeQure® catheter, the embolic solution can become more concentrated as the fluid component exits the holes within the distal catheter; therefore, we recommend the initial solution be adequately diluted to prevent aggregation and occlusion of the catheter. A Waltman loop maneuver was then used to select the right internal iliac artery with the 5-Fr catheter. Angiography was again performed, demonstrating the right prostatic artery arising from a vesicoprostatic trunk. The SeQure® microcatheter was then reinserted, and more selective angiography demonstrated the right hemi-prostatic blush (Figure 1). Embolization was performed with 250-µm microspheres. When flow was once again sluggish, embolization was completed with the gelfoam slurry.

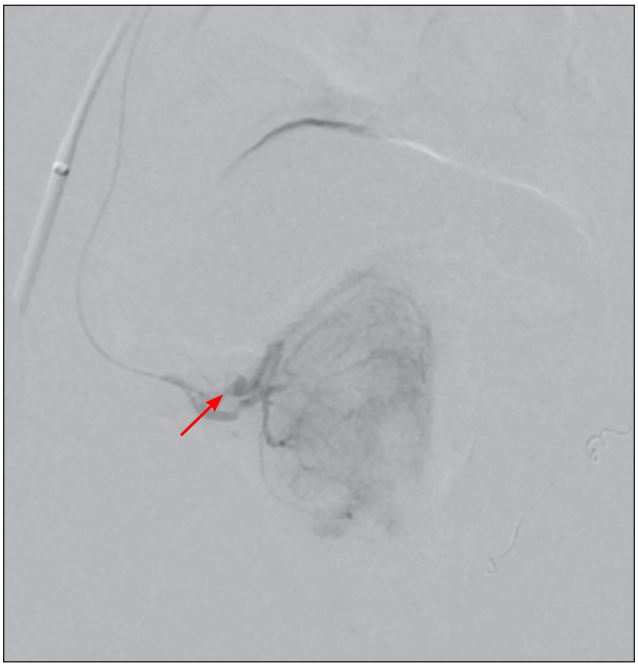


**Figure 1. Digital subtraction angiography with the SeQure® microcatheter positioned distally in the right prostatic artery (arrow), demonstrating the characteristic blush of the right hemi-prostate.**

After the catheters were removed, noncontrast, cone-beam computed tomography (CT) demonstrated contrast retention throughout the prostate, suggesting complete embolization (Figure 2).

## DISCUSSION

The SeQure® catheter was designed to reduce premature embolic reflux during embolization procedures. In this case, after initial embolization,

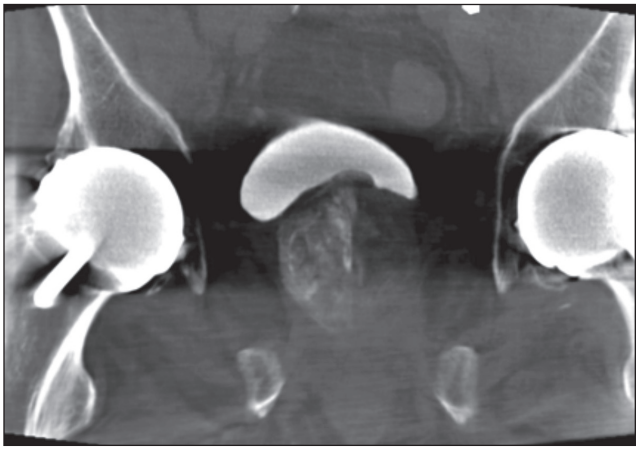


**Figure 2. Coronal image from a noncontrast cone-beam CT after embolization, demonstrating retained contrast throughout the prostate. The increased density seen in the right hemi-prostate is due to the fact that it was embolized after the left and, therefore, less of the contrast had been resorbed.**

contrast was observed exiting through the side hole at the distal segment of the catheter, creating the protective pressure gradient and preventing reflux (Figure 3). This potentially results in more microspheres being injected into the prostate compared to a standard end-hole catheter. The final cone-beam CT images suggest that this catheter is capable of thorough embolization of the prostate.

Importantly, the patient was evaluated before and after the procedure for symptom severity using the International Prostate Symptom Score (IPSS) questionnaire, an 8-question tool used to screen for, diagnose, and track symptoms of BPH. The IPSS has seven questions related to symptoms and one related to QOL. In this case, the patient's baseline IPSS was 25 (on a scale of 1 to 35; 25 is severely symptomatic) and his QOL was 4 (on a scale of 0 to 6; 4 is mostly dissatisfied). Three months postprocedure, his IPSS score was 10 (low-to-moderately severe) and his QOL score was 1 (pleased), indicating that PAE performed with a SeQure® catheter successfully alleviated this patient's symptoms.

## CONCLUSION

PAE performed with a SeQure® catheter is an emerging interventional technique that can be used successfully to manage patients with urinary tract symptoms secondary to BPH. ■

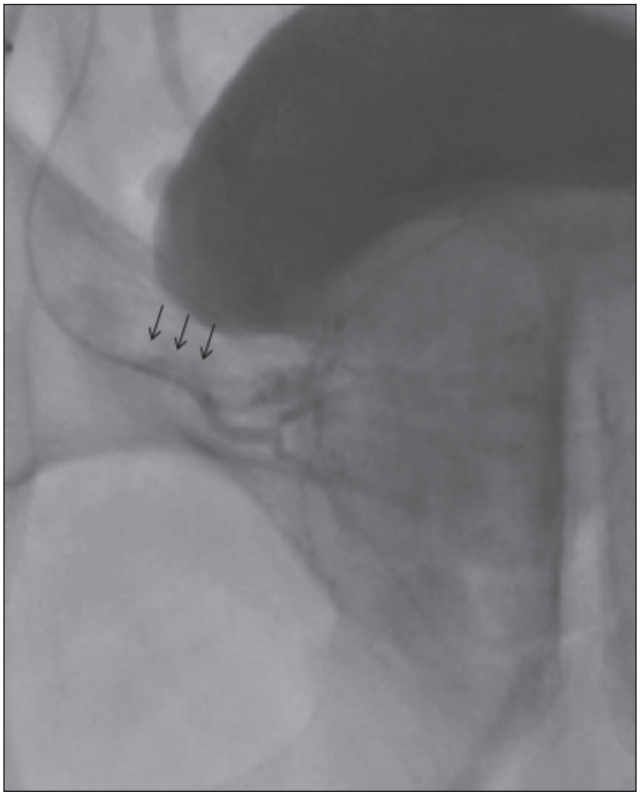


**Figure 3. Fluoroscopic image demonstrating embolization of the right hemi-prostate. Contrast can be seen exiting the holes in the distal segment of the microcatheter forming the anti-reflux pressure gradient (arrows).**

Recommended Reading

1. Gao YA, Huang Y, Zhang R, et al. Benign prostatic hyperplasia: prostatic arterial embolization versus transurethral resection of the prostate--a prospective, randomized, and controlled clinical trial. Radiology. 2014;270:920-928.
2. Pisco JM, Bilhim T, Pinheiro LC, et al. Medium- and long-term outcome of prostate artery embolization for patients with benign prostatic hyperplasia: results in 630 Patients. J Vasc Interv Radiol. 2016;27:1115-1122.
3. Ray AF, Powell J, Speakman MJ, et al. Efficacy and safety of prostate artery embolization for benign prostatic hyperplasia: an observational study and propensity-matched comparison with transurethral resection of the prostate (the UK-ROPE study). BJU Int. 2018;122:270-282.
4. Uflacker A, Haskal ZJ, Bilhim T, et al. Meta-analysis of prostatic artery embolization for benign prostatic hyperplasia. J Vasc Interv Radiol. 2016;27:1686-1697.

*The SeQure® microcatheter is not recommended for use with gelfoam.

Results from case studies are not necessarily predictive of results in other cases. Results in other cases may vary.

**Ari J. Isaacson, MD**
Associate Professor, Vascular-Interventional Radiology
Director of Clinical Research, Department of Radiology
UNC School of Medicine
Chapel Hill, North Carolina
*Disclosures: Received compensation from Guerbet for this article.*

P20000083

*Sponsored by Guerbet*

# Uterine Artery Embolization

**BY AARON ROHR, MD, MS**

## CASE SUMMARY

A 49-year-old perimenopausal female presented with a history of abnormal uterine bleeding, pelvic pain, prolonged menstruation, uterine fibroids, and metabolic syndrome. Pelvic ultrasound demonstrated increased size of numerous fibroids, including subserosal and intramural subtypes. The largest intramural fibroid measured 3.0 X 3.0 cm. The remaining sonographic examination was unremarkable, aside from a stable 1.7-cm right ovarian cyst. Endometrial biopsy was negative for malignancy; the patient had previously trialed intrauterine device hormonal therapy without symptom relief. She was then presented with treatment options such as uterine artery embolization (UAE), hysterectomy, and hormone therapy.[1] The patient elected to be treated with UAE and was referred to interventional radiology and surgery.[2]

## DIAGNOSIS

Symptomatic uterine fibroids

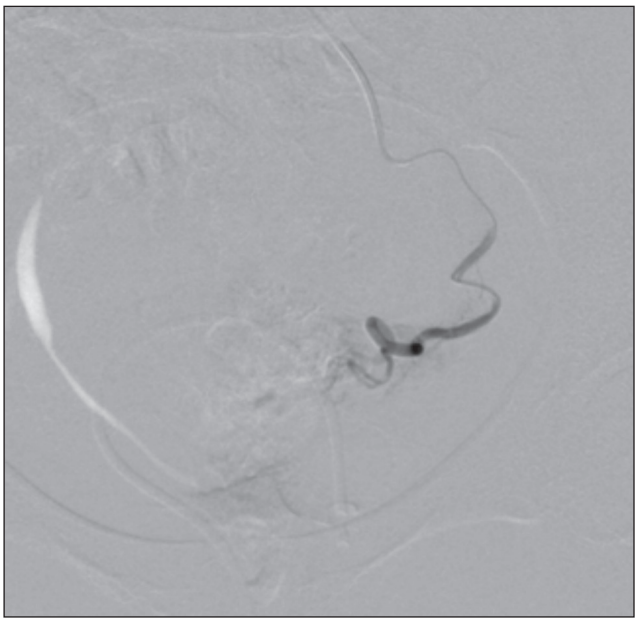


**Figure 1. Angiography of the left uterine artery post bland embolization with complete stasis.**

## IMAGING FINDINGS

The patient underwent UAE utilizing the left radial artery approach.[3] A 4/5-Fr slender sheath was placed into her left radial artery, followed by delivery of a vasodilator cocktail. The bilateral iliac arteries were cannulated with a 5-Fr Soft-Vu JB-1 catheter (AngioDynamics). Angiography demonstrated tortuous and engorged bilateral uterine arteries supplying the leiomyomatous uterus.

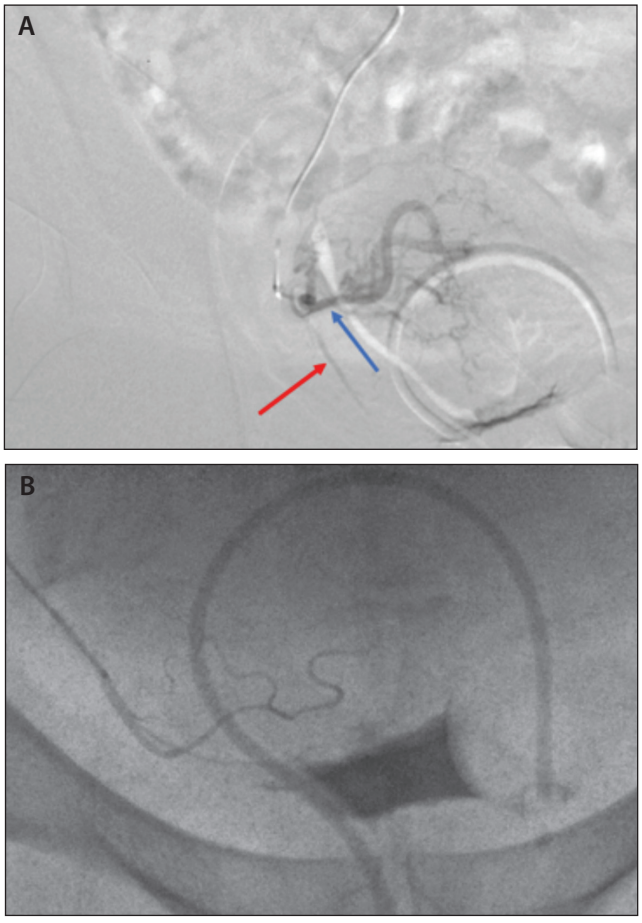



**Figure 2. Initial angiogram of the right uterine artery demonstrating engorged and tortuous uterine artery (blue arrow), with inferior accessory cystic artery (red arrow) (A). Superselective arteriogram of accessory cystic artery off of the uterine artery (B).**

Reprinted with permission from *Applied Radiology* Vol. 48, No. 5.

After careful image-guided planning, the left uterine artery was selected via a 130-cm, 2.8-Fr SeQure® microcatheter (Guerbet). Initial arteriogram re-demonstrated tortuous and dilated uterine artery without evidence of collateral supply or accessory cystic artery. Bland embolization via 300–500-µm Embospheres (Merit Medical Systems Inc.) was administered via the left uterine artery. Postembolization angiography demonstrated complete stasis without evidence of contrast reflux (Figure 1).

The right uterine artery was then selected using the SeQure® microcatheter in a similar fashion. However, this angiogram demonstrated an additional single-vessel supply to the inferior margin of the bladder, most consistent with an accessory cystic artery (Figure 2). The SeQure® microcatheter was easily negotiated beyond the accessory cystic artery takeoff, through the tortuous right uterine artery. The right uterine artery was then embolized in a similar fashion with exclusion of the accessory vesicular artery, presumably via the unique flow-directed methodology of the SeQure® microcatheter. Complete stasis of the right uterine artery was noted postembolization, with complete preservation of the accessory cystic artery (Figure 3).

## DISCUSSION

The SeQure® microcatheter was designed to assist with, and limit reflux during, flow-directed embolization procedures. In this case, the microcatheter was employed to deliver embolic agents to the bilateral uterine arteries in the setting of symptomatic fibroids.[2] Specifically, the microcatheter was able to isolate the right uterine artery and completely exclude the accessory cystic artery without requiring additional interventions, such as balloon occlusion, etc. This case demonstrates additional use of a microcatheter for excluding unwanted, nontargeted embolization in the appropriate clinical setting.

The SeQure® microcatheter provided excellent tracking ability through the uterine arteries in a well-controlled fashion without causing spasm of the associated artery.

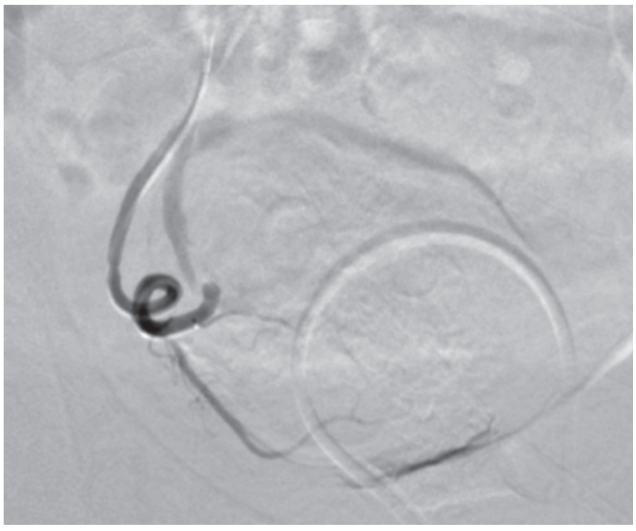


**Figure 3. Digital subtraction angiogram of the right uterine artery demonstrating stasis with complete preservation of the accessory cystic artery.**

## CONCLUSION

UAE can be performed with a SeQure® microcatheter to successfully manage patients with symptomatic fibroids. ■

1. Mortensen C, Chung J, Liu D, et al. Prospective study on total fluoroscopic time in patients undergoing uterine artery embolization: comparing transradial and transfemoral approaches. Cardiovasc Interv Radiol. 2018;42:441–447.
2. Gupta JK, Sinha A, Lumsden MA, Hickey M. Uterine artery embolization for symptomatic uterine fibroids. Cochrane Database Syst Rev. 2012;CD005073.
3. Hirst A, Dutton S, Wu O, et al. A multi-centre retrospective cohort study comparing the efficacy, safety and cost-effectiveness of hysterectomy and uterine artery embolisation for the treatment of symptomatic uterine fibroids. The HOPEFUL study. Health Technol Assess. 2008;12:1–248, iii.



**Aaron Rohr, MD, MS**
Associate Professor, Vascular-Interventional Radiology
University of Kansas
Kansas City, Kansas
*Disclosures: Received compensation from Guerbet for this article.*

P20000084

*Sponsored by Guerbet*

# Use of the SeQure® Microcatheter in Bronchial Embolization Procedures*

**BY GONZALO RUÍZ VILLAVERDE, MD, PHD; PEDRO PARDO MORENO, MD, PHD; AND JUAN JOSÉ CIAMPI-DOPAZO, MD, EBIR**

## CASE PRESENTATION

An 82-year-old woman presented with mild hemoptysis for 72 hours and recurrent pulmonary infections. Chest CT demonstrated bronchiectasis in the right pulmonary base (Figure 1). The patient was hemodynamically stable and had mild heart failure, and there was no other relevant medical history.

Bronchial endoscopy revealed the bleed origin in the upper right lobe due to chronic pulmonary infections, and the decision was made to proceed with bronchial arteriography and embolization for treatment.

## PROCEDURAL OVERVIEW

Using a right femoral artery approach, a 5-Fr introducer sheath was placed. With a combination of a 5-Fr MIK-5 catheter (AngioDynamics) and a 0.035-inch hydrophilic guidewire, the intercostobronchial artery was catheterized, and a selective angiogram showed a hyperemic area in the right upper lobe in relation to the suspected area of bleeding (Figure 2). Subsequently, a 2.8-Fr SeQure® microcatheter (Guerbet) was advanced selectively over a 0.016-inch guidewire to the arterial vessel that supplied the right pulmonary lobe. After identifying the suspicious vessel, embolization was performed using a mixture of 350–500-µm Contour™ polyvinyl alcohol particles (Boston Scientific Corporation) with 5 mL of iodinated contrast and 5 mL of saline solution (50:50 dilution). The total volume injected was approximately 10 mL. The embolic material infusion was administered, ensuring that the reflux of contrast did not exceed the proximal radiopaque marker of the microcatheter (Figure 3), to prevent embolization of

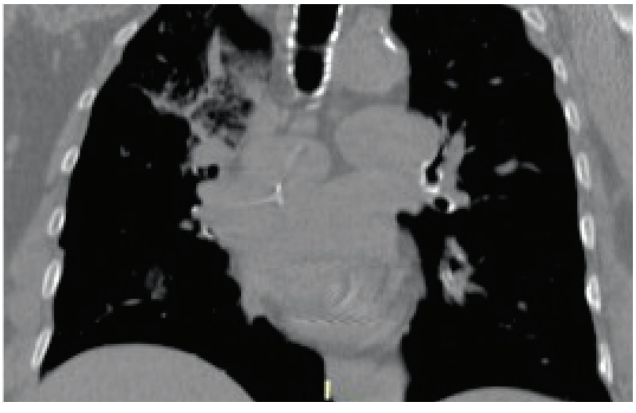


**Figure 1. Chest CT showing bronchial alterations in the upper right lobe.**

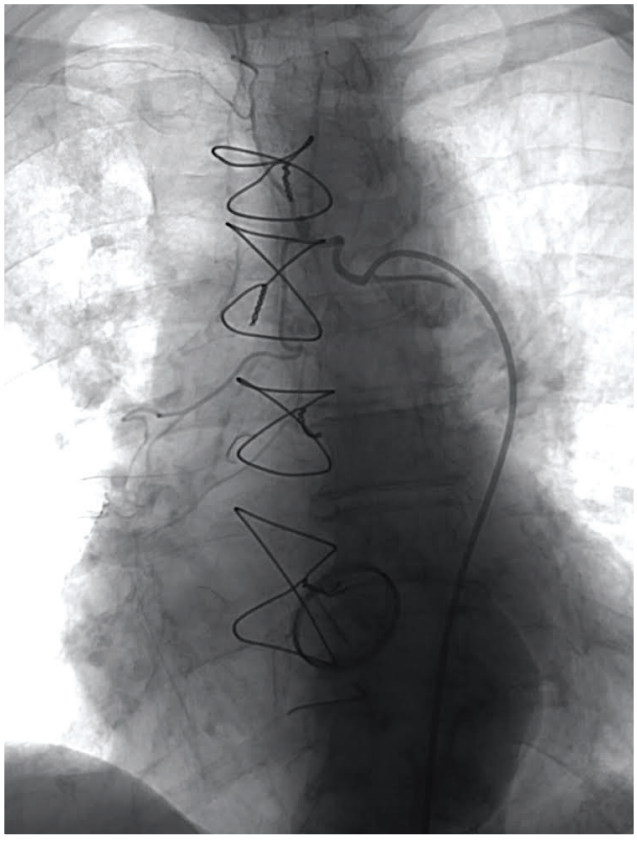


**Figure 2. Selective angiogram of the intercostobronchial trunk demonstrating mild right upper lobe parenchymal blush.**

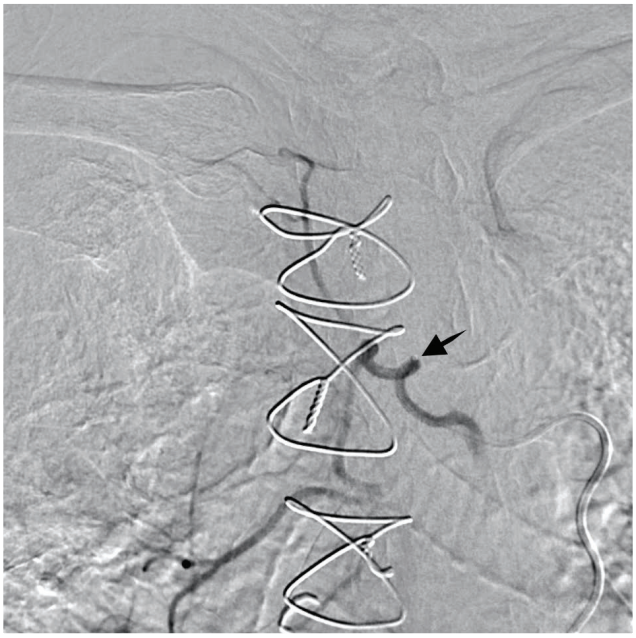


**Figure 3. Selective embolization of the right bronchial artery was performed using a 2.8-Fr SeQure® microcatheter. The black arrow shows the proximal radiopaque mark of the microcatheter.**

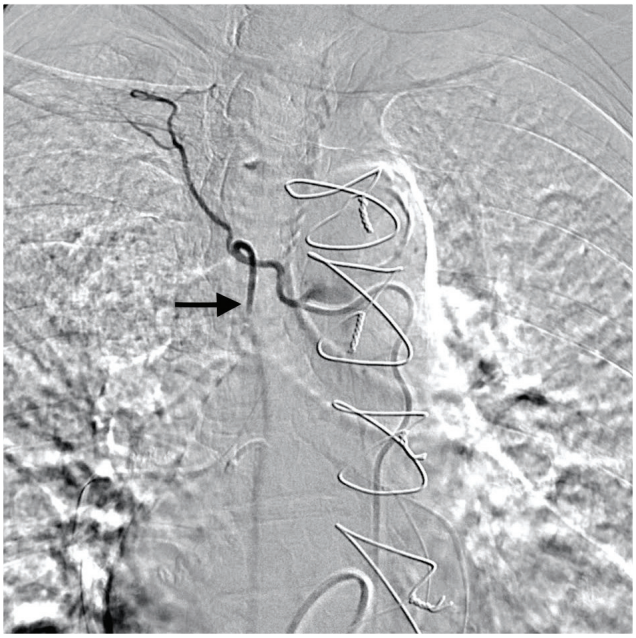


**Figure 4. After embolization, there is no further flow into the right bronchial branch (black arrow). Arterial flow into the intercostal branch was preserved.**

undesired arterial territories. A final control angiogram demonstrated total occlusion of the artery that supplied the right bronchial upper lobe (Figure 4).

Immediate control of active bleeding was achieved. The patient was discharged at 72 hours without complications, and she did not report recurrent hemoptysis after 1 month.

## DISCUSSION

Bronchial artery embolization is an established procedure in the management of massive and recurrent hemoptysis. The SeQure® microcatheter reduces the risk of nontarget embolization to help maximize selective embolization. ■

*The SeQure® microcatheter is not recommended for use with PVA particles.

Results from case studies are not necessarily predictive of results in other cases. Results in other cases may vary.

**Gonzalo Ruíz Villaverde, MD, PhD**
Interventional Radiology Unit
H.U. Virgen de las Nieves
Granada, Spain
*Disclosures: Received compensation from Guerbet for this article.*

**Pedro Pardo Moreno, MD, PhD**
Interventional Radiology Unit
H.U. Virgen de las Nieves
Granada, Spain
*Disclosures: Received compensation from Guerbet for this article.*

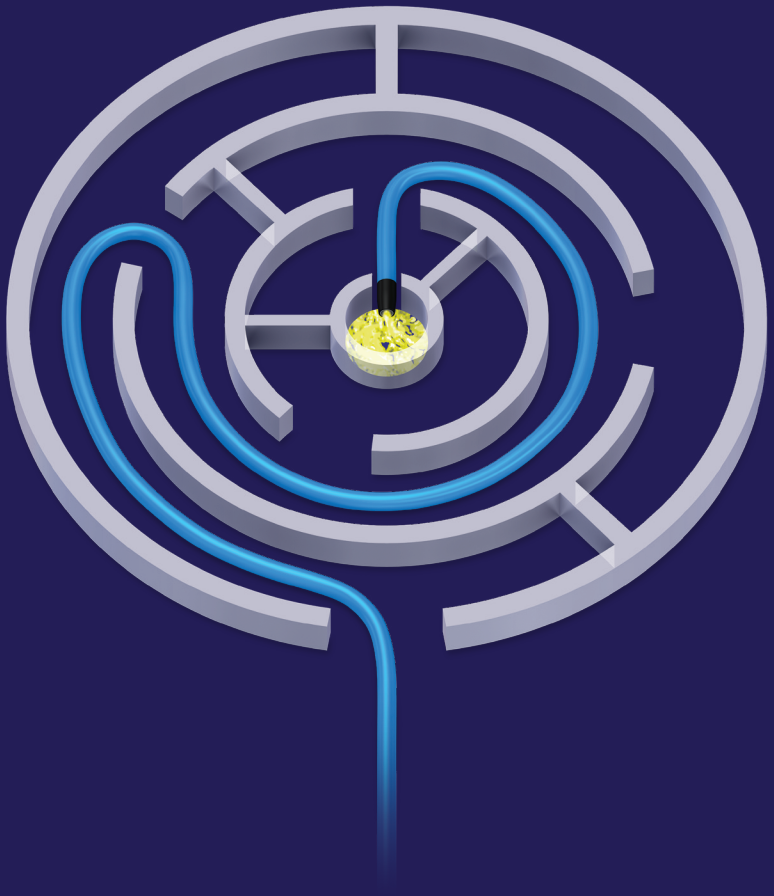
**Juan José Ciampi-Dopazo, MD, EBIR**
Interventional Radiology Unit
H.U. Virgen de las Nieves
Granada, Spain
*Disclosures: Received compensation from Guerbet for this article.*

P20000017

# DRAKON™

Peripheral Microcatheter

## Track well. Reach farther[1]. With no compromise.



Optimizing pushability, flexibility, torqueability for improved trackability.

Guerbet

GU03201084 - P19 080 DRA - March 2020 - Photo: Guerbet

**1.** Flexibility test report Bench report TR-025. Torque Transmission Bench Test report TR-006. Trackability Bench Test report TR-017.

Endovascular TODAY

DraKon™ and SeQure® are class II medical devices in the USA. Outside USA, DraKon™ and SeQure® are class IIb medical devices. DraKon™ and SeQure® are intended for use by interventional radiologists and interventional oncologists for the infusion of contrast media into all peripheral vessels and for drug infusion in intra-arterial therapy, and infusion of embolic materials. They should not be used in cerebral vessels.

For complete information about precautions and optimal usage conditions for these medical devices, we recommend consulting the instructions for use supplied with each device or with your local Guerbet representative(s). Information for use only in countries with applicable health authority registrations. Notified Body: MedCert 0482. Manufacturer: Accurate Medical Therapeutics Ltd. EC Rep: Guerbet. Document creation date: March 2020. DraKon™ and SeQure® are registered trademarks of Guerbet Group or its affiliates.

USA: for more information, please contact Customer Service at 877-729-6679 or customer.service-us@guerbet.com
Outside USA: for more information, please visit www.guerbet.com or contact your local Guerbet representative.
Registration and availability may vary according to countries.

Guerbet

P20000090
GU03201083