Complications in Interventional Radiology

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Interventional Procedures are Minimally Invasive

A *minimally invasive procedure* is any procedure (surgical or otherwise) that is **less invasive than open surgery** used for the same purpose where there is **minimal damage** to the biological tissue at the **point of entry**. *

Coined by J E A Wickham in 80's

* Wikipedia

Minimally invasive procedures doesn't necessarily preclude complications

Some procedures entail a great deal of **minor** and **major** complications including death if utmost care is not taken.

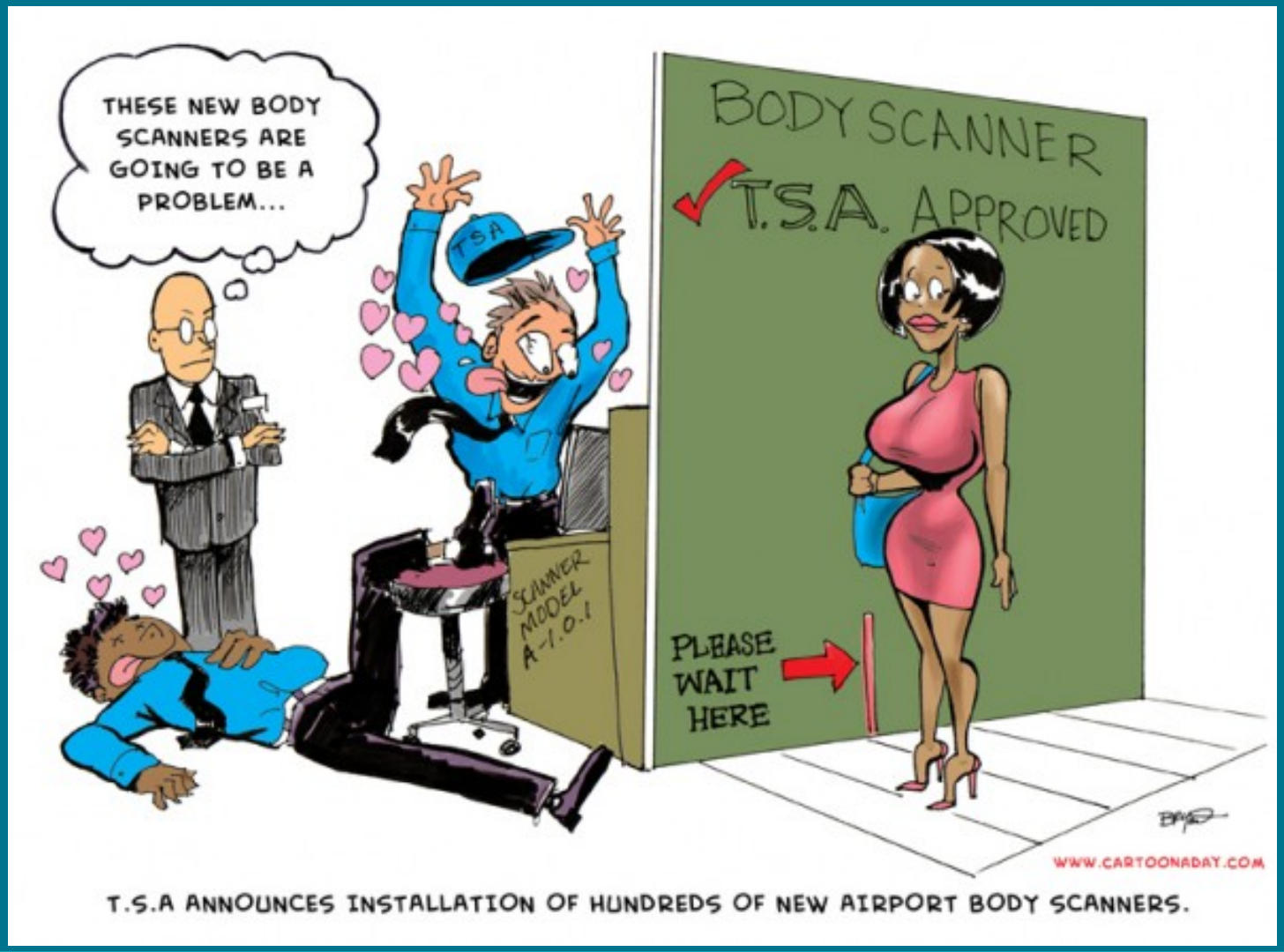
SIR (Society of Interventional Radiology)
standard practice committee

Classification of complication by outcome

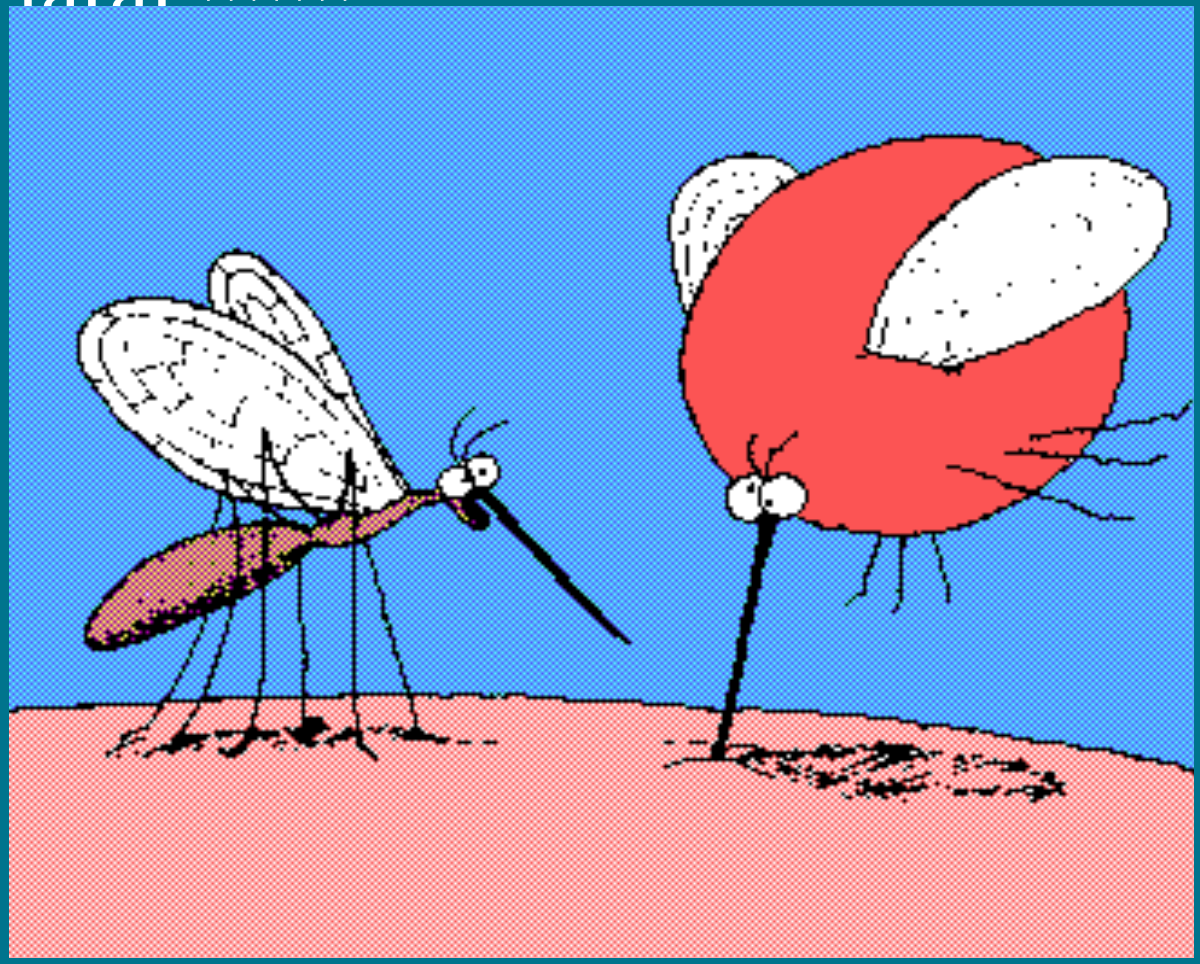
Minor complications
A. No. therapy, no consequence
B. Nominal therapy, no consequence; includes overnight admission for observation only

Major complications
C. Require therapy, minor hospitalization (<48 hours)
D. Require major therapy, unplanned increase in level of care, prolonged hospitalization (>48 hours)
E. Permanent adverse sequelae
F. Death

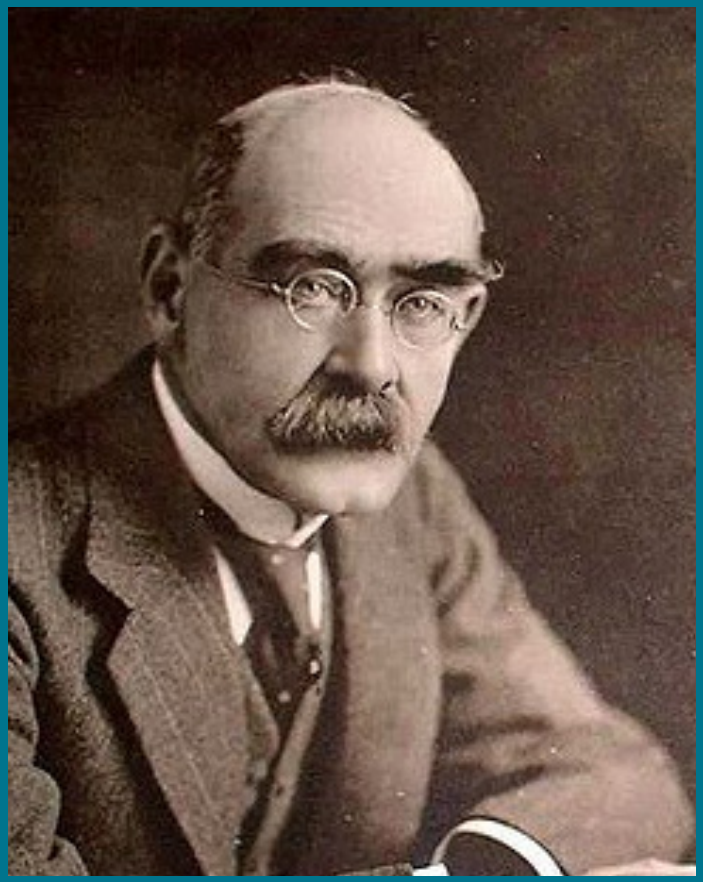
Even diagnostic radiology has its complications!!!



Interventions can be fatal !!!!!!



"PULL OUT BETTY, PULL OUT !! YOU'VE HIT AN ARTERY"



I keep six honest
serving-men
(They taught me all
I knew);
Their names are
What and **Why**
and **When**
And **How** and
Where and **Who**.

Rudyard Kipling

The question is therefore not only ‘**What**’

- **Why** at all the procedure is necessary – Benefit of performing the procedure must outweigh the risk of not performing it. Alternatives.
- **When** – when is the most appropriate time for the procedure. Pre-procedural evaluation.
- **Whom** – proper patient selection
- **How** – optimal method and technique
- All procedures must be **supported by evidence**

Complications

Minor procedures

- FNAC & Biopsy
- Nephrostomy
- Ascites drainage
- Pleuracentesis
- Abscess drainage
- Cyst puncture
- GB drain

liver biopsy

Complications

- Bleeding and **death** after percutaneous biopsy **(~1 in 10000)**

Author	Year	No. Pt.	Trnsfu/ Intervent	Mortality	Needle
Piccinino	1986	**68,276**	0.2	**0.009**	Mix
McGill	1990	9212	0.24	0.11	Mix
Huang	2007	3806	0.32	0	18G
Myers	2008	4275	0.75	0.14	Mix

- Mortality after transvenous biopsy about 9 in 10000 (Kalambokis G et al, J Hepatol 2007;47:284-294.)
- Detectable intrahepatic and / or perihepatic bleed in 18-20 % (1. Minuk et al, Gastroenterology 1987;92:290-293. 2. Firpi R J et al, Clin Gastroenterol Hepatol 2005;3:926-929.)
- Pain – 84% (Eisenberg E et al, Anesth Analg 2003;96:1392-1396, table of contents)
- **Moderate to Severe pain - 3 & 1.5%** (Perrault J et al, Gastroenterology 1978;74:103-6)

Percutaneous drainange

Table 2
Published Complication Rates and Suggested Thresholds

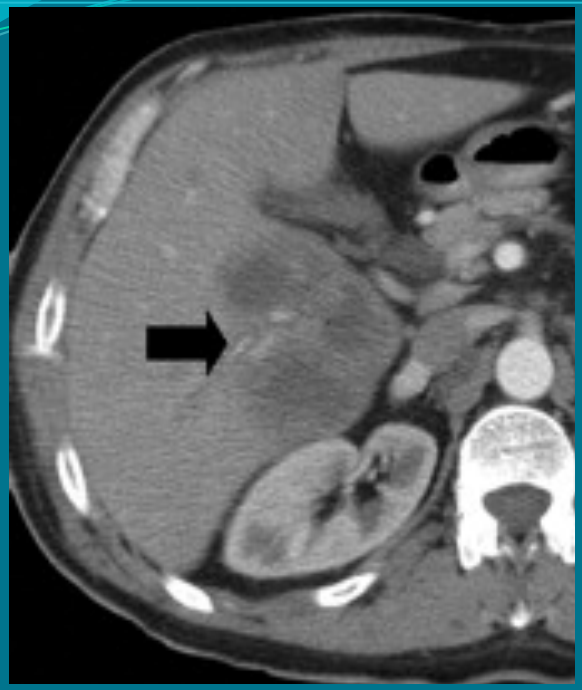
Specific Major Complication	Reported Rate (%)	Suggested Threshold (%)
Septic shock	1–2	4
Bacteremia requiring significant new intervention	2–5	10
Hemorrhage requiring transfusion	1	2
Superinfection (includes infection of sterile fluid collection)	1	2
Bowel transgression requiring intervention	1	2
Pleural transgression requiring intervention (abdominal interventions)	1	2

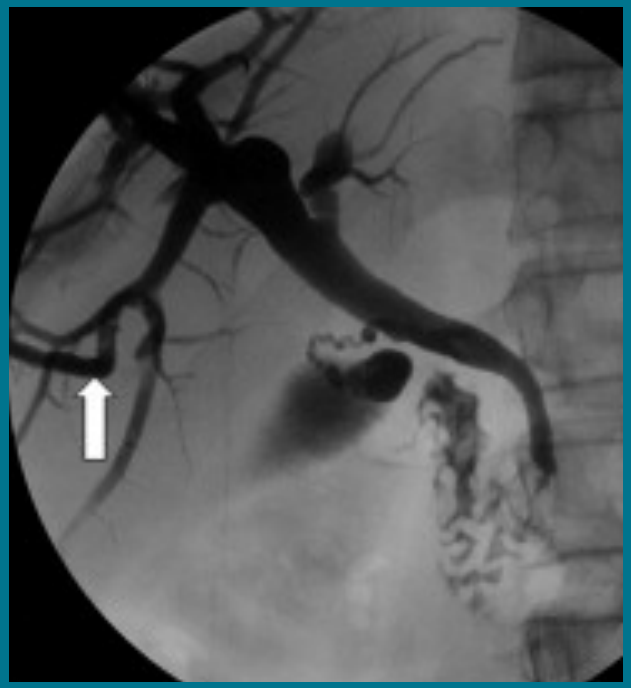
Table 3
Overall Complication Rate

Overall Procedure	Suggested Threshold
All major complications resulting from adult percutaneous drainage procedures	10%

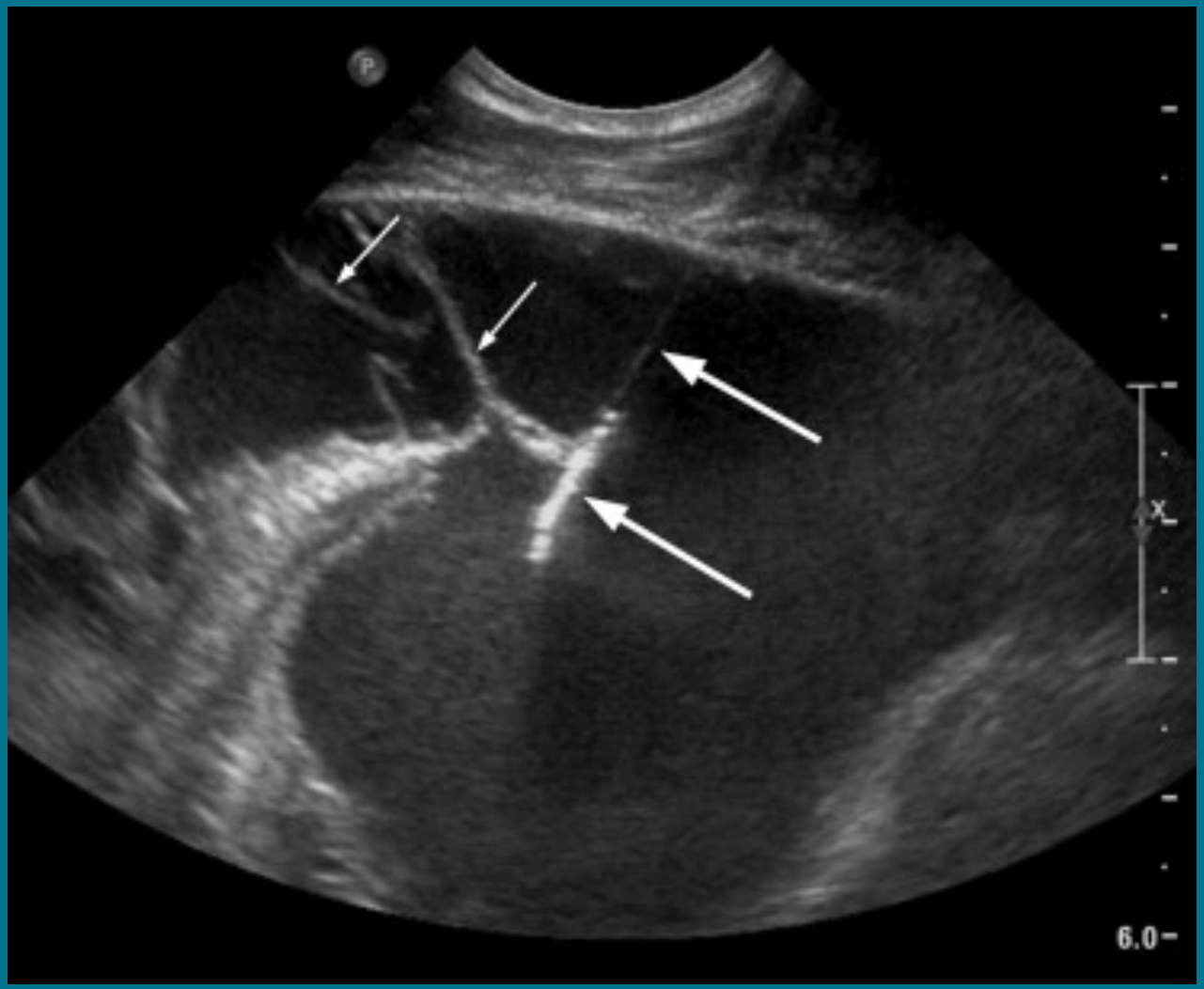
J Vasc Interv Radiol 2010; 21:431–435

Percutaneous drainange





Percutaneous drainange



Nephrostomy

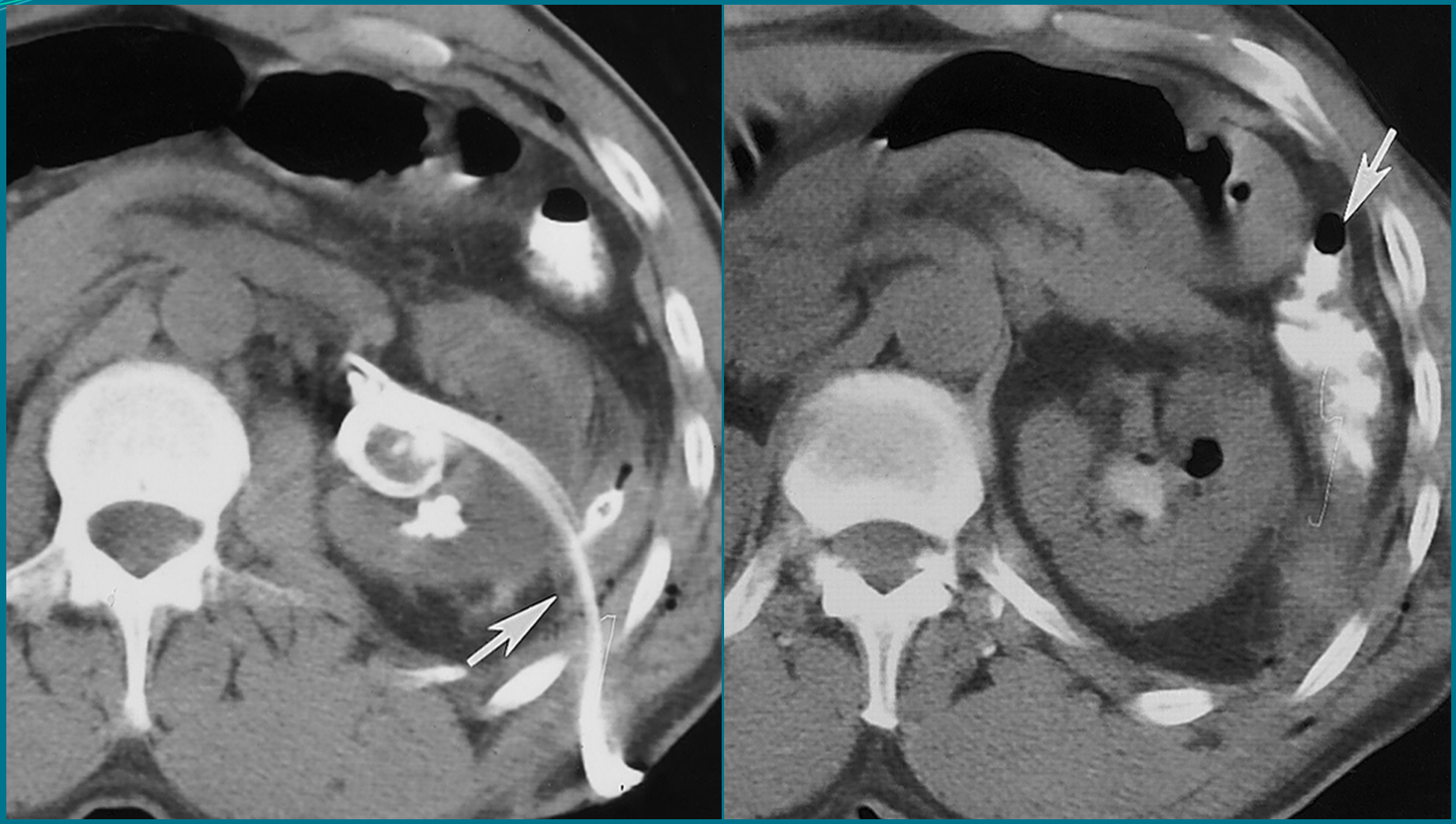
Thresholds (%) for Major Complications of Percutaneous Nephrostomy

Complication	Reported Rate	Threshold
Septic shock (fever, chills with hypotension, requiring major increase in level of care) (6,12,47)	1–3	4
Septic shock (20–22) (in setting of pyonephrosis)	7–9	10
Hemorrhage (requiring transfusion)		
PCN alone (6,7,24,47)	1–4	4
With PCNL (35,37)	12–14	15
Vascular injury (2,49) (requiring embolization or nephrectomy)	0.1–1	1
Bowel transgression (44)	0.2	<1
Pleural Complications (pneumothorax, empyema, hydrothorax, hemothorax)		
PCN alone (2,6)	0.1–0.2	<1
With PCNL or endopyelotomy (40,41) (intercostal puncture for upper pole access for endoscopic procedures)	8.7–12	15
Individual Threshold		
Complications that result in unexpected transfer to an intensive care unit, emergency surgery or delayed discharge from the hospital (6,24)	4–7	5

Note.—PCN = percutaneous nephrostomy; PCNL = percutaneous nephrolithotomy.

J Vasc Interv Radiol 2003; 14:S277–S281

Nephrostomy



Major procedures
Vascular interventions

Procedural Complications

CASES

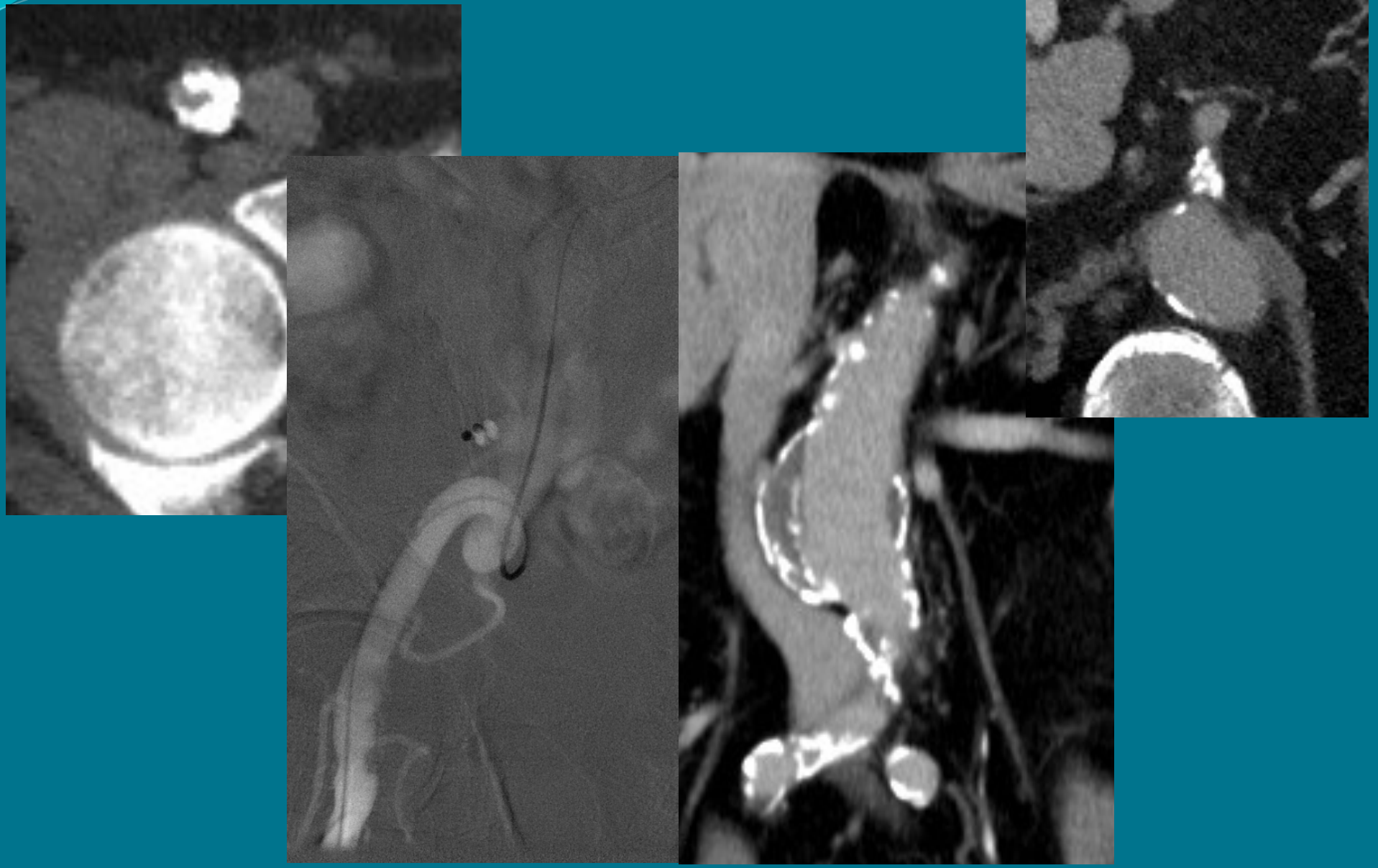
Arterial Puncture & Catheterization

Aarhus University Hospital

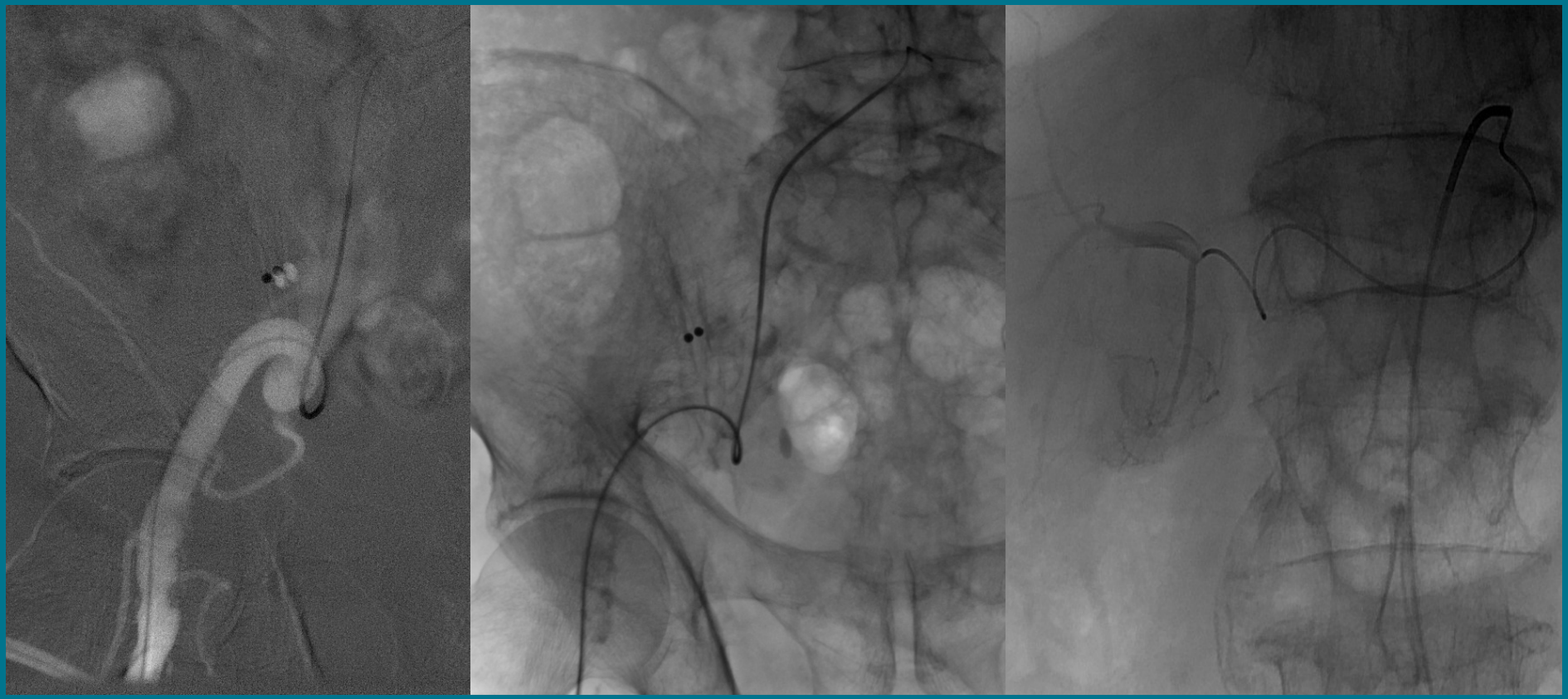
Complications of Puncture & Catheterization

- Failed or Difficult puncture/ catheterization leading to failed procedure
- Pseudo-aneurysm
- Dissection
- Rupture

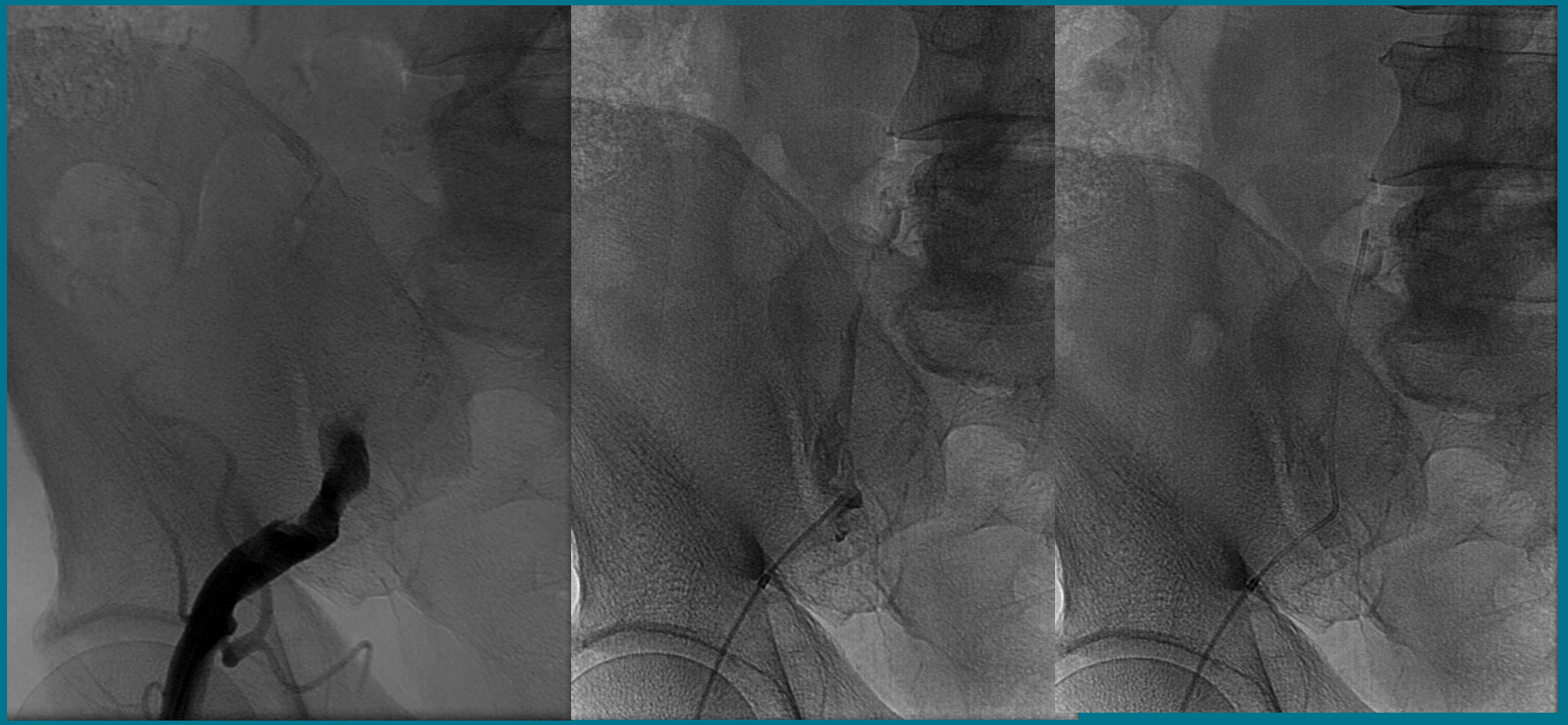
Failed catheterization



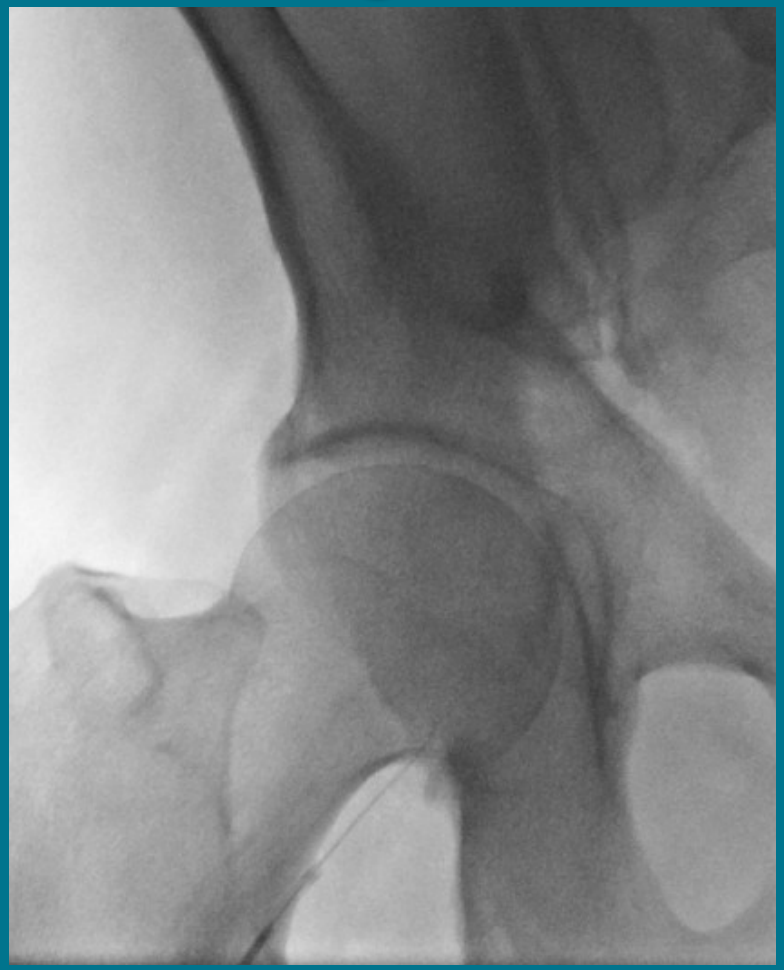
Failed catheterization negotiated successfully



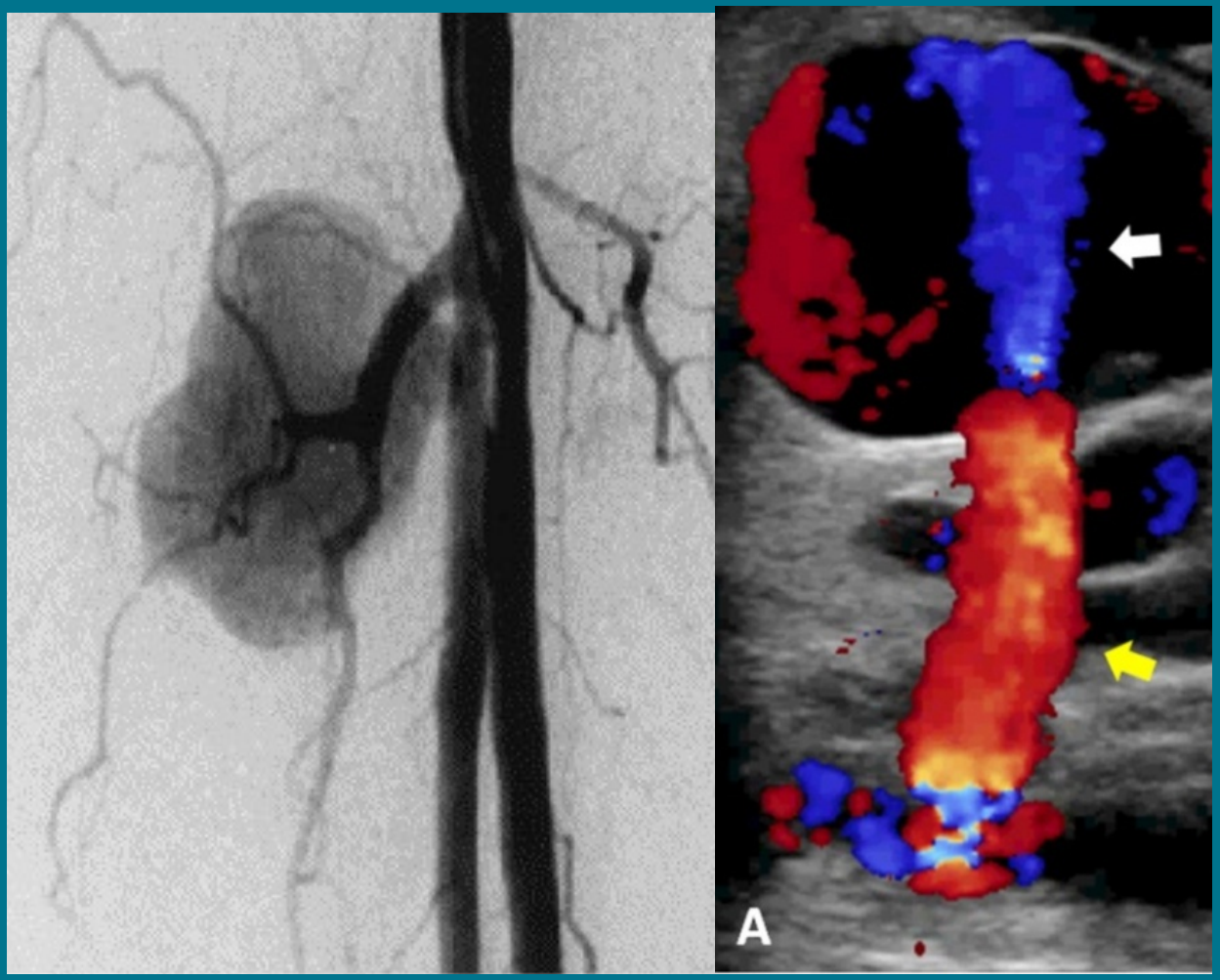
Failed catheterization due to dissection



Failed catheterization due to dissection - negotiated successfully



Pseudoaneurysm



TABLE

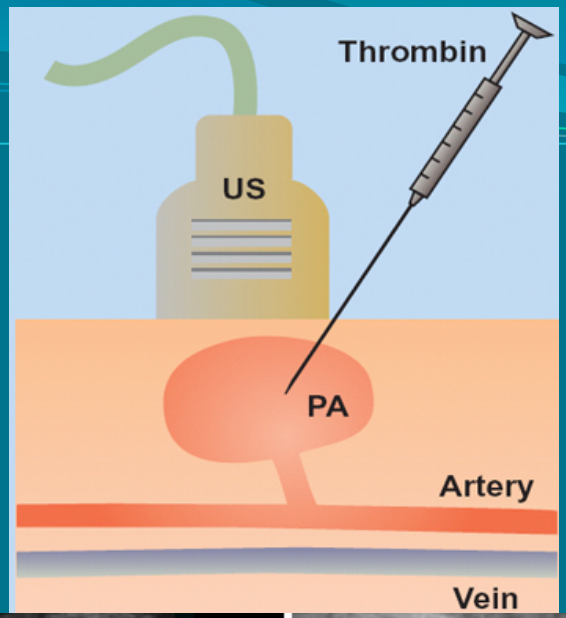
Characteristics of 30 Patients with **Postcatheterization Femoral Artery Pseudoaneurysms** Randomized to Compression or Thrombin Injection

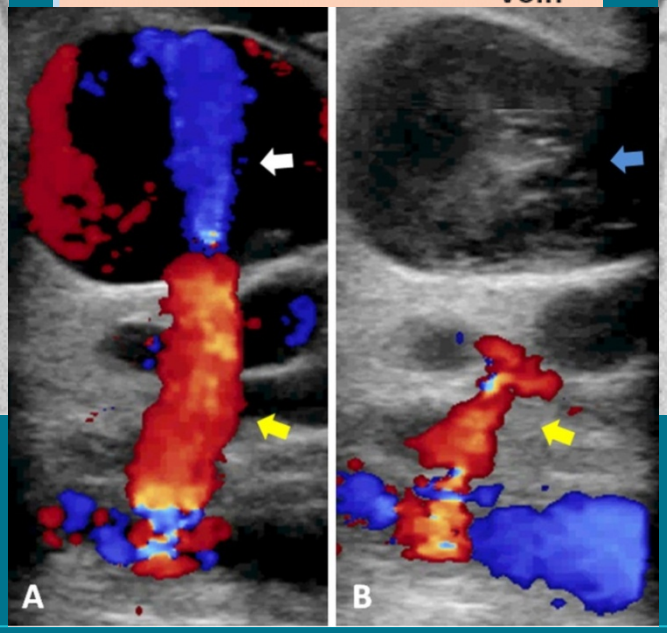
	Compression (n=15)	**Thrombin** (n=15)
Men	12 (80%)	10 (67%)
Mean age ± SD, y	67±9	66 ±7
Type of intervention		
Cardiac, PTCA	**14 (93%)**	**12 (80%)**
Aortoiliac		
Angioplasty	1 (7%)	2 (13%)
Stent		1 (7%)
Anticoagulation (heparin)	8 (53%)	9 (60%)
Platelet inhibition		
Aspirin, clopidogrel,	6 (40%)	8 (53%)
GP IIb/IIIa inhibitors	4 (27%)	4 (27%)

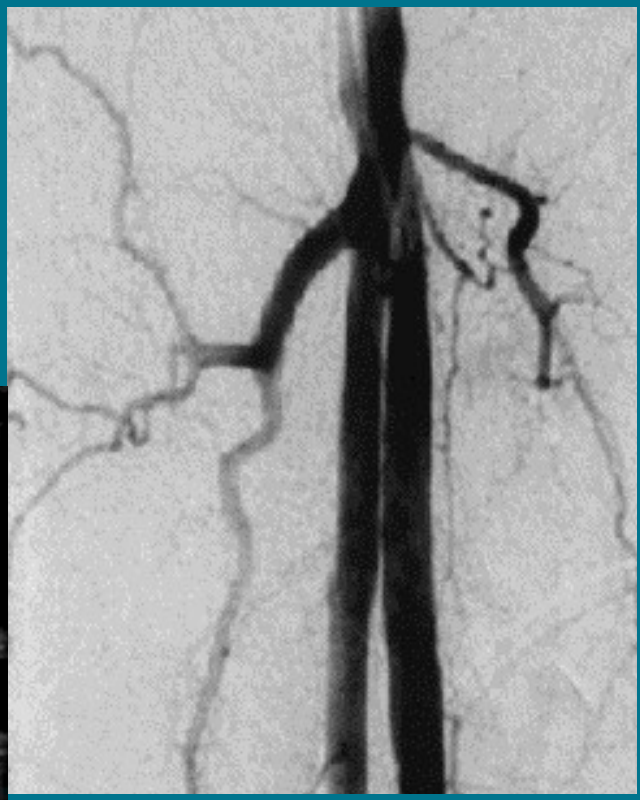
SD: standard deviation, PTCA: percutaneous transluminal coronary angioplasty, GP: glycoprotein.

Lars Lonn, Anne Olmarker, Kjell Geterud, Bo Risberg, J ENDOVASC THER 2004;11:570–576
Departments of Radiology and Surgery, Sahlgrenska University Hospital, Goteborg, Sweden.

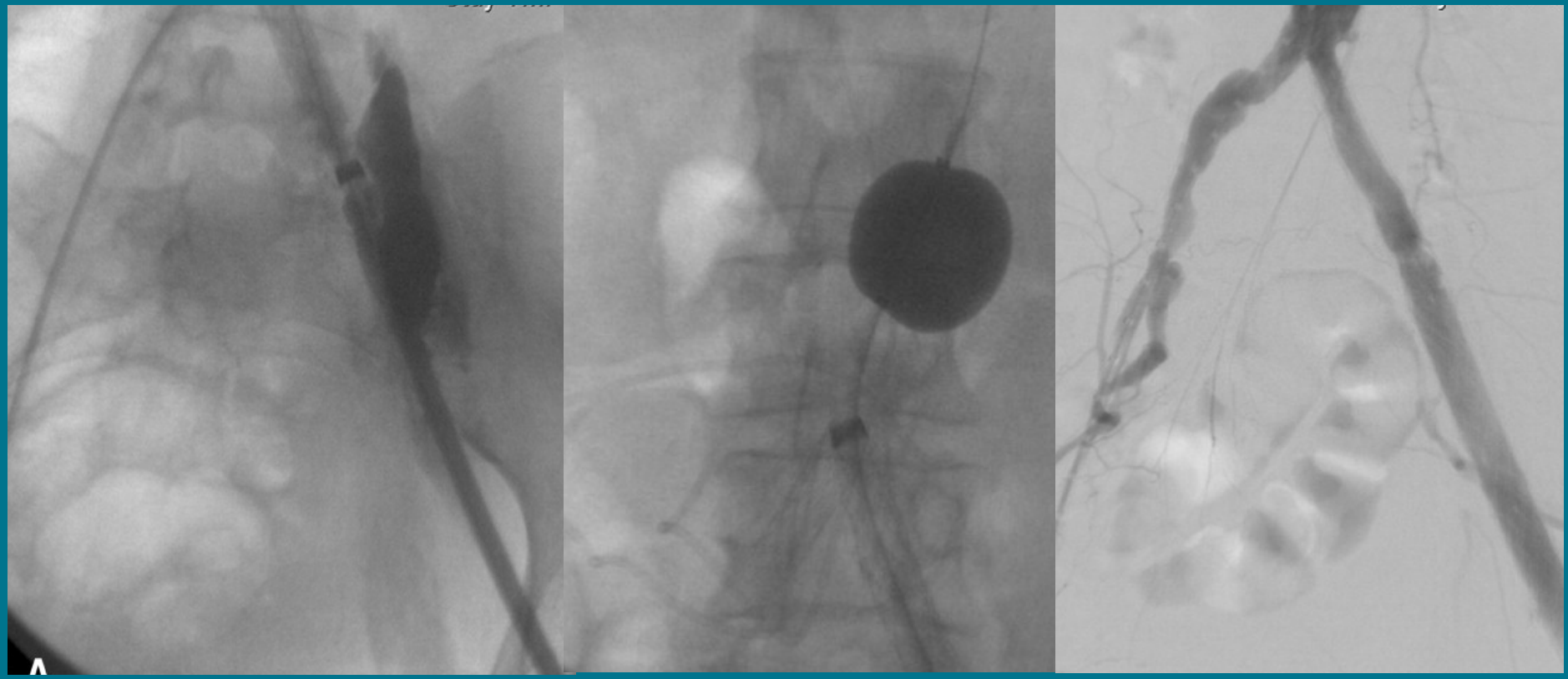
	Ultrasound-guided compression	Thrombin injection
Procedure time	≥60 minutes	<15 minutes
Pain	Painful	Painless – local anaesthetic not required
Intravenous sedation	Frequently required	Not required
Technical success	74%[7]	93–100%[8]
Effective with antiplatelet/ anticoagulant agents	Reduces efficacy	Yes
Recurrence	Up to 20%[9]	Rare
Complications	Rare	0–4%[9]


Thrombin
US
PA
Artery
Vein

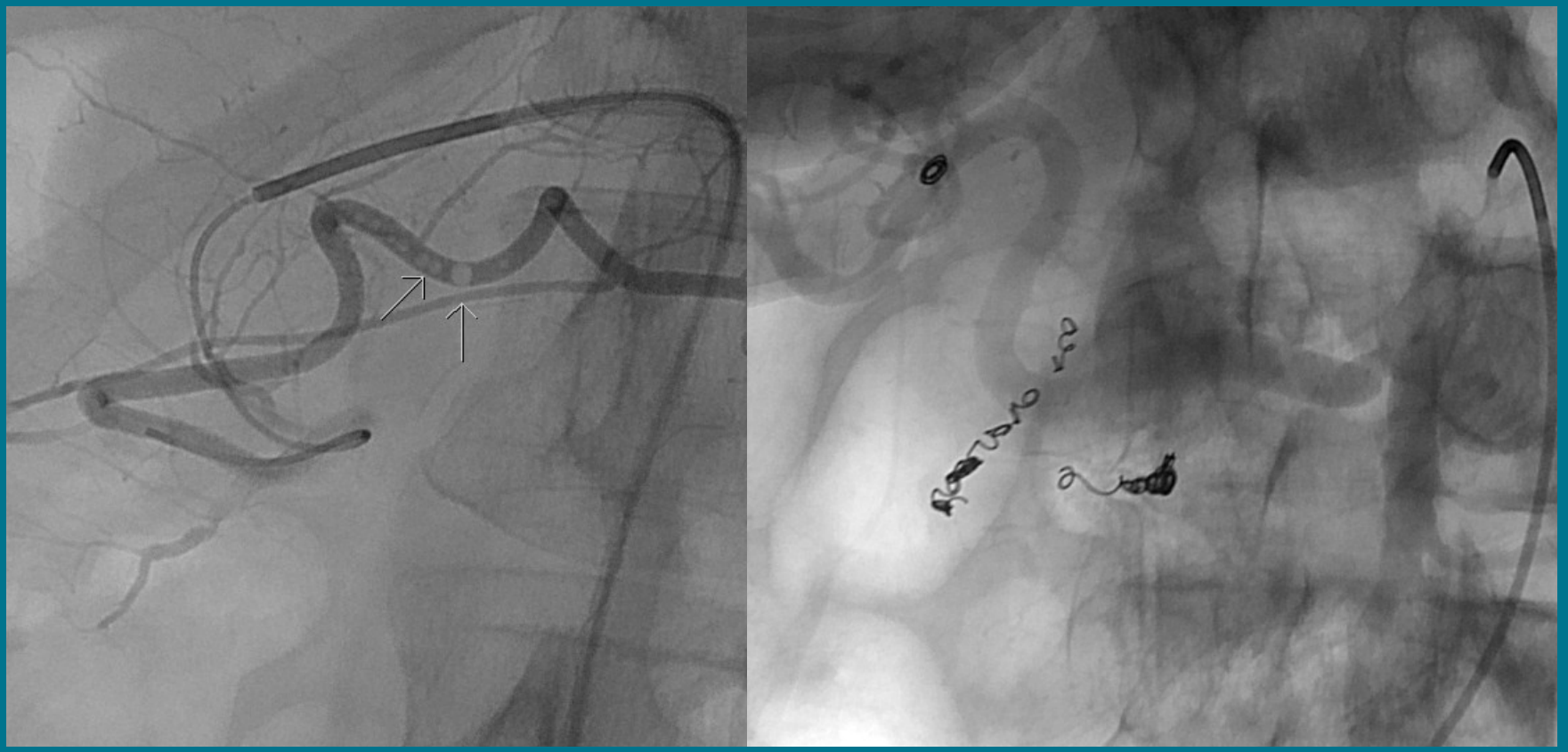

A
B



Lt external iliac artery rupture - stented

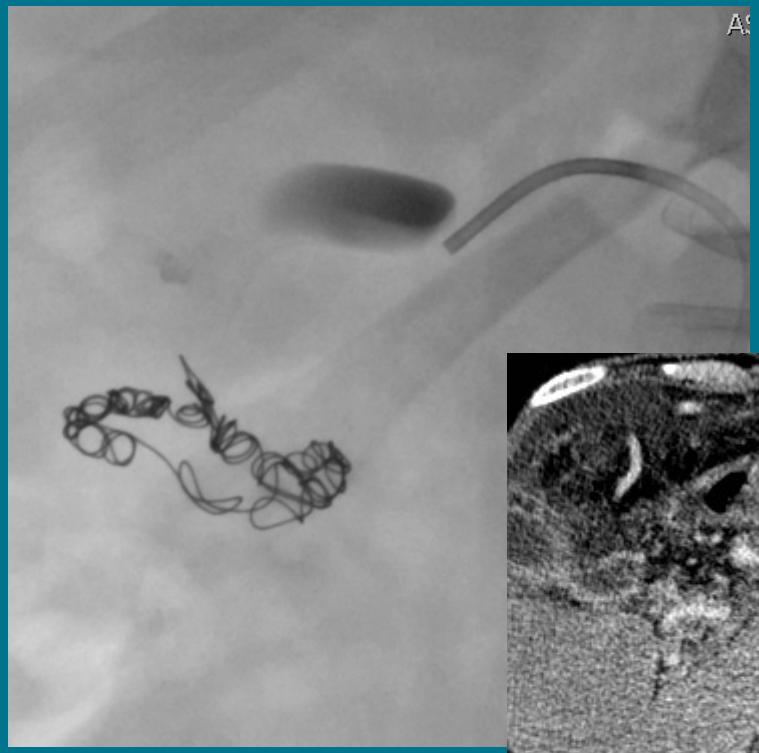


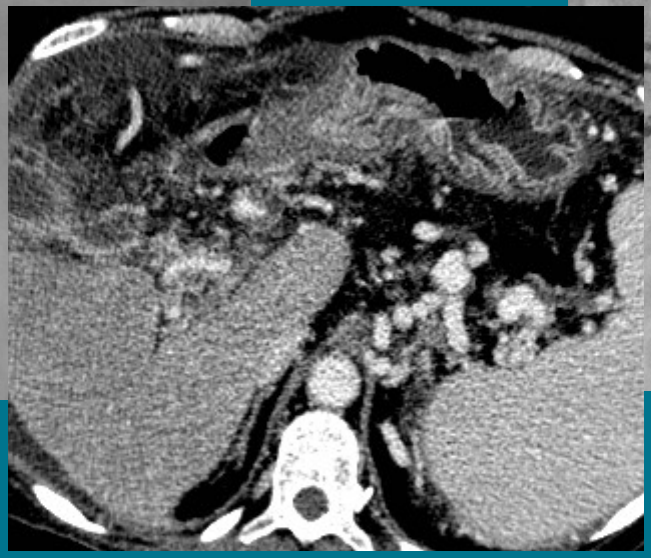
Non-target embolization



Non flow limiting

RHA dissection





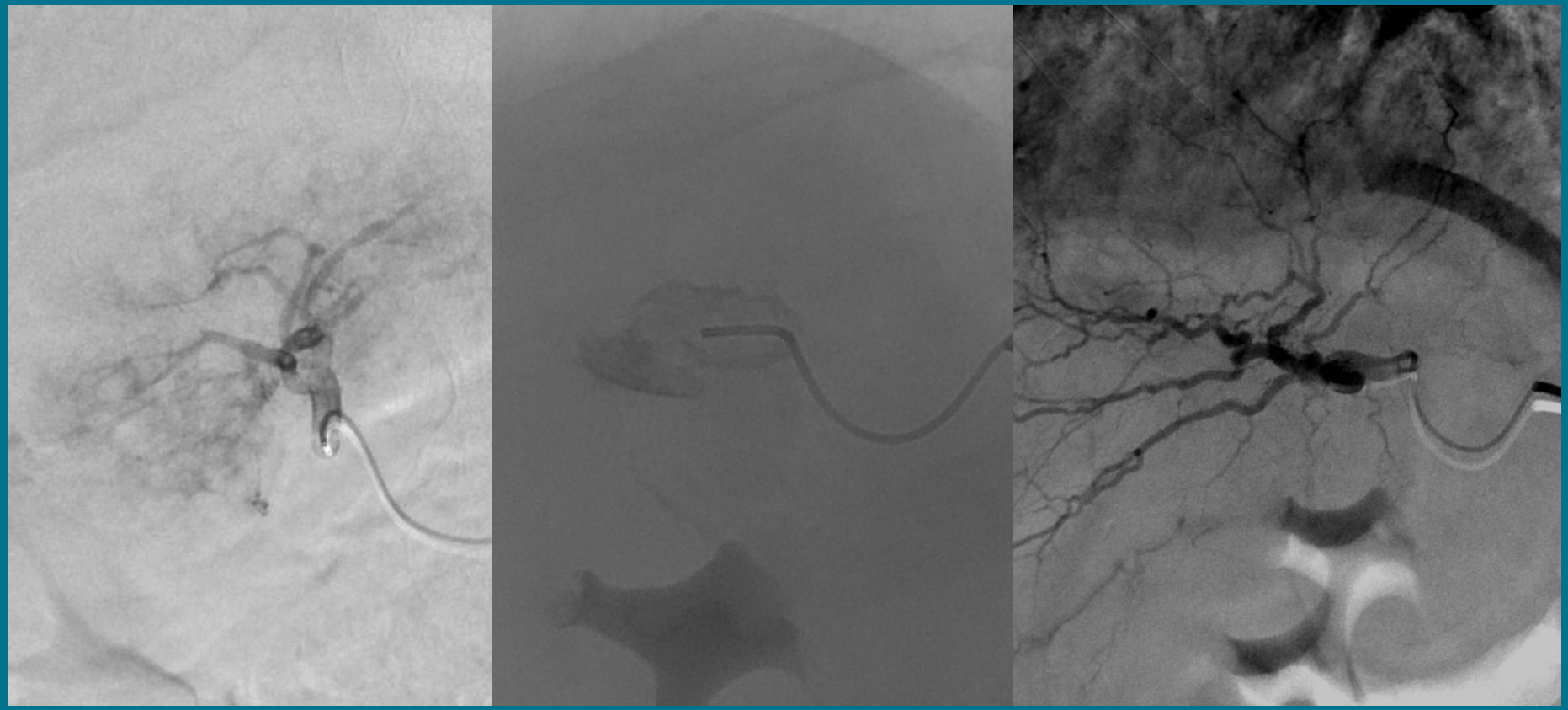
Non flow limiting

TACE

Complication	Reported rate	Threshold
Liver failure	**2.3**	4
Post-embolization syndrome	**4.6**	10
Abscess with biliary-enteric anastomosis/ Biliary stent / sphincterotomy	25	25
Abscess with functional sphincter of Oddi	<1	2
Surgical cholecystitis, Biloma requiring Drainage, pulmonary artery oil-emboli, GI hemorrhage, Iatrogenic dissection Preventing treatment	<1 each	1-2
Death within 30 days	**1**	2

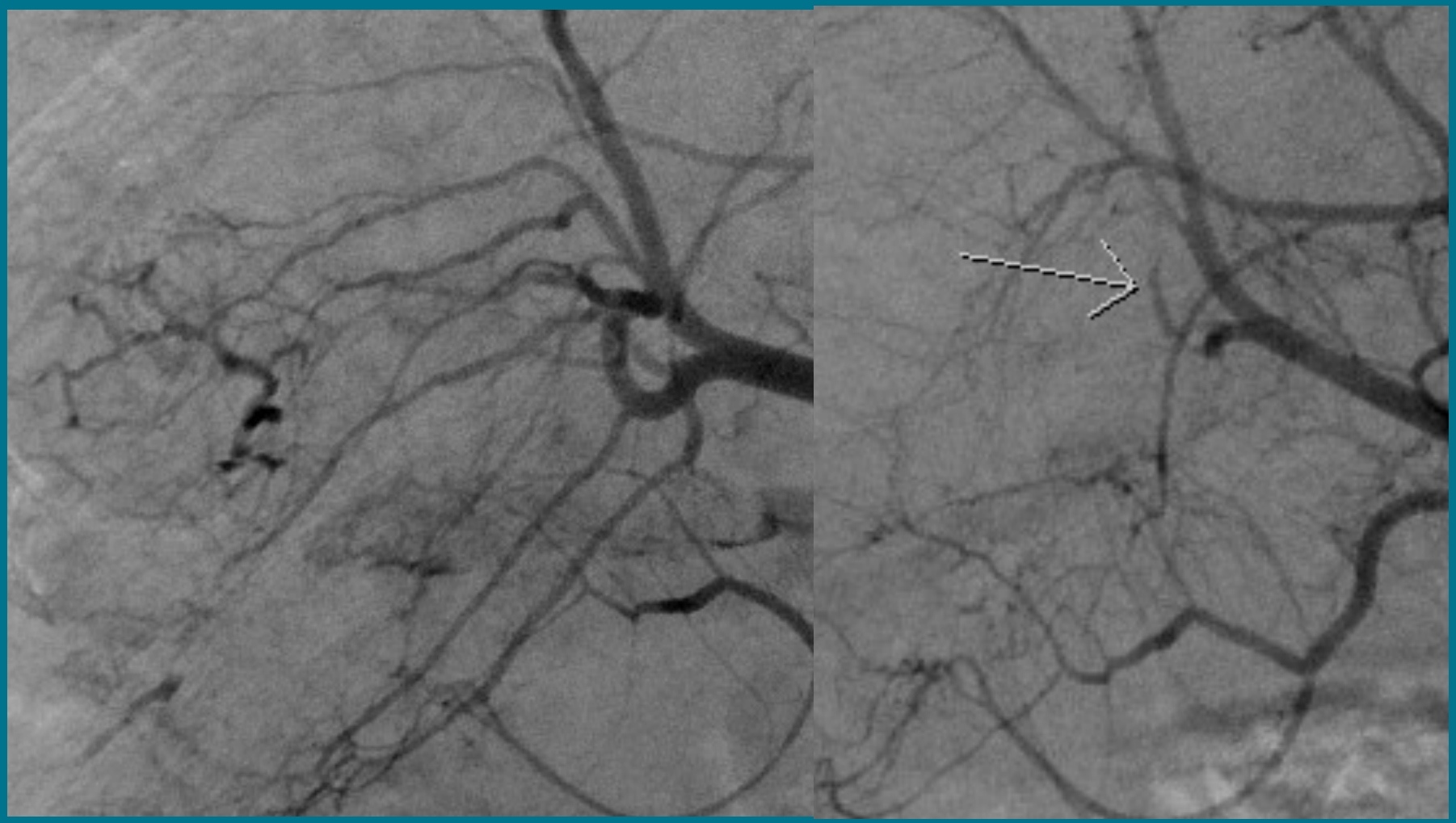
Source: Quality improvement guideline for TACE, SIR 2006

Chemoembolization



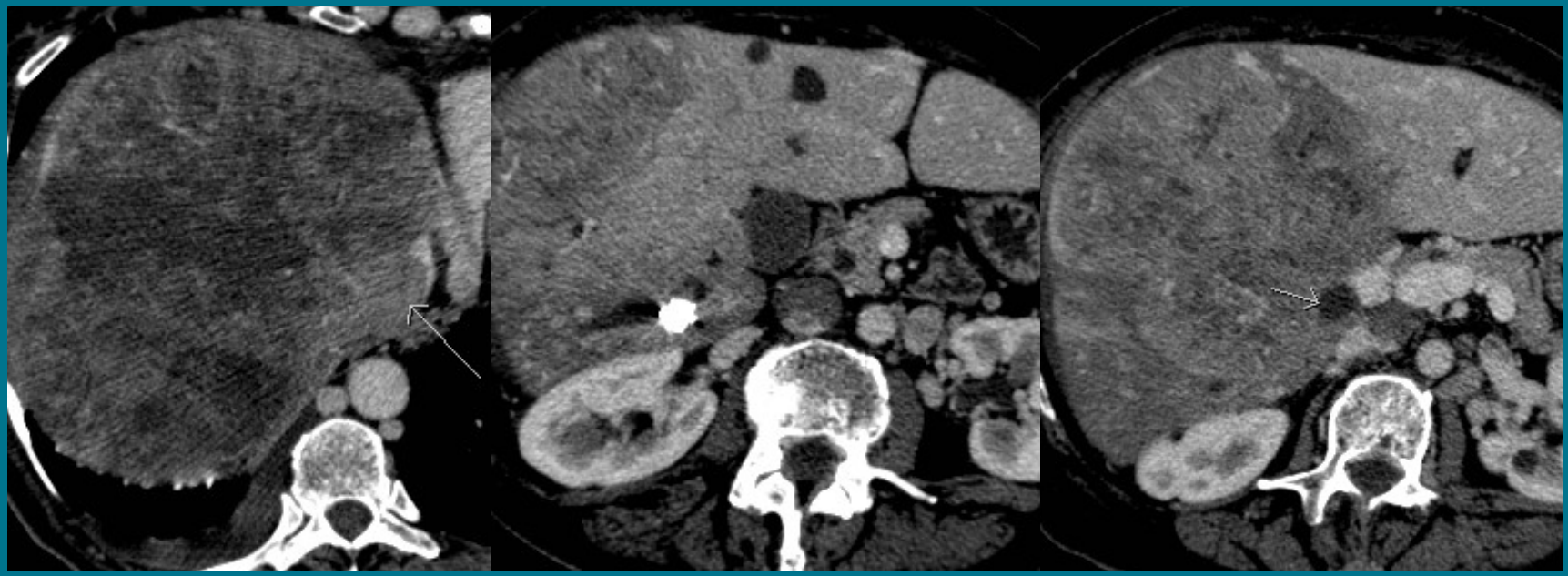
Non flow limiting

Chemoembolization



Flow limiting

Pre-Radioembolization(SIRT)



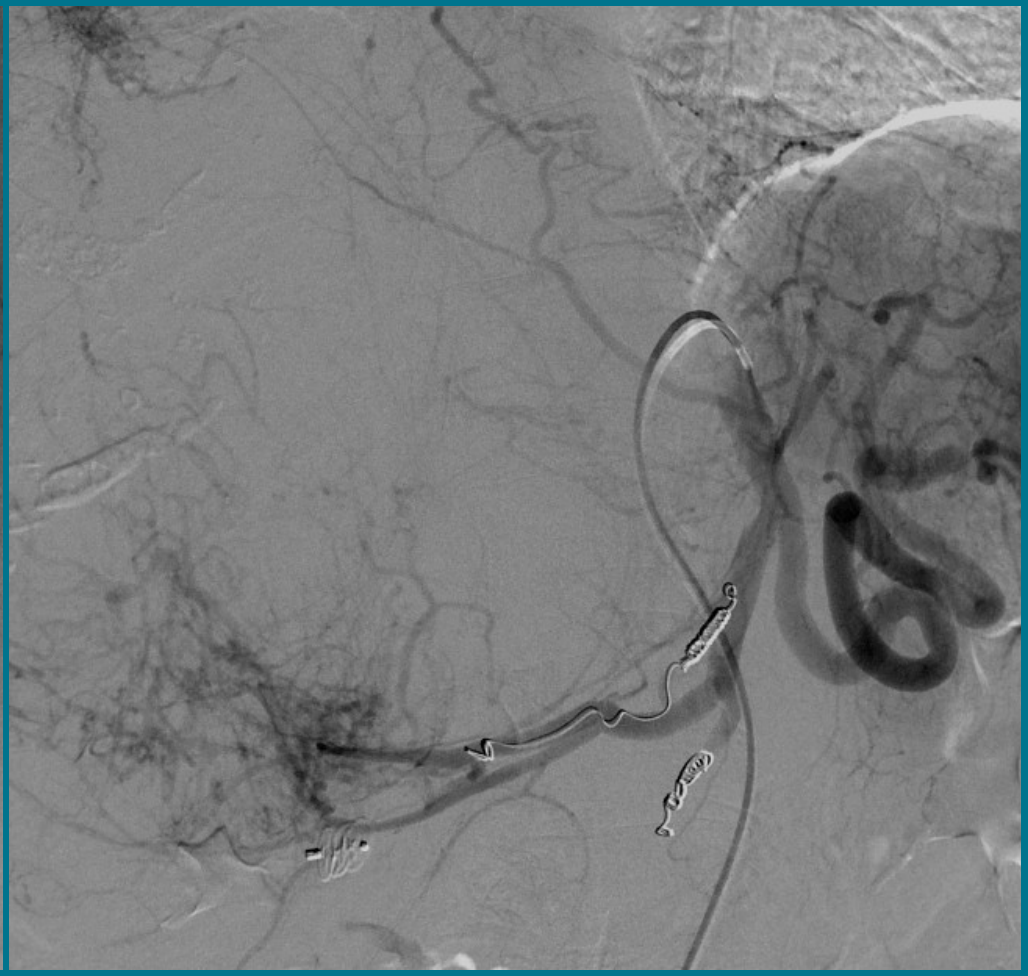
Tumour thrombus in IVC

Portal vein embolization

Pre-radioembolization

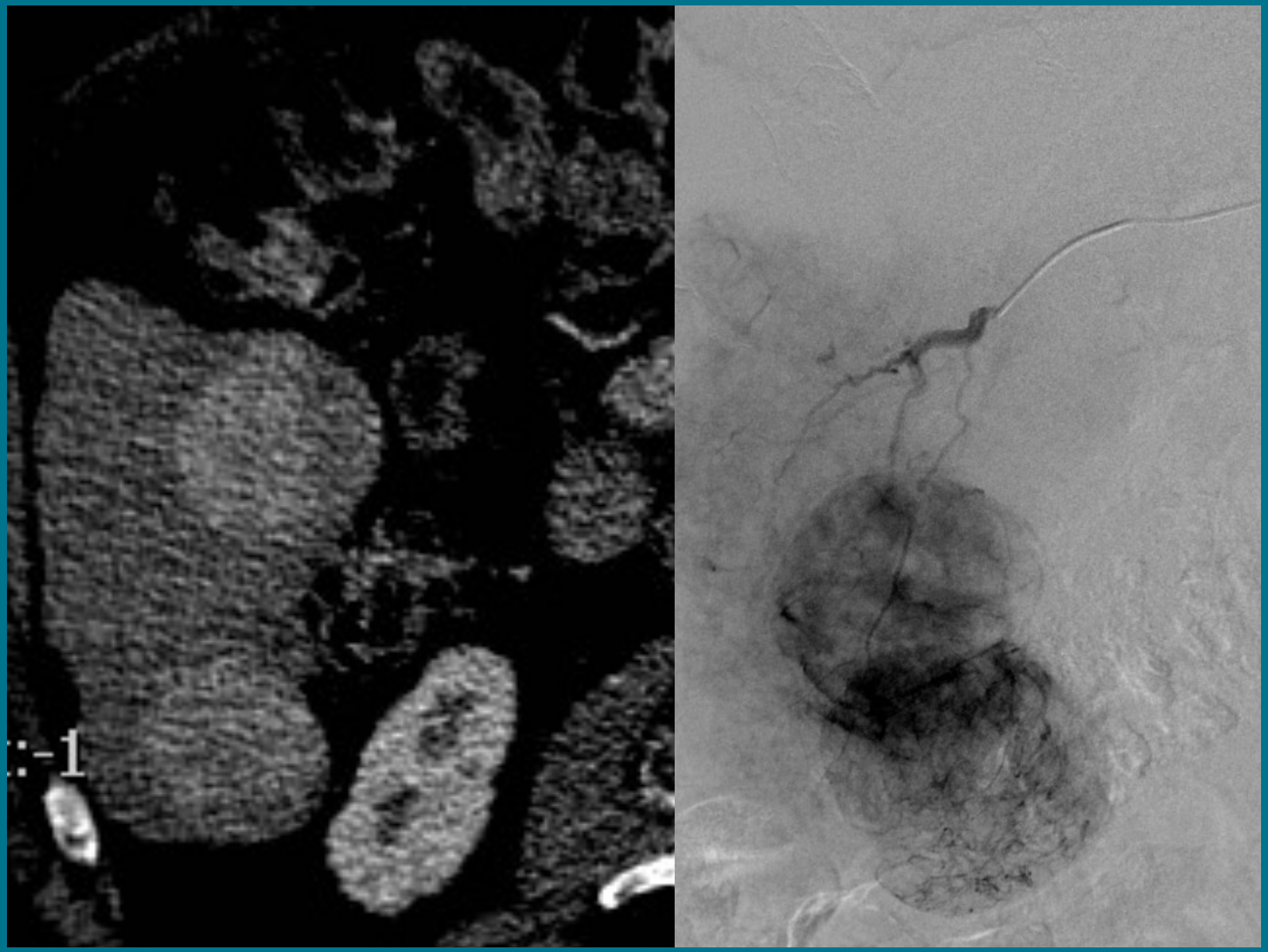
Non Flow-limiting

Pre-radioembolization

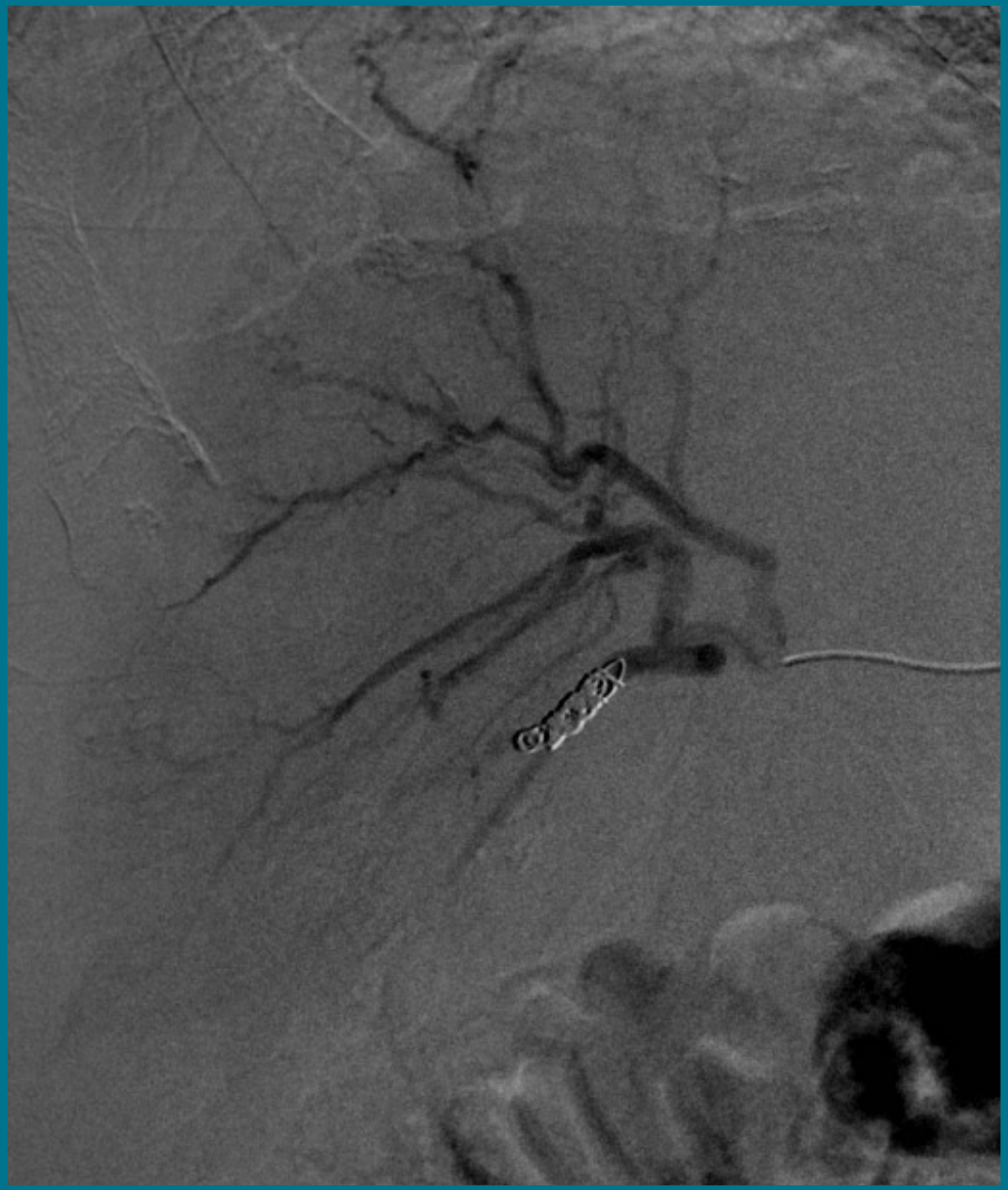


Non Flow-limiting

Chemoembolization



Chemoembolization



PTBD: Major Complications*

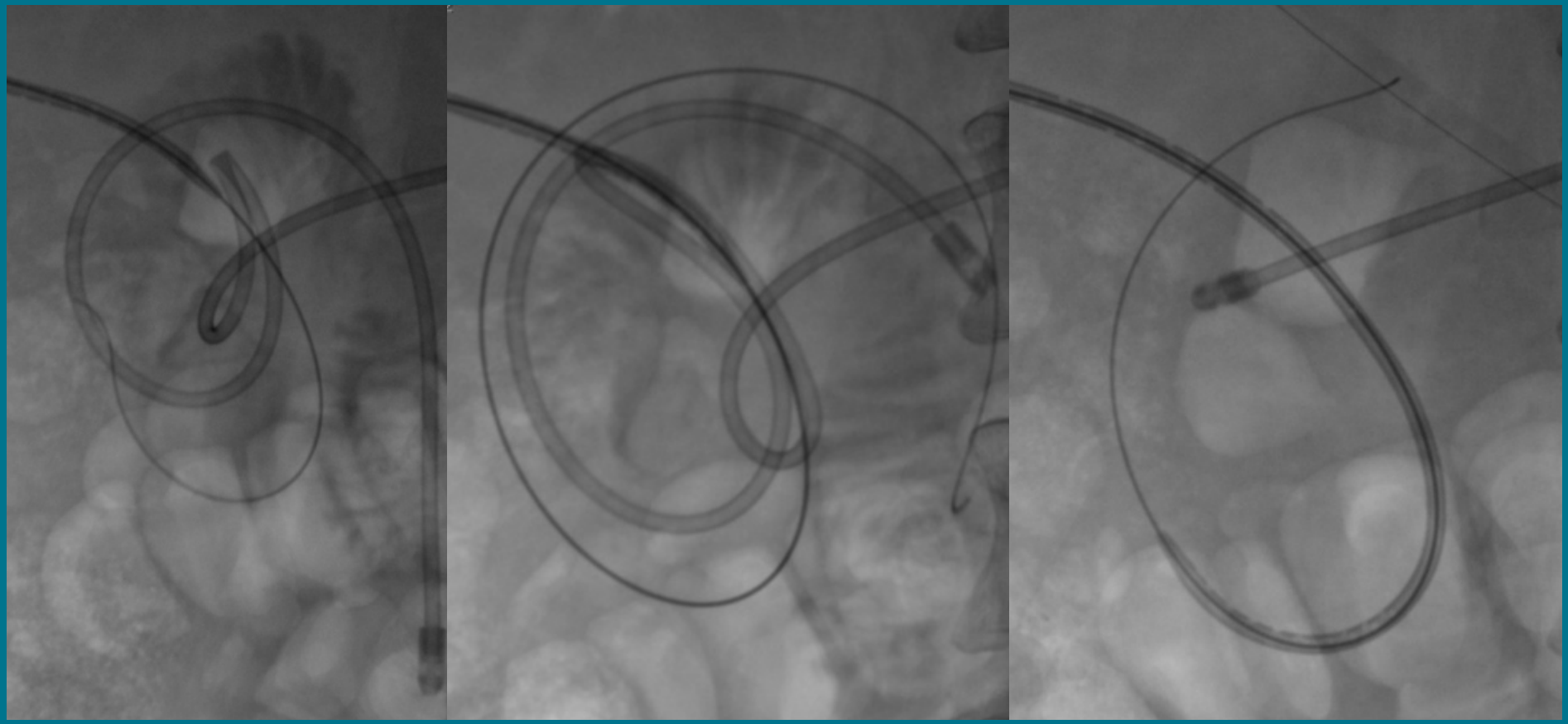
Major complications	Reported rate (%)	Suggested Threshold(%)
Intraprocedural		
• **Sepsis**	**2.5**	**5**
• **Hemorrhage**	**2.5**	**5**
• Inflammatory/infectious (abscess, peritonitis, cholecystitis, pancreatitis)	1.2	5
• Pleural	0.5	2
• **Death**	**1.7**	**3**
Postprocedural		
• Inadvertant catheter discontinuation requiring de novo PTC, death and / or surgery	*	*

* No clear consensus in literature (though recognized complications).

Recommended **overall** procedural threshold for major complication is **10%**

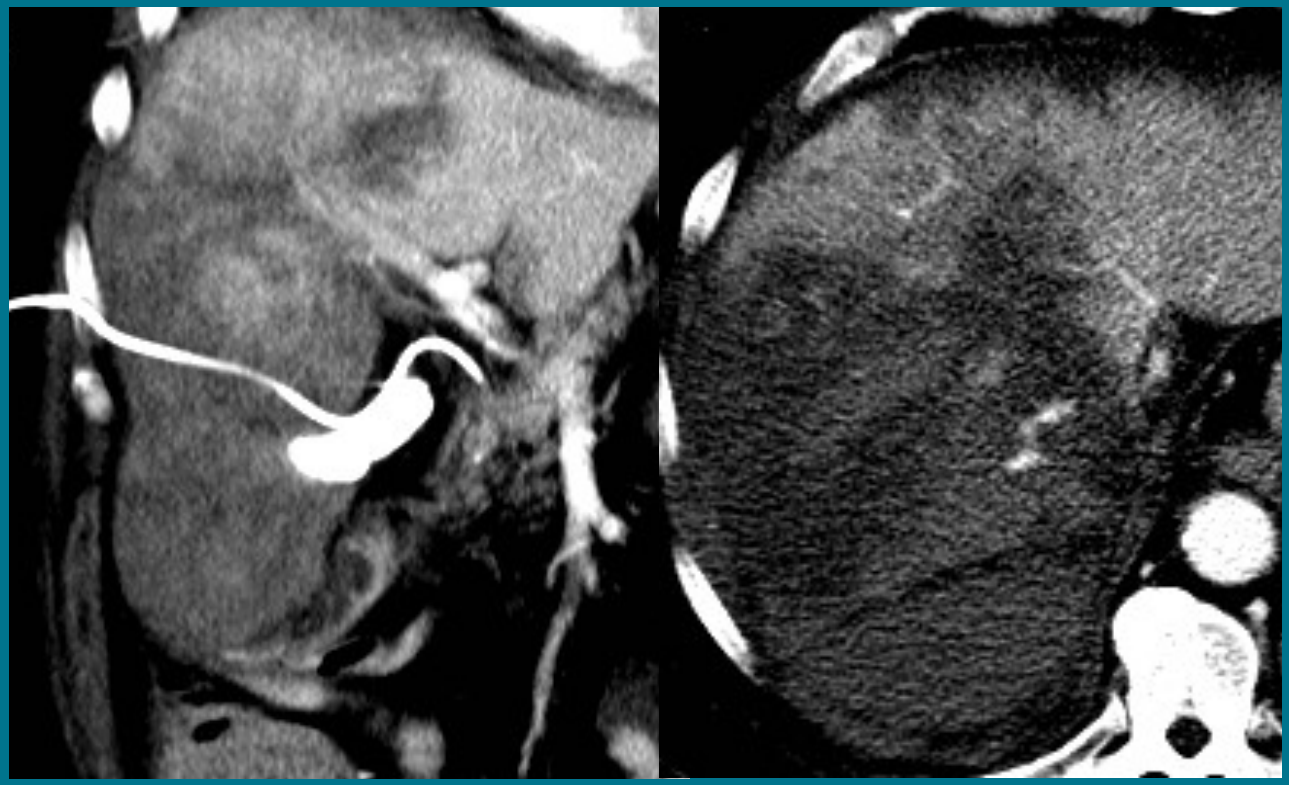
External-internal biliary catheter removal

External-internal biliary catheter removal



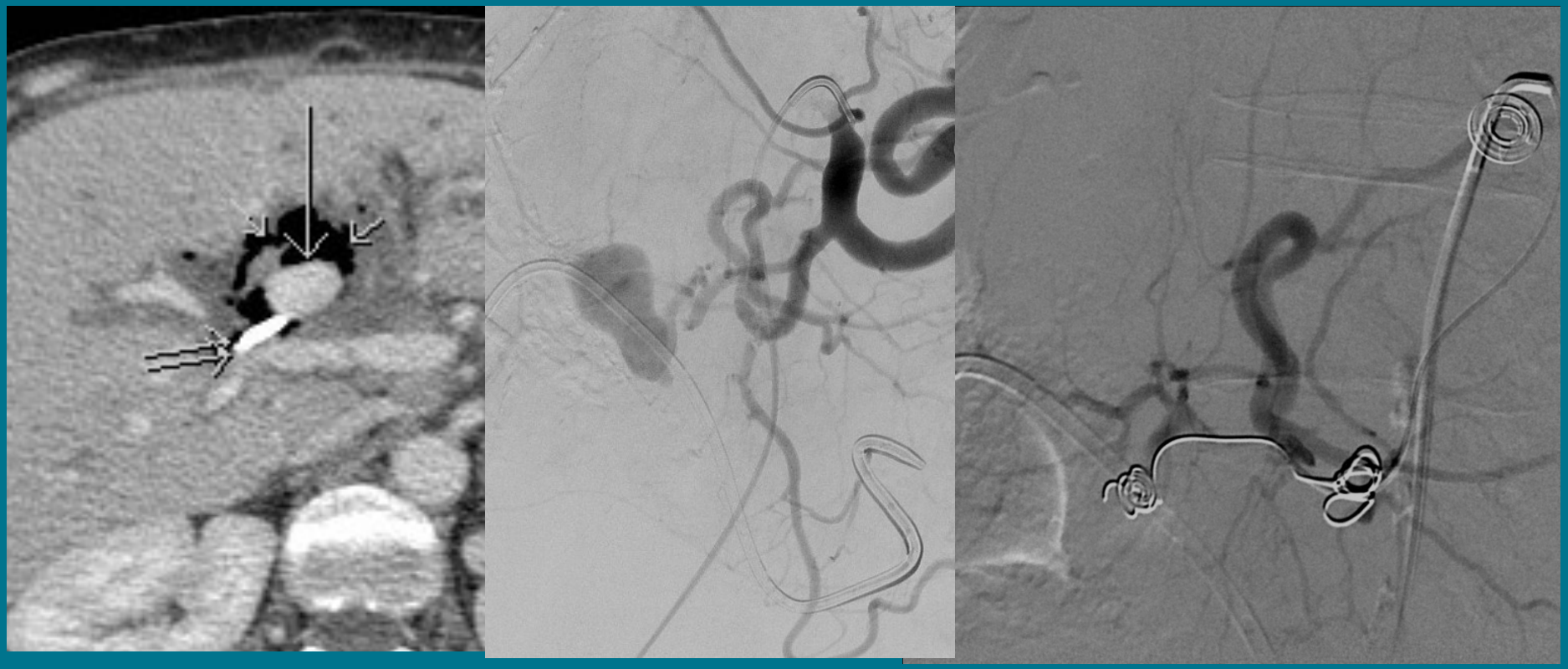
Entanglement of PTBD catheter and jejunal feeding tube due to internal thread-fixation

PTBD through GB after failed cannulation of non-dilated intrahepatic bile duct

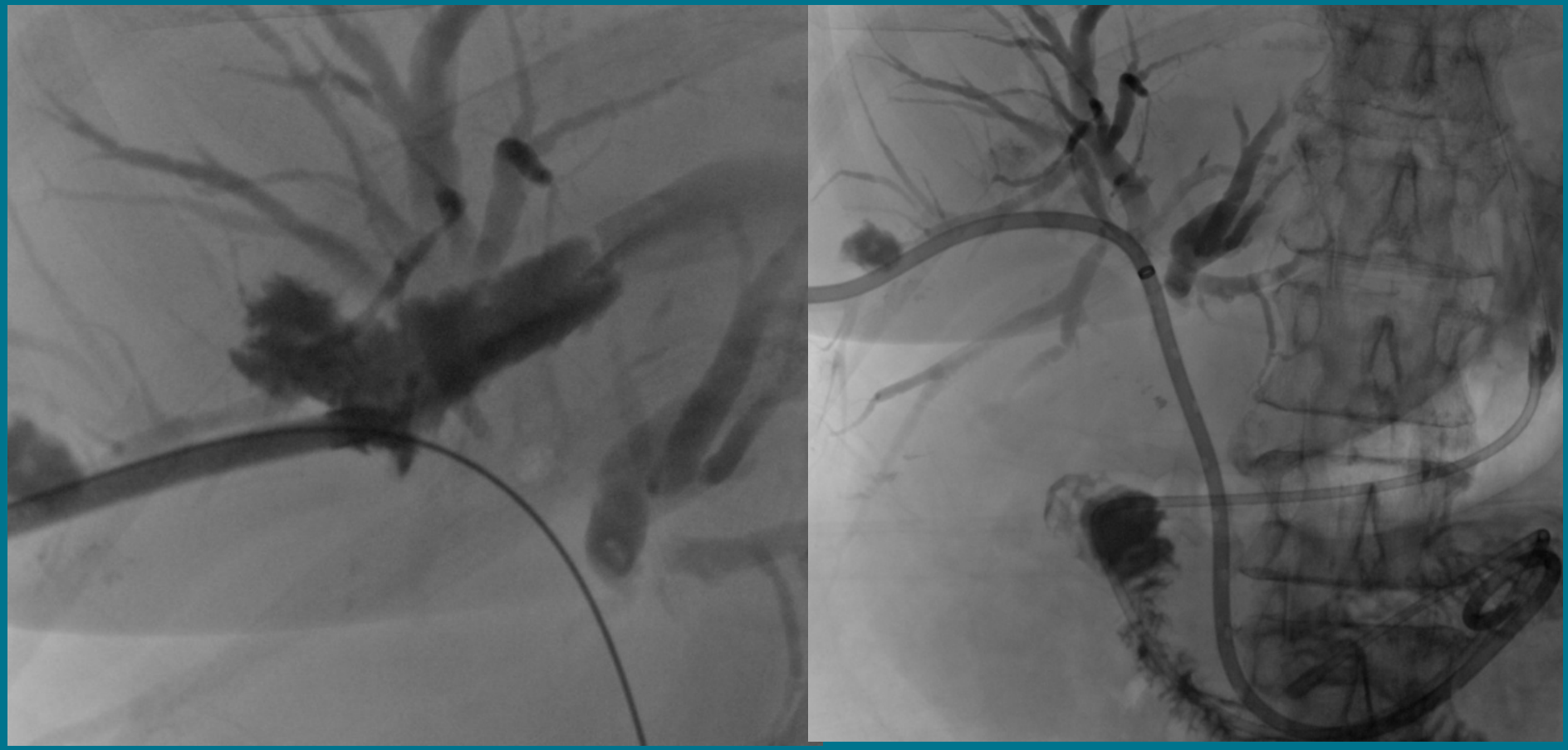


- PTBD through GB
- Large intrahepatic hematoma & extravasation

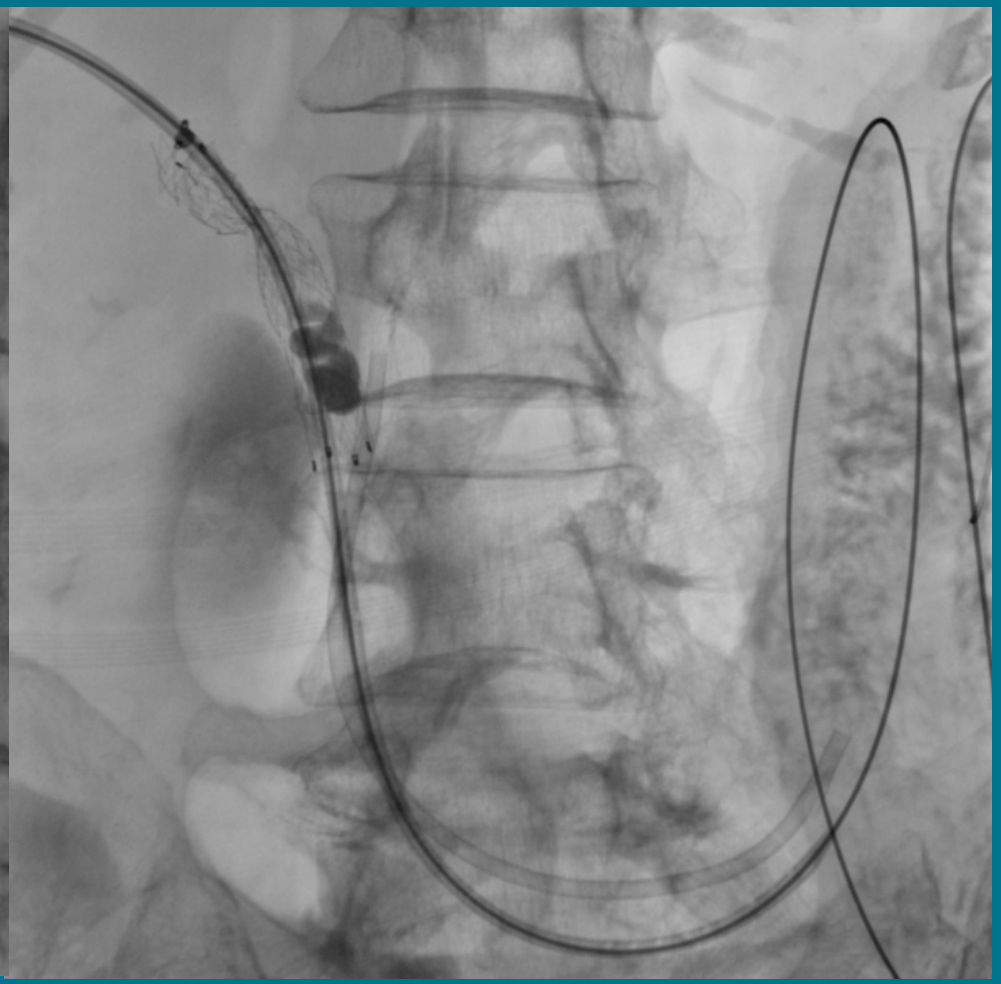
Pseudoaneurysm after PTBD



Biliary venous fistula



Biliary venous fistula & liver fracture



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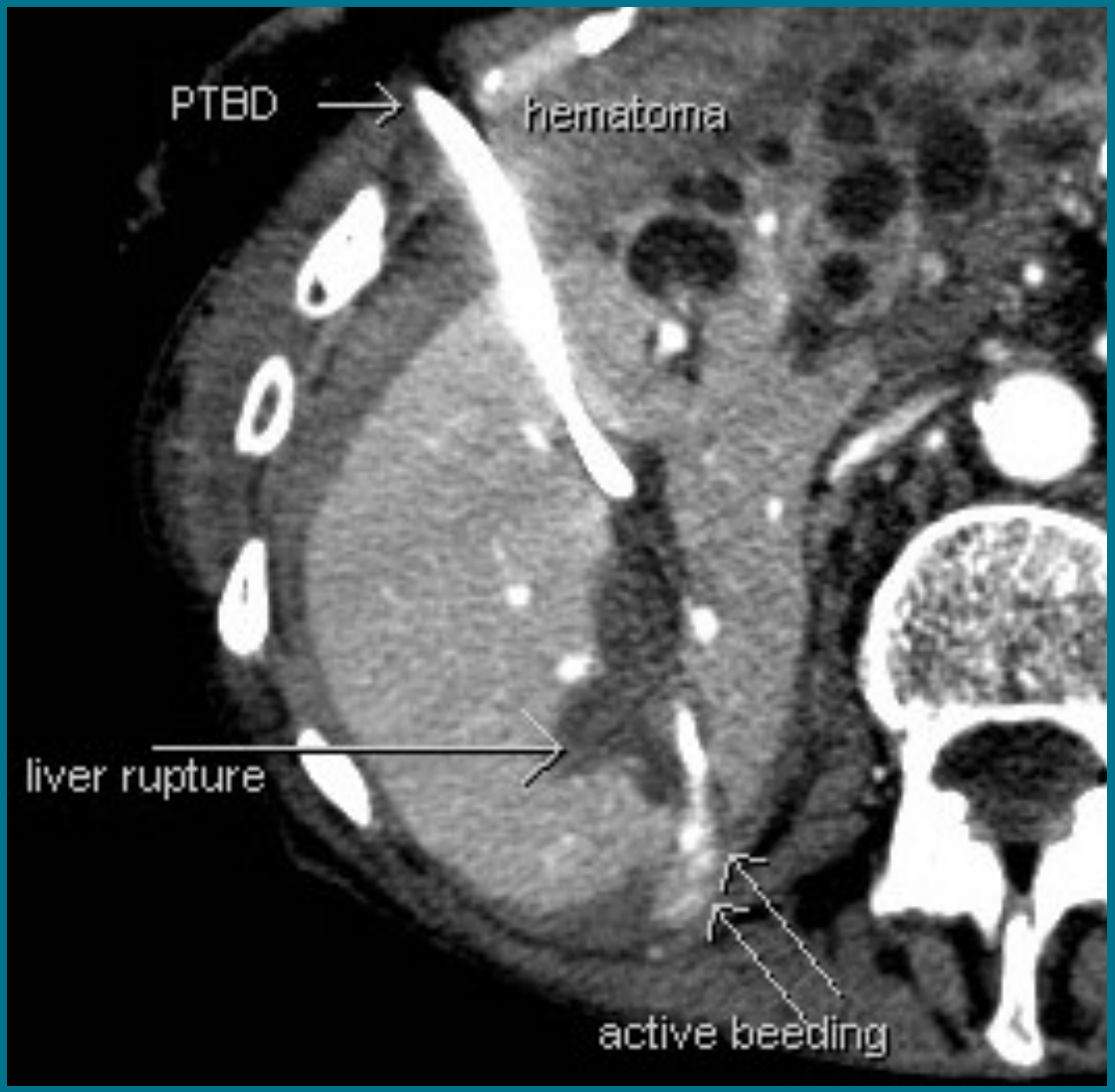


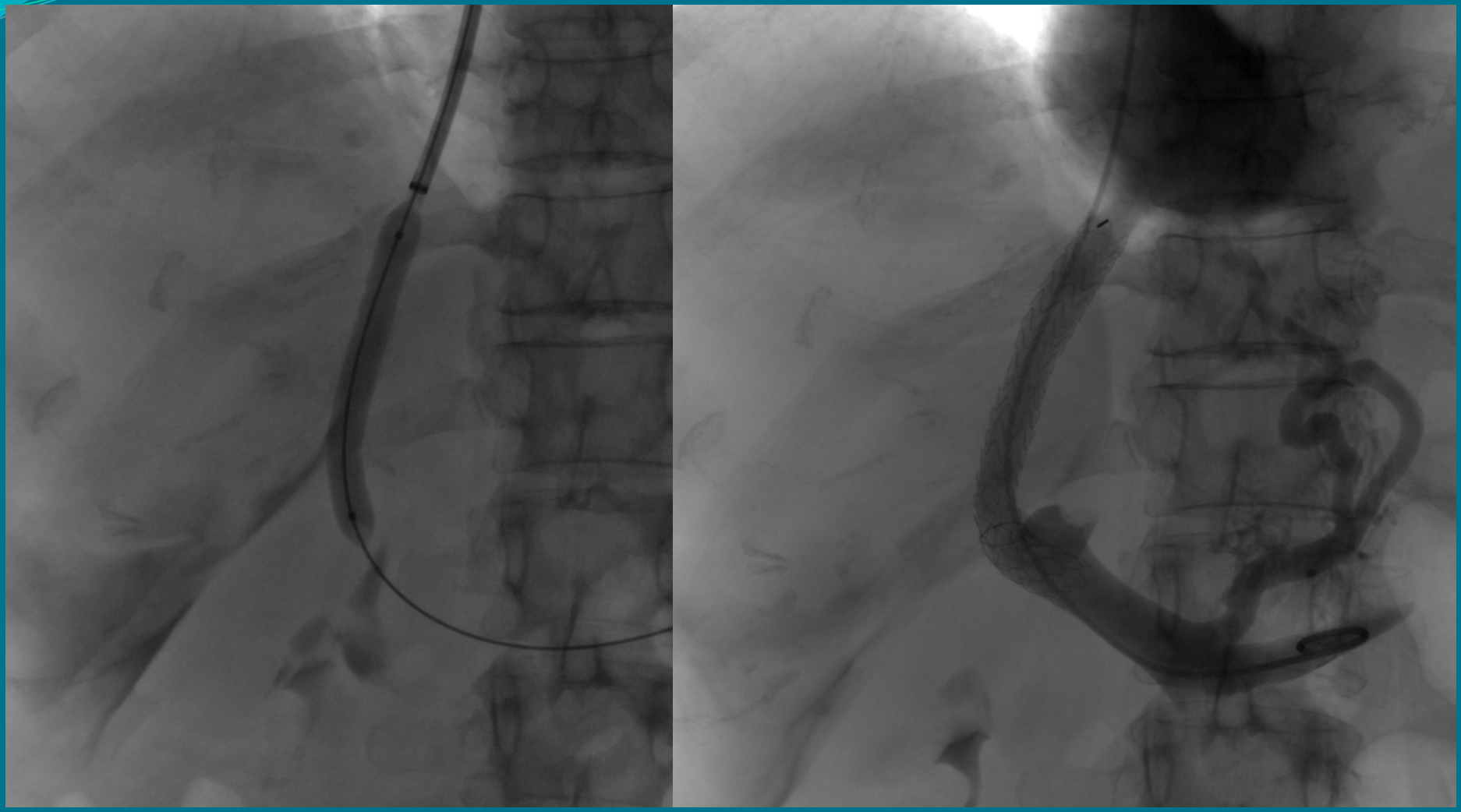
Complications*

	frequency (%)
• TIPS dysfunction^	
• Thrombosis	10-15
• Occlusion/stenosis	18-78
• Transcapsular puncture	33
• Encephalopathy	
• New / worse	10-44
• Chronic	5-20
• Stent migration	10-20
• Hemolysis	10-15

* Boyer et al, Liver, 2003: 369-382 and Rossle et al, Liver 1998; 18: 73-89

^ **TIPS dysfunction** : ≤ 50% TIPS patency, > 12 mm Hg HVPG (Hepatic venous pressure gradient), recurrence of complication for which TIPS was performed (AASLD guidelines , Boyer et al, Hepatology, vol 51, No.1, 2010)

Intraperitoneal bleeding



RFA

regionmidtjylland

Contraindications*

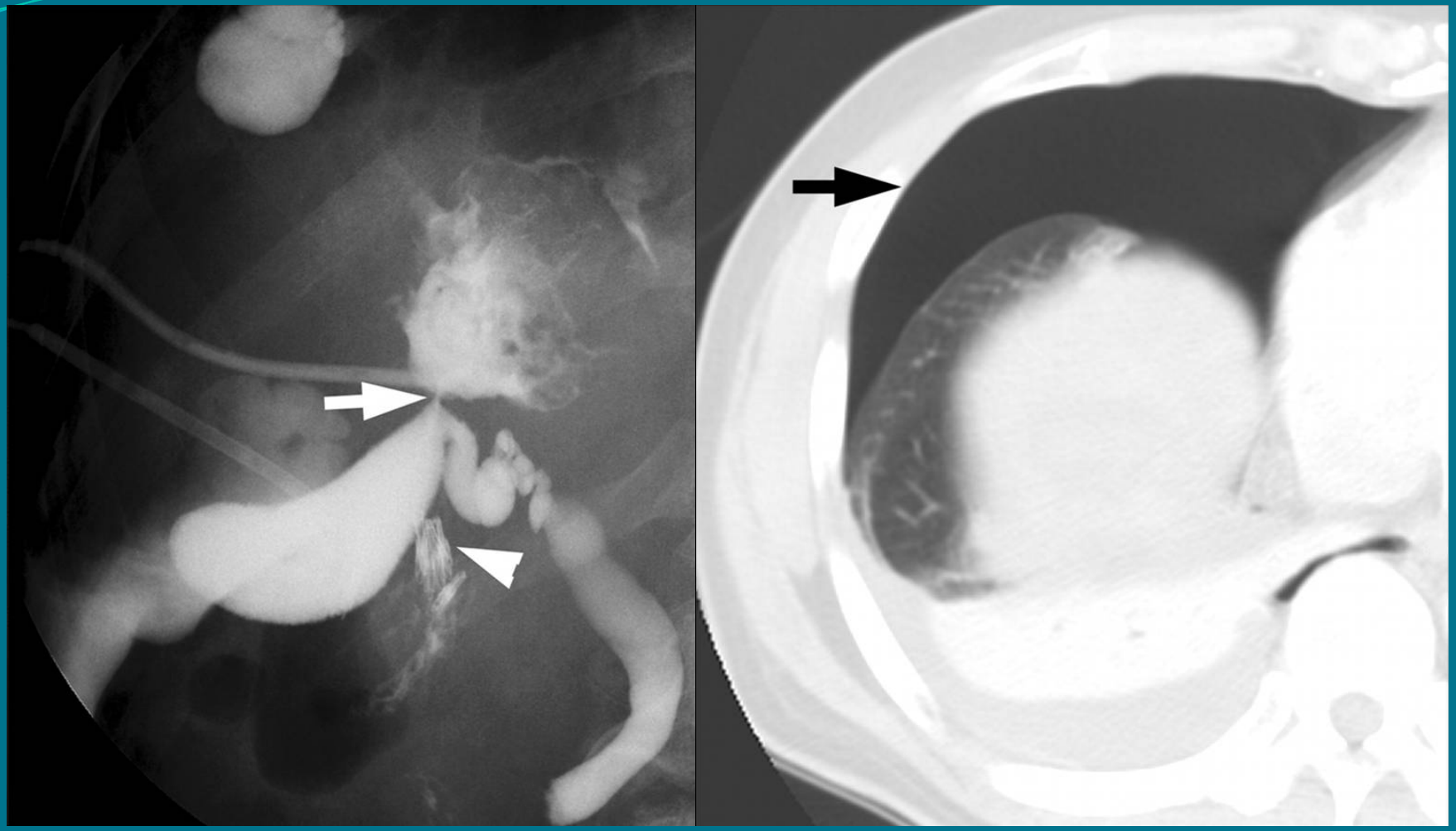
- Tumor < 1cm from main biliary duct
- IHBD
- Anterior exophytic location – risk of seedling
- Bilioenteric anastomosis
- Unmanageable coagulopathy

Complications*

- Mortality 0.1-0.5 % (Threshold 1%)
- Early major complications 2.2-3.1%; hemorrhage 1% (Threshold 2%) [Other – bowel perforation, abscess, hemothorax, seedling, biliary injury, ground pad burns, hepatic failure all $\leq$ 0.5% each]
- Early minor complications 5-8.9%

* Crocetti, de Baere & Lencioni: CIRSE guideline for RFA of liver tumors, Cardiovasc Intervent Radiol 2010; 33: 11-17

RFA



Akahane M et al. Radiographics 2005;25:S57-S68

RFA

regionmidtjylland

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Interventional Procedures are Good, but....

Don't be too aggressive !

Or land up in trouble !!

Thank you for **ATTENTION !!!!!**