PLANETS Cancer Charity

University Hospital Southampton NHS Foundation Trust

Interventional Radiology in NETS

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@interadiologist

Disclosures

- Consultancy Agreements, including proctoring and honoraria
  - Boston Scientific.
  - Delcath Systems.
  - Guerbet.

Interventional Radiology – Who are we ?

Interventional Radiology – Who are we ?

Dr Tim Bryant

Interventional Radiology – Who are we ?

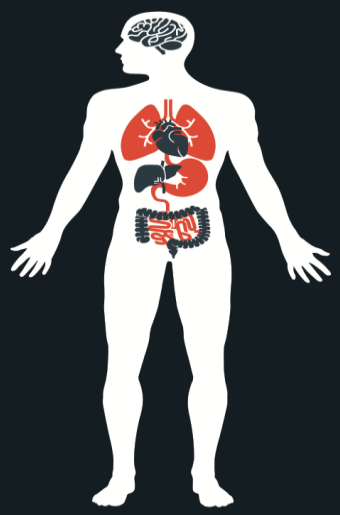
Dr Brian Stedman

Interventional Radiology – Who are we ?

Dr Sachin Modi

The great big of Minimally Invasive, Image-guided Procedures #MIIPs as EMOJIS and HASHTAGS

What parts of the body can be treated by Interventional Radiologists? #WithoutaScalpel



liver

kidneys

lungs

intestine

stomach

spine

brain

gallbladder

uterus

legs

spleen

prostate

What can the Interventional Radiology (#irad) team do through a pinhole in the skin?

Dissolve blood clots #stoptheclot

Open blocked blood vessels #PTA

Stop internal bleeding #embolization

Freeze tumors #cryoablation

Keep vessels open #PAD #stent

Prevent amputation #CLI #CLIfighters

Take tissue samples #biopsy

Kill tumors with energy #radiofrequency

Treat infection #cholecystostomy

Send patients home with just a band-aid #qualityof life #patientsfirst #empowered

Stop aneurysms from bursting #coiling #aneurysm

Poison tumors #TACE #theCancerSnipers

Shrink fibroids #UFE #DontLoseURU

Stop pain from spinal fractures #vertebroplasty

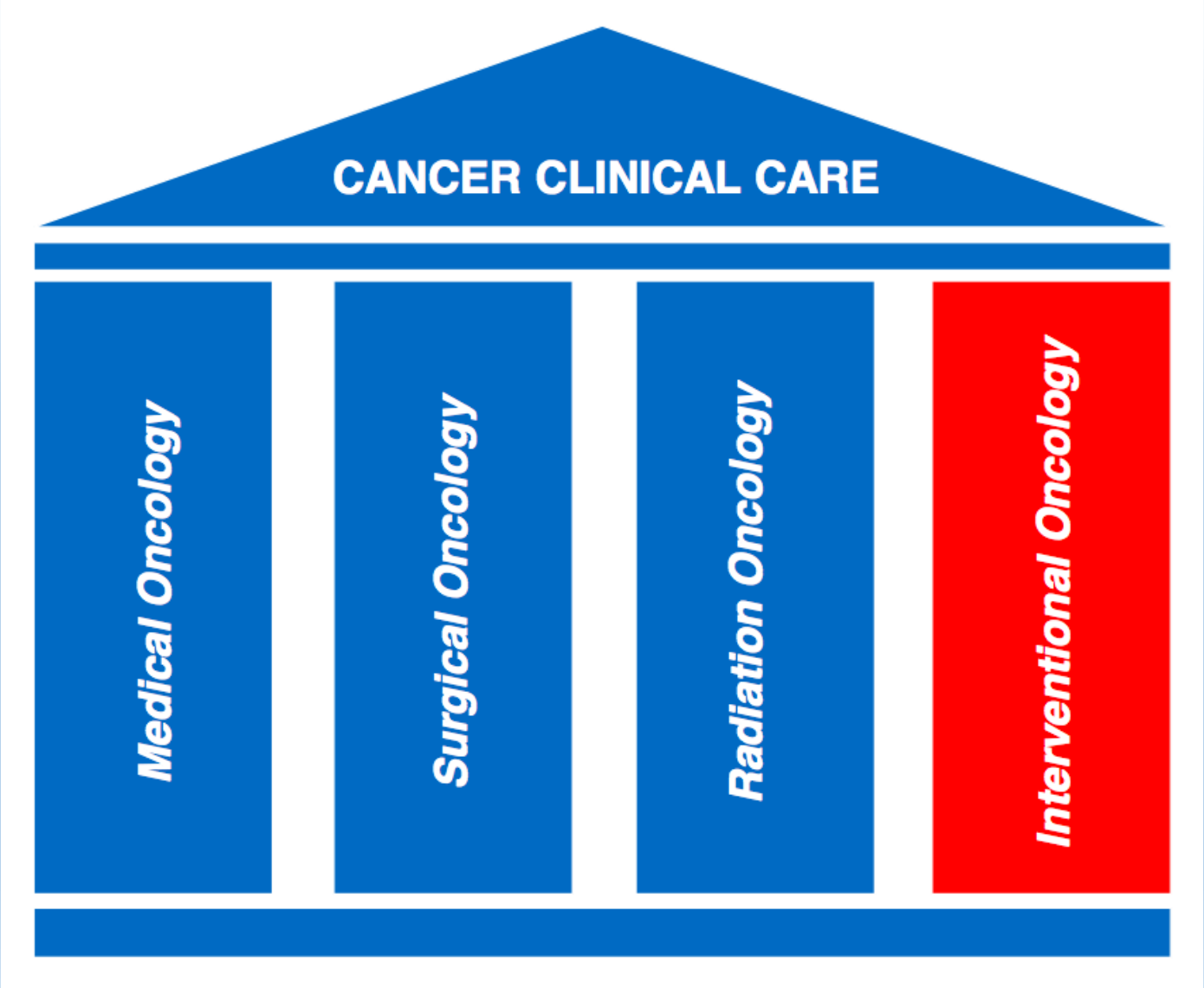
Suppress the hunger hormone #nanoblock

Shrink an enlarged prostate #PAE

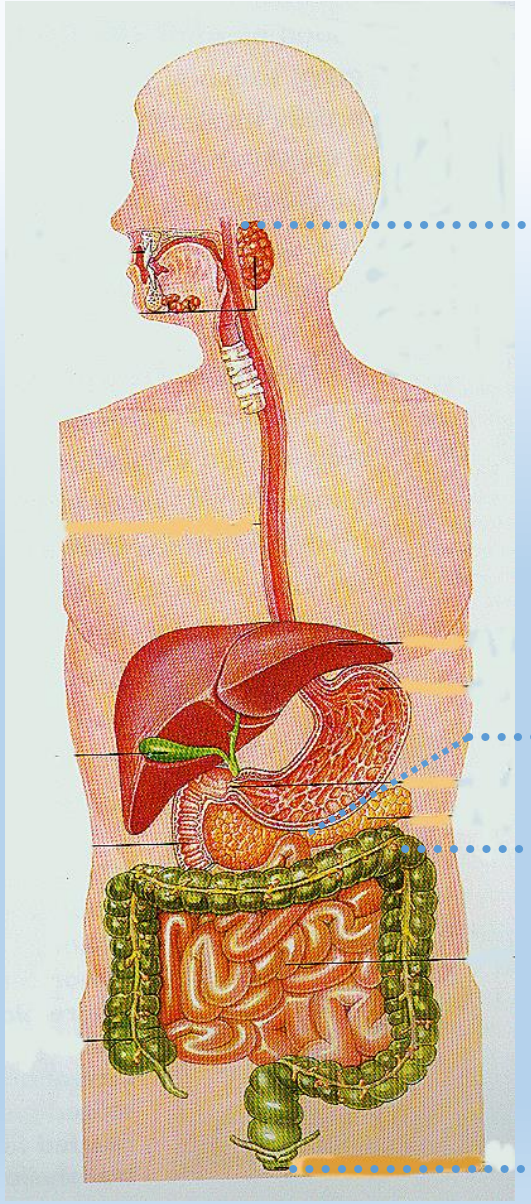
Stop blood clots from traveling to the lungs #DVT #PE #filterout

the Interventional Initiative

Interventional Oncology



Type, Distribution and Frequency of GEPNET



	Relative frequency	Function	Histology
Foregut	30%	Functional	Islet cell
Midgut	60%	Functional	Carcinoid
Hindgut	<10%	Non-functional	Carcinoid

Grades of Neuroendocrine Neoplasms – WHO 2017

Grade	Differentiation	Miotic Count/Ki-67
1 (low) - NET	Well differentiated	<2 mitoses/10 HPF <3% Ki-67 index
2 (Intermediate) - NET	Well differentiated	2-20 mitoses/10 HPF 3-20% Ki-67 index
3 (high) - NET	Well differentiated	>20 mitoses/10 HPF >20% Ki-67 index
3 (high) – Neuroendocrine Carcinoma (NEC)	Poorly differentiated	>20 mitoses/10 HPF >20% Ki-67 index
Mixed Neuroendocrine Non-Neuroendocrine Neoplasm (MiNEN) - See text		

®RonnyAllan.NET

Background

- Neuroendocrine tumours from gastro-pancreatic origin (GEP-NET) can be responsible for liver metastases.

- Metastases can be the dominant part of the disease
  - Tumour burden
  - Symptoms related to liver metastases

- Liver metastases constitute the most frequent metastatic site.

Background

- ENETS recommends - only G1 and G2 tumours are potential candidate for liver-directed (locoregional) therapies.

- G3 carcinomas are candidates for systemic treatment due to the rapid progression of the disease and usually widespread metastases.

Goals for IA therapy

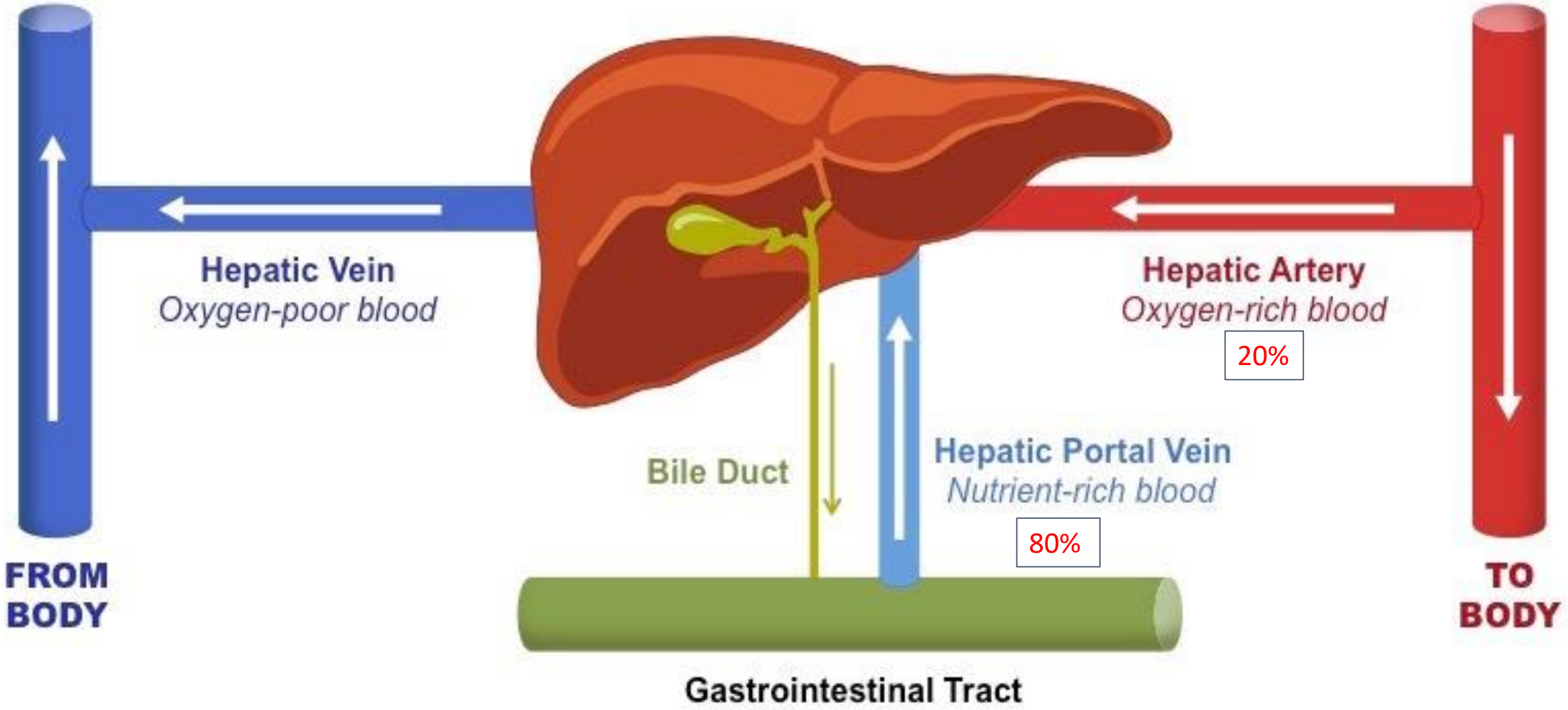
- Reduction in tumour burden
- Potential conversion to resectable status
- Control of hormonal symptoms (when somatostain analogues fail)

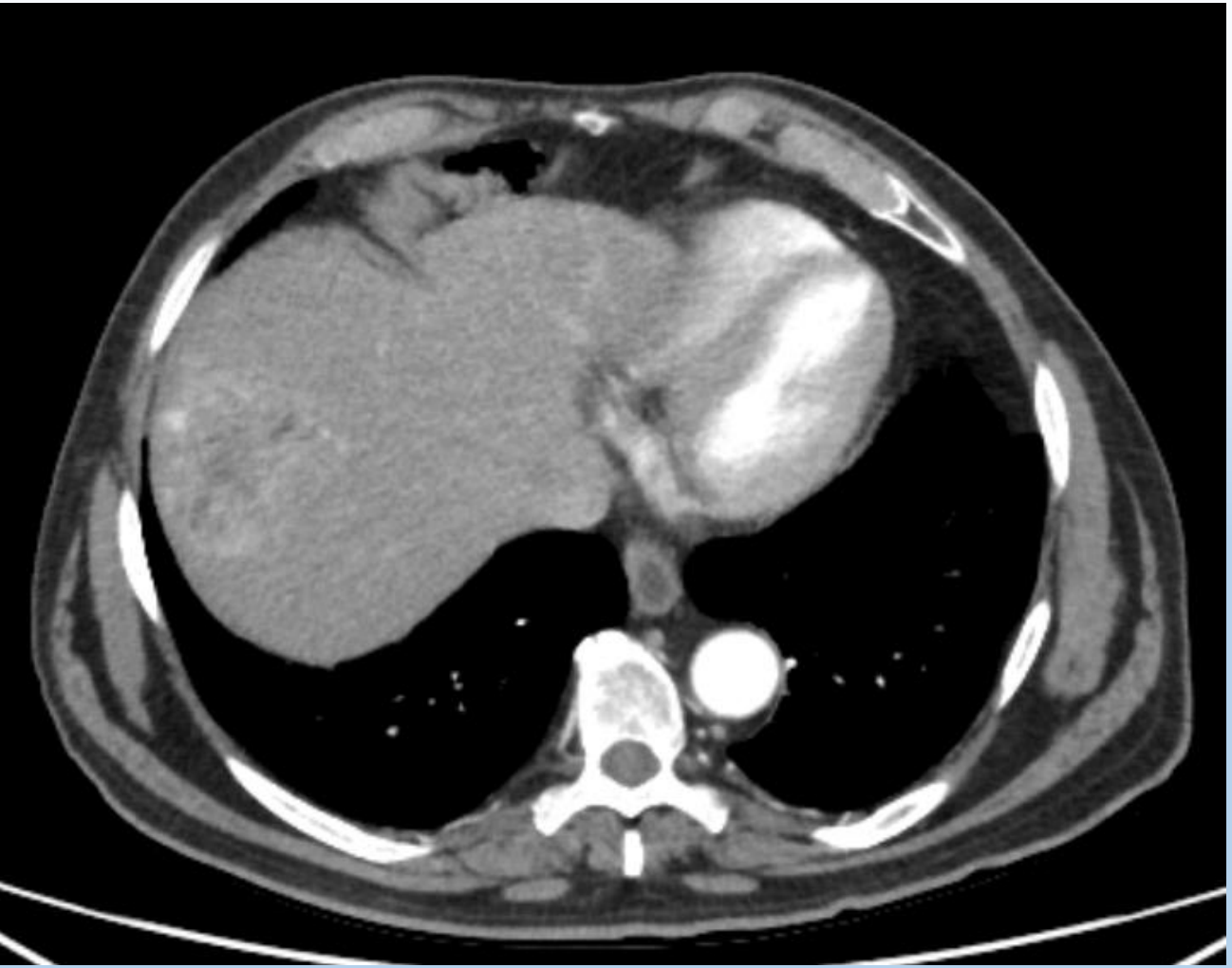
IA Therapies

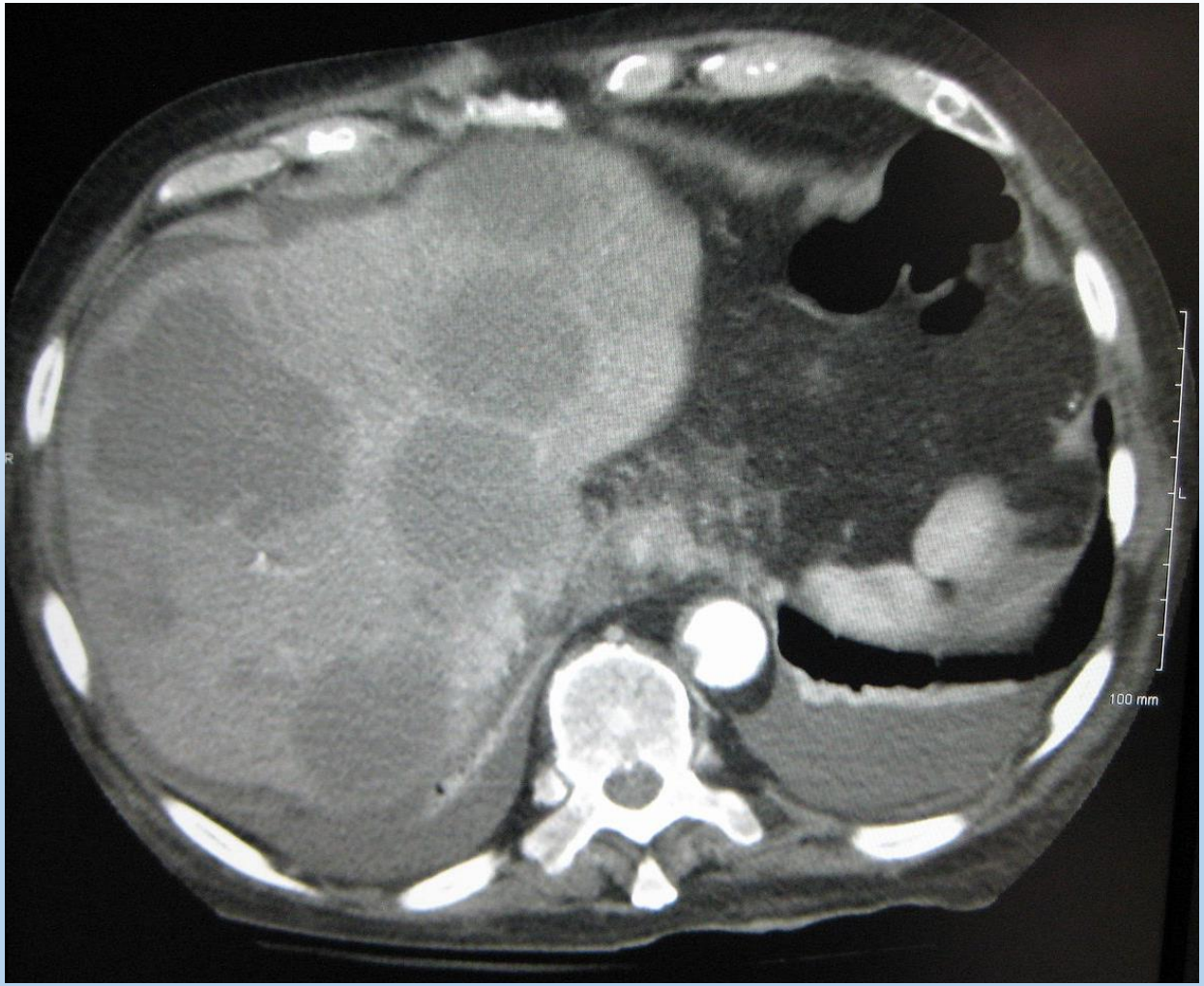
- Trans arterial chemoembolisation (TACE)
- Tran arterial embolisation (TAE)
- Selective Internal Radiation Therapy (SIRT)

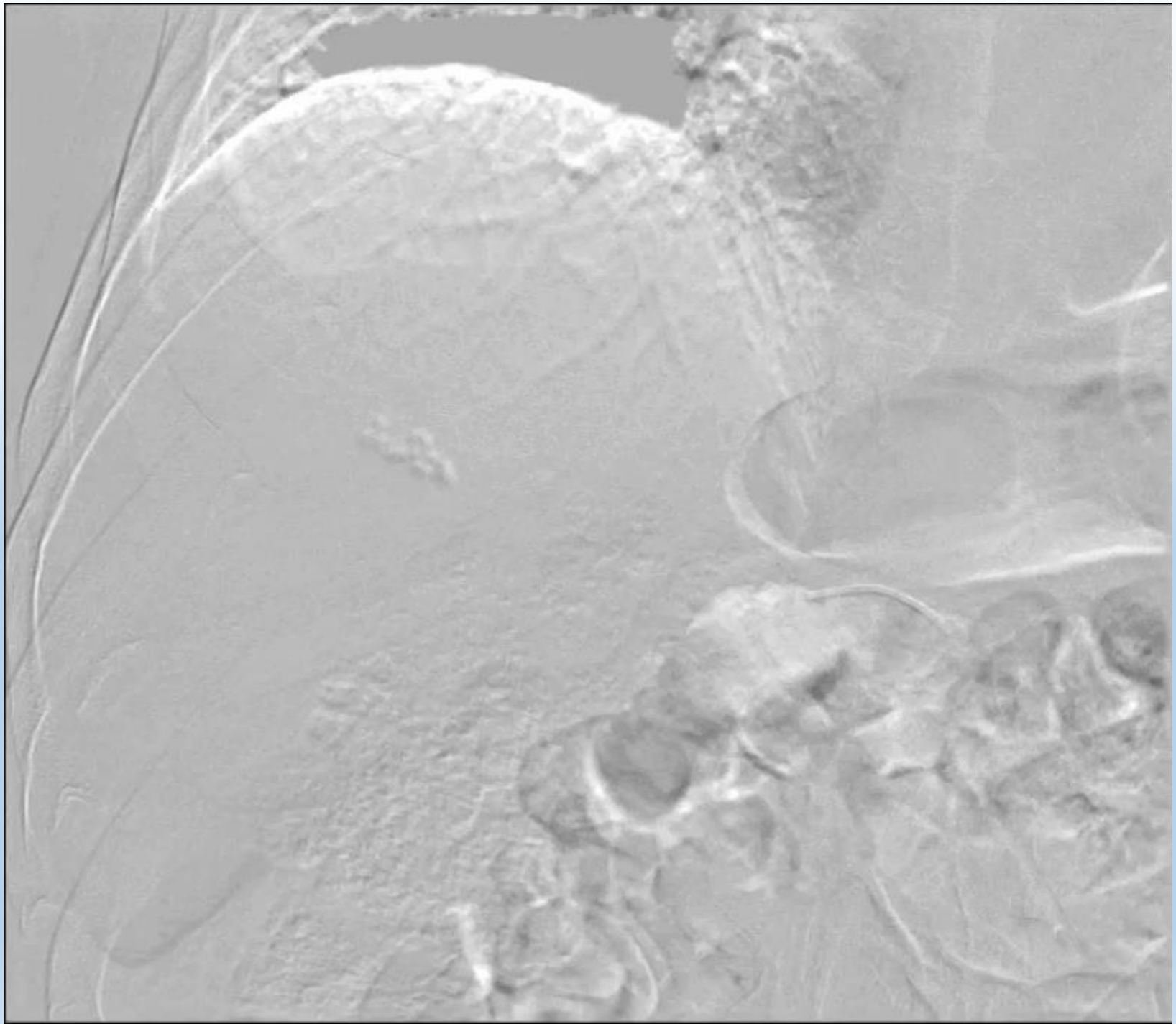
Rationale for IA therapy

- Normal liver has a dual vascular supply including 20% inflow from the hepatic artery and 80% inflow from the portal vein.
- This differential supply allows IA treatment as primary and metastatic liver lesions take their blood supply from HA.
- NET especially arterialised compared to other mets (mCRC/Breast). Good target for IA therapy.


Hepatic Vein
Oxygen-poor blood
Hepatic Artery
Oxygen-rich blood
20%
Bile Duct
Hepatic Portal Vein
Nutrient-rich blood
80%
FROM BODY
TO BODY
Gastrointestinal Tract




100 mm



Se:5
Im:300 (F1/1)
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IODINE
C2048
W4095

Se:5
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MRN:
IODINE
C2048
W4095

Se:5
Im:302 (F1/1)
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IODINE
C2048
W4095

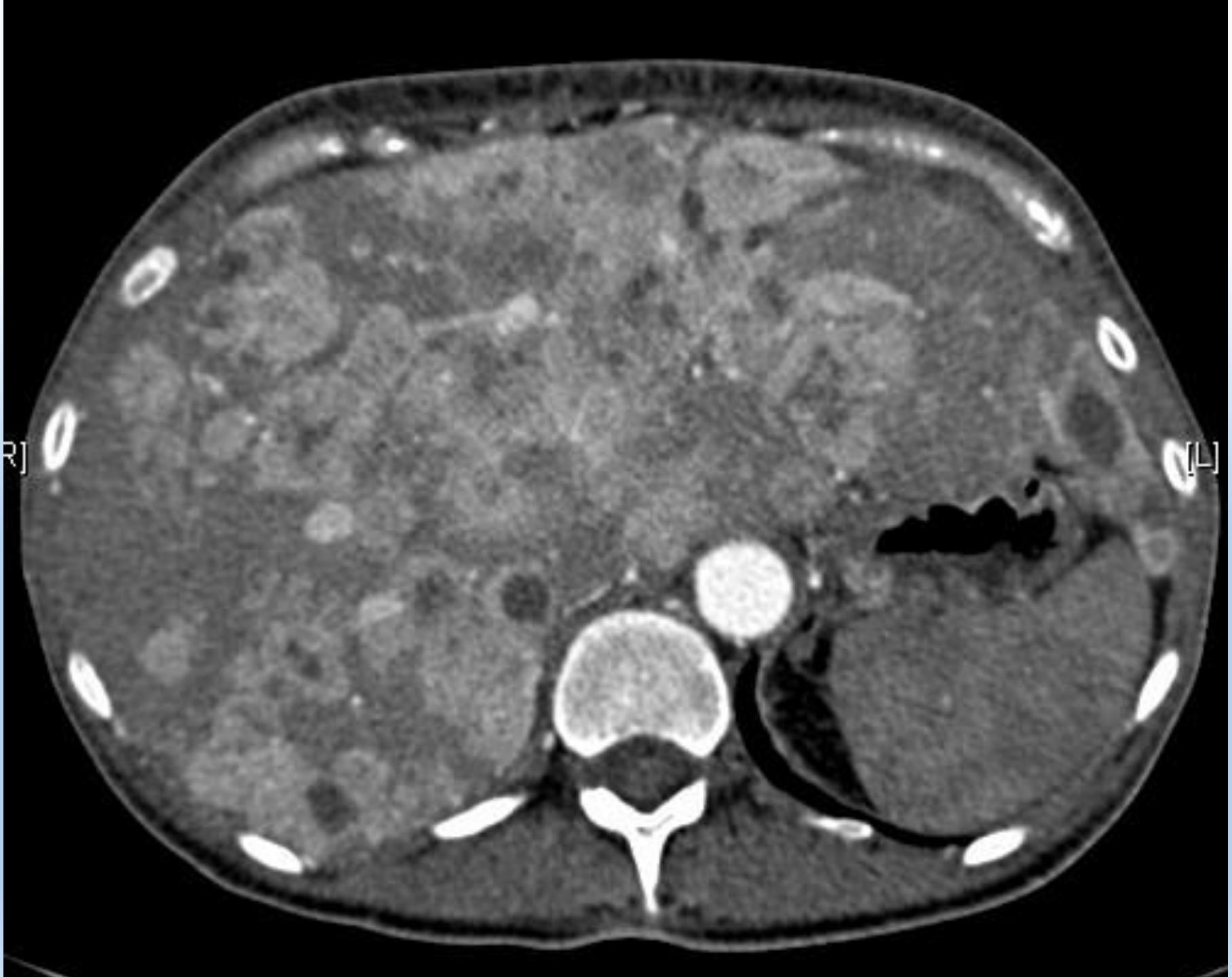
Patient Selection - Contraindications

Absolute

- Poor liver function (Bili >20, low albumin, ascites)
- Poor performance status (ECOG >2)
- PVT (main v segmental)

Relative

- Arterial dissection or inability to exclude extra hepatic supply
- Disease burden >50%
- Biliary Enteric anastomosis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At UHS

- MDT discussion (Surgeon, Endocrinologists, Radiologist, CNS, Nuclear med and Oncologists)
- Patient referred to IR for TAE/TACE
- Seen in IR clinic with IR CNS

- Pre admission for Octreotide infusion as per protocol
- GA

Protocol for Perioperative Management of Patients with Neuroendocrine or Carcinoid Tumours

	Non-functioning	Previous History of carcinoid syndrome/well controlled carcinoid on depot octreotide	Active carcinoid syndrome	Active carcinoid syndrome with symptomatic/significant Carcinoid heart disease
Surgical or IR procedure unrelated to neuroendocrine tumour	**A**	**A**	**B**	**C**
Minor surgical intervention/biopsy/ablation of neuroendocrine tumour	**A**	**B**	**C**	**D**
Major Surgery on metastatic deposits or bulky primary tumour or embolic therapy or cardiac surgery	**B**	**C**	**D**	**E**

A no octreotide required
B octreotide 100mcgs IV on induction
C octreotide 12.5mcgs/hr IV infusion for 8-12 hours pre-operatively, continued for 12-24 hours post procedure *(octreotide 300mcgs in 250mls of 0.9% saline at 10mls/hr)*
D octreotide 25mcgs/hr IV infusion for 24 hours pre-operatively and continued for 24-48 hours post operatively *(octreotide 600mcgs in 250mls of 0.9% saline at 10mls/hr)*
E octreotide 50mcgs/hr IV infusion for 24 hours pre-operatively and continued for 72 hours post operatively *(octreotide 1200mcgs in 250mls of 0.9% saline at 10mls/hr)*

Regardless of chosen regimen: if signs of carcinoid syndrome (dry flushing, tachycardia, hypotension and wheeze caused by release of serotonin from tumours) are observed the patient should be given bolus octreotide 100mcgs IV to be repeated as required: this is the mainstay of treatment (continue or start background infusion 50mcg/hr).
If haemodynamic instability is encountered support from critical care/ICU should be requested urgently.
Drugs to consider using in a carcinoid crisis: hydrocortisone, ranitidine, chlorpheniramine (reduce histamine release)

- Hypotension: IV fluids, consider phenylephrine or noradrenaline or vaspopressin
- Hypertension: optimise analgesia and anaesthesia (fentanyl/propofol), consider magnesium or GTN infusion in acute setting

AVOID DRUGS THAT CAUSE HISTAMINE OR SEROTININ RELEASE: thiopentone, suxamethonium, atracurium, morphine, tramadol, dopamine, isoprenaline

WESSEX NET GROUP

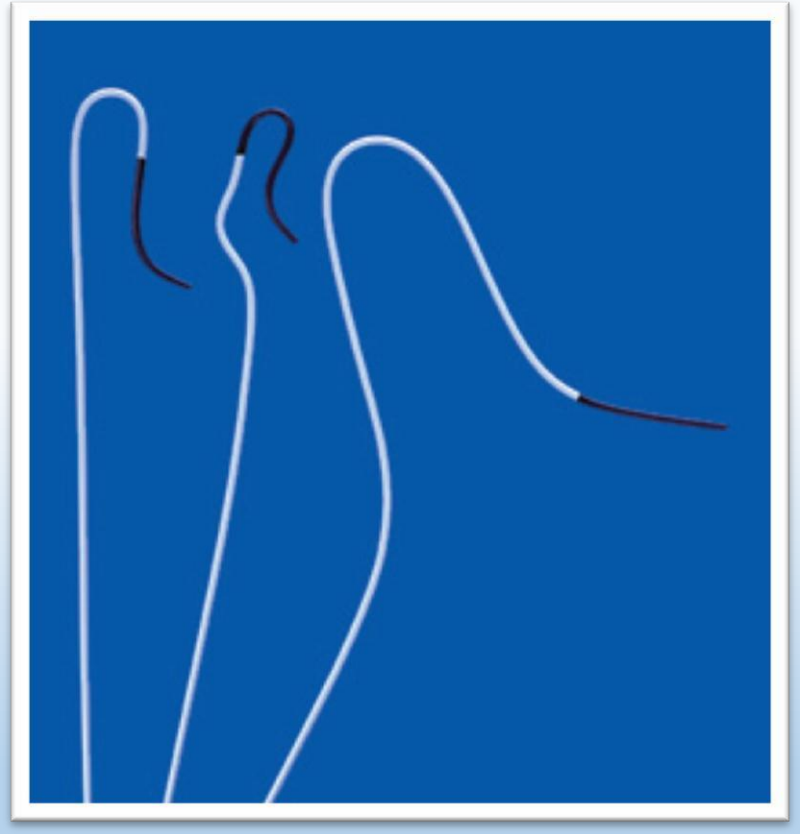
Post Procedure

- Overnight inpatient stay (1-3 days)
- Continue Octreotide as per protocol
- Advice re: post embolization syndrome
- Home with analgesia/antiemetics
- Phone review IR CNS day 3 and 7
- Clinical and CT review at 8 weeks/MDT
- ? Re treat

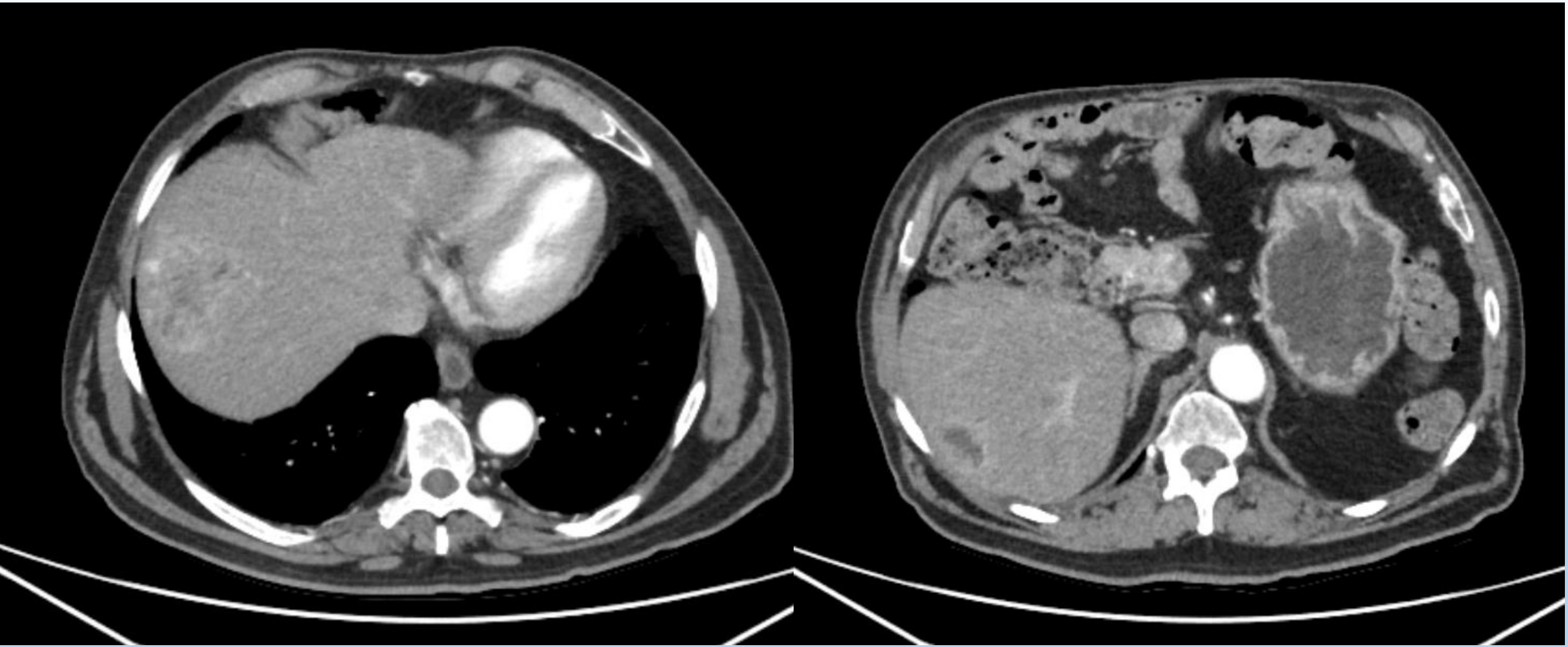
Principles of Treatment

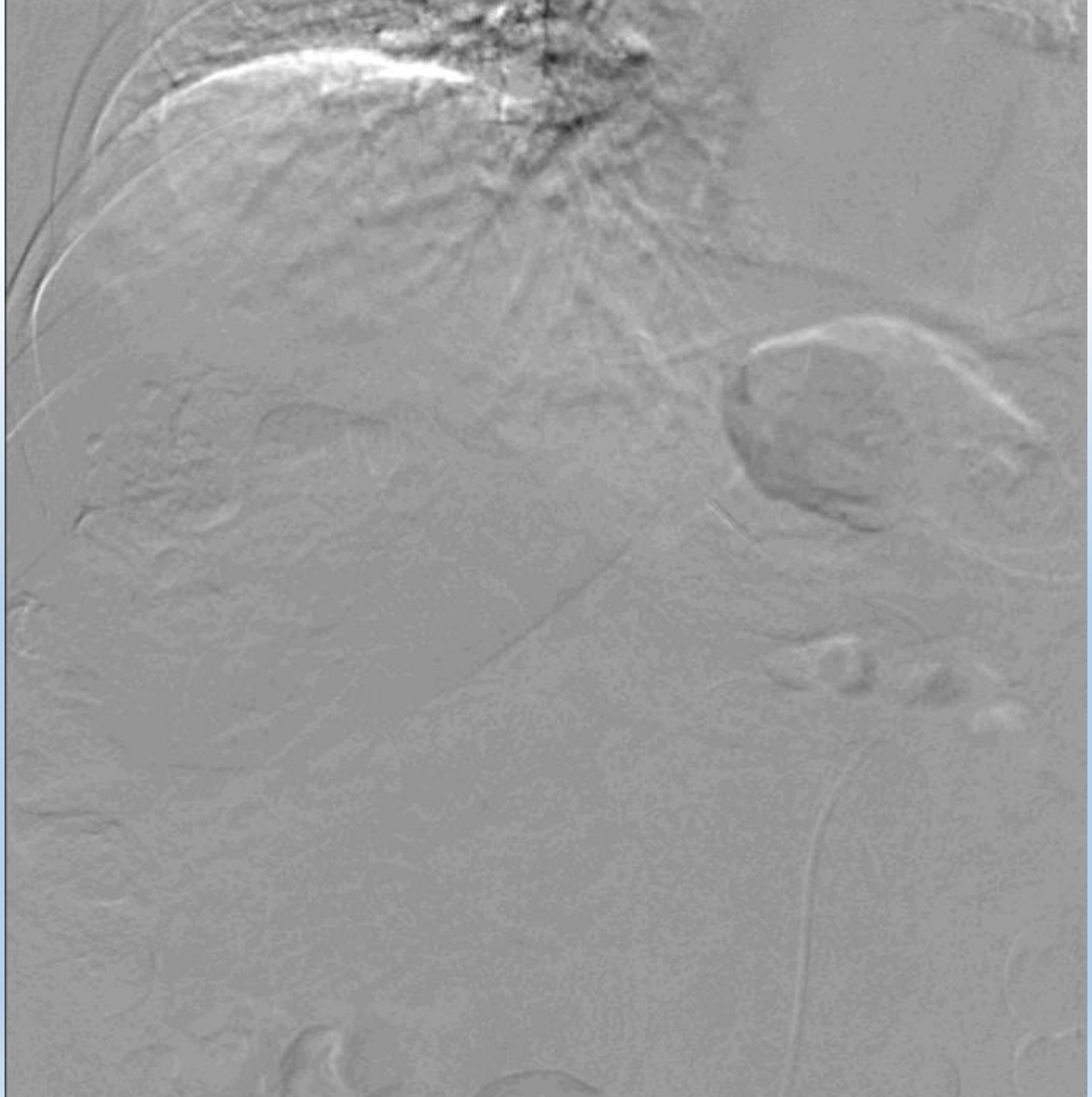
- Normal background liver
- Selective vs Lobar
- For disease vol >50% - segmental treatments.
- For Bilobar disease – Lobar treatments 4-6weeks apart.
- PVT or Biliary enteric anastomosis – consider oil based (Lipiodol)
- Endpoint – sluggish antegrade flow v stasis

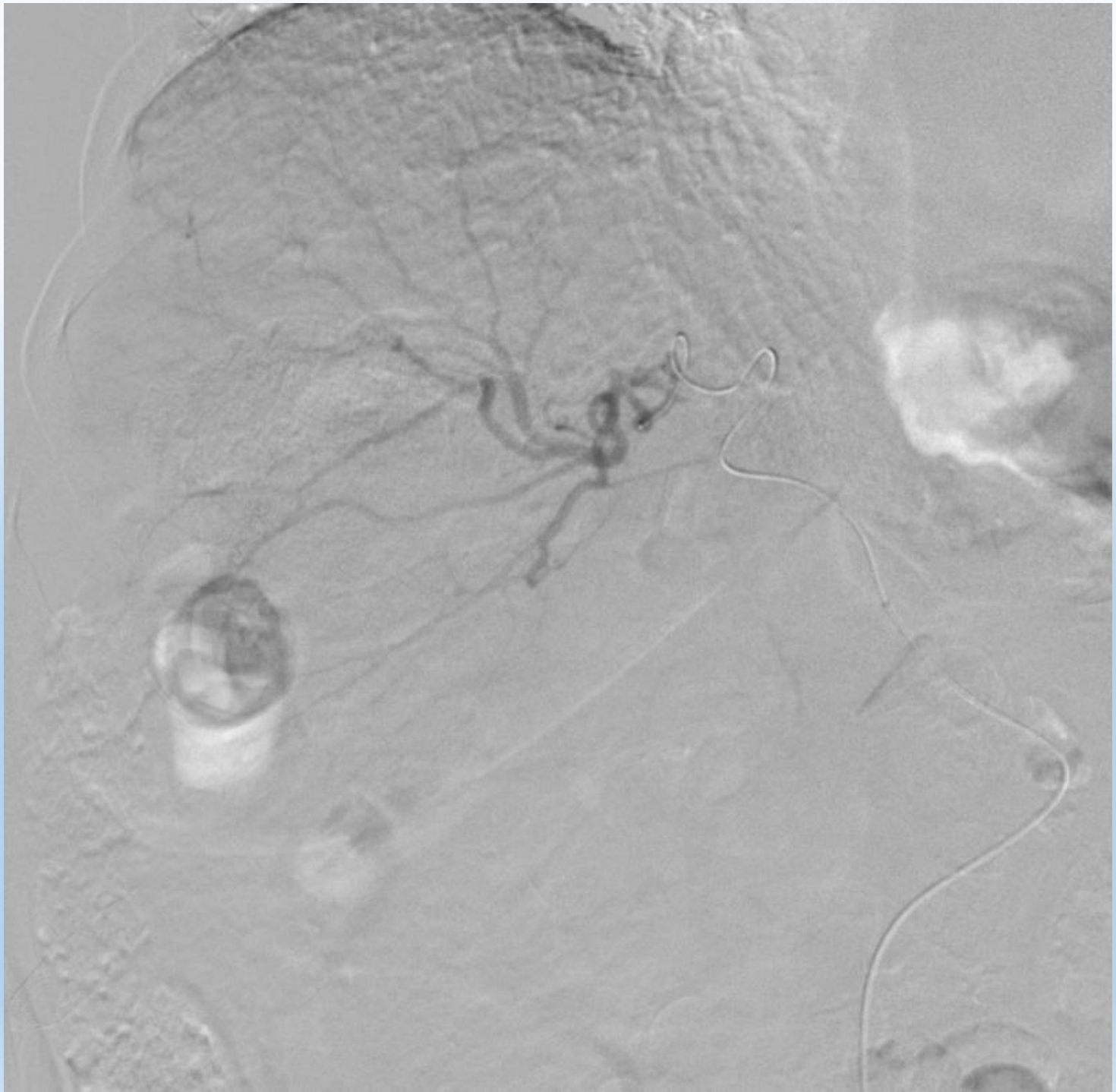
Technical Aspects

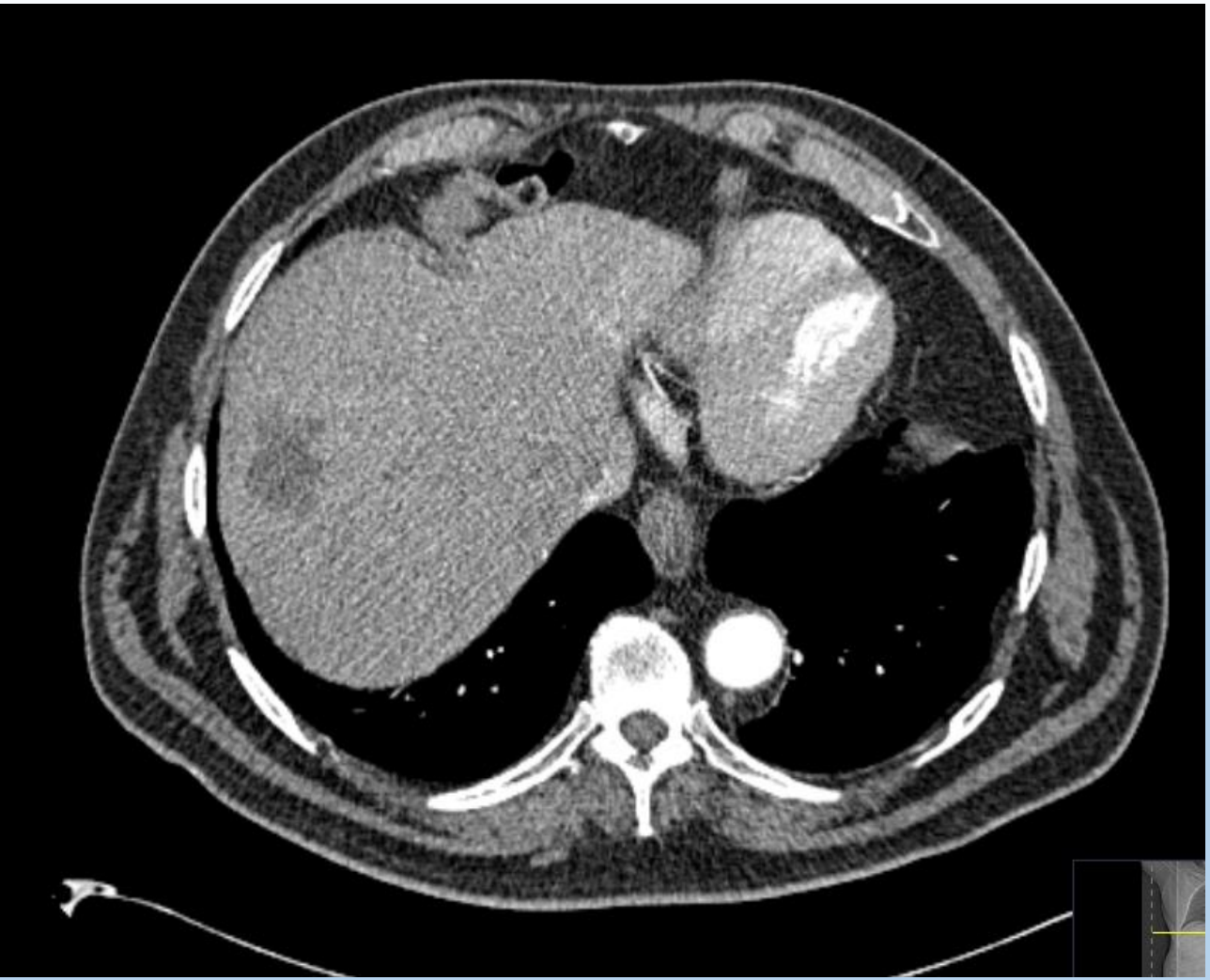


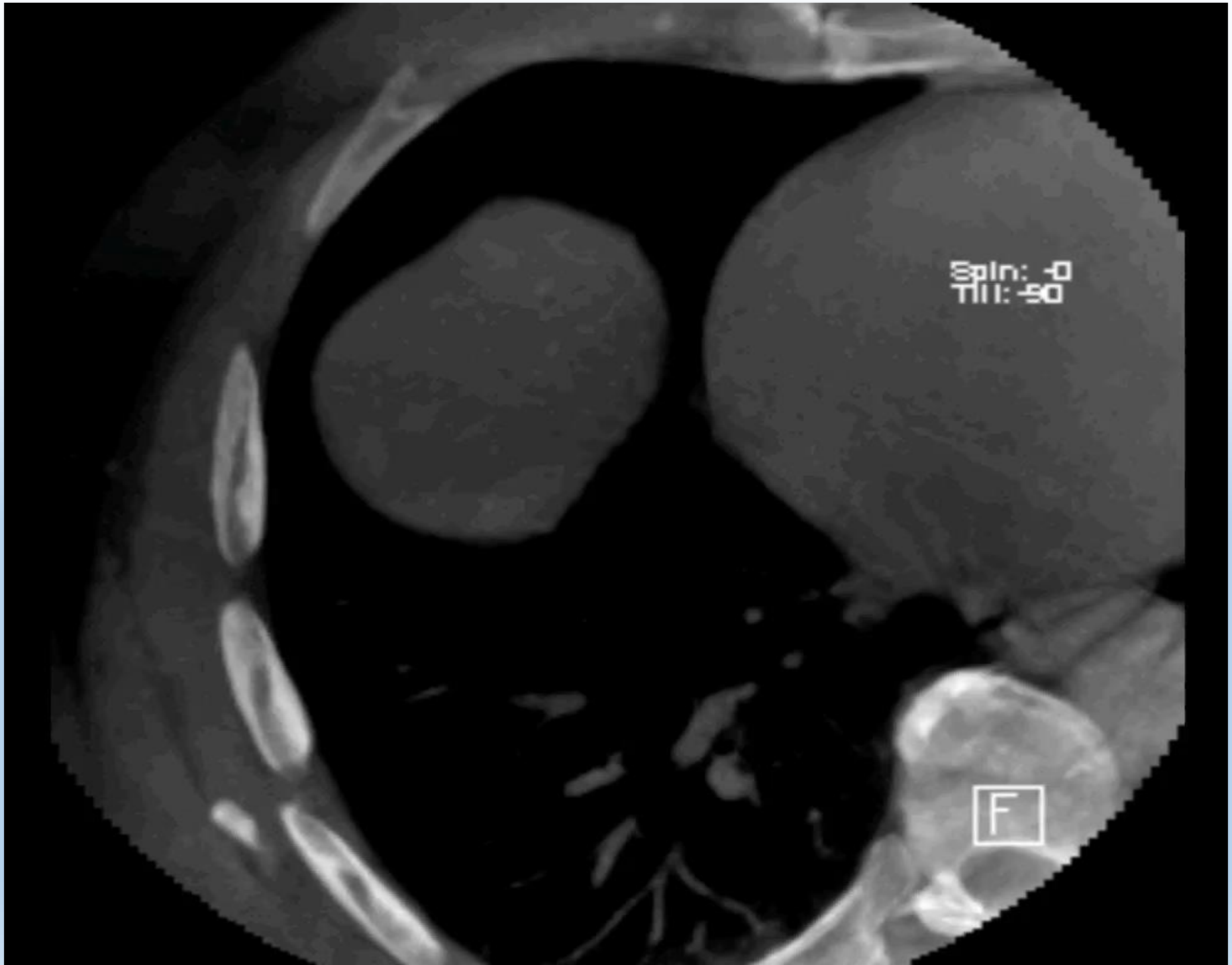
- Right CFA. US guided
- 4/5Fr sheath
- Access to Coeliac axis with base catheter
- Microcatheter and microwire to more selective hepatic arterial branches.
- Rotational CT
- Haemostasis : manual compression /6F angioseal closure.



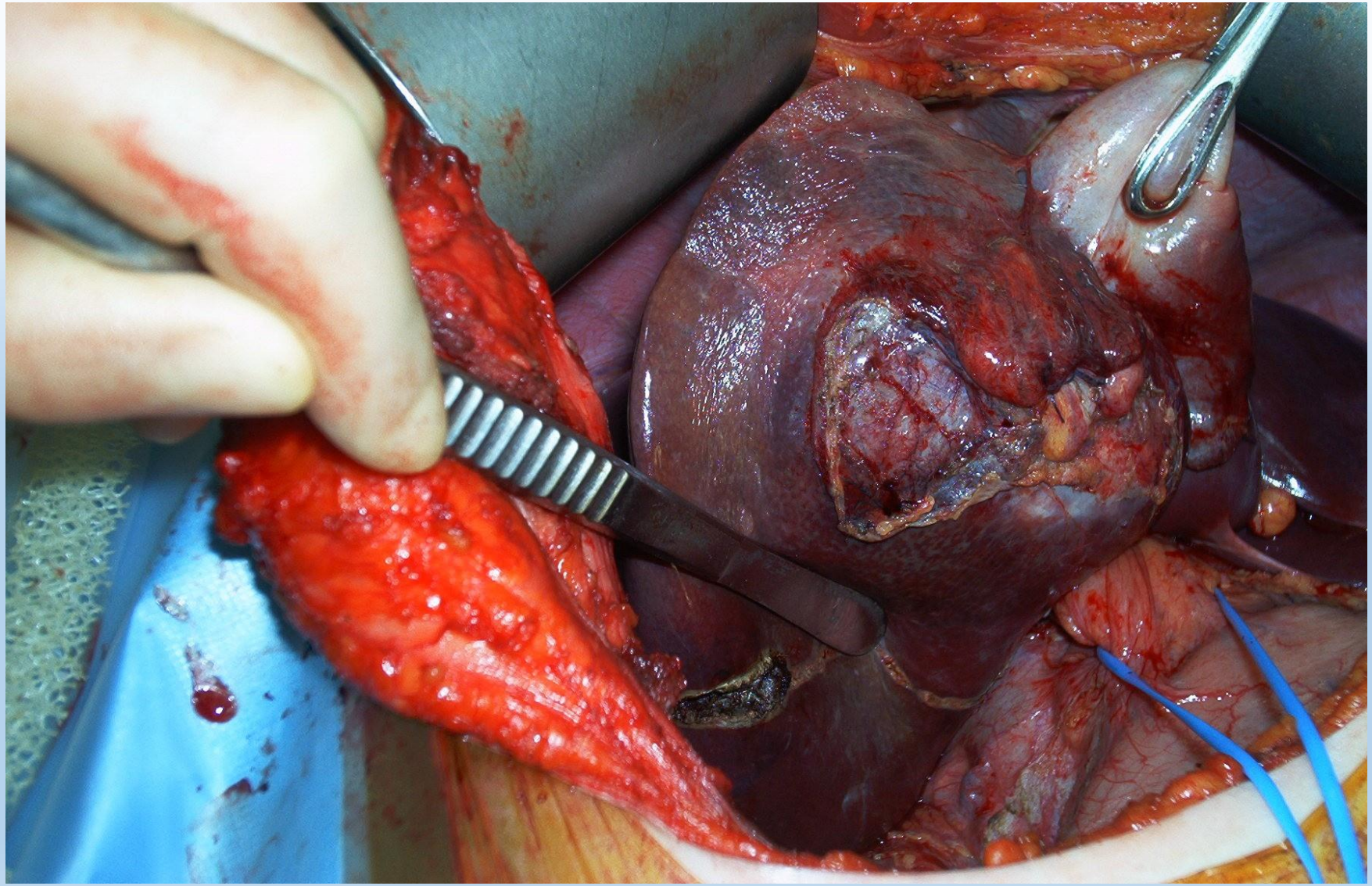




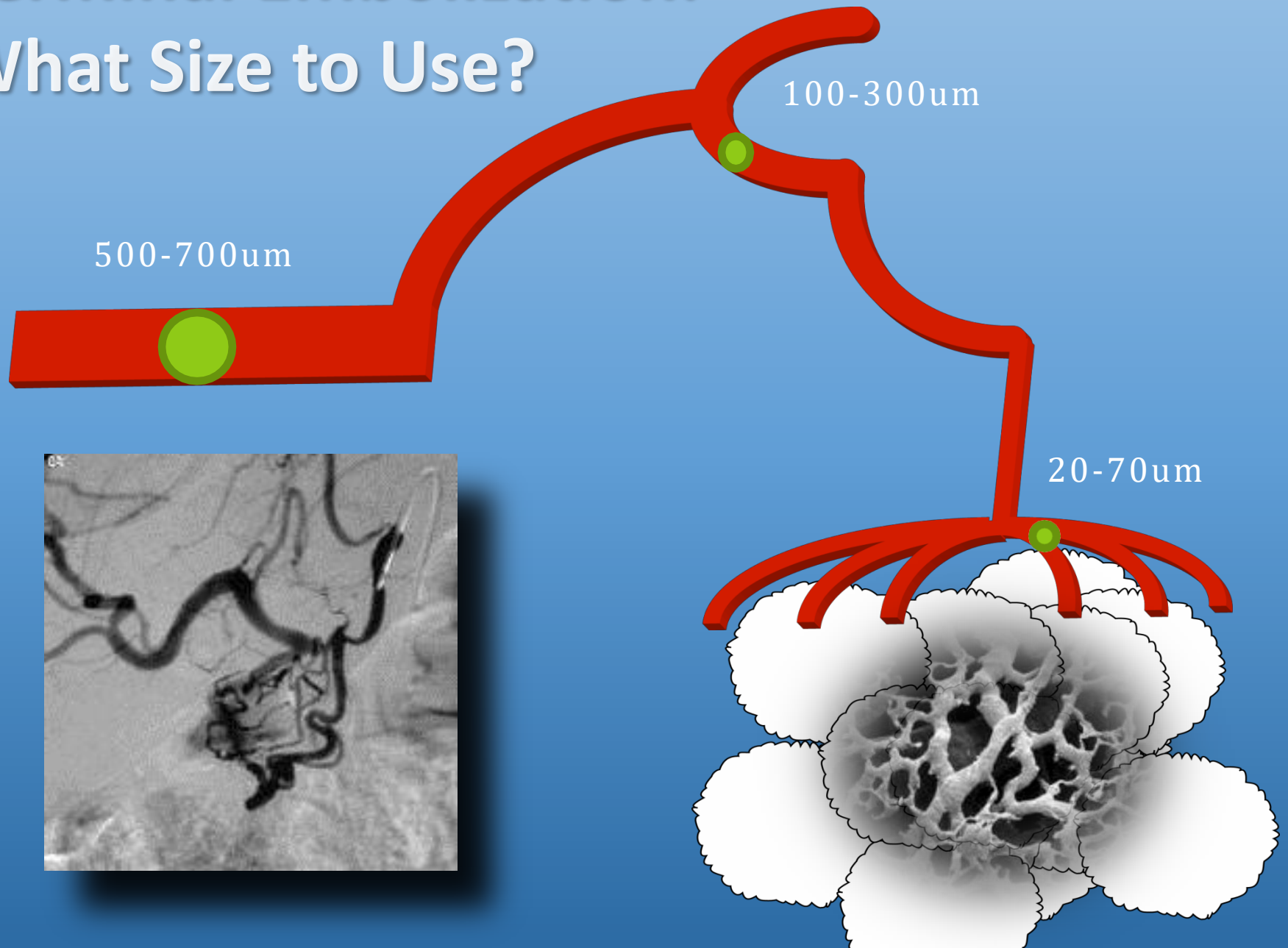



Spin: -0
Tilt: -50
F

Bulky segment 5 NET



Terminal Embolization: What Size to Use?

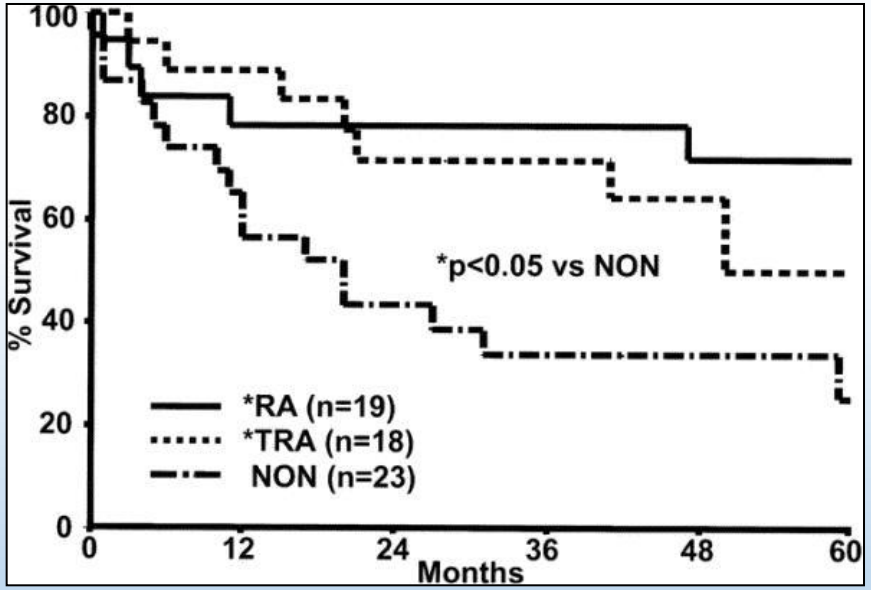


Aggressive Cytoreduction for Liver mets

The case for symptomatic embolisation is proven
90% response

Surgical paper from Indiana

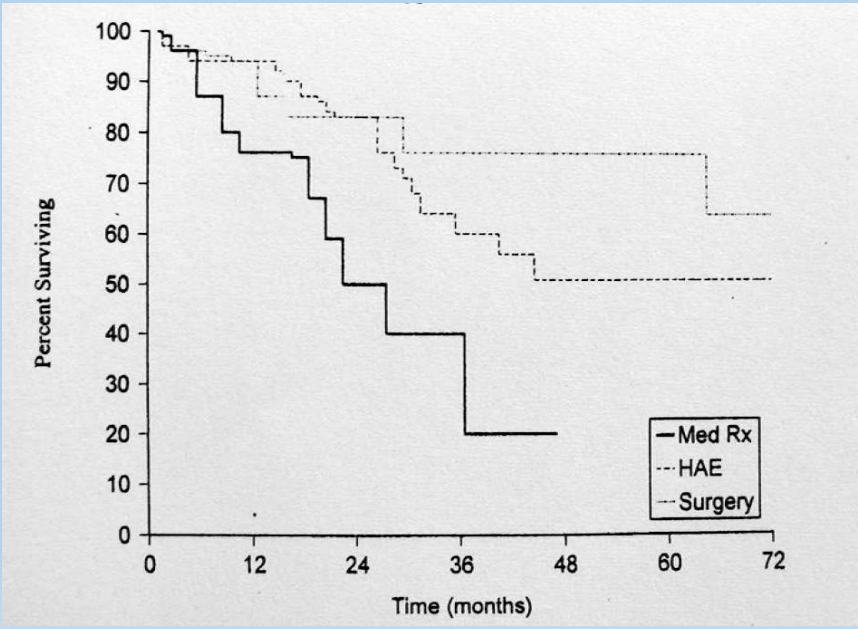
"aggressive management of NET hepatic metastases does improve survival and TACE increases the patient population eligible for this strategy."



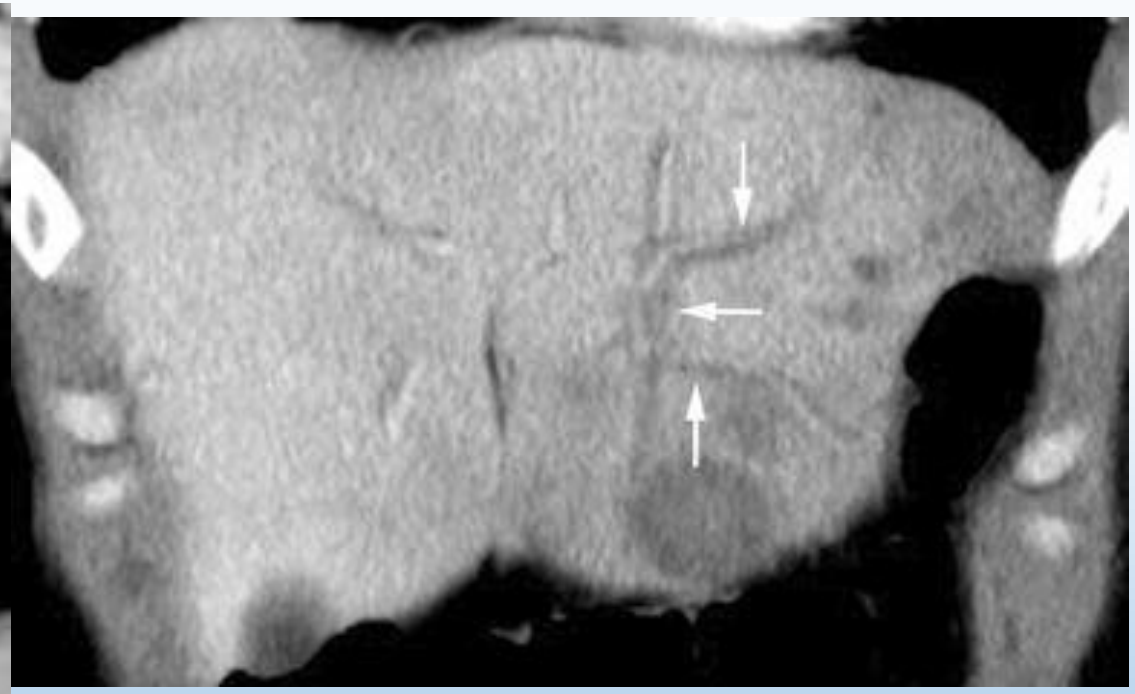
Touzios JG et al, *Annals of Surgery* 2005

60 Patient retrospective

Chamberlain study
- 85 pts, liver mets from NET
- Surgery
- Medical tx



Chamberlin RS, *J Am Coll Surg 2000*



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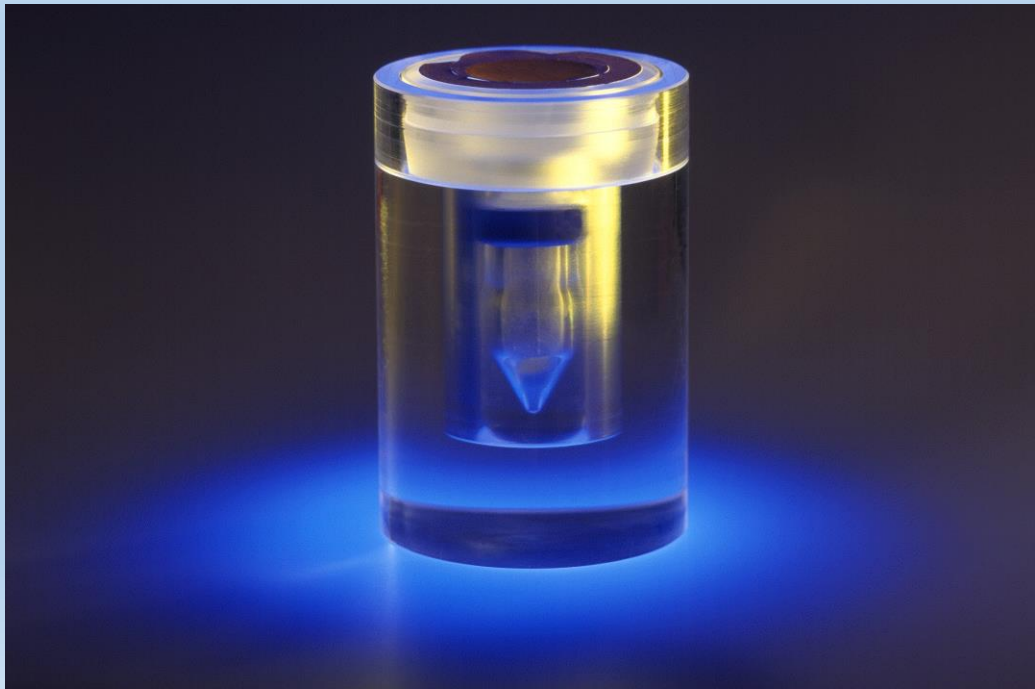
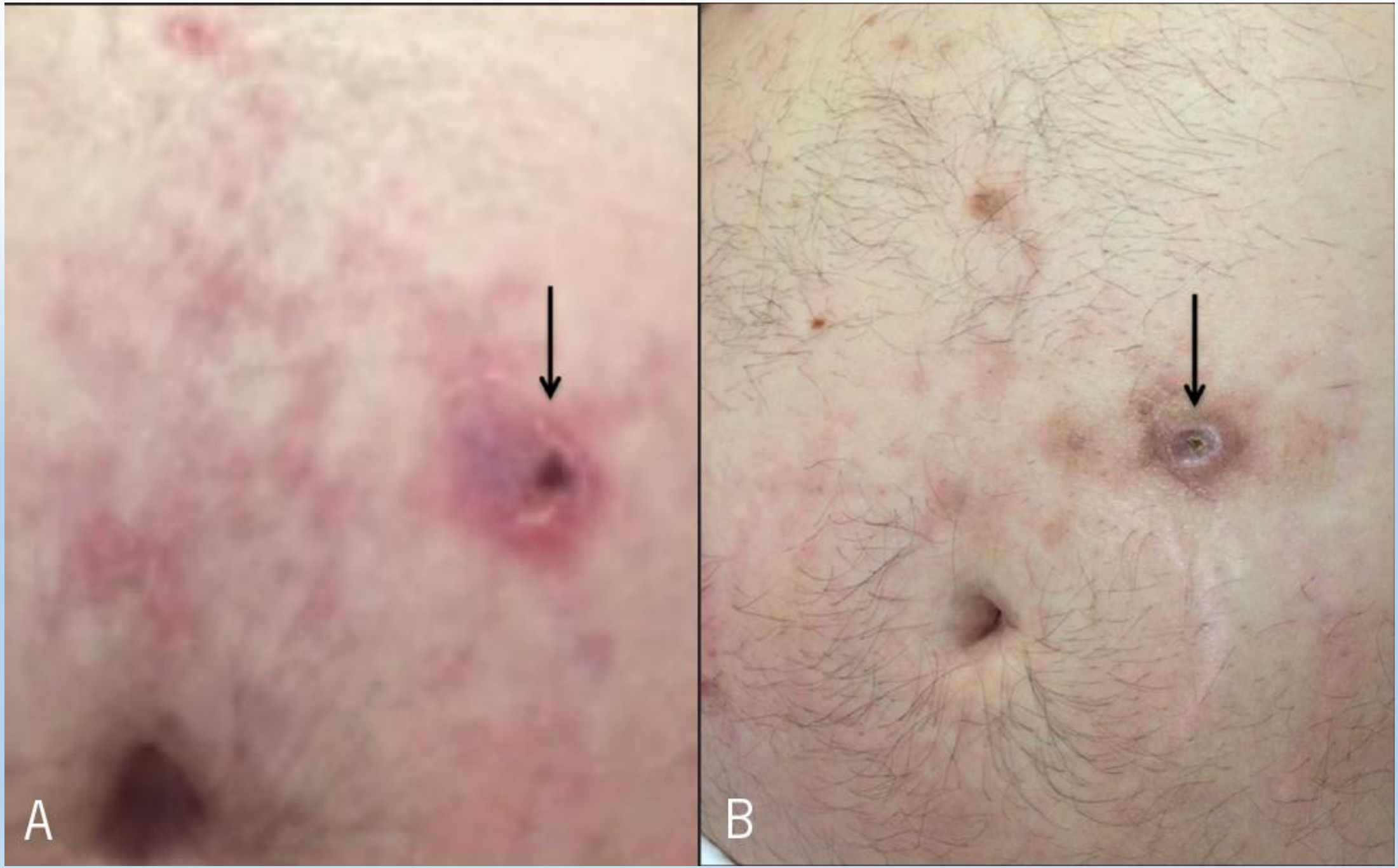
Radioembolisation

- Radioembolization is also known as transarterial radioembolisation, selective internal radiation therapy, or intraarterial brachytherapy.
- Yittrium 90 (Y90).
    - *100% pure beta emitter*
    - *Tissue penetration range 2.5 mm (max. 11 mm)*
    - *Decays to ^{90}Zirconium*
    - *Physical half-life of 64 hrs (2.67 days)*
    - *94% of radiation delivered within 11 days*



Angiographic Assessment – Work up

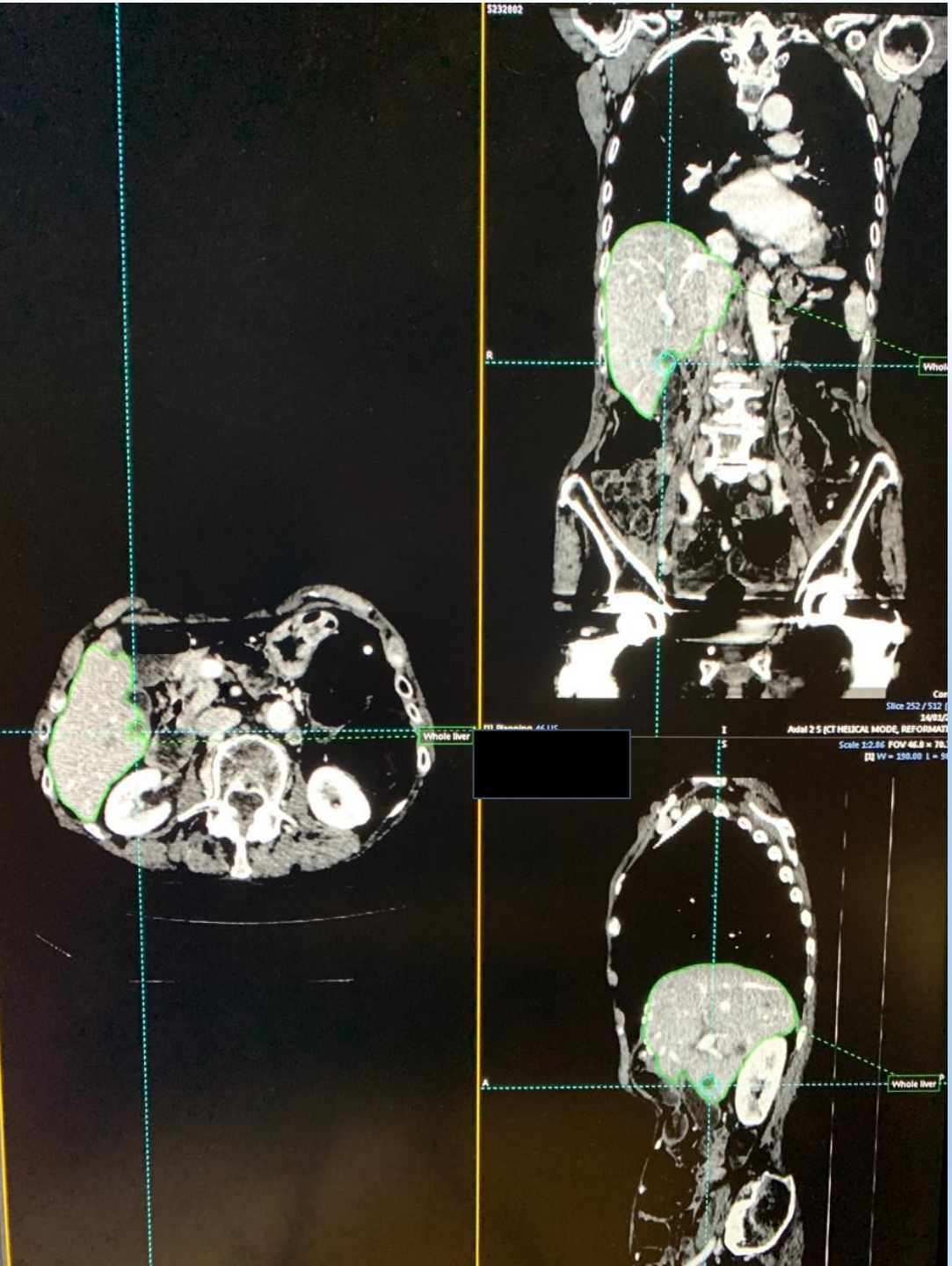
- Day case
- Hepatic angiography
- Determine lung shunt fraction (15% - 30Gy)
- Embolisation of extra hepatic supply
- Treatment strategy
- Deliver ^{99m}Tc-labeled macroaggregated albumin (^{99m}Tc-MAA).
- SPECT/CT within 2 hours

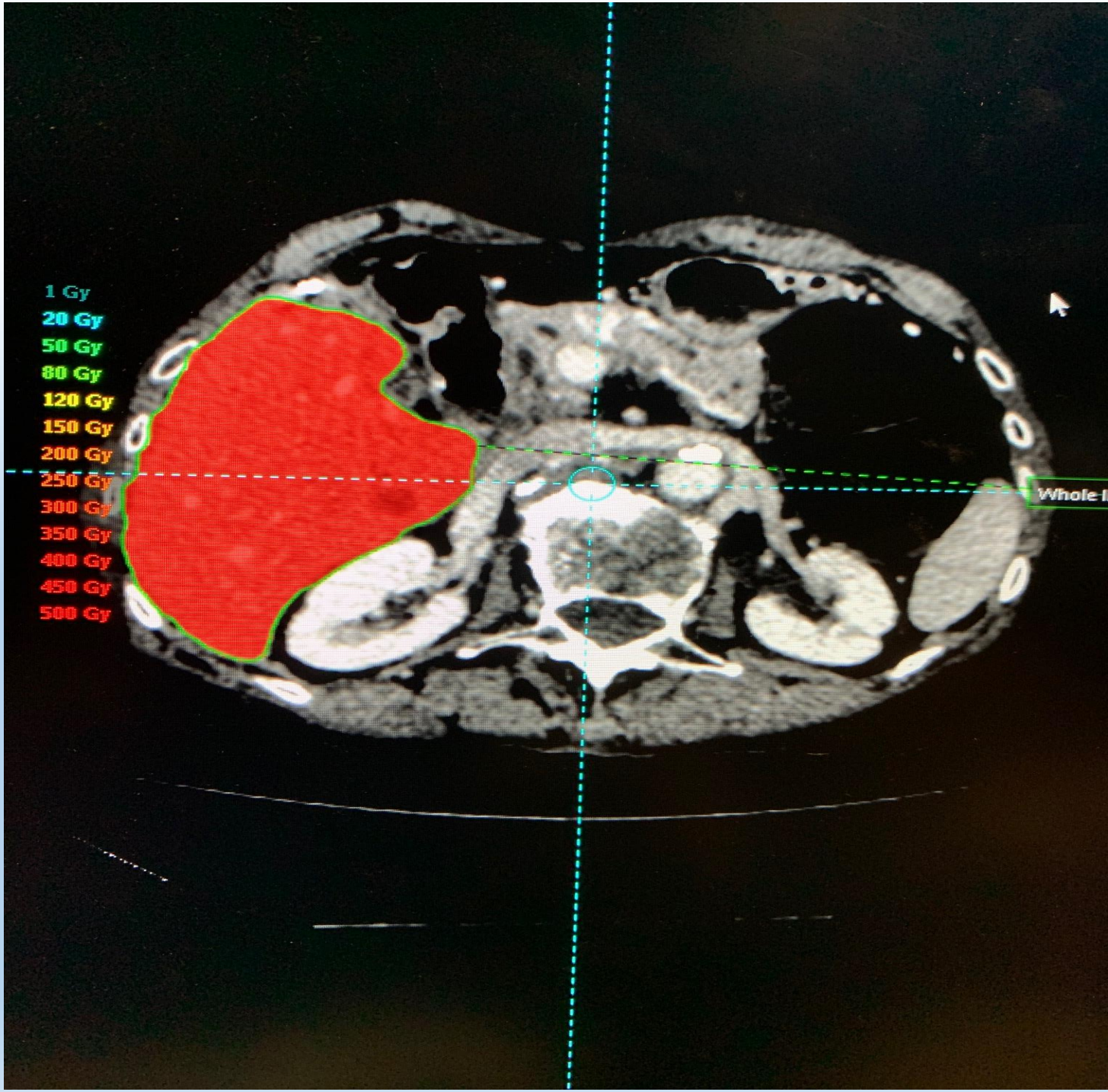

A
B

Dosimetry

Dosimetry

- >120Gy
- Calculate perfused liver volume
- Simplicity Mirada

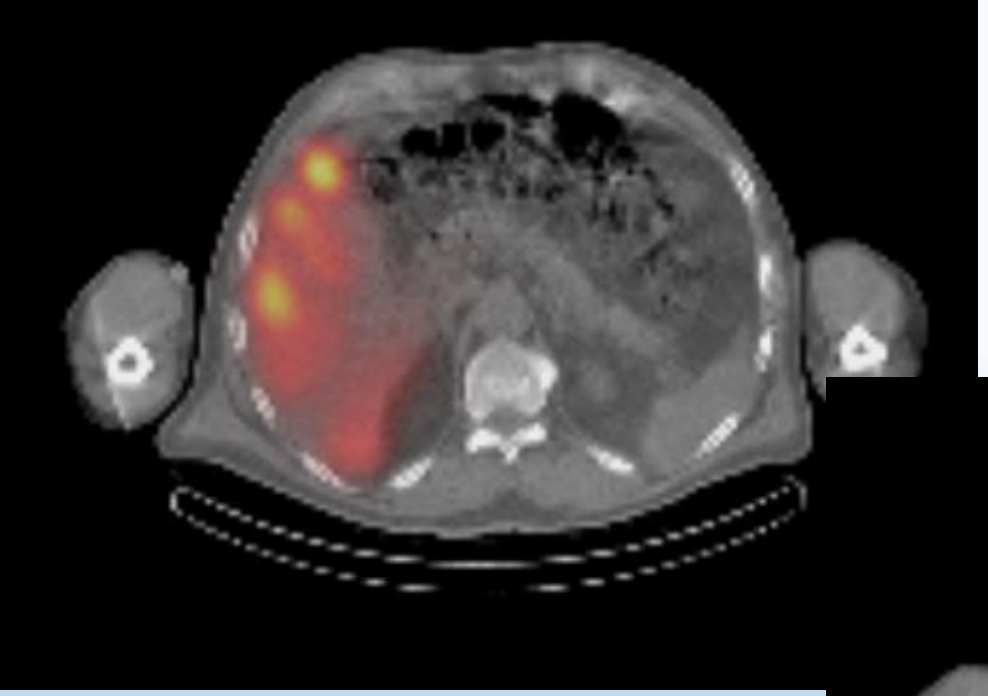

Whole liver
Whole liver

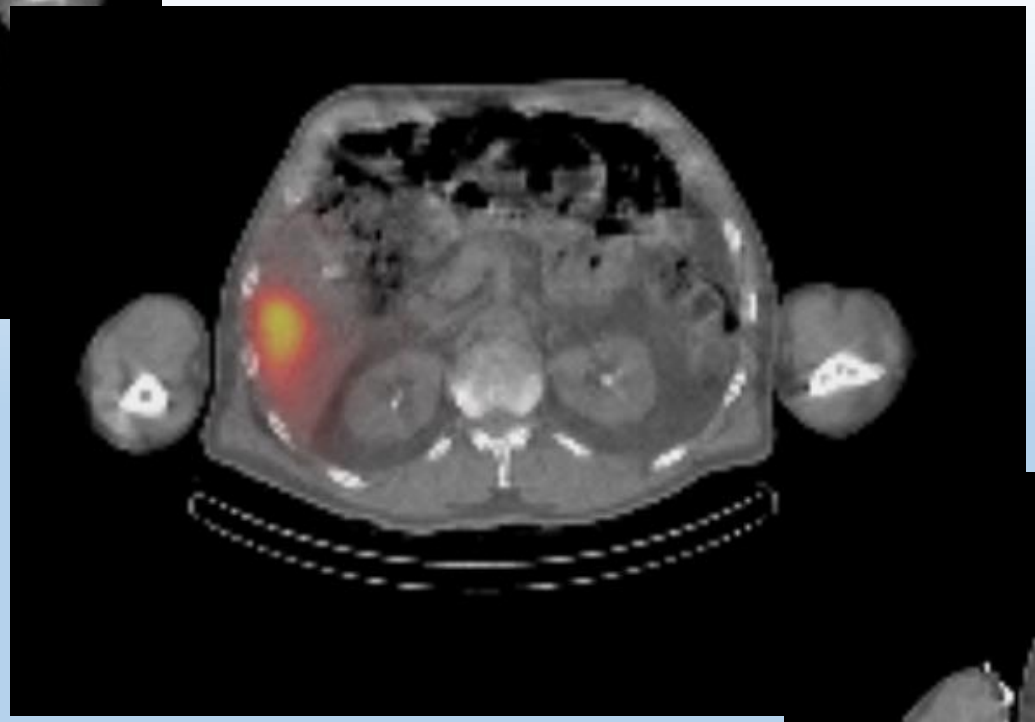

1 Gy
20 Gy
50 Gy
80 Gy
120 Gy
150 Gy
200 Gy
250 Gy
300 Gy
350 Gy
400 Gy
450 Gy
500 Gy

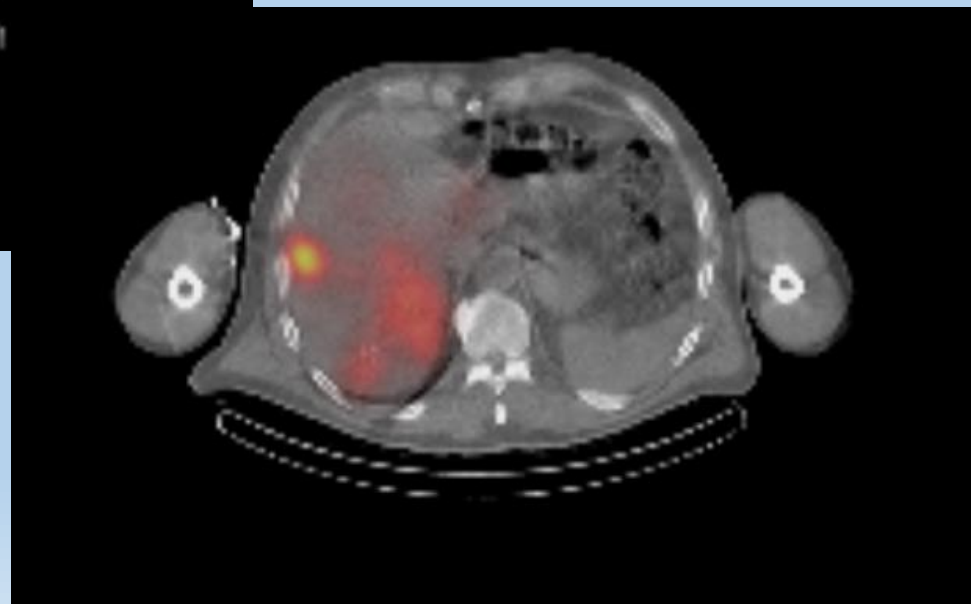
Radioembolisation

Treatment usually 1-3 weeks after.

- Overnight stay
- Isolation for 24 hours
- Bremsstrahlung SPECT/CT is performed to confirm tumour coverage and evaluate for extrahepatic perfusion
- Angioseal







Radioembolisation – Complications

- Postembolisation syndrome normal (nausea, pain, fatigue and loss of appetite). 1-2 weeks
- Non target embolization (ulcers and pancreatitis <2%)
- Cholecystitis rare.
- Infection/abscess.
- Radiation hepatitis (elevated bili/alk phos/ascites 4%).

Radioembolisation – Follow up

- A CT or MRI evaluation of the response after radioembolization can take 2–3 months.
- Tumor necrosis and oedema can result in increased tumor size at 1 month, even when the tumour is responding to treatment.
- CT/MRI at 2-3months.

Radioembolisation

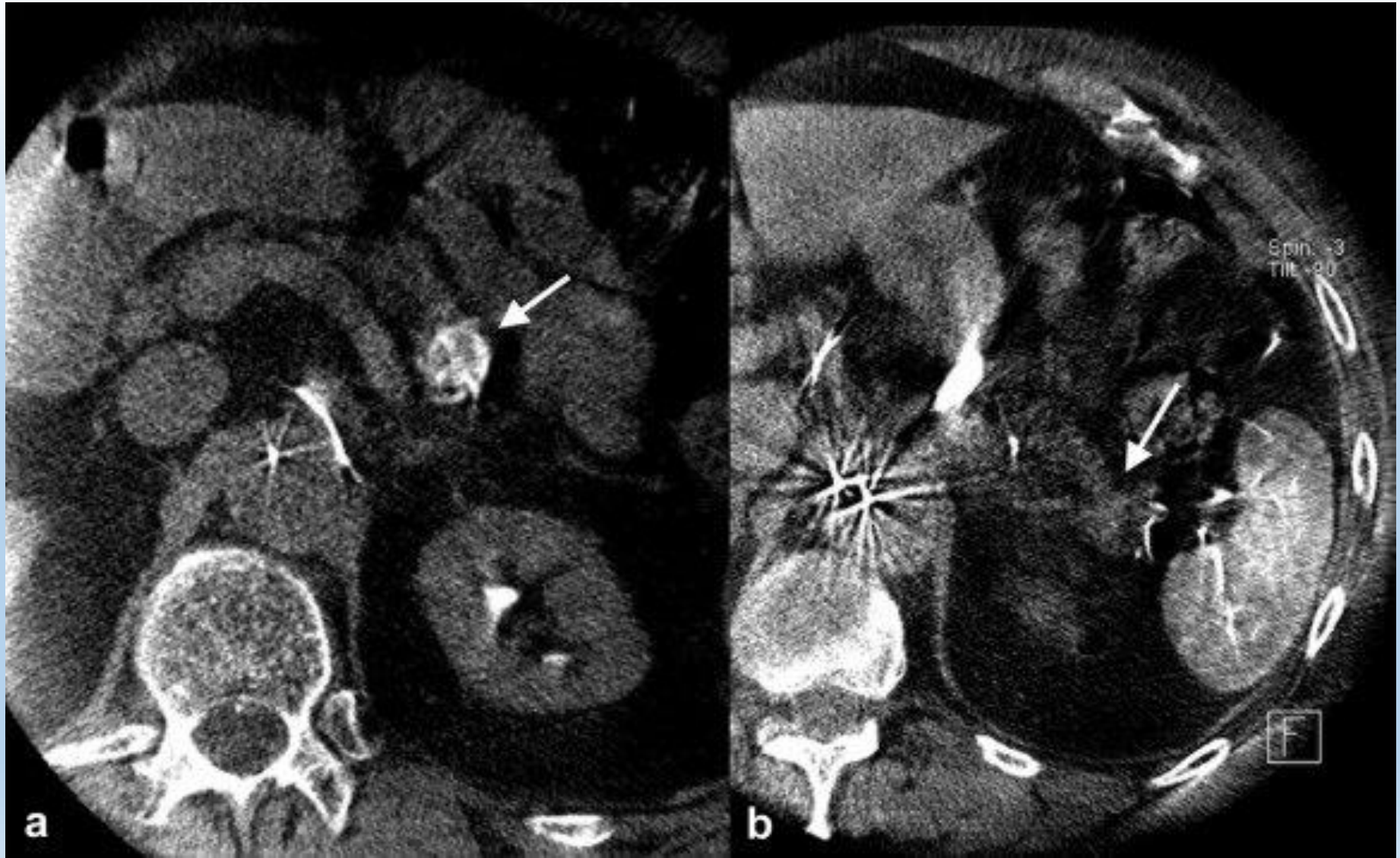
42 Symptomatic patients unresectable NETLM's
Mean activity 1.63Gbq
Recist @ 3 months

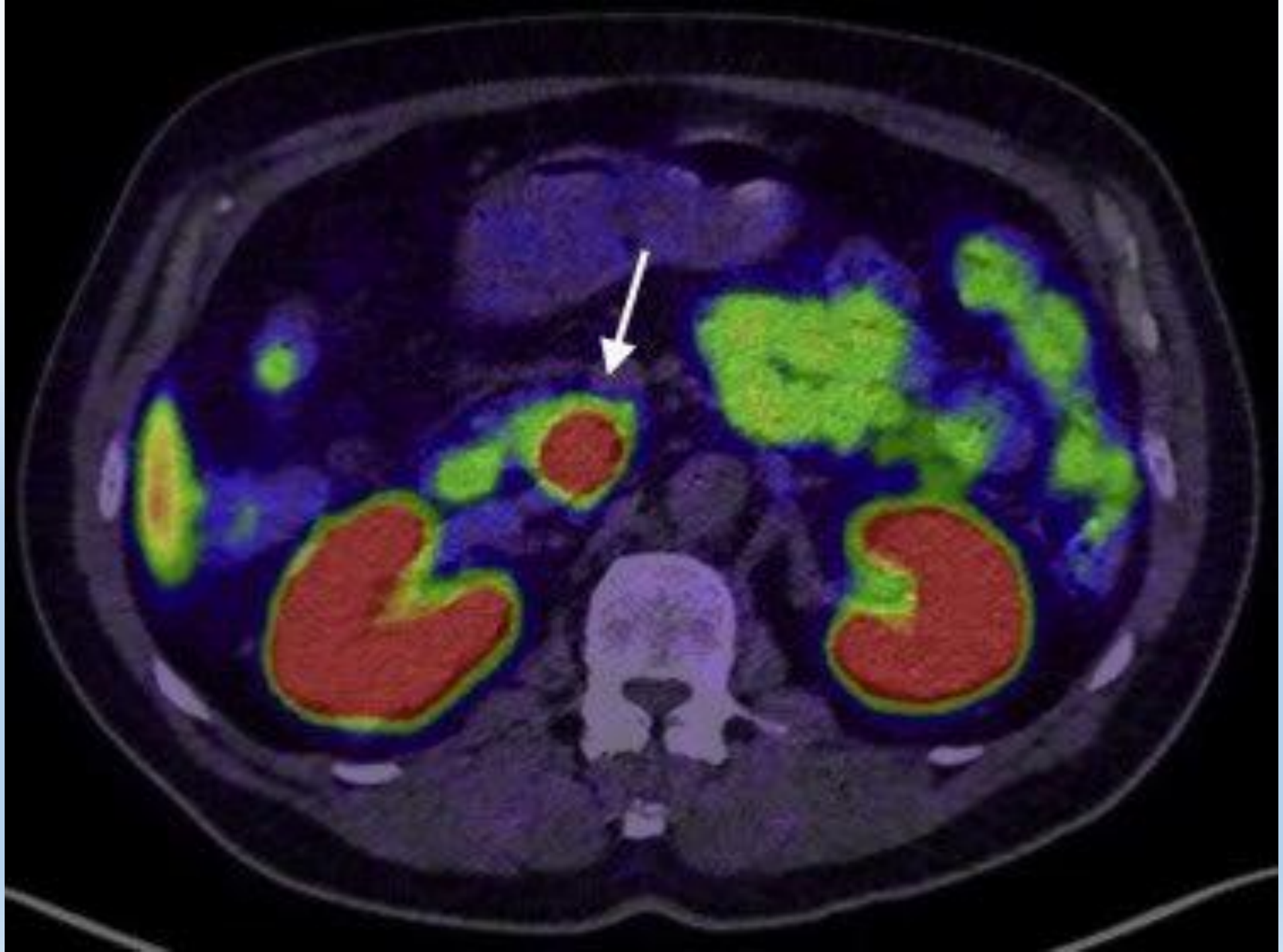
Partial response 22.5%
Stable disease 75%
Progressive disease 2.5%

97% patients tumours appeared hypovascular at 3 months
No toxicity > grade 2
Improve symptoms in 36 of 38 patients

Jakobs, CVIR Epub 2011ç

Other arterial therapies…

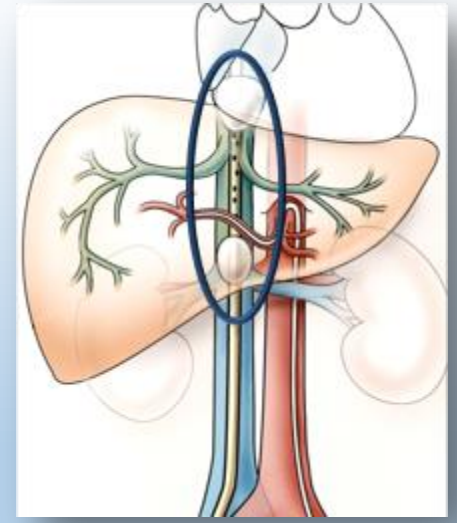




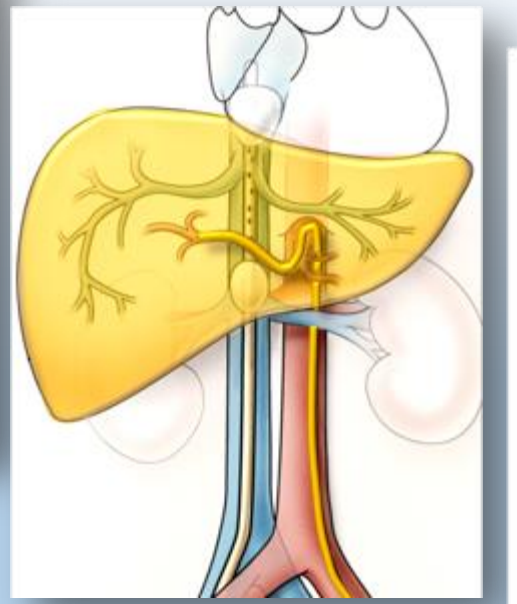
CHEMOSATURATION Therapy (CS-PHP)

3 Procedural Steps

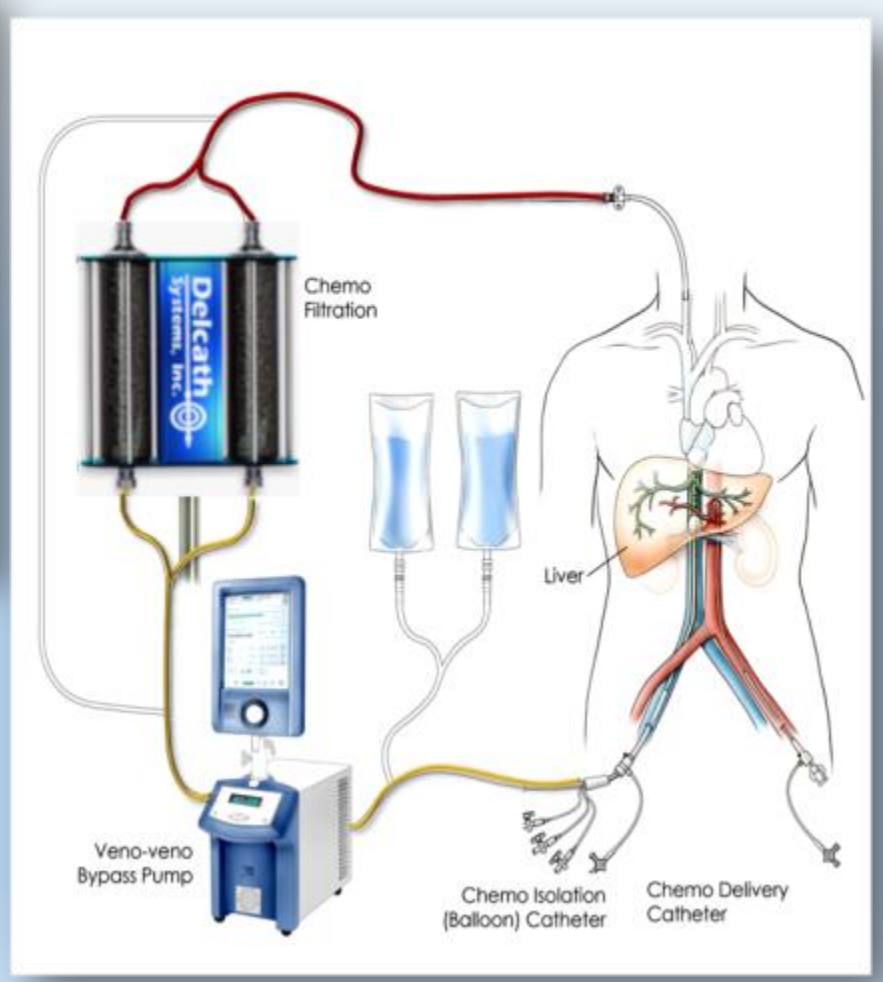
Isolation



Saturation



Filtration



COVID

Stock Shop
Hospital Security
CAFE
SE USE THE
GELS BEFORE
TERING THE
HOSPITAL

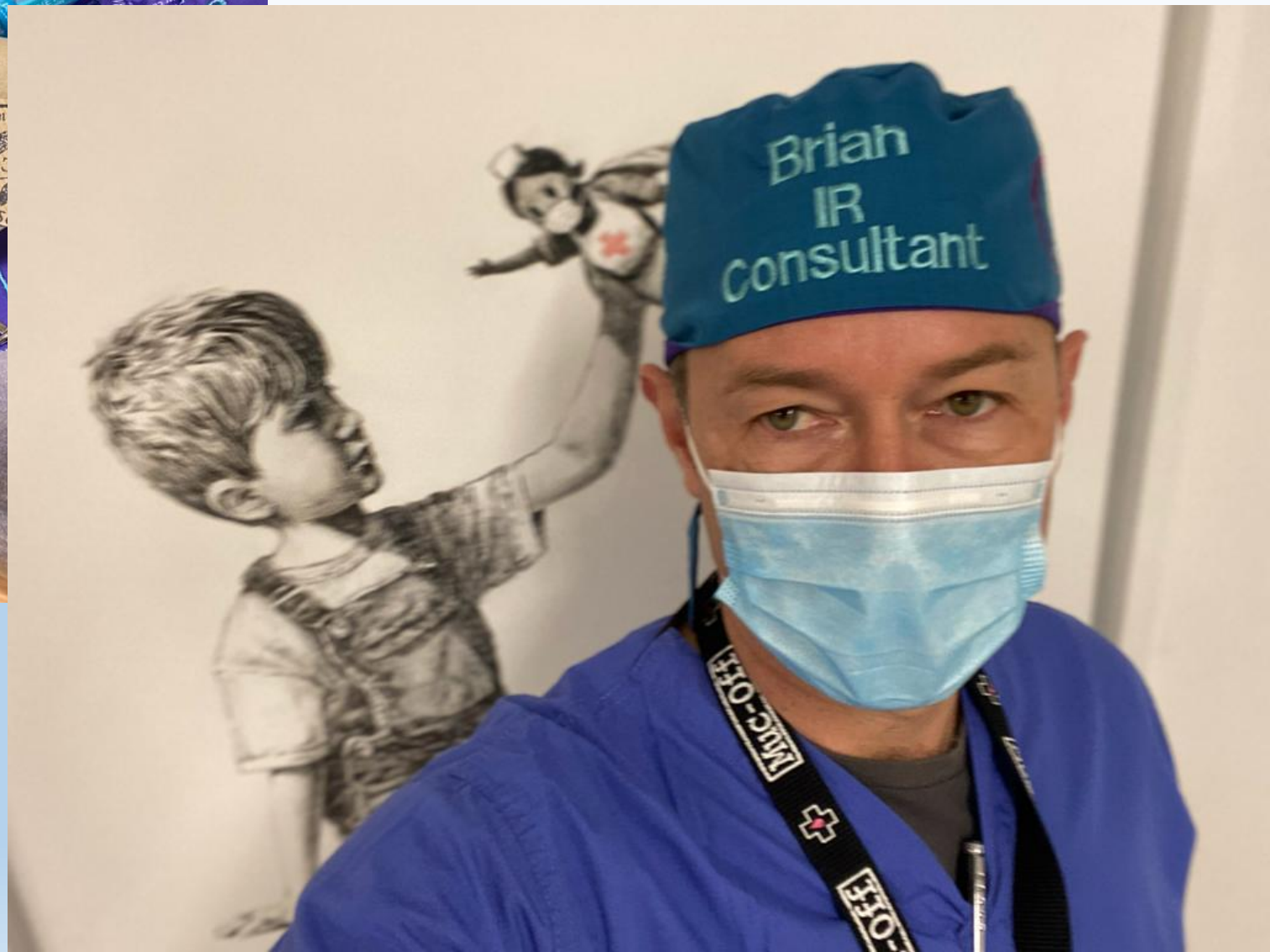
Stock Shop
Hospital Security
CAFE
Make a difference today

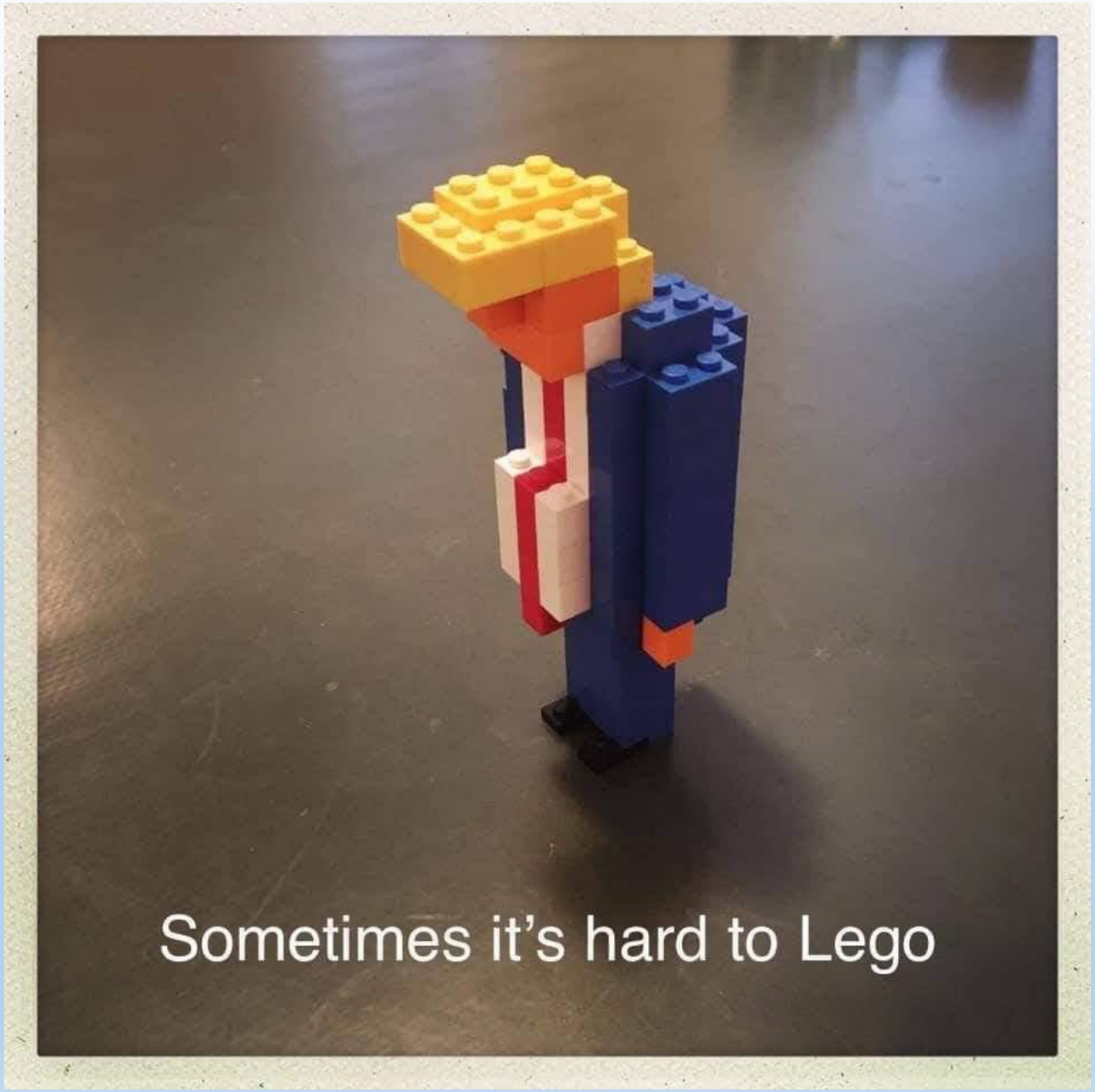
SIEMENS
Artis Q
PL
A
NE
TS

NE
TS

CLINICAL WASTE
10kg

Kieran
Radiographer
IR
Nurse


Brian
IR
Consultant

SIEMENS
Artis
Andy
Maz

Thank you & Questions ??