Many Thanks to A.Magnusson and organizers of the Congress.

The importance of Swedish/ Scandinavian Radiology is historic and continues today….

It is a great honor to give the Forssell Lecture. Forssell contributed many scientific reports but also defined the role of Radiology in 1937 and defended it versus pioneers like Dr. William Mayo

History of CT Procedures : Past, Present and "Back to the Future"

John R. Haaga MD,FACR,FSIR,FSCBT
Emeritus Chairman,Tenured Professor CWRU

Dr. Alfidi
Chair CWRU

Prince of
Wales
Charles

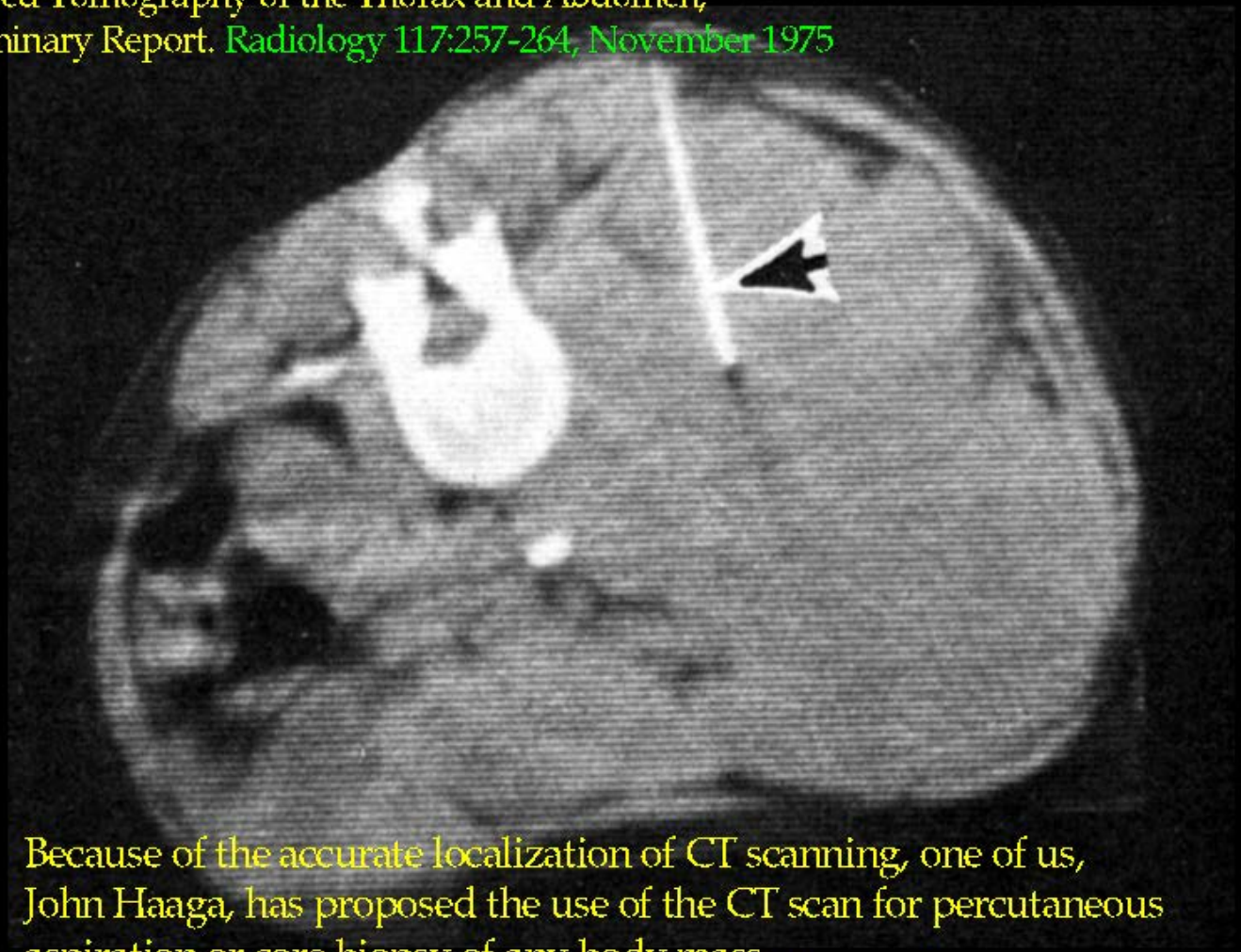
Dr. Haaga
with “Hair”

Dr. Meaney
Chair CCF

CT Procedures and Seldinger Technique
“An acute attack of common sense”

First CT procedure in 1975

Ralph J. Alfidi, M.D., John Haaga, M.D., et al:
Computed Tomography of the Thorax and Abdomen;
A Preliminary Report. Radiology 117:257-264, November 1975



Because of the accurate localization of CT scanning, one of us, John Haaga, has proposed the use of the CT scan for percutaneous aspiration or core biopsy of any body mass. . .

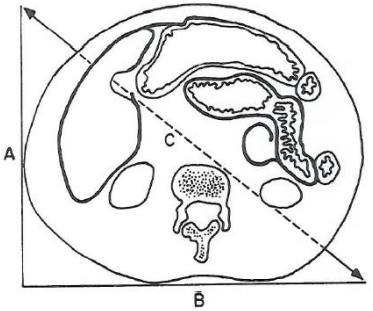
First CT BX's & Abscess Drain performed on 2 minute/scan Technicare Scanner 1975-6

(original needle and papers in Smithsonian Museum of American History, requested by Judy Chelnick curator)

“Back to the Future” with CT radiation dose-lowest dose possible

Radiation dose reduction in computed tomography: techniques and ...
www.ncbi.nlm.nih.gov › Journal List › NIHPA Author Manuscripts
by L Yu - 2009 - Cited by 59 - Related articles

[Reprinted from RADIOLOGY, Vol. 138, No. 2, Pages 449–454, February, 1981.]



The Effect of mAs Variation upon Computed Tomography Image Quality as Evaluated by *In Vivo* and *In Vitro* Studies[1]

New Techniques for CT-Guided Biopsies

6 MAS

John R. Haaga[1]

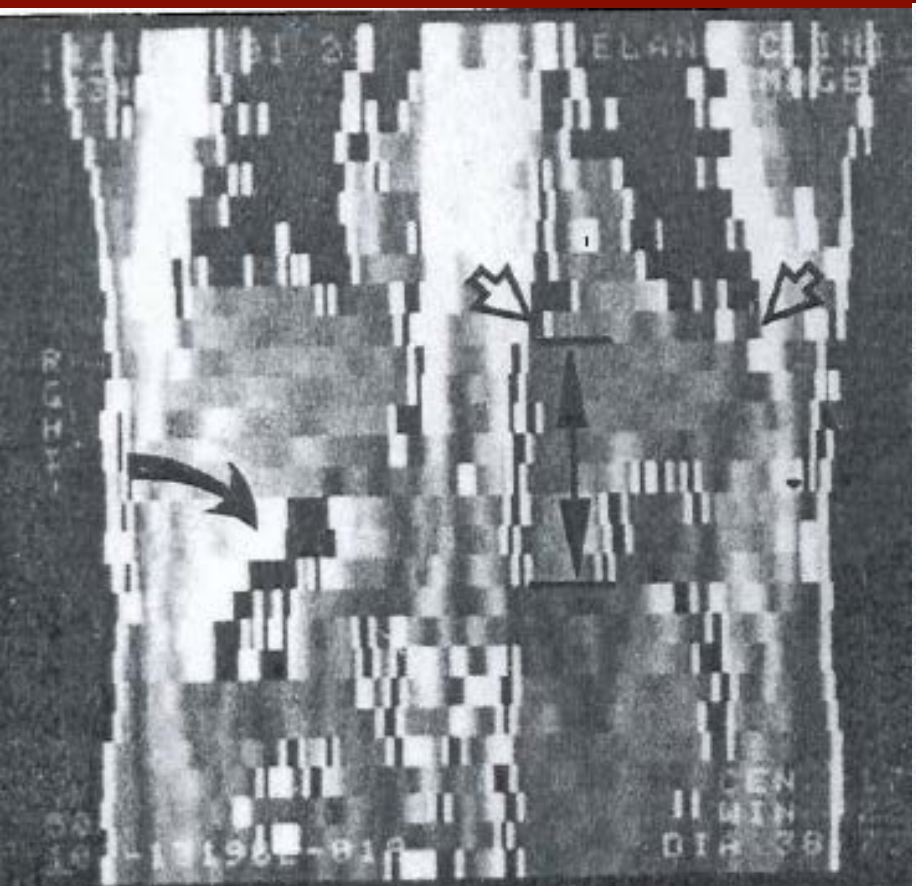
Abington Rd., Cleveland, OH 44106.

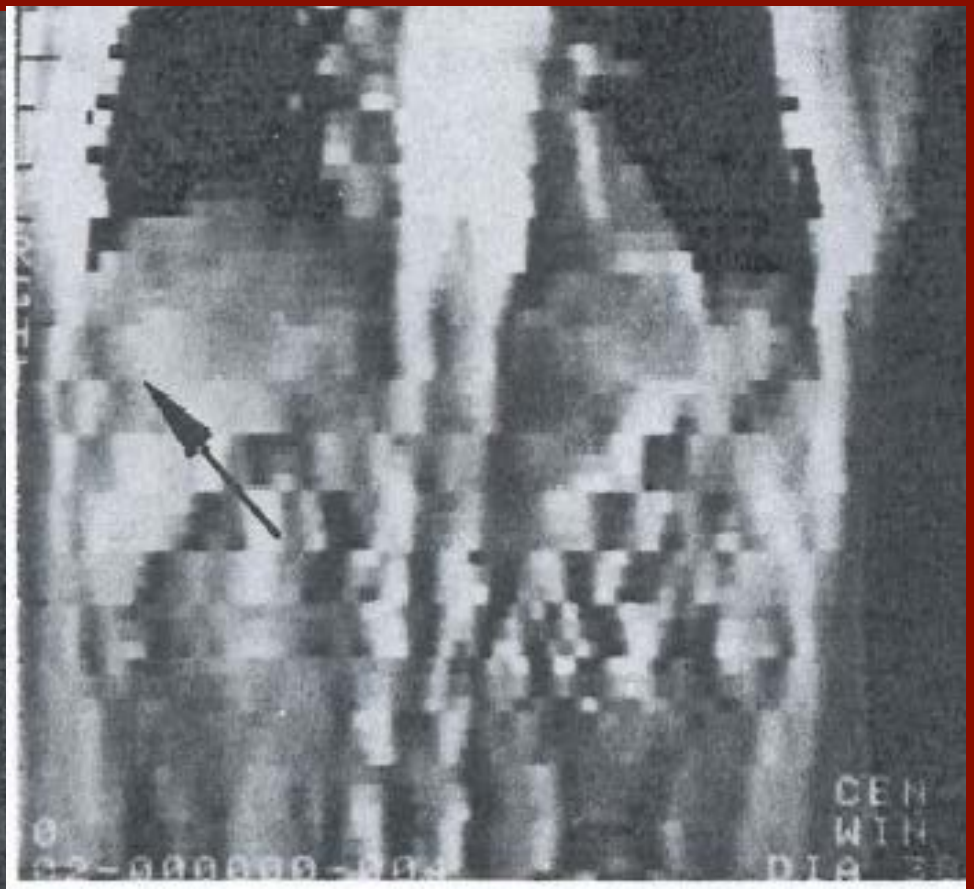
AJR 133:633–641, October 1979
0361–803X/79/1334–0633 $00.00

Low-Dose Localization

After the abnormality is localized on the diagnostic scan, four scans at differe
pere-second settings are obtained. From these, the lowest permissible radiation

Scoutview, Topogram, etc intended to assist for Drainage Procedures- Haaga J, et al, AJR,127:1059-60,1976





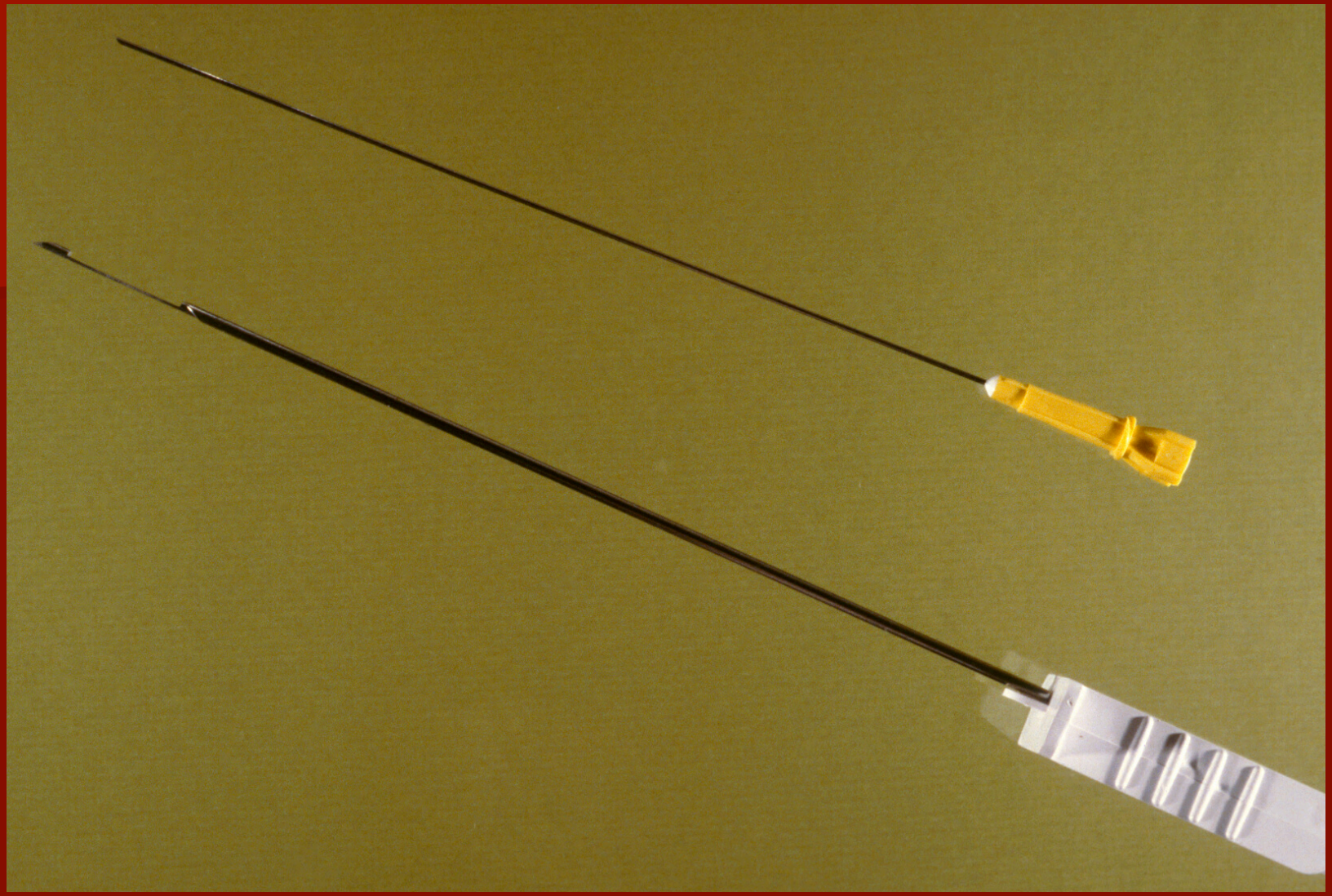
Evolution of CT procedures-involved imaging equipment, devices, pathology

- Myriad of instruments-chiba, menghini, crown or rotary tip, Menghini end cut, Tru-cut Side cutting, vacuum assist
- Development of cell/tissue analysis-simple stains, cytology/core biopsy, immunohistochemistry, flow cytometery, microchemistry,Biomarkers, genetic arrays
- Refinement of imaging equipment, US,MRI, and CT
- Applications for biopsy, drainage of abscess, pseudocyts, parasitic cysts, lymphocele,
- Rx by EtOH/liquids, Radiofrequency,Thermal:heat/cryo

Fiducial markers for Rad Onc

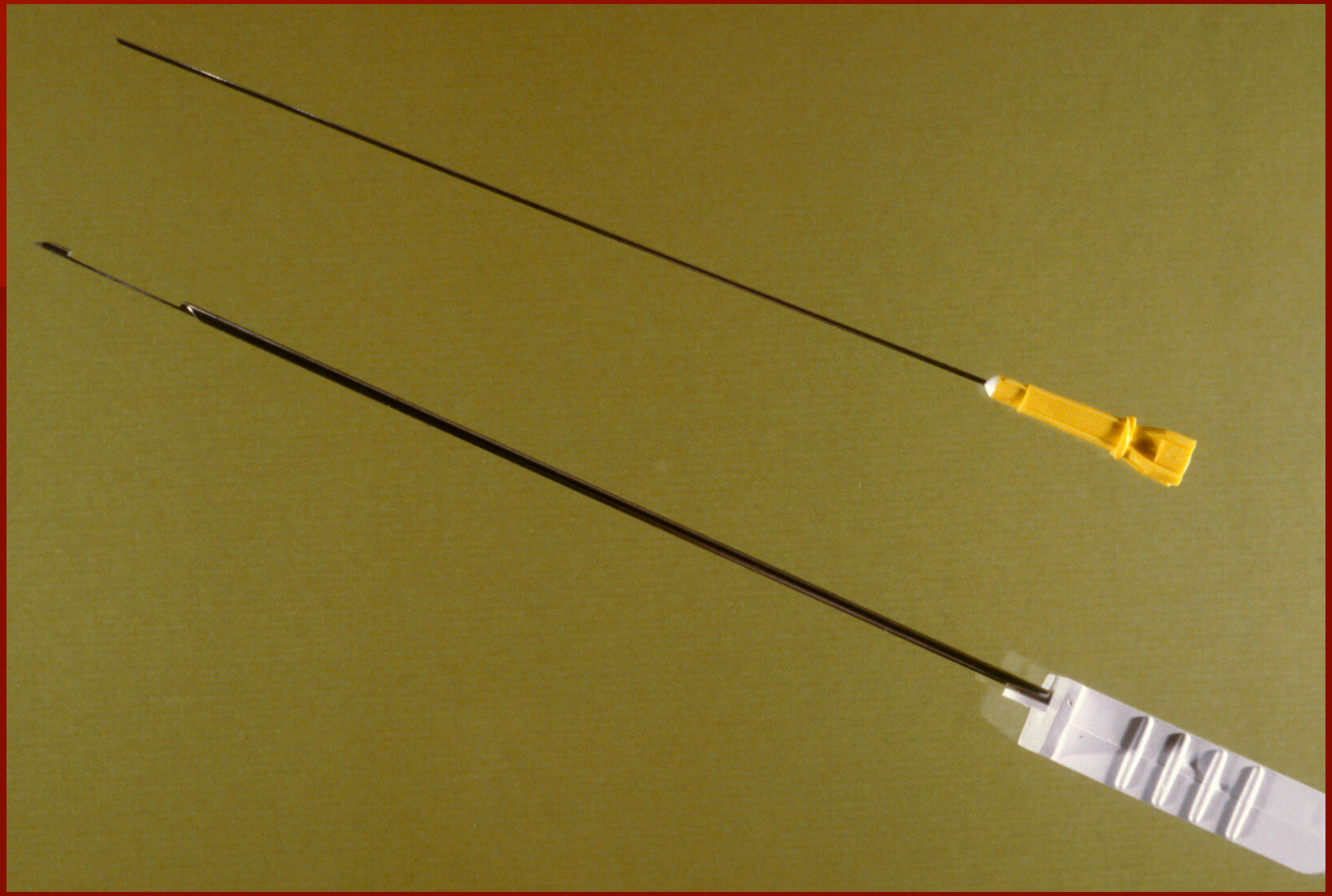
Discussion

- The role for aspiration and cutting biopsies:
  1)Aspiration for lung and "risky" procedures
  2)Cutting for all cases when safe, especially for flow cytometry, gene analysis, immunohistochem for biomarker, EGF
- Techniques for hemostasis: 1) coil closure for unanticipated or anticipated post biopsy bleeding 2) for coagulopathies precautionary Rx FFP, platelets
- Celiac Nerve blocks- experience with ½ needles, chemical, RF shows Cryoablation is Rx of choice
- Difficult special approaches and fiducial markers for Cyberknife to be discussed in Panel Session



Many have reported cutting needles superior for all organs but few

- **Haaga JR**, LiPuma JP, Bryan PJ, Balsara VJ, Cohen AM. Clinical comparison of small- and large-caliber cutting needles for biopsy. Radiology 1983; 146(3):665-667.
- Andriole JG, **Haaga JR**, Adams RB, Nunez C. Biopsy needle characteristics assessed in the laboratory. Radiology 1983; 148(3):659-662
- Martino C, **Haaga JR**, Bryan PJ, LiPuma JP, El Yousef SJ, Alfidi RJ. CT-guided liver biopsies: eight years' experience. Radiology 1984; 152:755-757.
- Baran GW, **Haaga JR**, Shurin SB, Alfidi RJ. CT-guided percutaneous biopsies in pediatric patients: technical note. Pediatr Radiol 1984; 14(3): 161-164
- Goralnik CH, O'Connell DM, El Yousef SJ, **Haaga JR**. CT-guided cutting needle biopsies of selected chest lesions. AJR 1988;151:903-907
- Knelson M, **Haaga J**, Lazarus H, Ghosh C, Abdul-Karim F. CT-guided retroperitoneal biopsies. J Clin Oncol 1989; 7(8):1169-1173.



ANNALS OF SURGERY
A Monthly Review of Surgical Science Since 1885

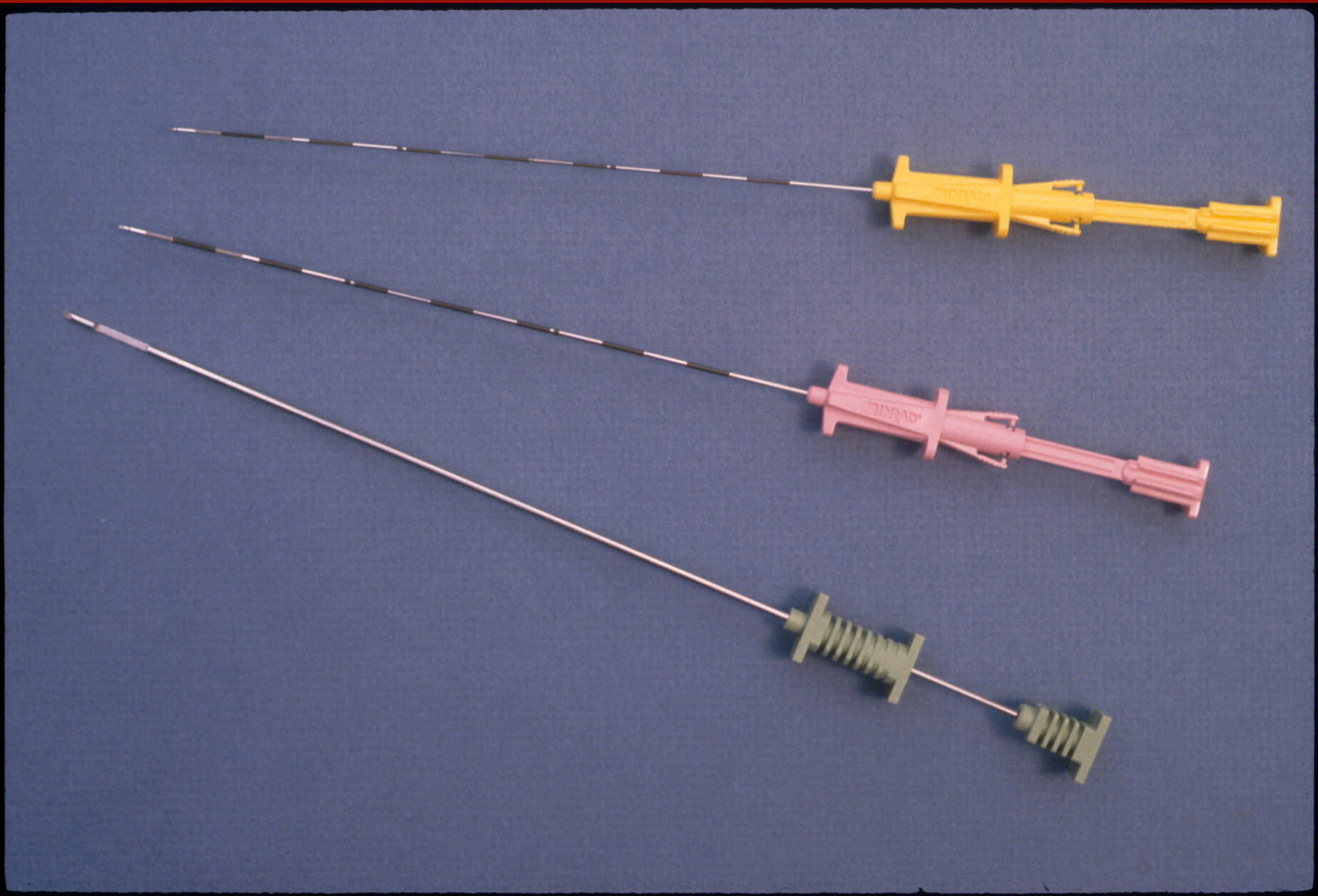
Ann Surg. 1987 December; 206(6): 728–732. PMCID: PMC1493337

Percutaneous ultrasonography-guided cutting biopsy from liver metastases of endocrine gastrointestinal tumors.

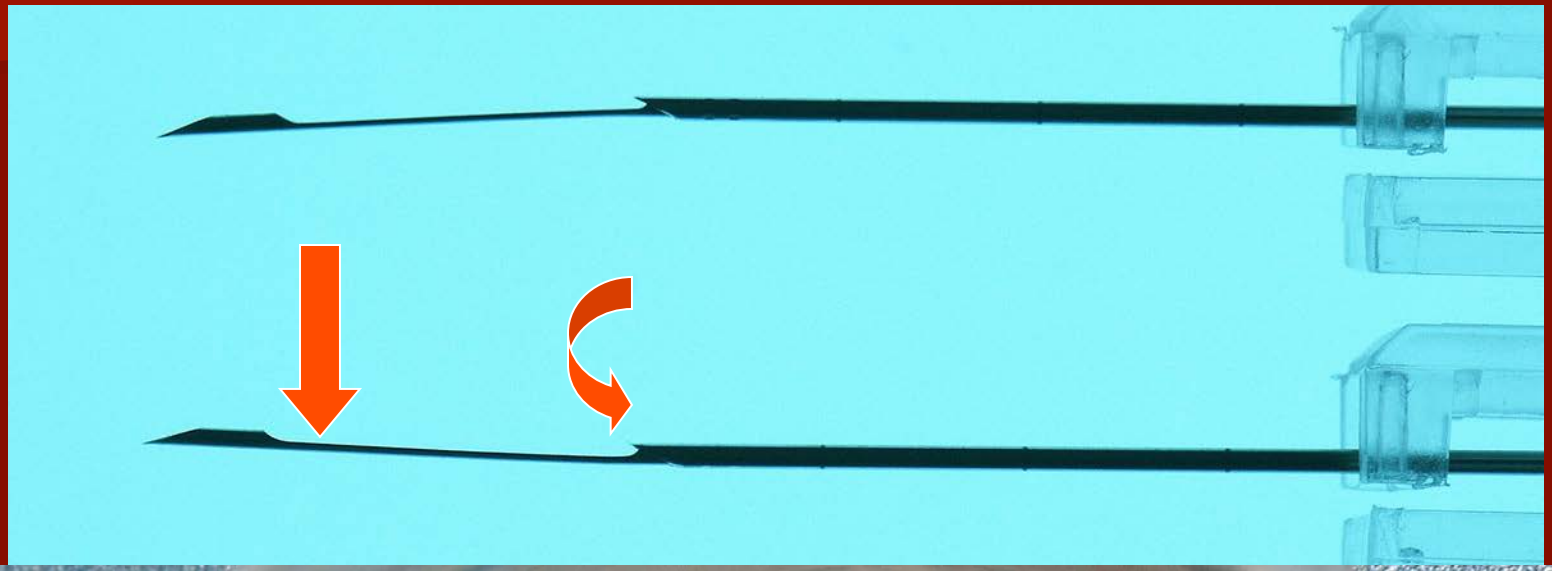
T Andersson, B Eriksson, P G Lindgren, E Wilander, and K Oberg

P.Lindgren MD of Upsaala developed and patented automated biopsy device in 1987. Because anual device difficult to use this innovation promoted the use of cutting needle BX in ultrasound and CT, different calibers

FIG. 1. The biopsy device is loaded with a specially designed cut



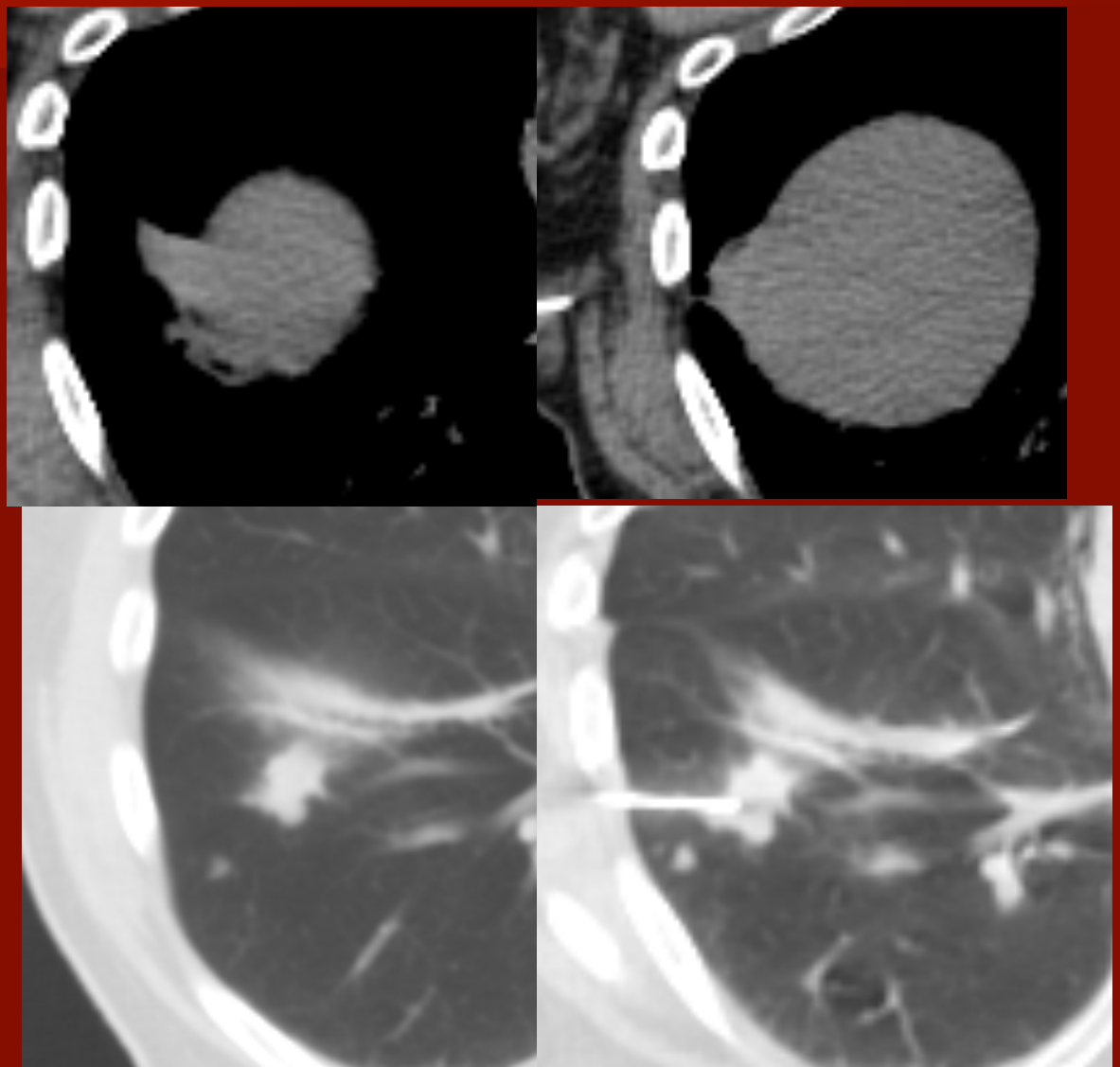
Cutting samples are larger if needle angle is optimal, may need to“realign”



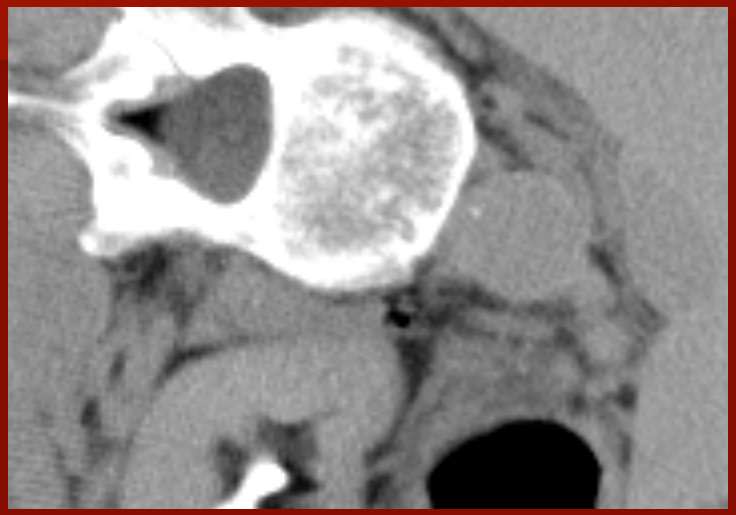
Where and when, what needle size and type, number of samples ??

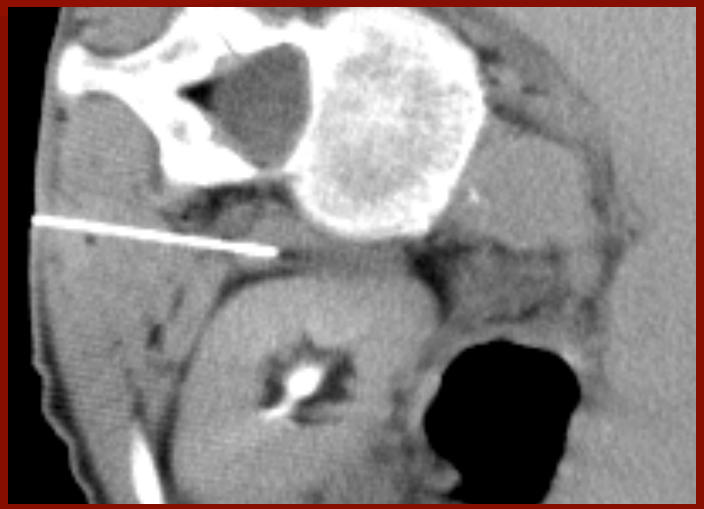
- Balance between acquisition of adequate sample for analysis, complication risk, safety
- In general, largest possible sample as many as necessary BUT use judgement to insure safety.
- For example lung biopsy 20g cutting needles need to be completely in tumor. If mass on pleura can use 18-14 g.
- If bolus before shows extreme vascularity, CANCEL. If slight increase, use hemostatic methods

Aspiration biopsy needed for small mass when patient has inconsistent breathing



For small masses close to vessels, in uncooperative patient do aspiration BX



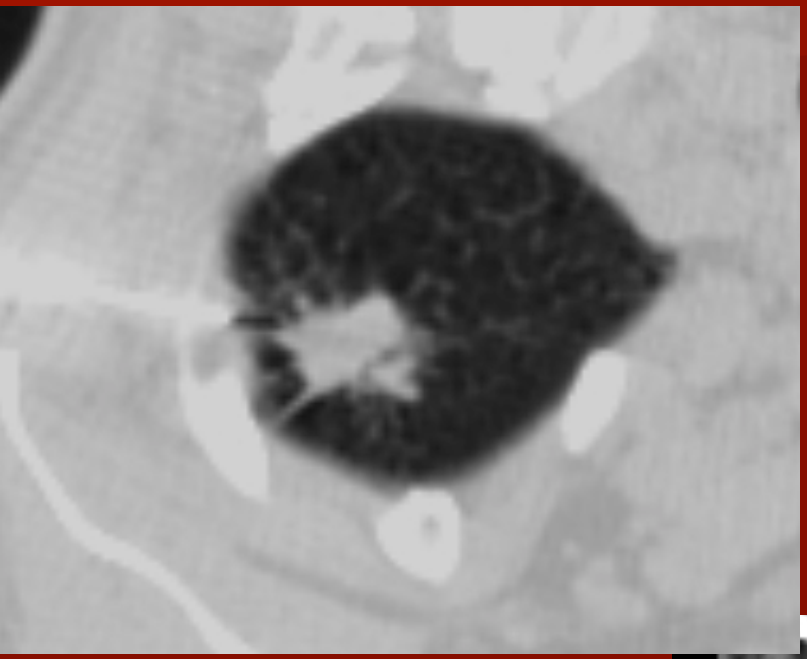


Aspiration Bx indicated when lesions poorly defined, close to vessels

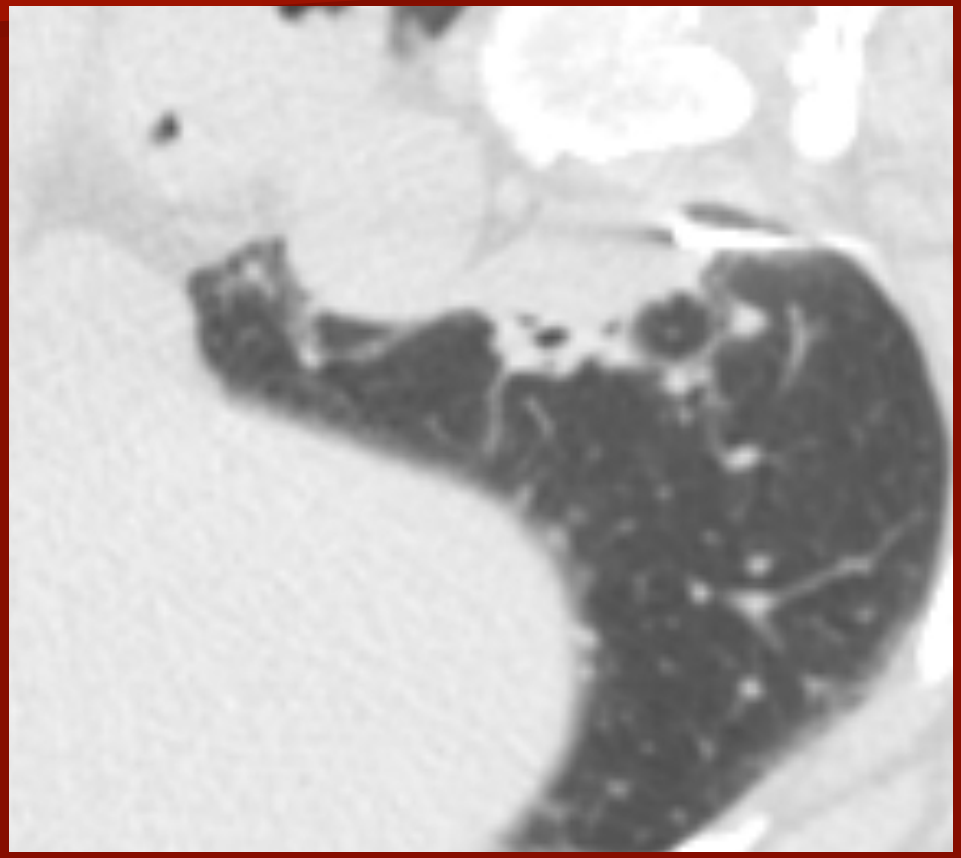
Proper technique for cutting Bx of lung masses

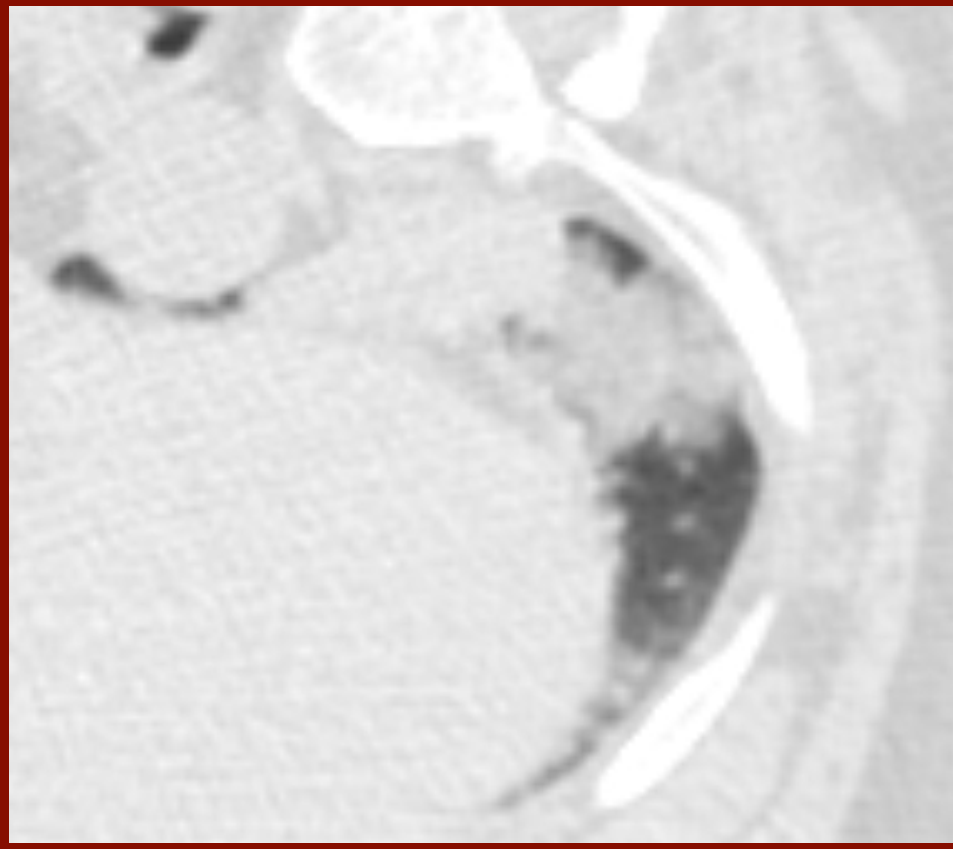
- Choose lesion and entrance site with shortest distance between pleura/ mass.
- Plan path to traverse fibrous strand
- If mass in lung use 20g with cannula, permits readjustment. If mass against pleura can use 18g or 14g
- If possible confine cutting gap to mass avoid parenchyma and bleeding

For small, mobile mass: Decubitus position, fibrous band, cannula



Best to confine cutting gap to mass to avoid hemorrhage





Cutting BX safe if vascular lesions avoided.

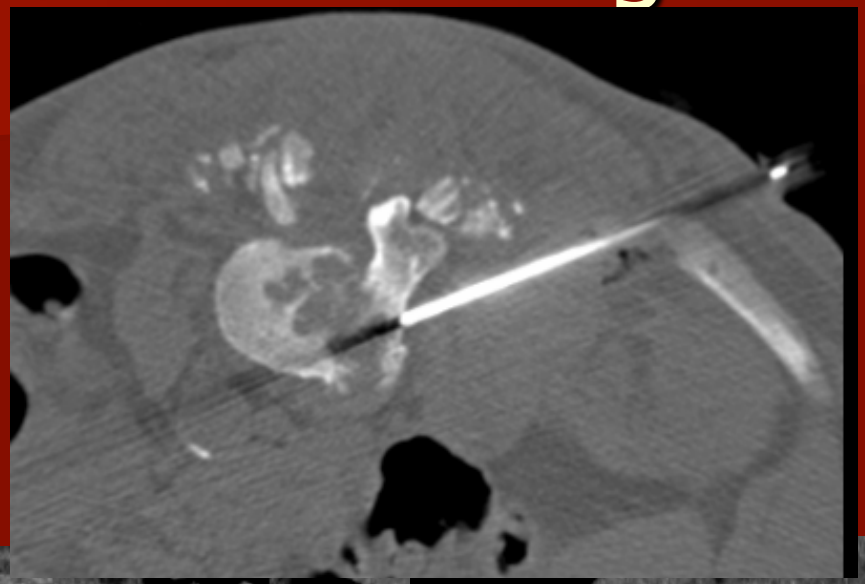
Experience with 14 Gauge Sequential Biopsies in Early Phase Clinical NIH Trials, Dowlati, Haaga, Remick et al, Clinical Cancer Research, Oct '01

- NIH CTEP (ChemoTherapeutic Exper. Protocols) Development of target based anticancer drugs to establish optimal dose biologic or biochemical targets=measured microsamples
- 1989-2001, 192 biopsies in 107 patients. All but 8 had sequential pre and post treatment biopsies. 87/99 had paired samples.
- Complication rate of 14 gauge needle using our techniques is 0.5% according to NIH survey

Techniques to avoid Bleeding

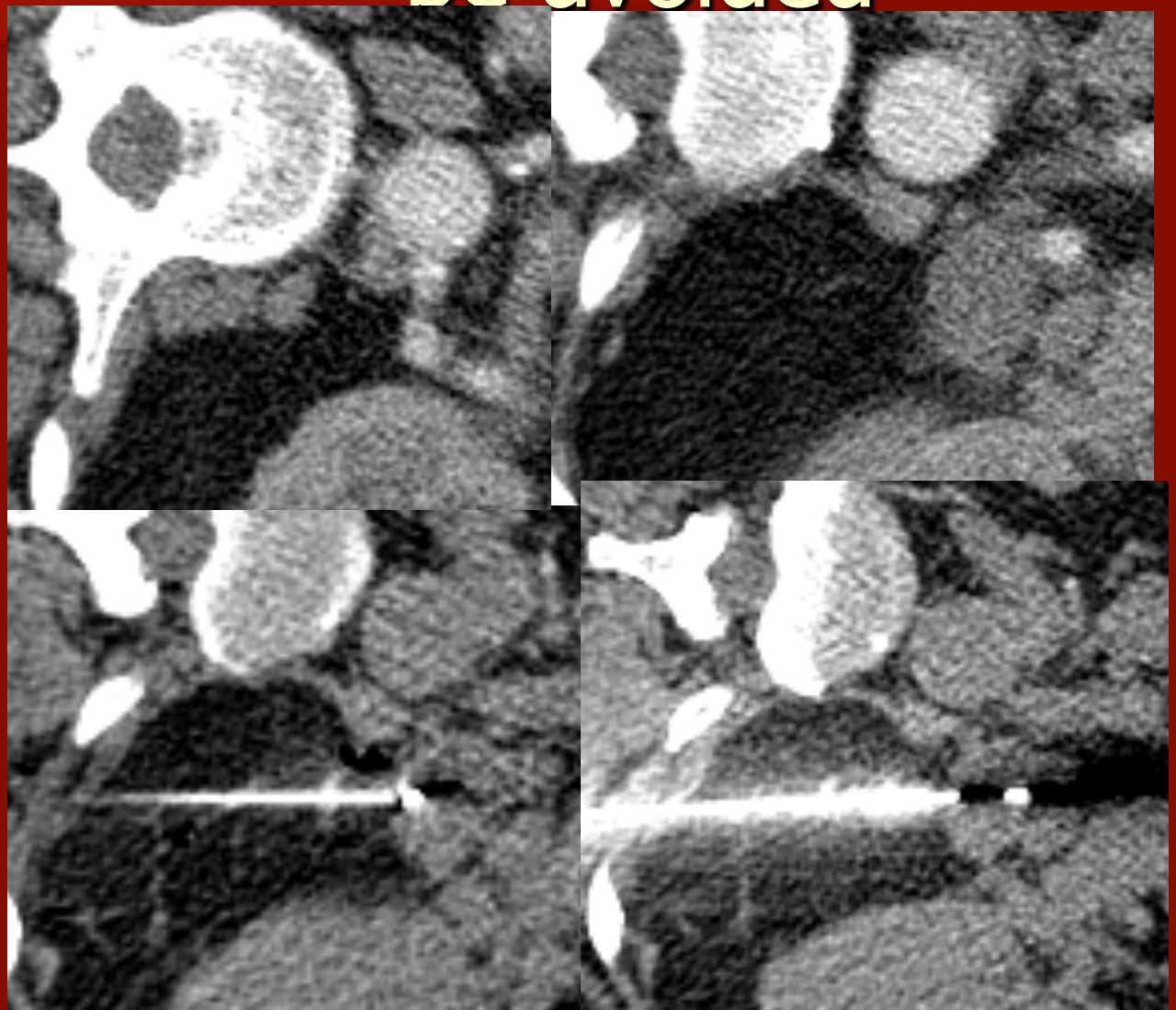
- Using bolus shows increased vascularity and normal vessels.
- Using guidance cannula provides access for hemostatic coil if bleeding occurs, coil can be prepared before or after biopsy.
- Hemostatic coil with thrombin excellent method
- Pretreatment for coagulopathic patients with systemic or “new” local injection method

Patient biopsied with cutting needle without bolus. Bleeding death (not me)

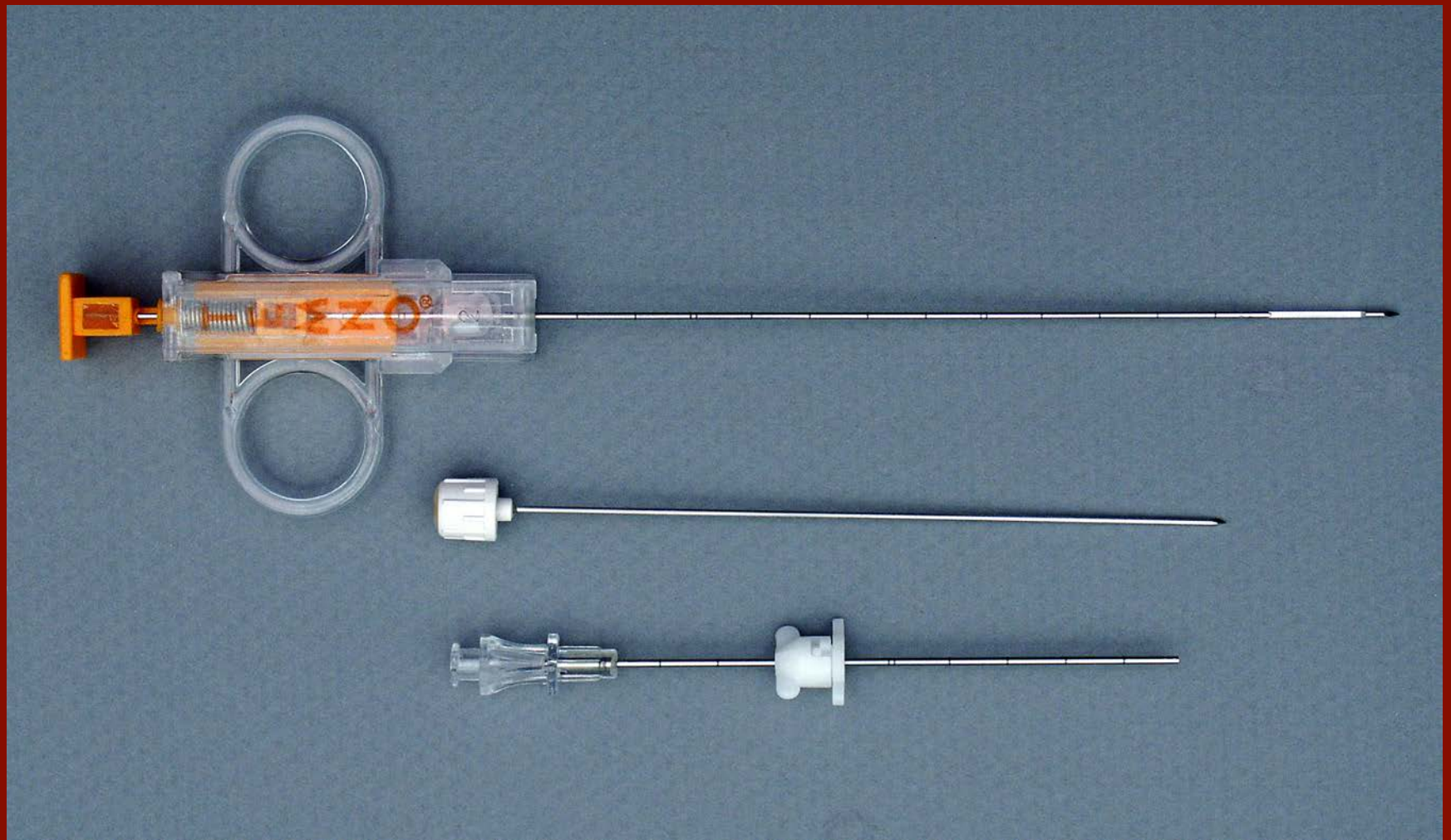



LEFT

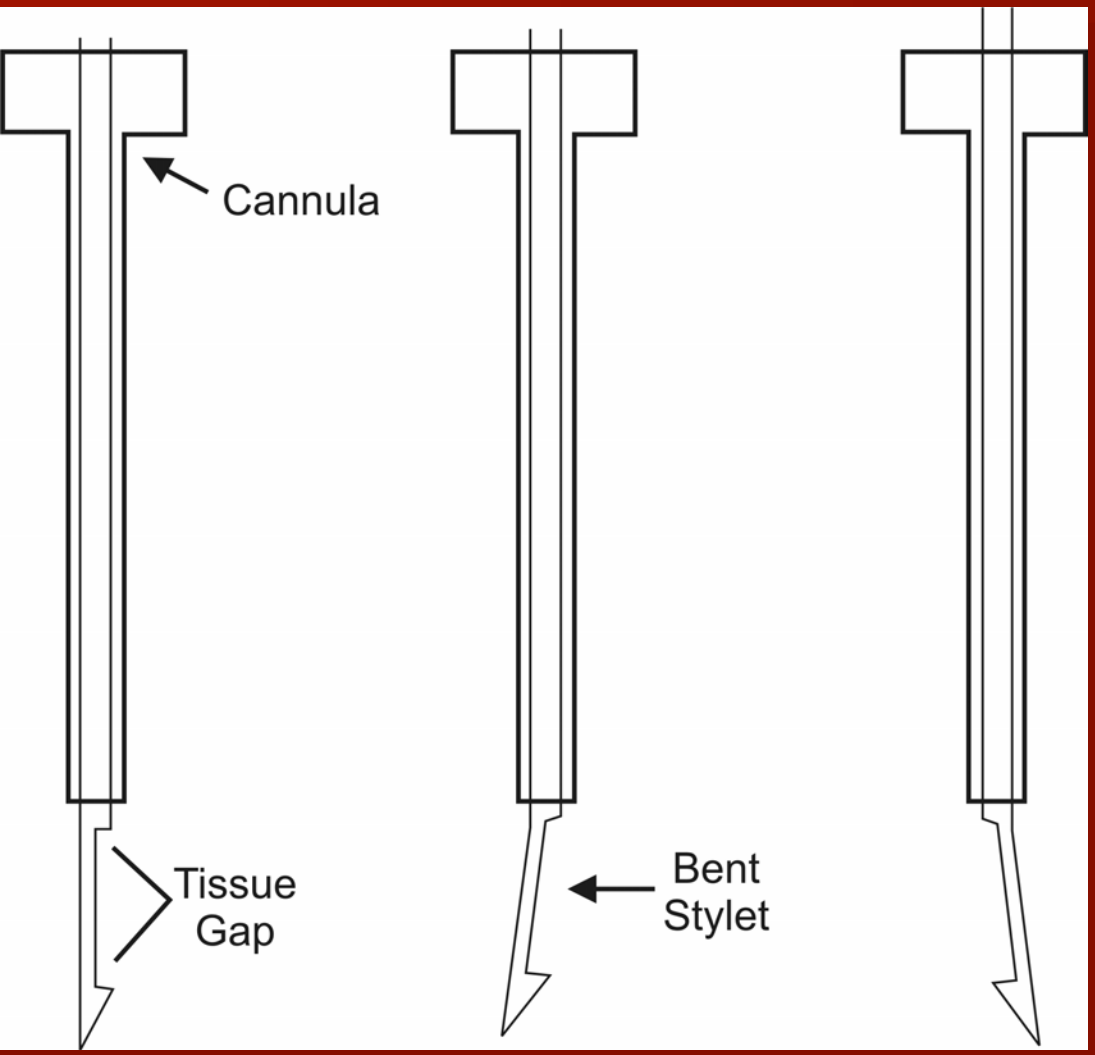
Adrenal BX: When vessels well seen with contrast bolus, they can be avoided

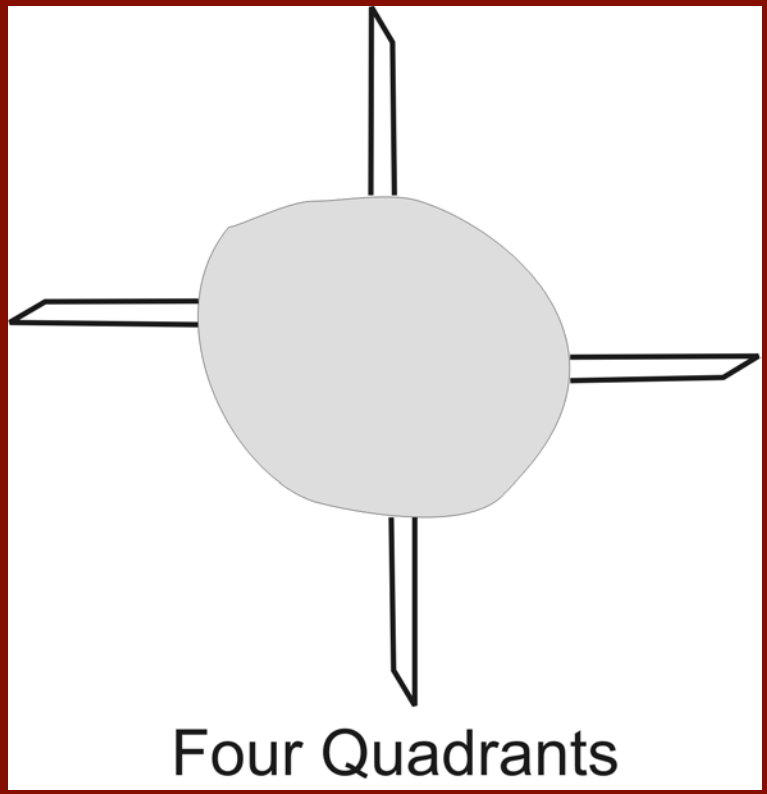


Cannula with cutting needle permits harvesting multiple tissue cores from separate areas: two methods

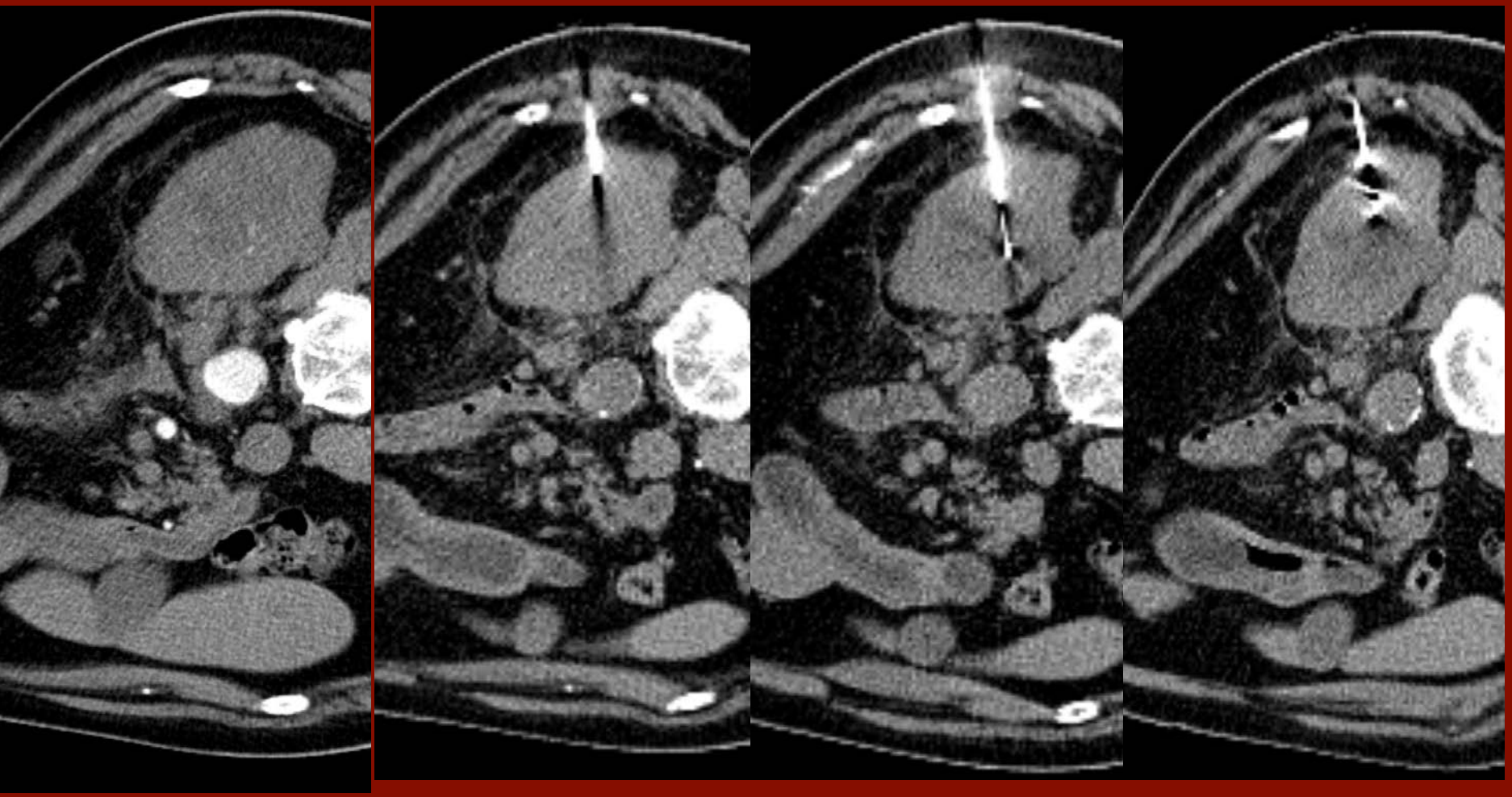


Multiple samples in four quadrants can be obtained with one entrance hole

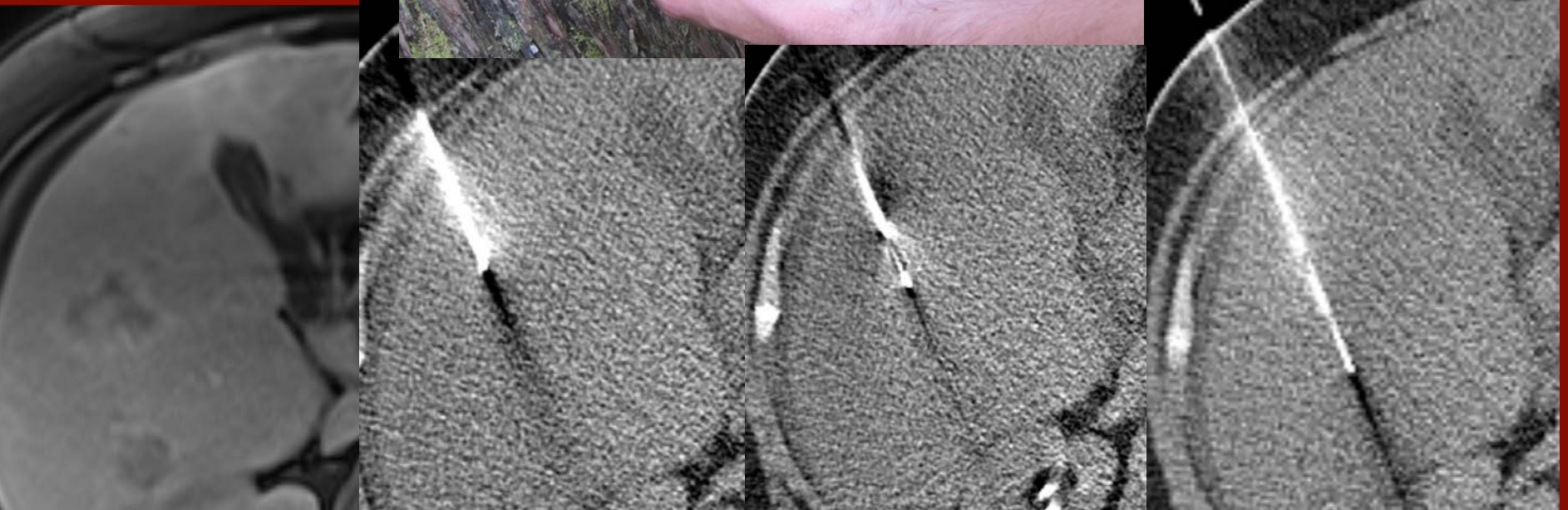




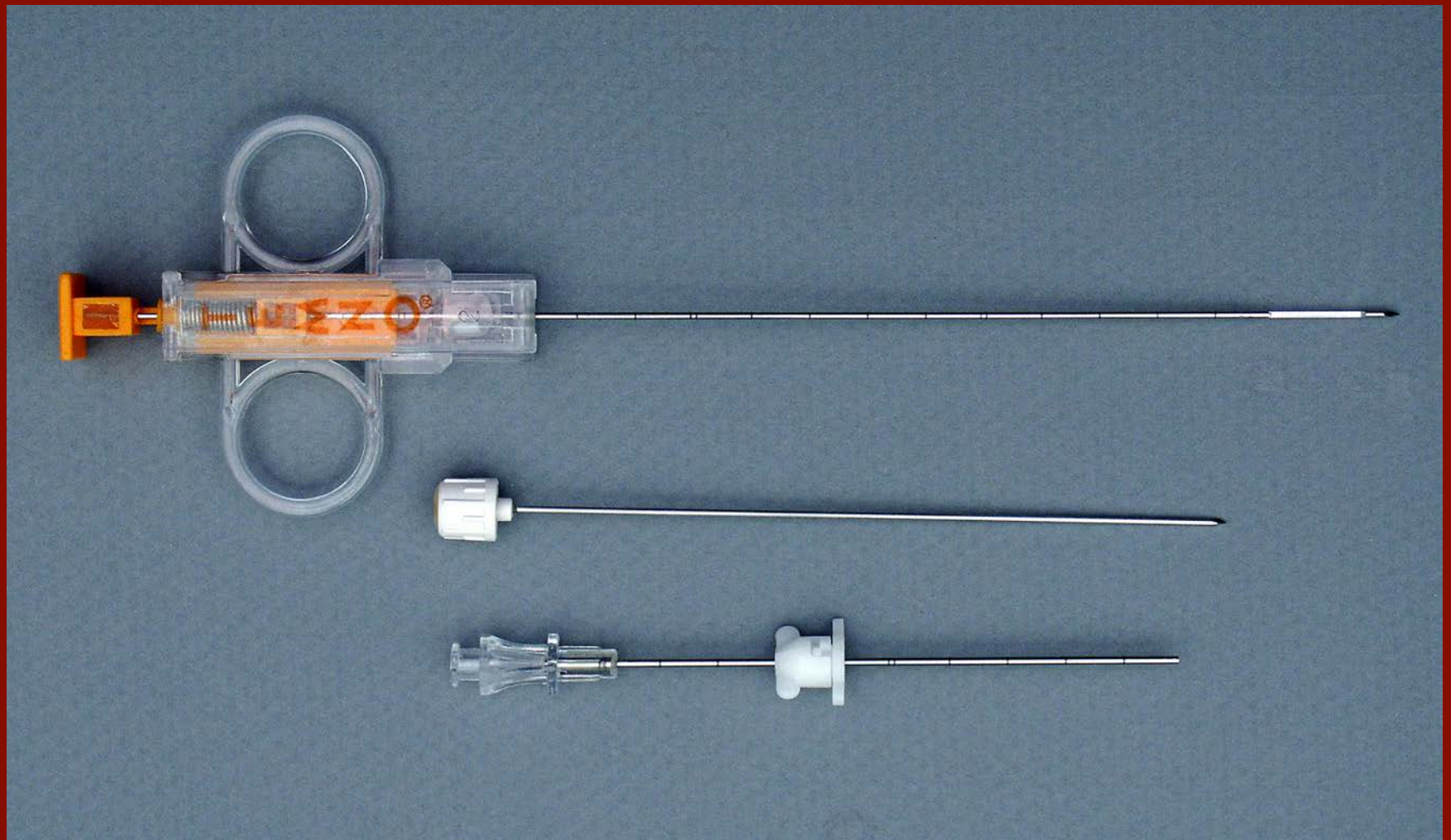
Suspected renal lymphoma: bolus, cannula, 4 BX, coil + thrombin as precaution to prevent bleeding



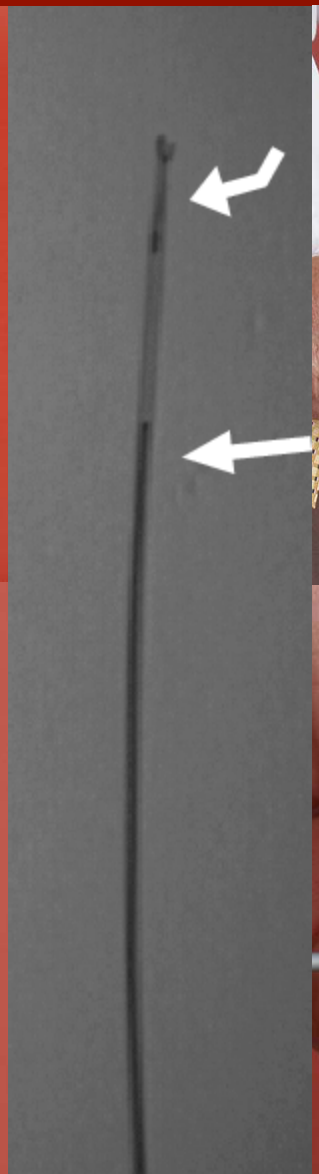
Suspect lymphoma or HCC- “Tree bore ’ Bx for genes, immunohistochem, etc - one hole to occlude to prevent bleeding

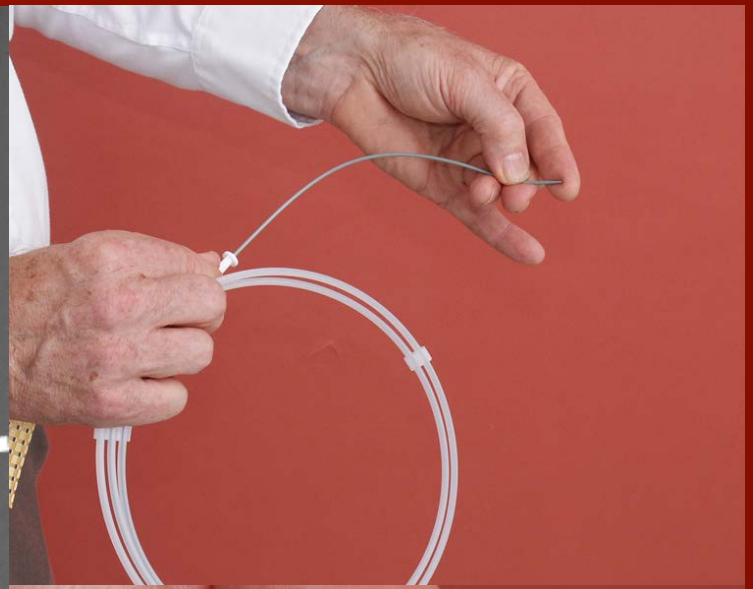


Cannula with cutting needle permits mechanical hemostasis if bleeding occurs after removal of bx needle

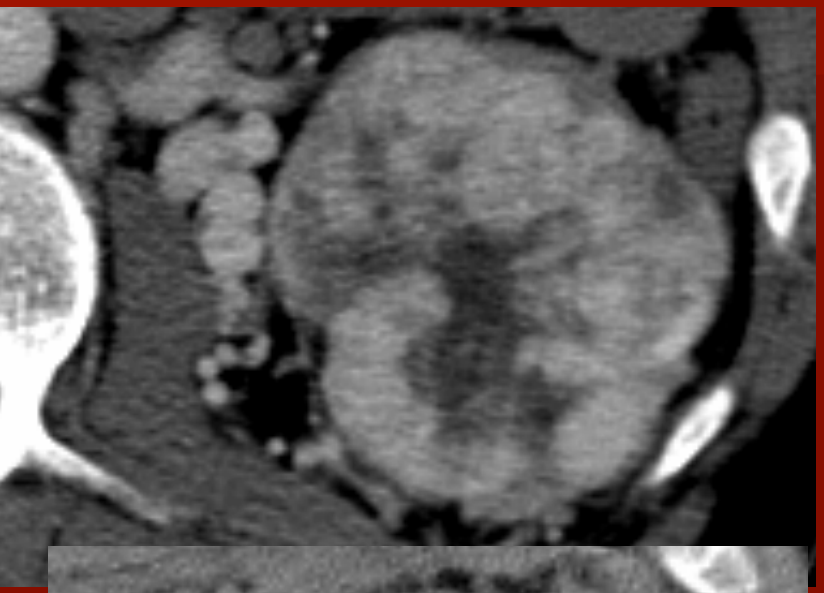


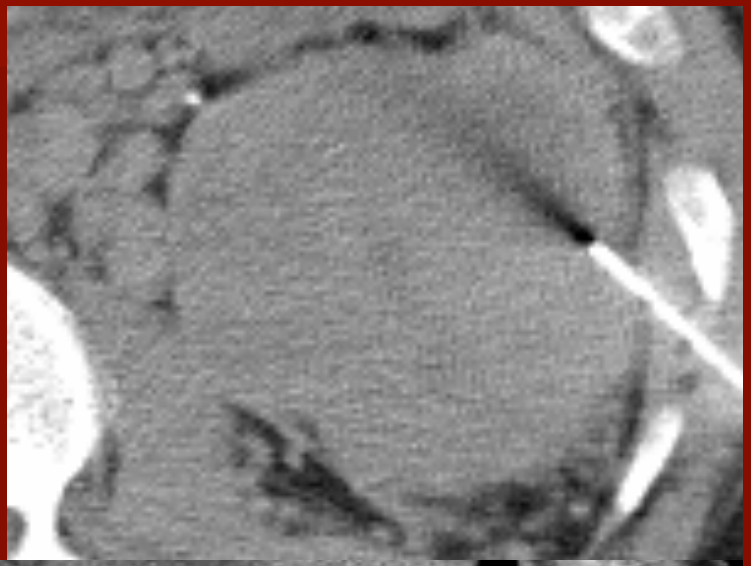
Preparation for hemostasis: insert coil into dilator and carefully flush thrombin.

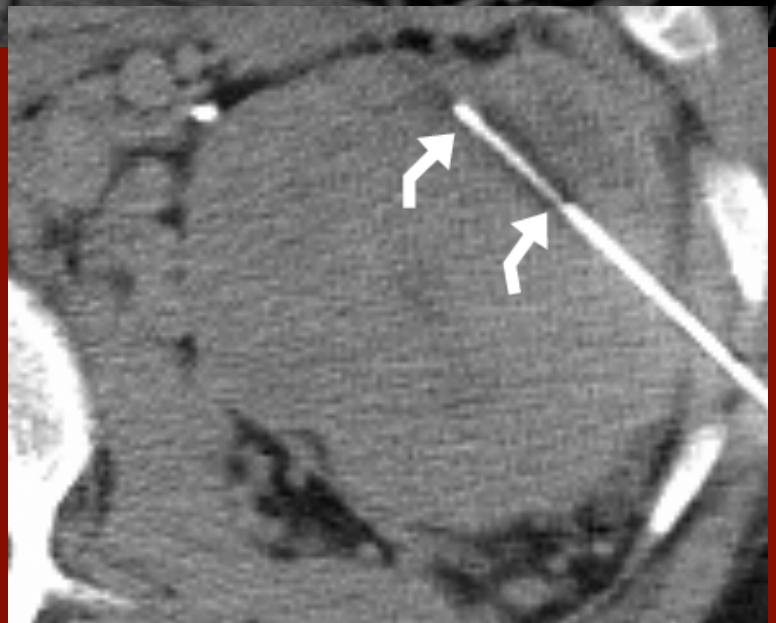


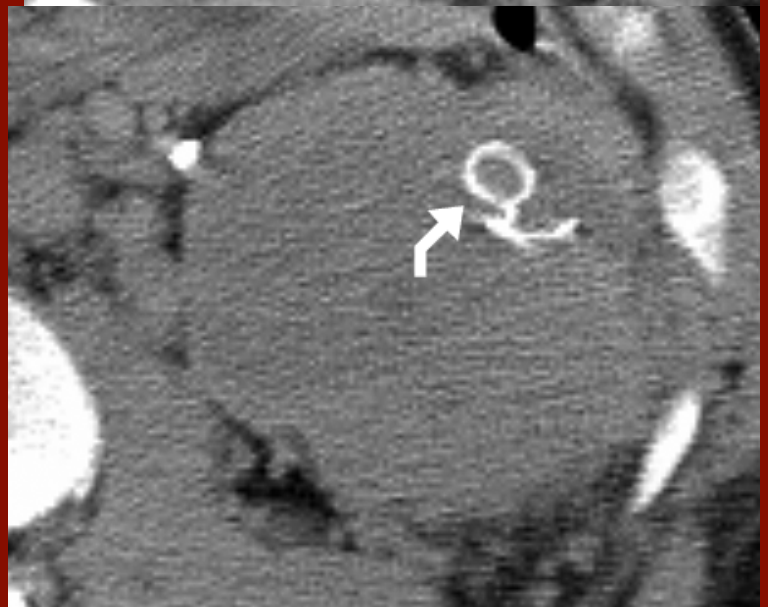


Use to prevent a bleed if tumor vascular. Insert prophylactically

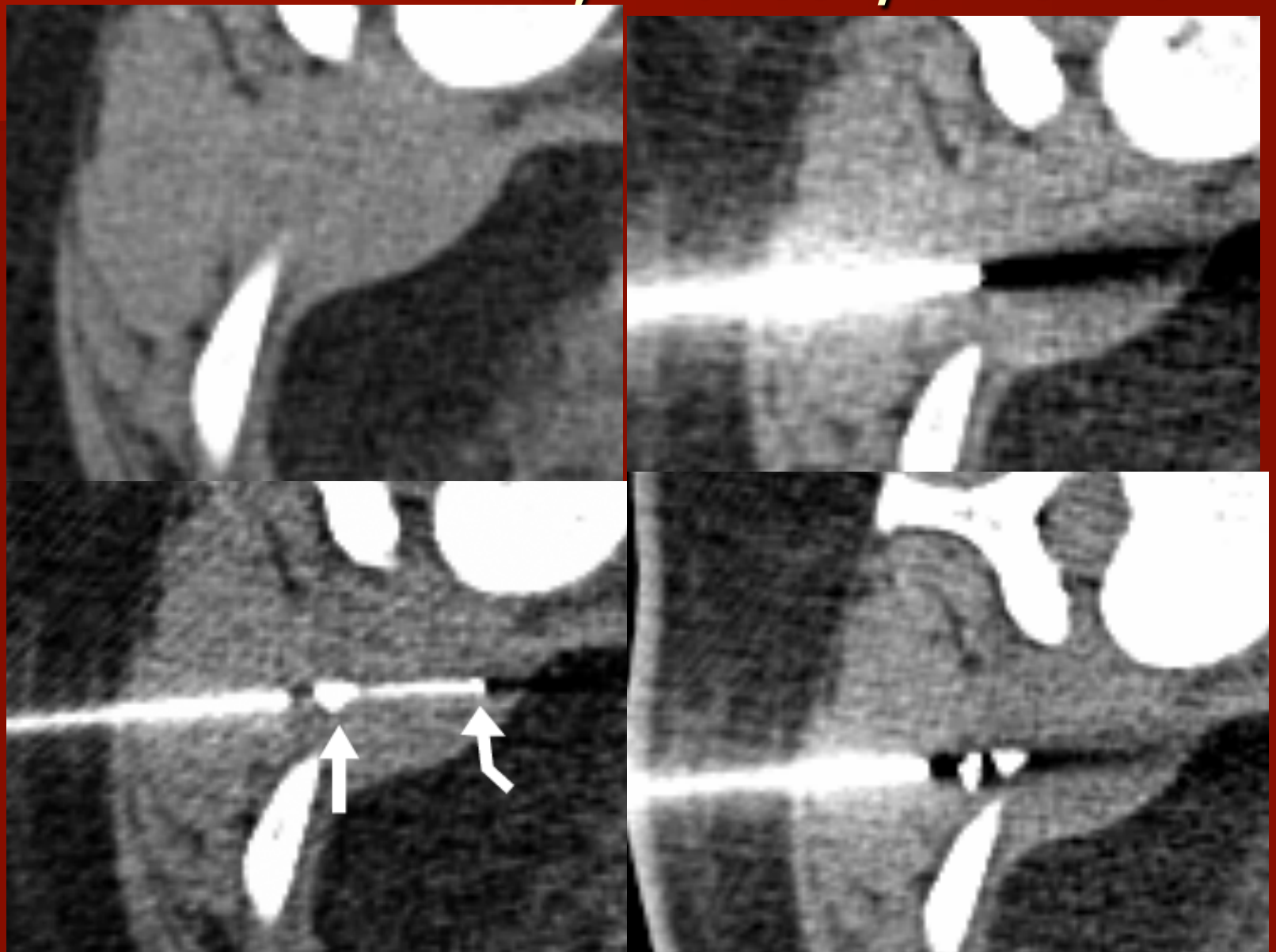








Unexpected bleeding can be managed if cannula used, via coil/thrombin



NEW TECHNIQUE: Prevention of bleeding in Coagulopathic patients with LIBE Local Injection of Blood Elements

- Entrance site and target chosen
- Site prepared with local anesthetic
- Site pre injected with appropriate product, i.e. FFP for high INR, platelets for low platelets, Factor IX for hemophiliac, etc
- After lidocaine 10cc product injected during needle insertion and 10cc when withdrawn.
- A seroma is created with very high levels, prevents bleeding because of local effect

Pig model for LIBE (Local Injected Blood Elements) JVIR, 2011)

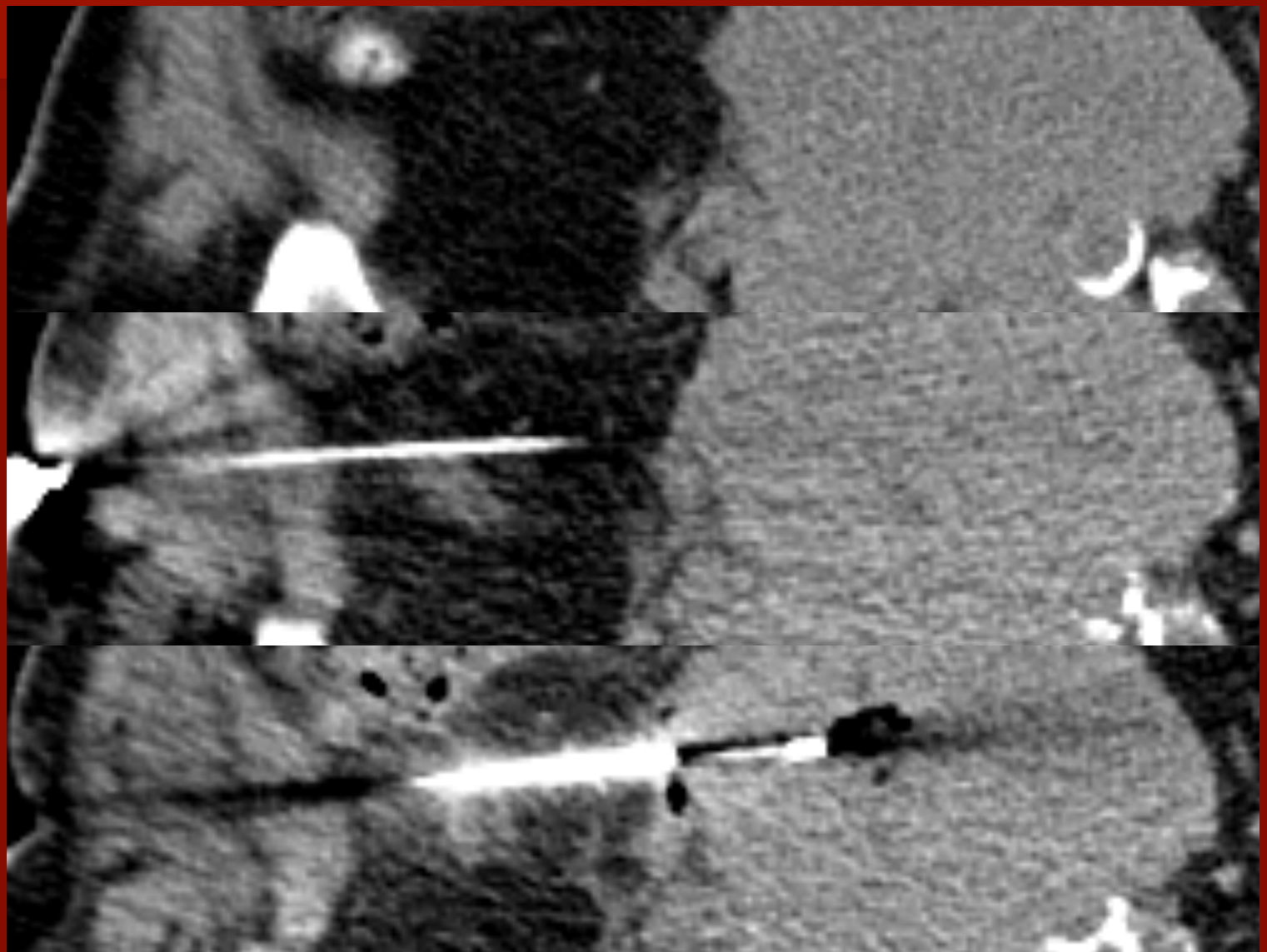
	Control Biopsy	Saline	FFP	Platelets
Untreated Control Pigs (n=3)	4.8 +/- 0.83	3.90 +/- 1.6	1.76 +/- 0.43 *	1.03 +/- 0.56 *
Coumadin-treated Pigs (n=5)	3.68 +/- 0.53	3.76 +/- 0.83	1.10 +/- 0.33 *	0.69 +/- 0.11 *
Aspirin-treated Pigs (n=4)	4.55 +/- 1.34	4.14 +/- 1.06	1.03 +/- 0.22 *	0.86 +/- 0.16 *

	Control Biopsy	Saline	FFP	Platelets
Untreated Control Pigs (n=3)	3.49 +/- 0.60	4.26 +/- 0.51	1.90 +/- 0.52 *	4.4 +/- 1.8
Coumadin-treated Pigs (n=5)	6.55 +/- 0.93	4.12 +/- 0.45	2.05 +/- 0.65 *	2.49 +/- 0.66 *
Aspirin-treated Pigs (n=4)	6.46 +/- 1.90	3.85 +/- 0.26	1.80 +/- 0.52 *	1.62 +/- 0.46 *

1st: 16 yo girl, hypersplenism, unresponsive to platelet infusions, 16K count, surgeons demand splenoportogram. Local platelets injected during needle insertion

2nd: 58 yo interventional radiologist, refractory leukemia, unresponsive to platelets because of antibodies, platelet count 0-5, surgeons refuse

Cancer Patient with 10K platelets, cutting bx, after local platelet injection



Preliminary Results IRB protocol comparing systemic and local injection

- 26 patients with abnormal INR or low platelets Rxed with systemic (S) or local (L) FFP or platelets
- No bleeding in either group.
- Other outcomes: 1) time delay between order and procedure 30 vs 8 hours 2)product used:8 units vs 20cc 3)Two serious complications in systemic group: Congestive heart failure and idiosyncratic reaction

Evolution of Posterior Celiac Block-35yr

Bilateral skinny needle, injection of 50cc phenol bilaterally (Haaga JR, Reich NE, Havrilla TR, Alfidi RJ. Interventional CT scanning. Radiol Clin North Am 1977; (3): 449-456.)

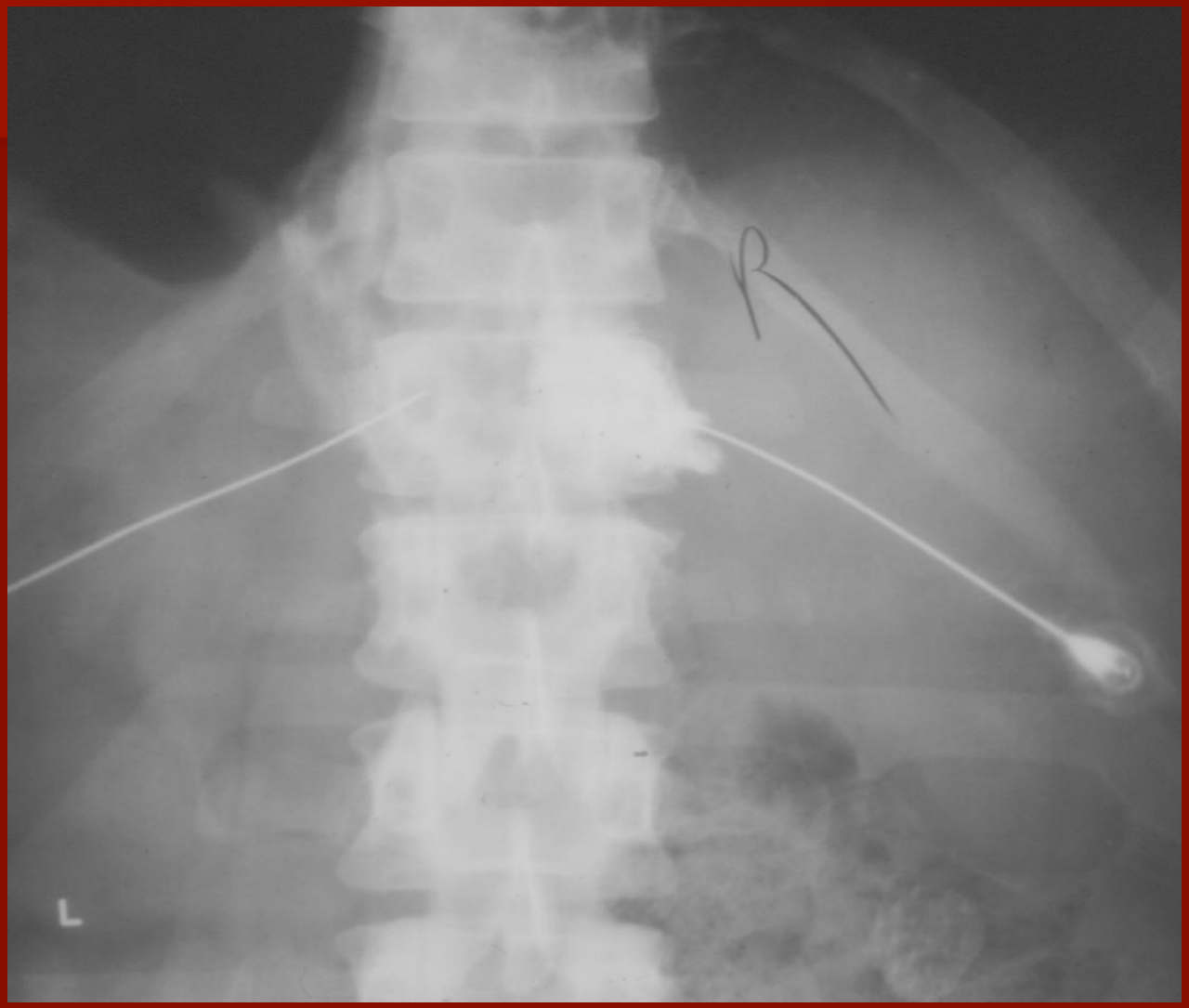
Unilateral 18g plastic sheath, injection 30cc ethanol in pre aortic space between SMA & celiac arteries

(Haaga JR, Kori SH, Eastwood DW, Borkowski GP. Improved technique for CT-guided celiac ganglia block. AJR 1984; 142:1201-1204.)

Unilateral radiofrequency in preaortic space, ablation of 8 patients, effective even if tumor invaded plexus, unable to see effect

Unilateral cryoablation in preaortic space (my idea ☺), 8 cases to data, excellent results clear visualization of damage in target site-METHOD OF CHOICE Yarmohammadi H, Nakamoto DA, Haaga JR. Percutaneous computed tomography guided cryoablation of the celiac plexus. J Cancer Res Ther 2011; 7:481-483.

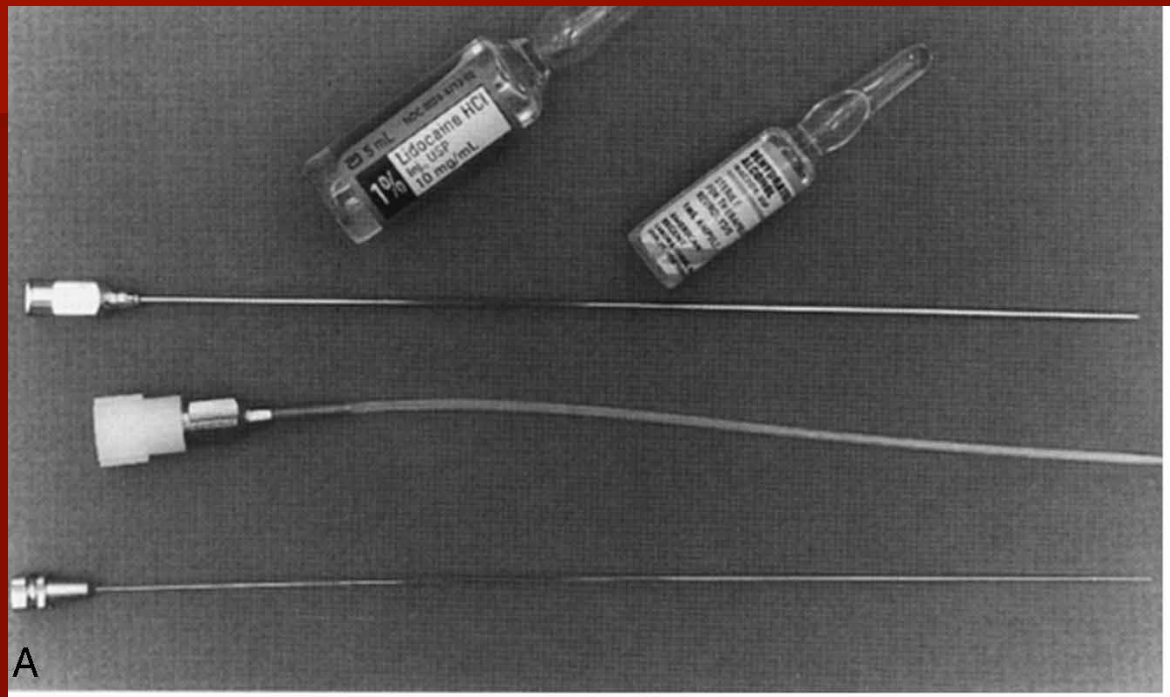
Fluoroscopic Celiac Block



1976 Rad.Clinics N.Am: Bilateral 20g needle block. 50cc of phenol injected on each side. Later changed to EToh

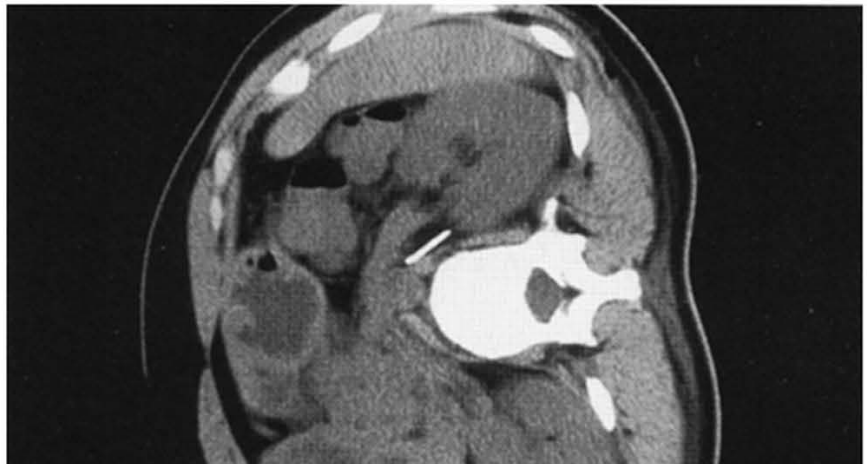
CT-guided Celiac Block
Anterior Approach

Unilateral 18g plastic sheath past aorta, air as marker, 30 cc EtoH, pre aortic

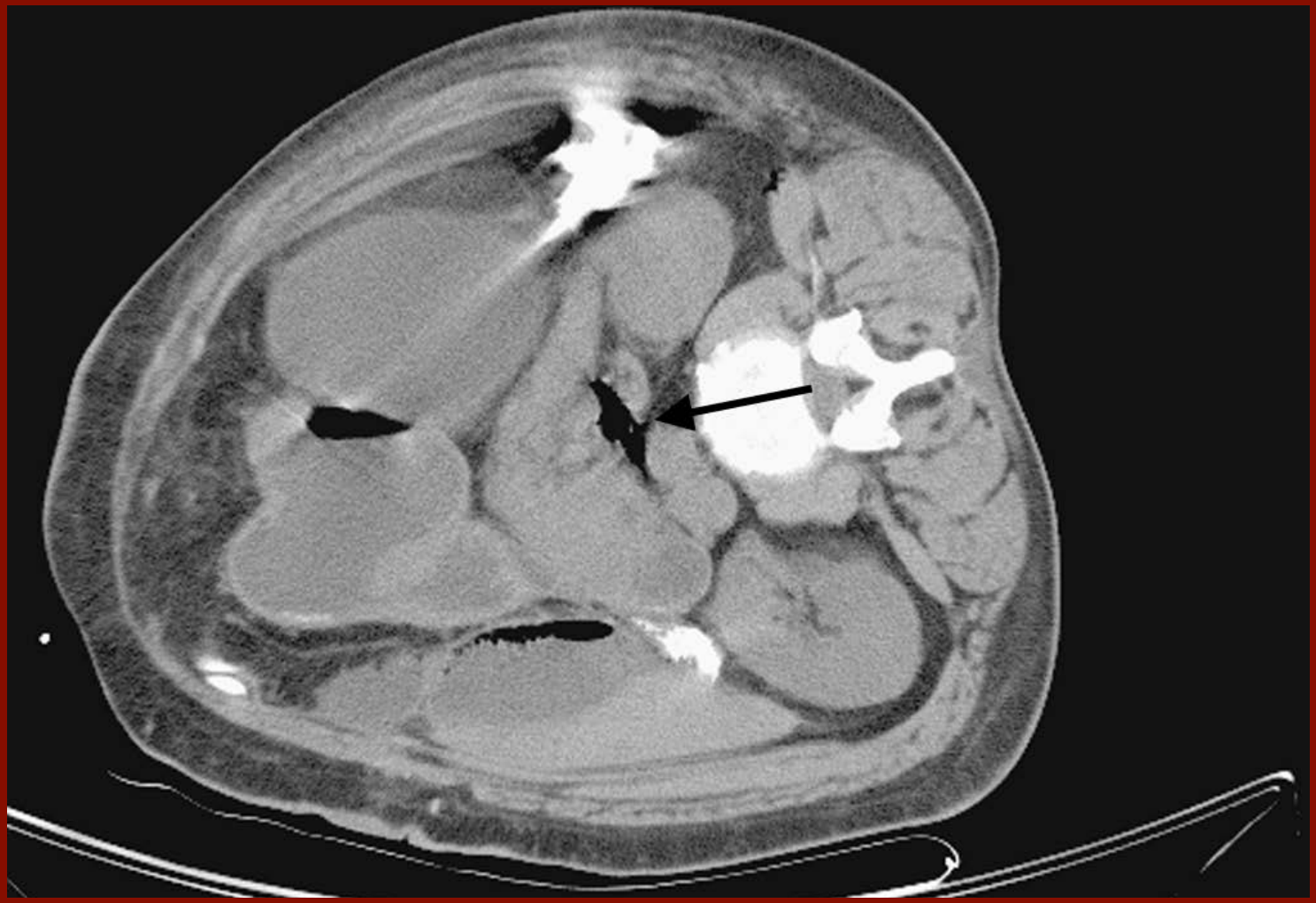


A


B



Rather than inject contrast, air used to assess distribution to plexus. Determine if tumor will block EtoH diffusion



Tumor invasion of Plexus impairs success: Correlation Between Grade of tumor and Pain Relief,Akhan et al, AJR,1997;168;p1565

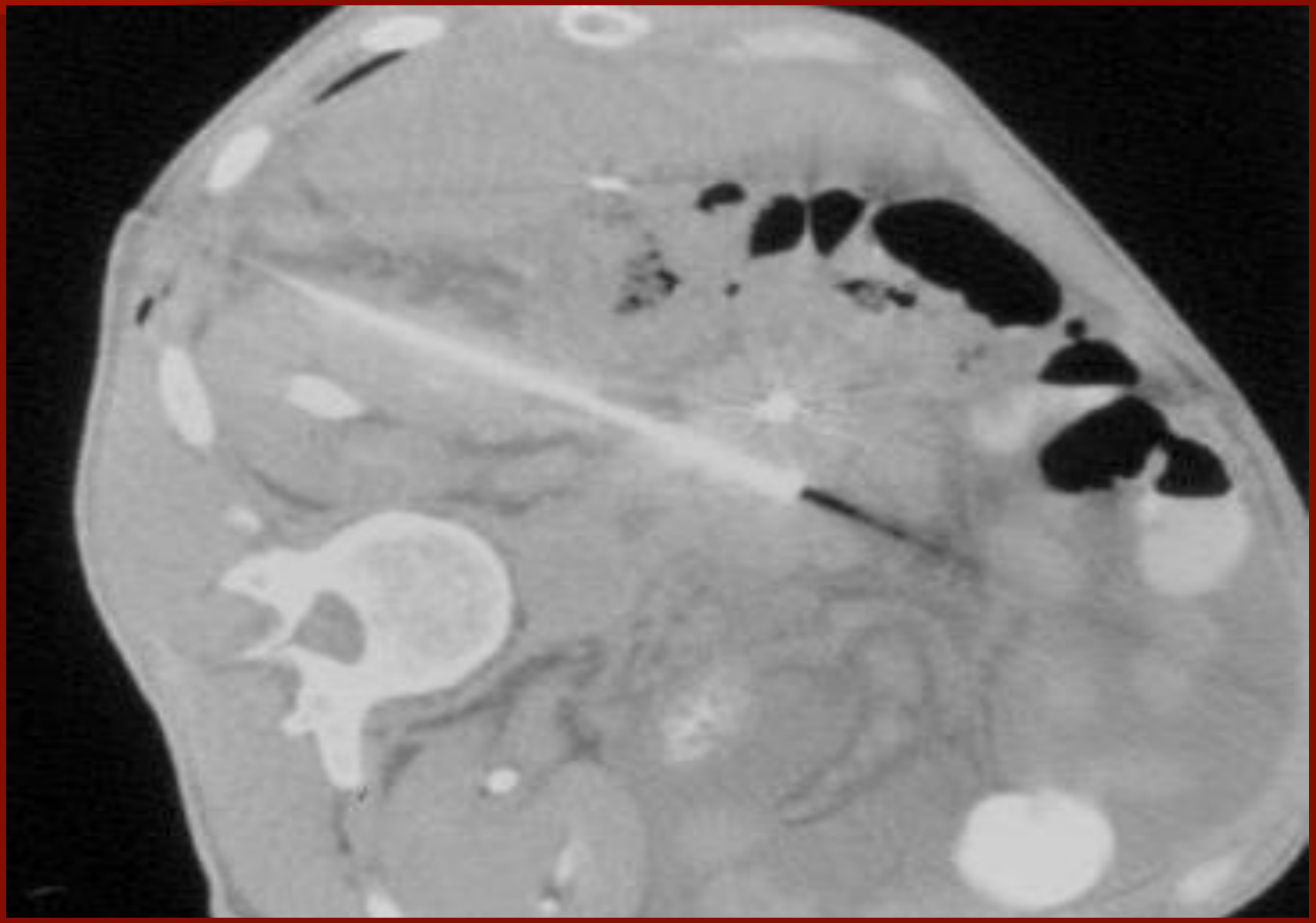
- Twenty five cases-extension graded I, II, III,IV
- I-fat planes intact, II>50% intact, III> %invaded, IV>fat planes totally invaded
- Pain graded 0-+3 (+3 less pain) stated differently O means no pain relief

Results-pain after block

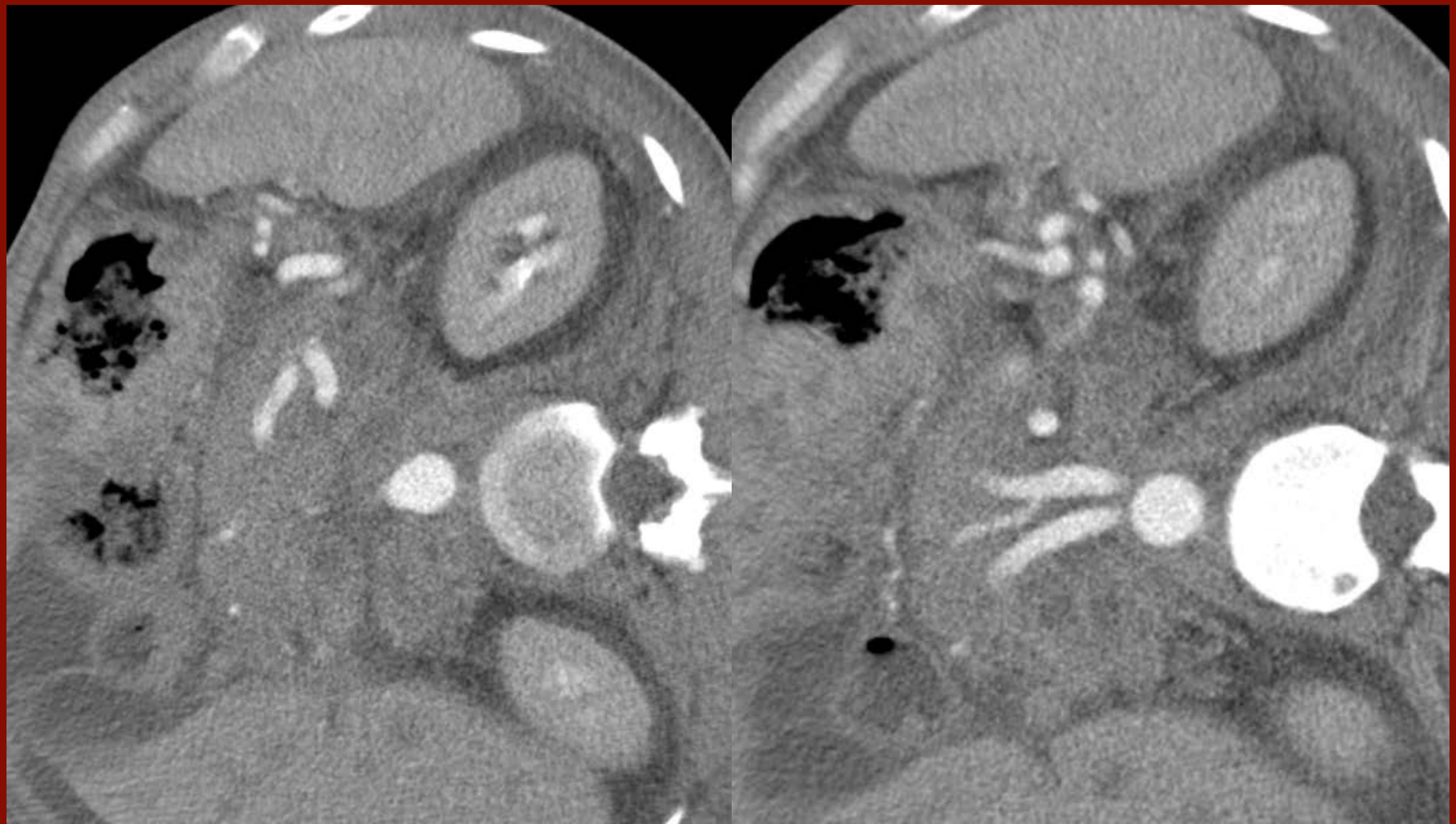
- Grade I: +3 in 4/4
- Grade II: +3 in 3/12, +2 in 6/12, +1 in 3/12
- Grade II: +2 in 2/6, +1 in 3/6, 0 in 1/6
- Grade IV: 0 in 3/3

- More invasion alcohol cannot penetrate so less relief and greater chance of complication
- Two patients with Grade IV,leaked to thorax

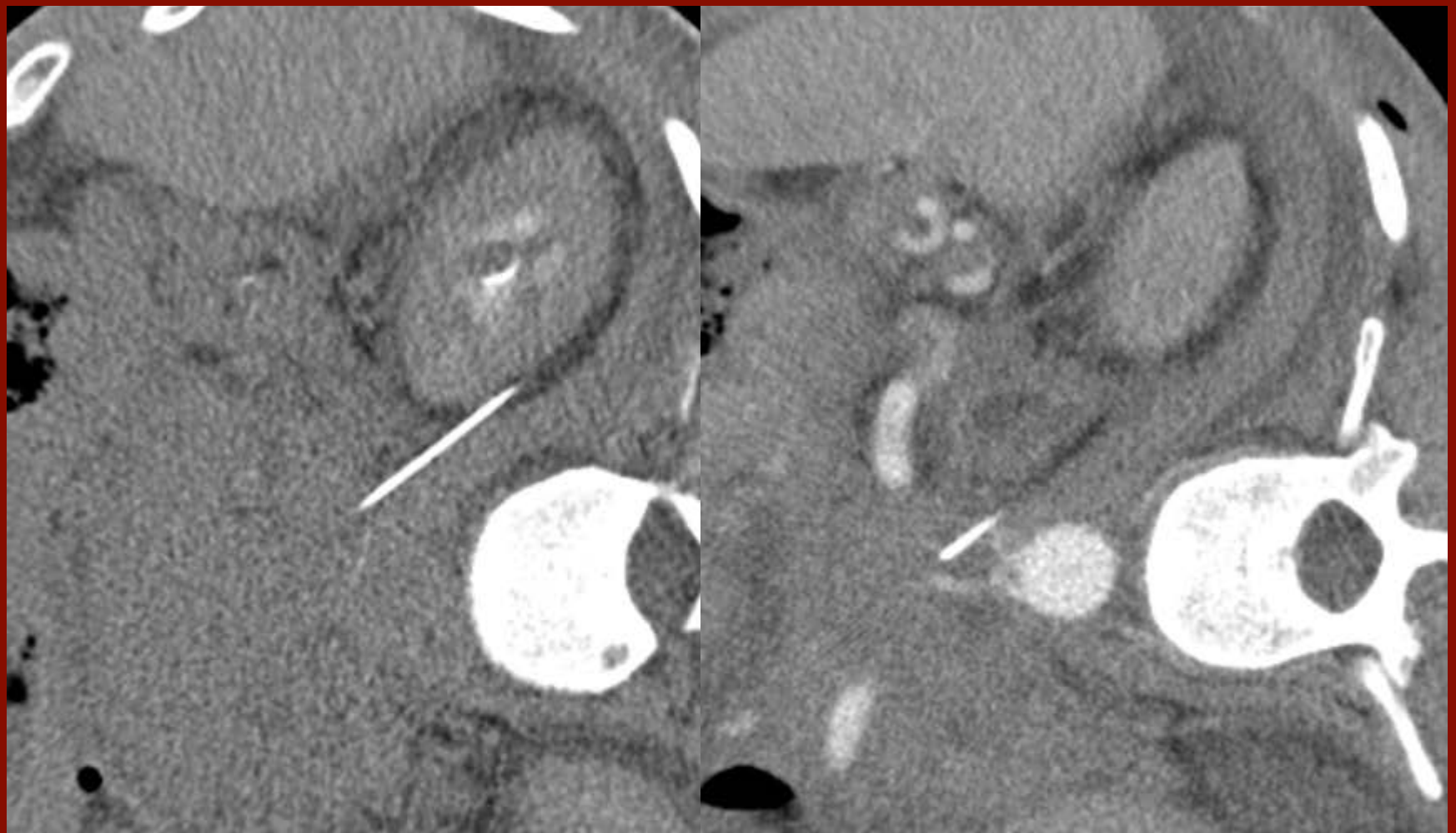
Radiofrequency Ablation of celiac plexus with tumor: 41 y/o man s/p Whipple procedure. Pain FREE for Christmas then died peacefully



75y male with pancreatic cancer encasing plexus and arteries.See vessels only with bolus contrast



With dense tumor infiltration, cannot see margin of vessels, used needle as reference marker



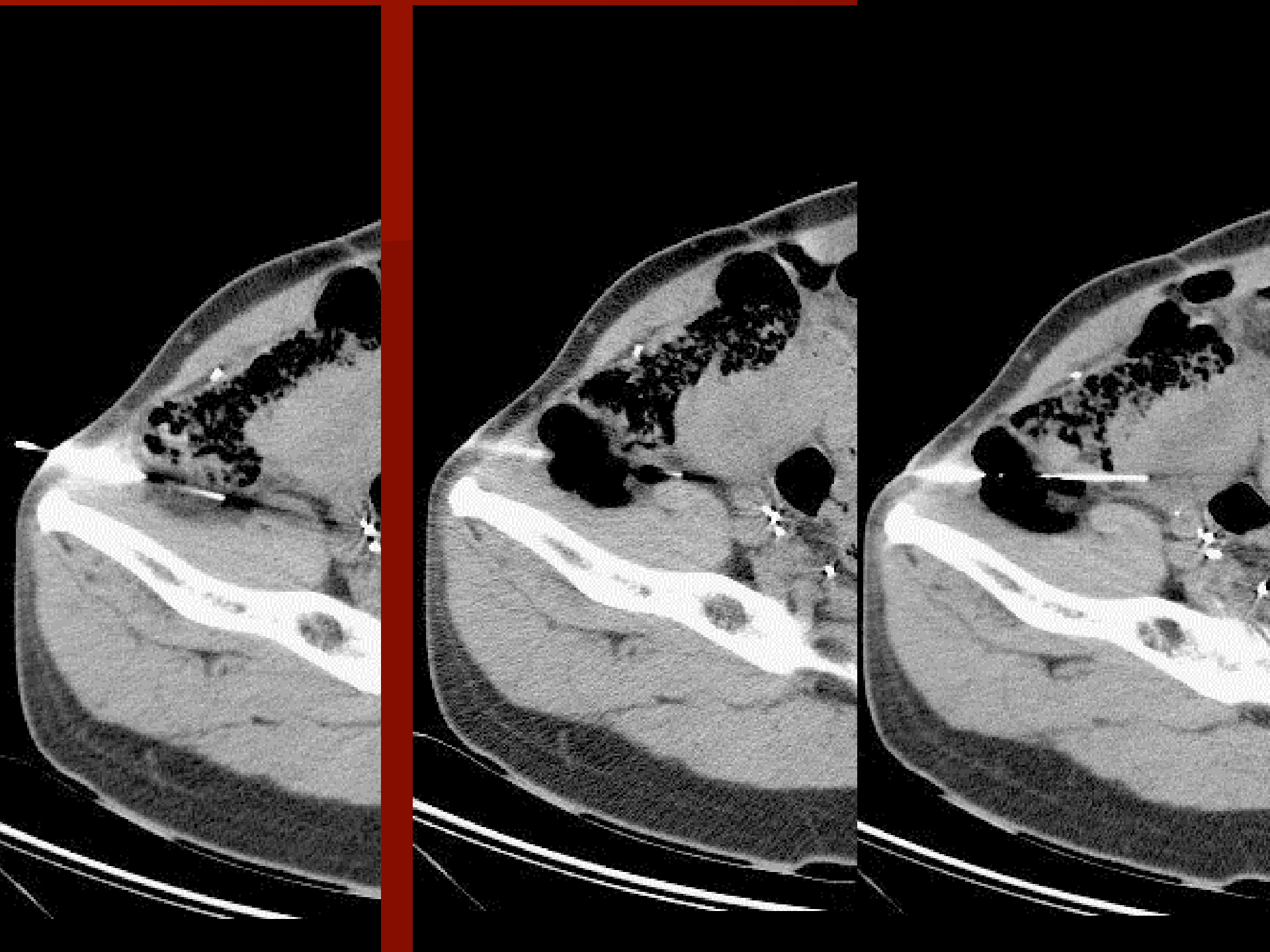
On first impression using cryo around vessels would seem dangerous but massive blood flow in aorta heat source

- BX & image REAL Bmarkers
- Ephrin, CAIX, MCT4, DWI, triple negative breast
- Rx: chemical, thermal, cryo, Microwave
- Nerve blocks-celiac,etc different methods
- Fiducial markers Rad.Rx
- Fluid Rx: pseudocyts, abscesses, parasites
- Deep lesions-medistinum
- Multiple large needle samples:chemistry gene
- Chiba:Superficial lesions

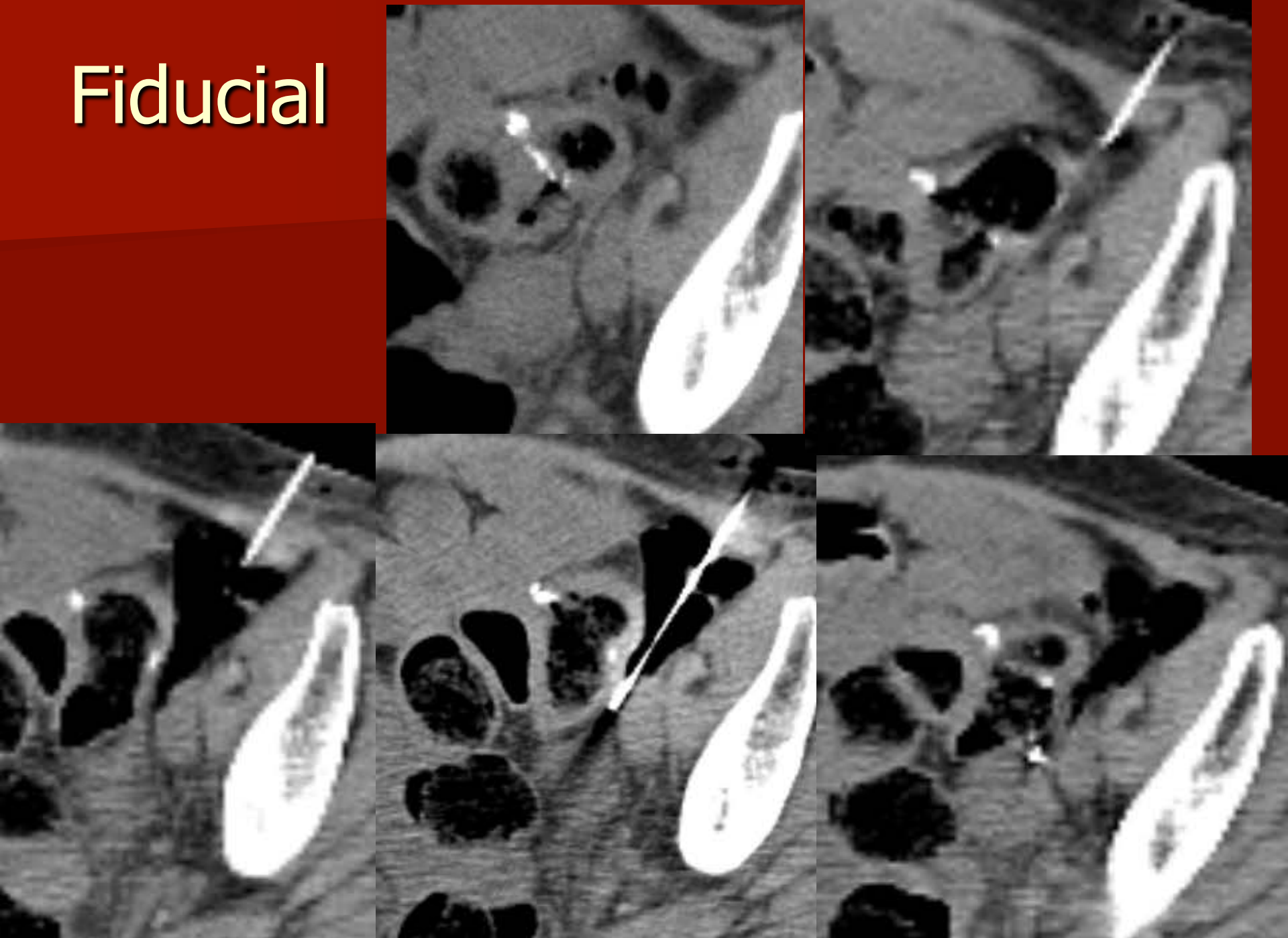
Thank you for opportunity to participate and your attention

Movement of organs or planes by injection of gas or fluid

- CO2 or air will effectively push bowel out of pathway but does not work with solid organs because they are heavier and the as compresses
- Saline or sterile water can push planes more easily and some organs, to clear pathway for safe procedure
- Both materials dissect along longitudinal pathway and are absorbed so the leverage is lessened.



Fiducial



Celiac Nerve blocks

- Blind technique or fluoroscopy
- Purpose to destroy celiac nerve plexus to provide pain relief for intractable pain,i.e pan CA
- Chemical injection
- RF abation
- Cryoablation-from 35 yr experience, cryoablat. Method of choice: more effective, permits treatment of cancer invasion of plexus, fewer complications because local effect, major vessels are not affected

Historical Evolution of Celiac Nerve Block

- Procedure to relieve severe abdominal pain due to tumor
- Guidance: anatomic landmarks, fluoroscopy, CT
- Earliest approach nerve destruction by bilateral injection 50cc of phenol or alcohol, later unilateral 20cc EtoH
- Recently used radiofrequency but now prefer cryoablation: local effect of ice ball target seen, treats thru cancer invasion of plexus, vessels are not affected because of heat transfer

Correlation Between Grade of tumor and Pain Relief,Akhan et al, AJR,1997;168;p1565

- Twenty five cases-extension graded I, II, III,IV
- I-fat planes intact, II>50% intact, III> %invaded, IV>fat planes totally invaded
- Pain graded 0-+3 (+3 less pain) stated differently O means no pain relief

Results-pain after block

- Grade I: +3 in 4/4
- Grade II: +3 in 3/12, +2 in 6/12, +1 in 3/12
- Grade II: +2 in 2/6, +1 in 3/6, 0 in 1/6
- Grade IV: 0 in 3/3

- Bottom line more invasion, less relief
- Two patients with Grade IV,leaked to thorax

CWRU / UH Approach with Radiofrequency

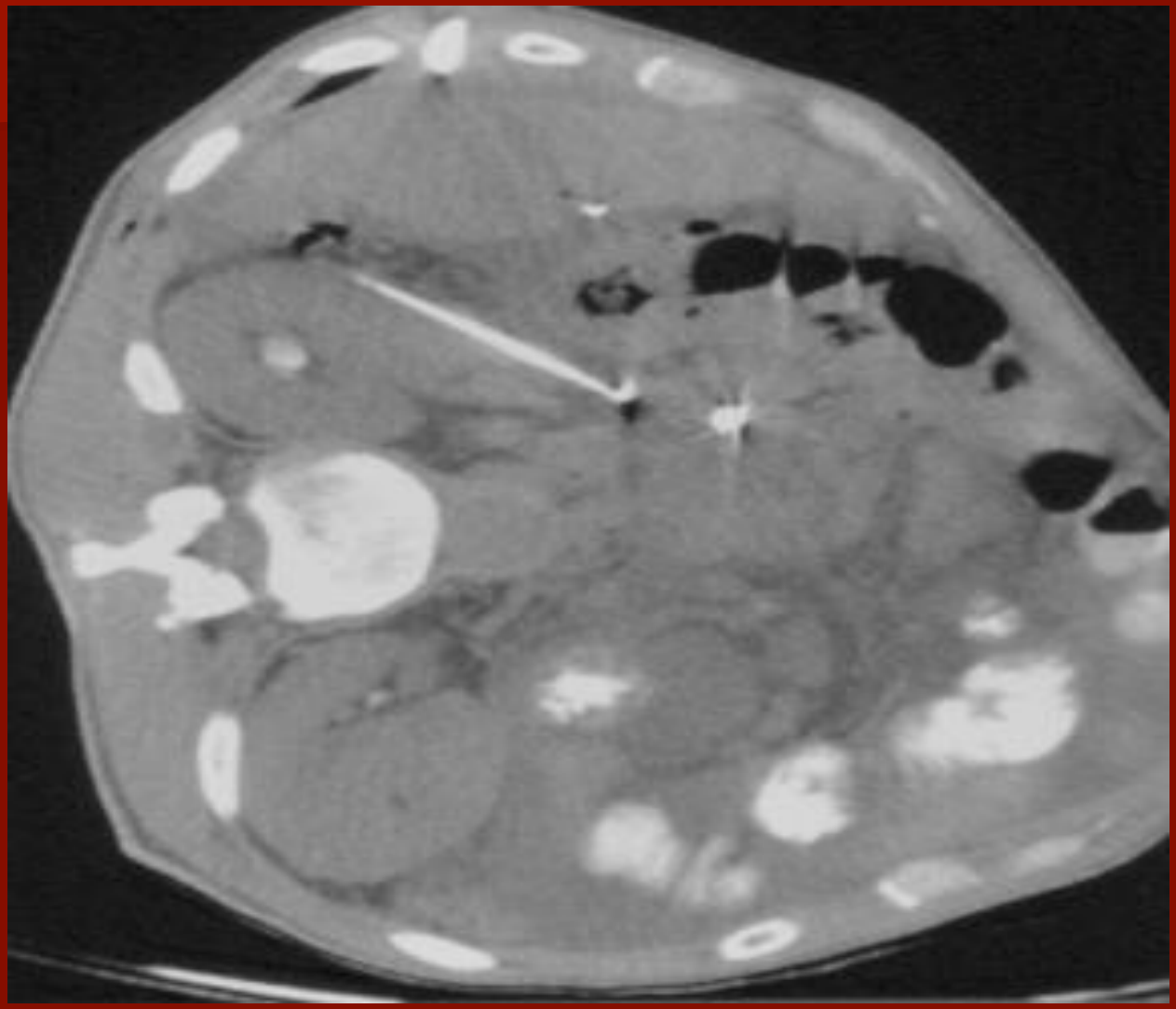
- Radionics RF Generator
- 18 gauge monopolar RF probe
- RF current to heat tissue to 90^0 C
- Duration determined by algorithm

Patient 1

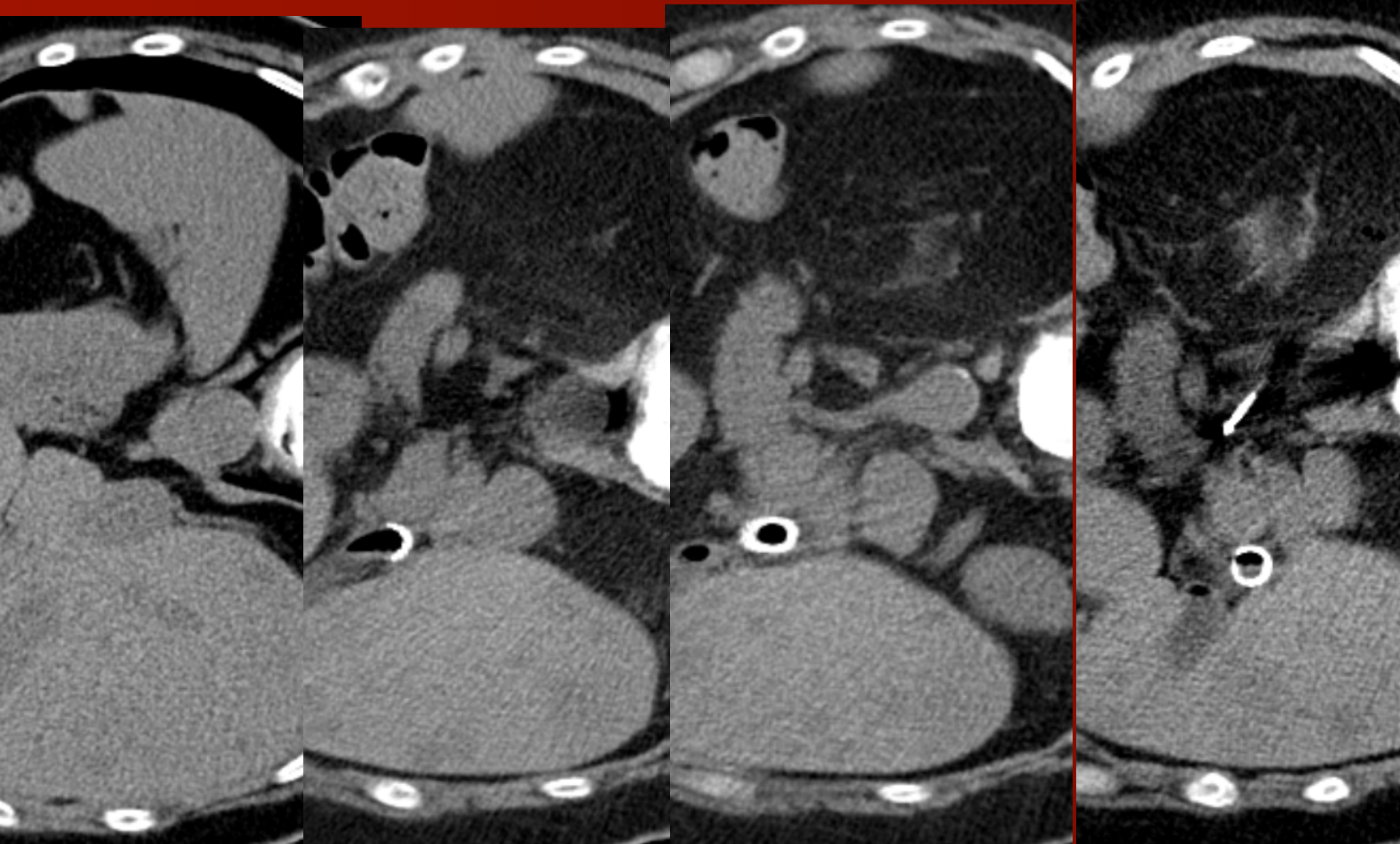
41 year old man recurrent pancreatico-biliary carcinoma

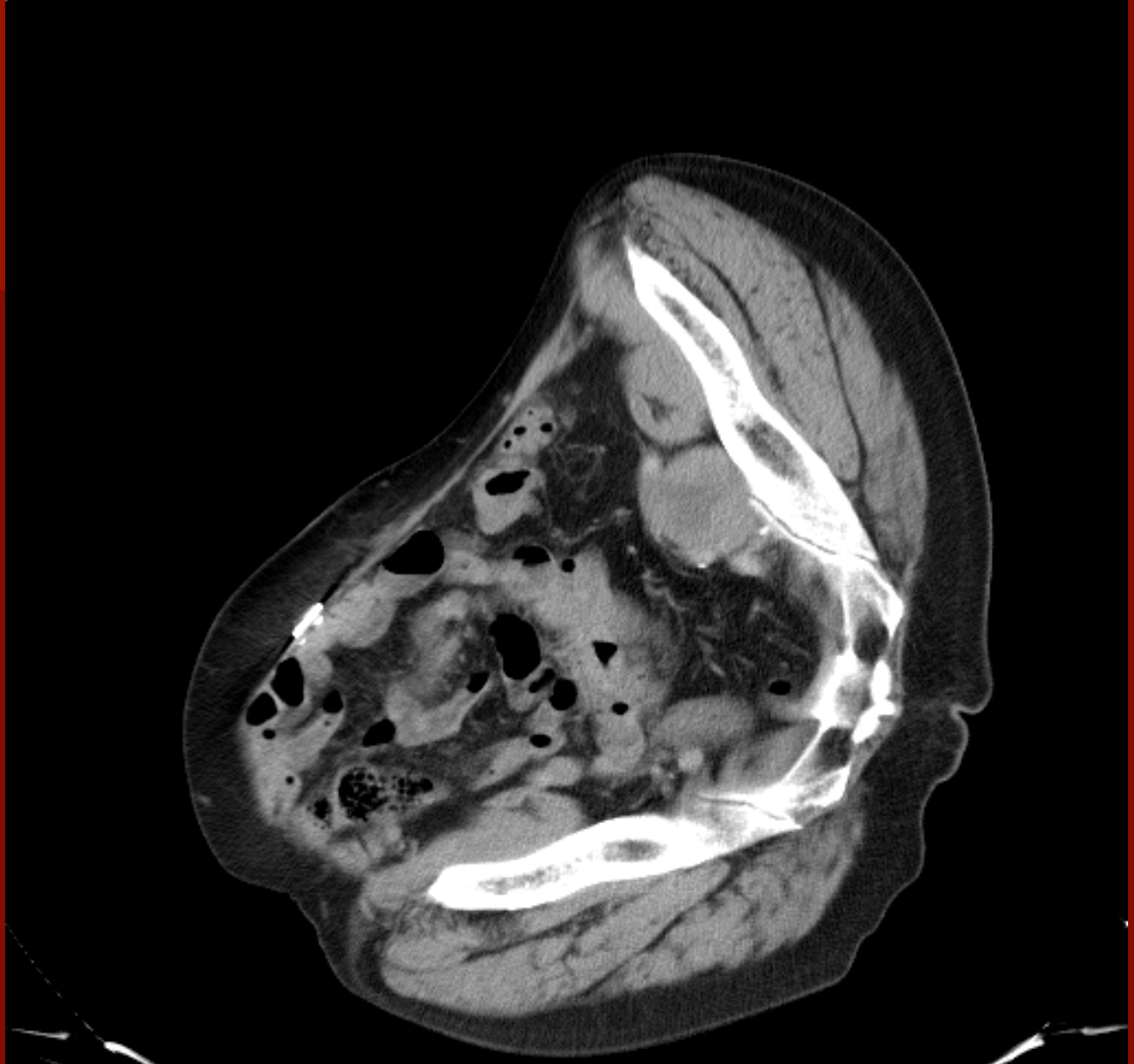
- Whipple procedure 4 years previously
- Severe, deep epigastric pain despite opioids
- Excellent pain relief with RF
- Elimination of oral opioid requirement

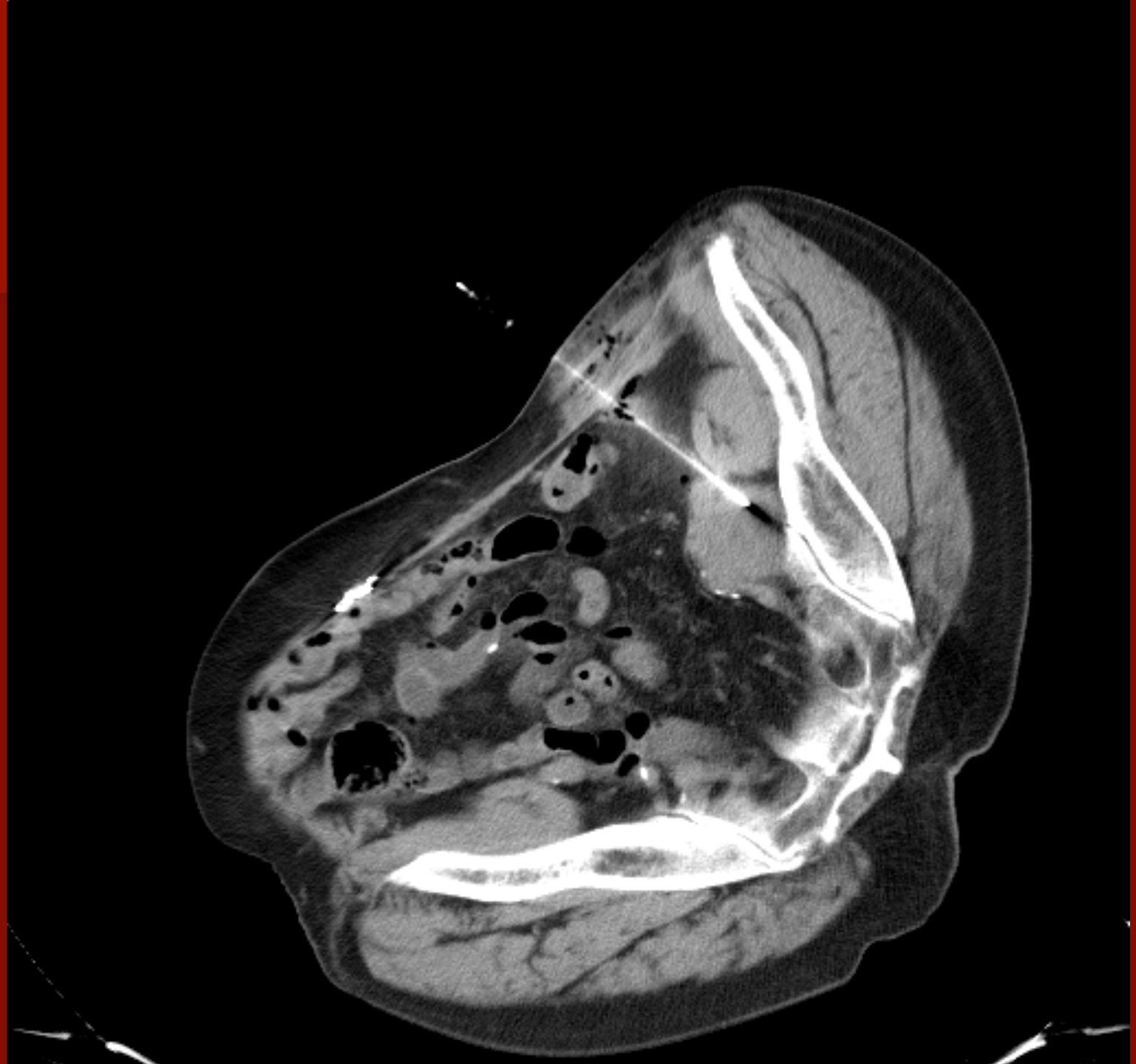
41 y/o man s/p Whipple procedure

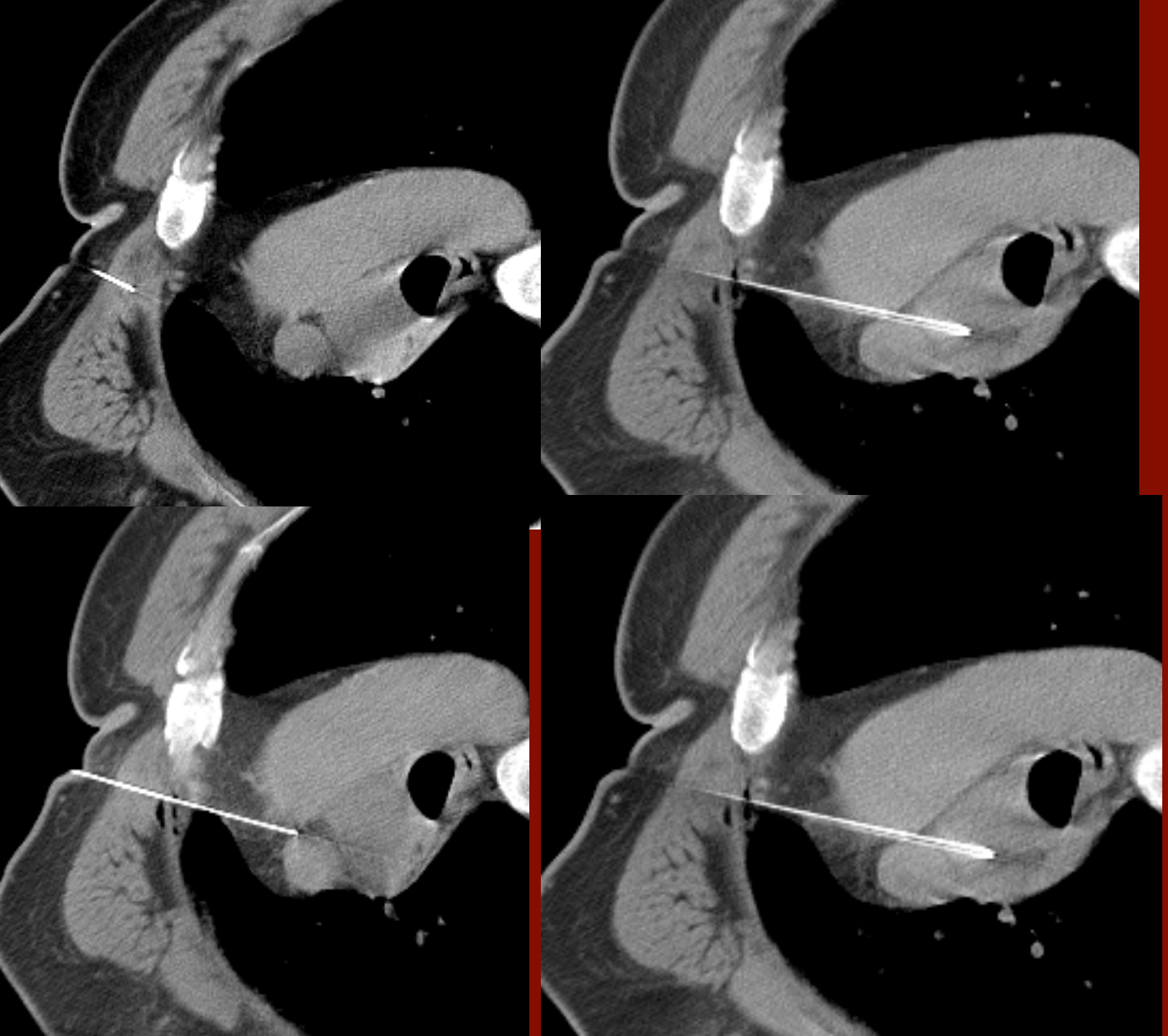


Cryoceliac Block

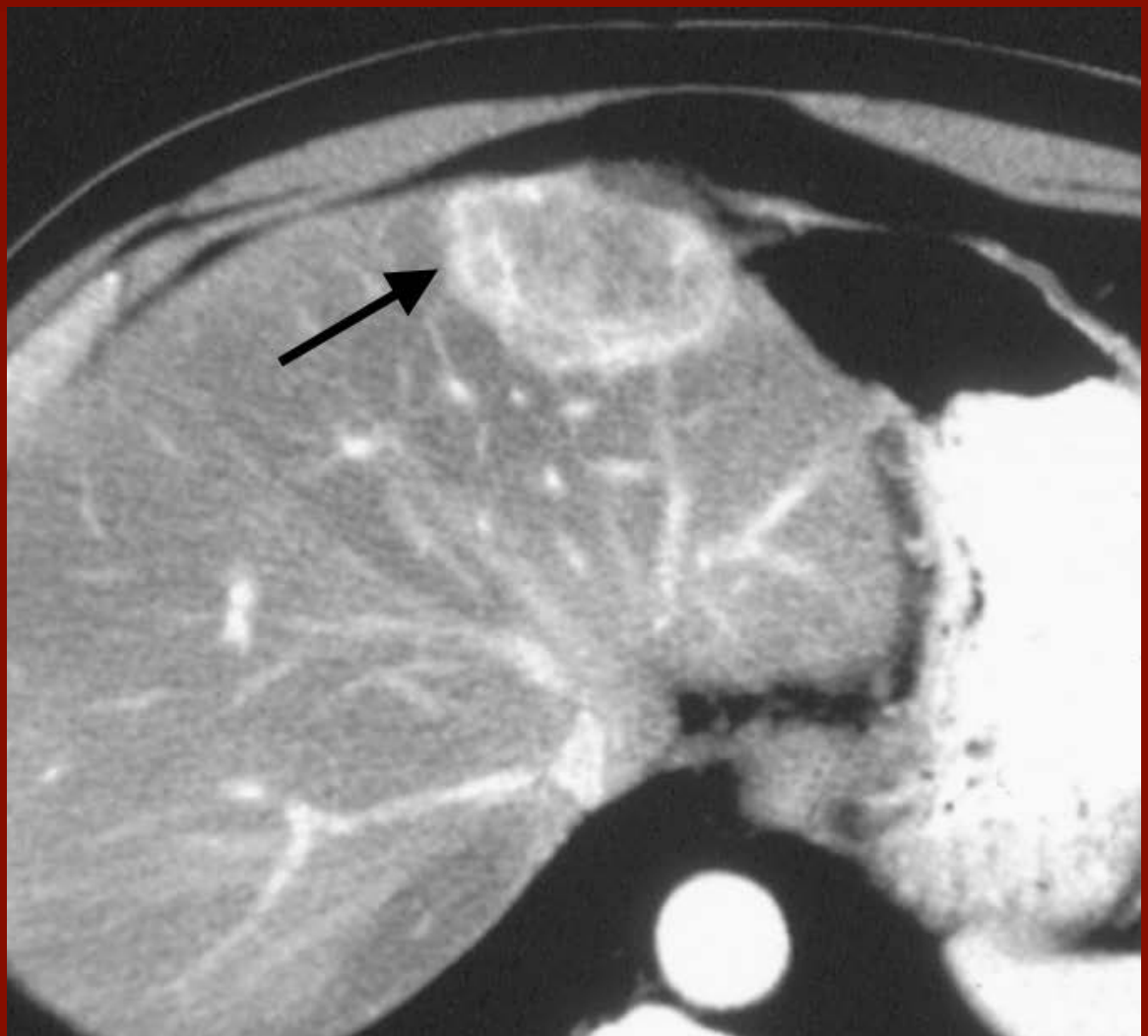




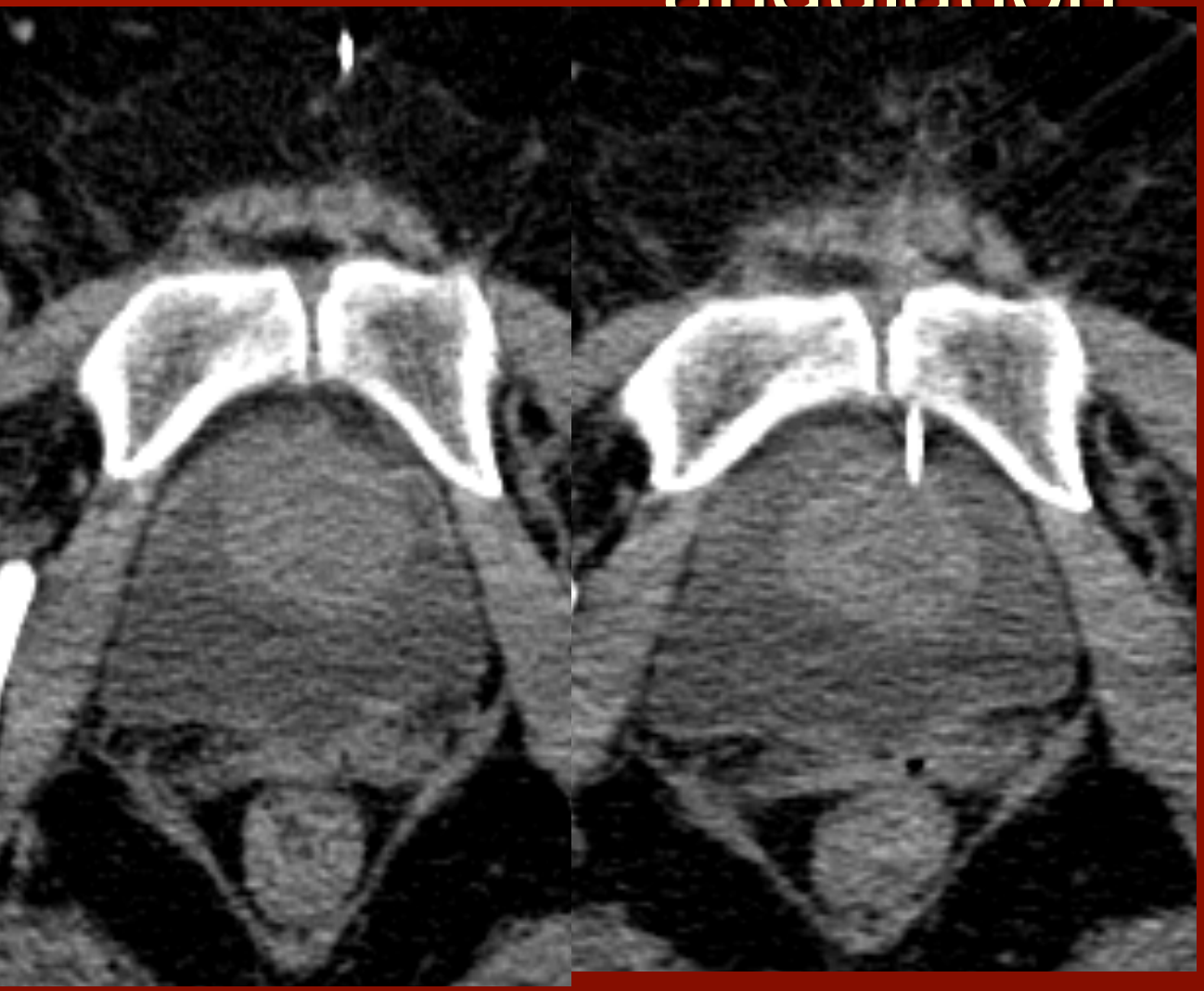




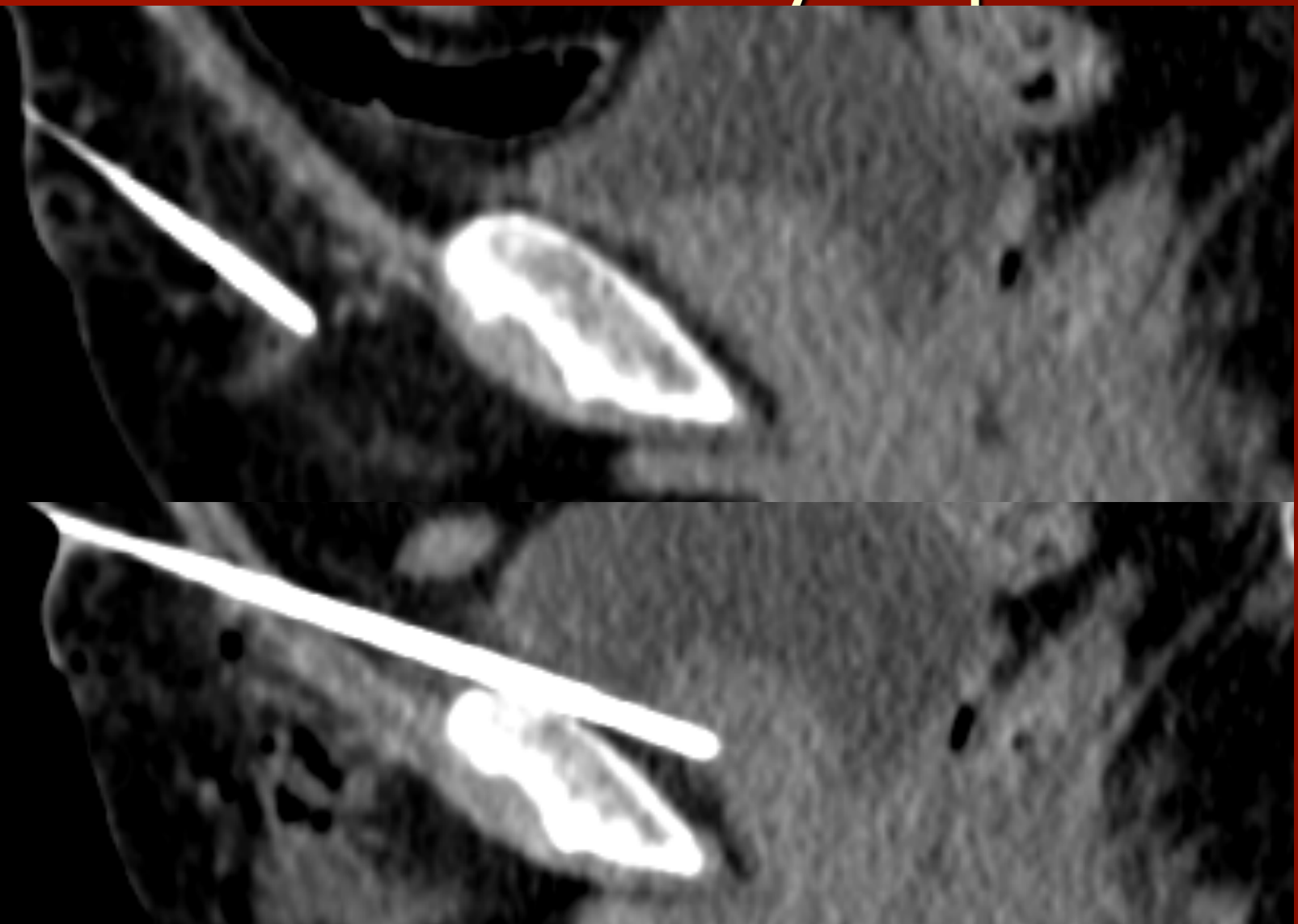
Bolus injection shows increased vacularity/vessels. Can avoid vessels, choose needle, or hemostatic method

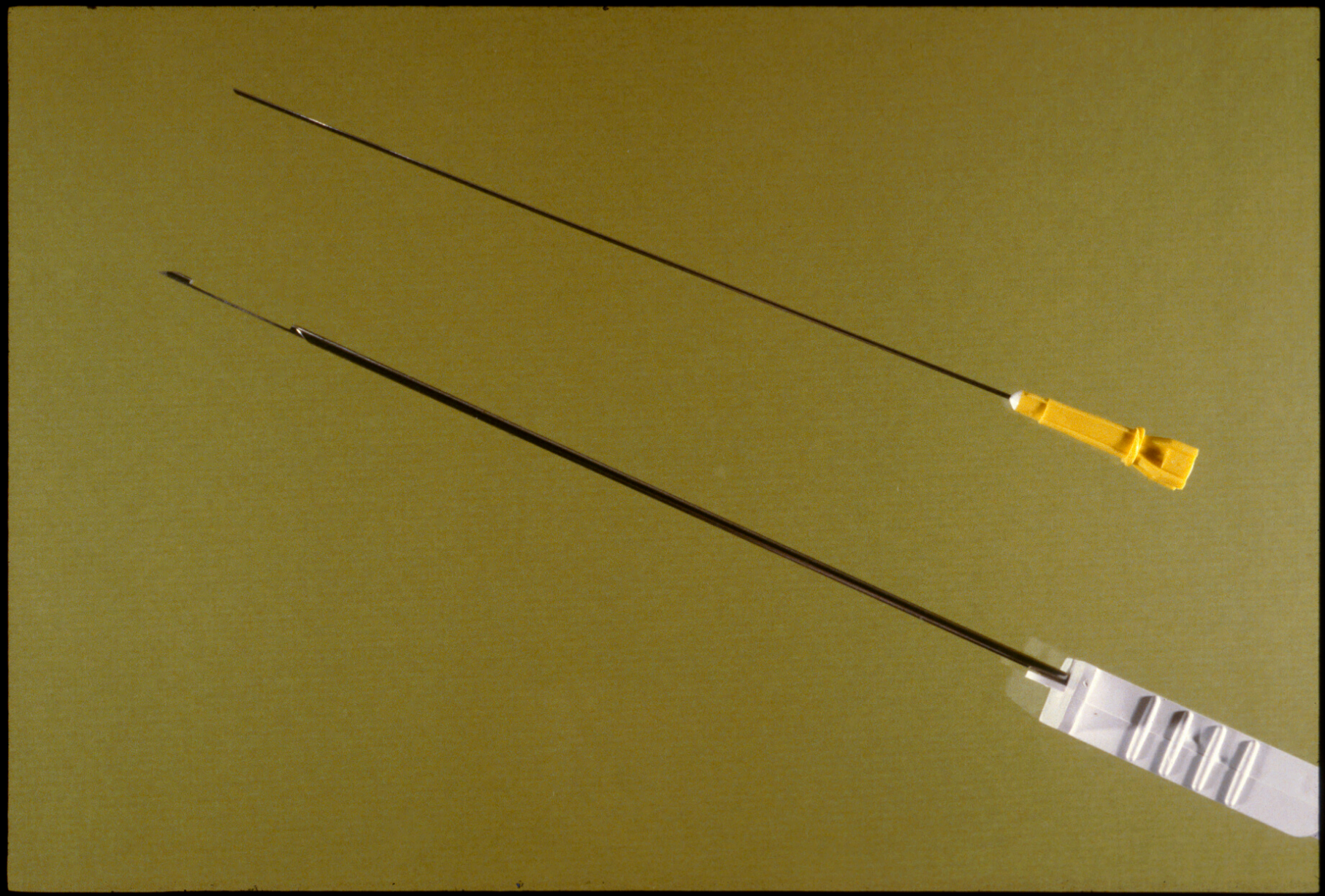


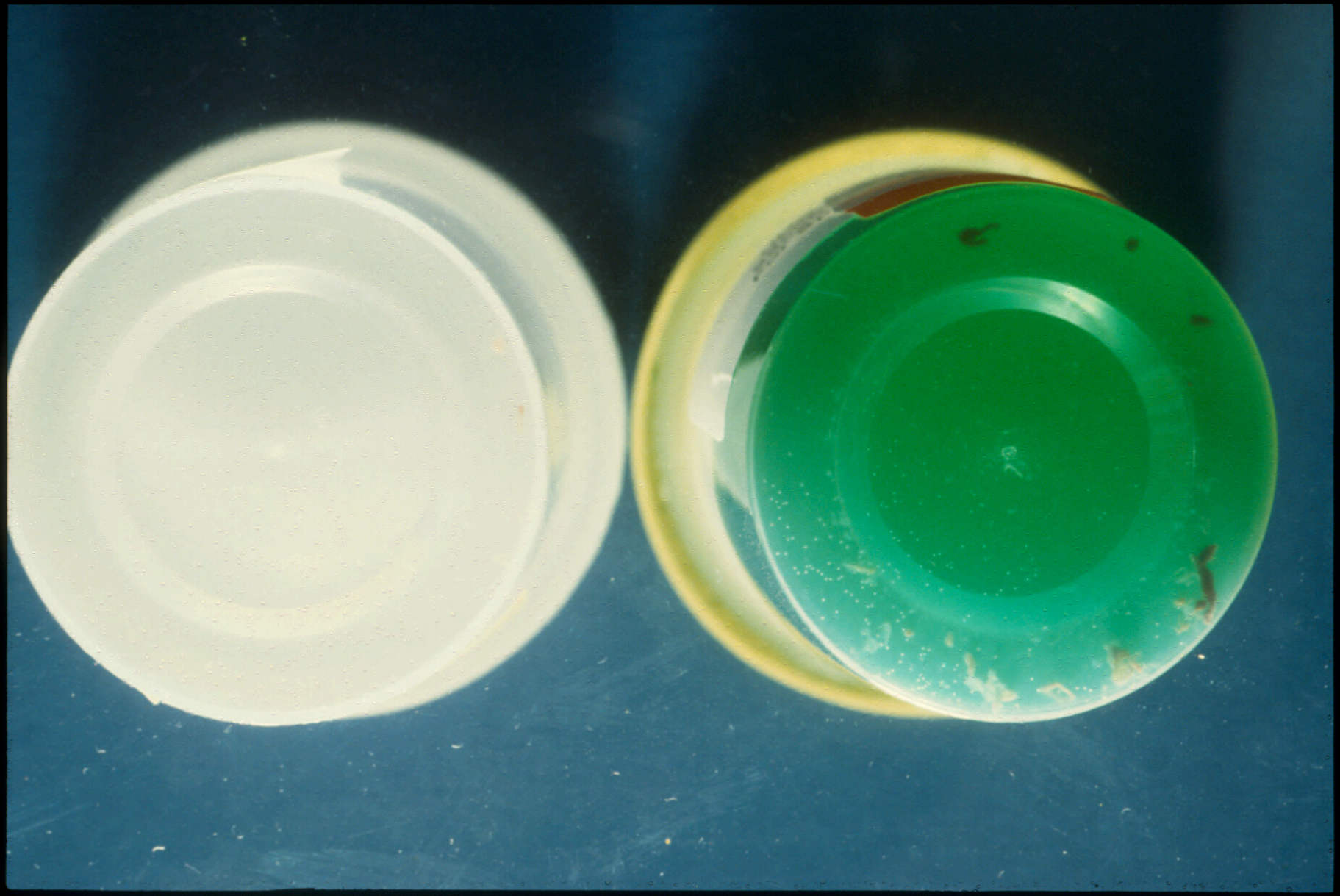
7.To biopsy mass in front of bladder, use anterior approach with acute angulation

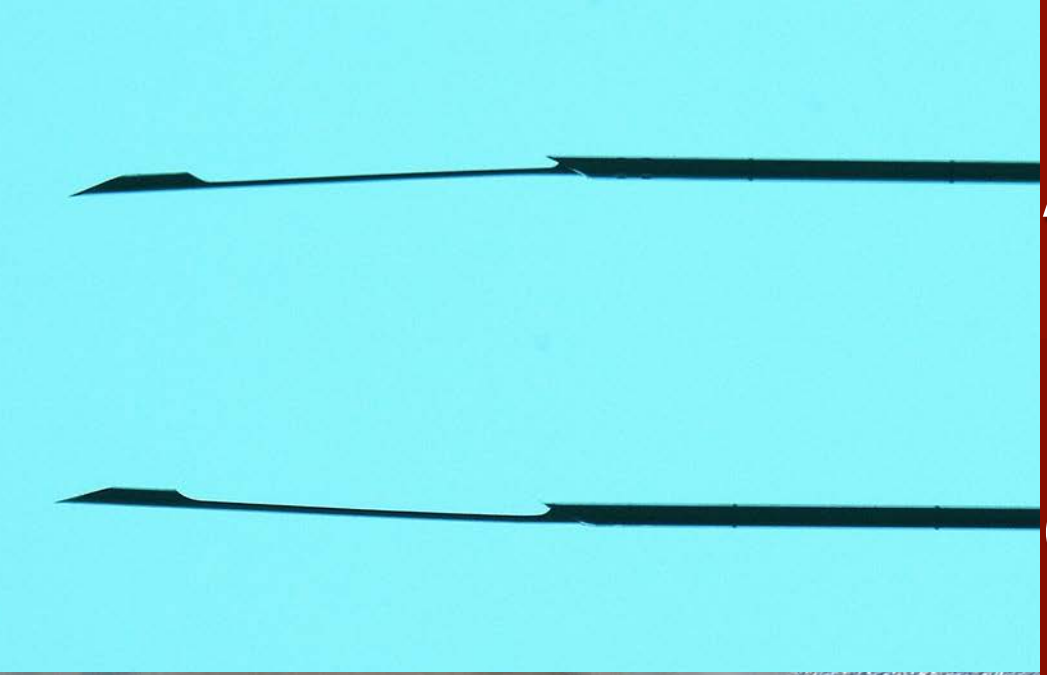


7.If plane of needle can be found, 3D is very helpful







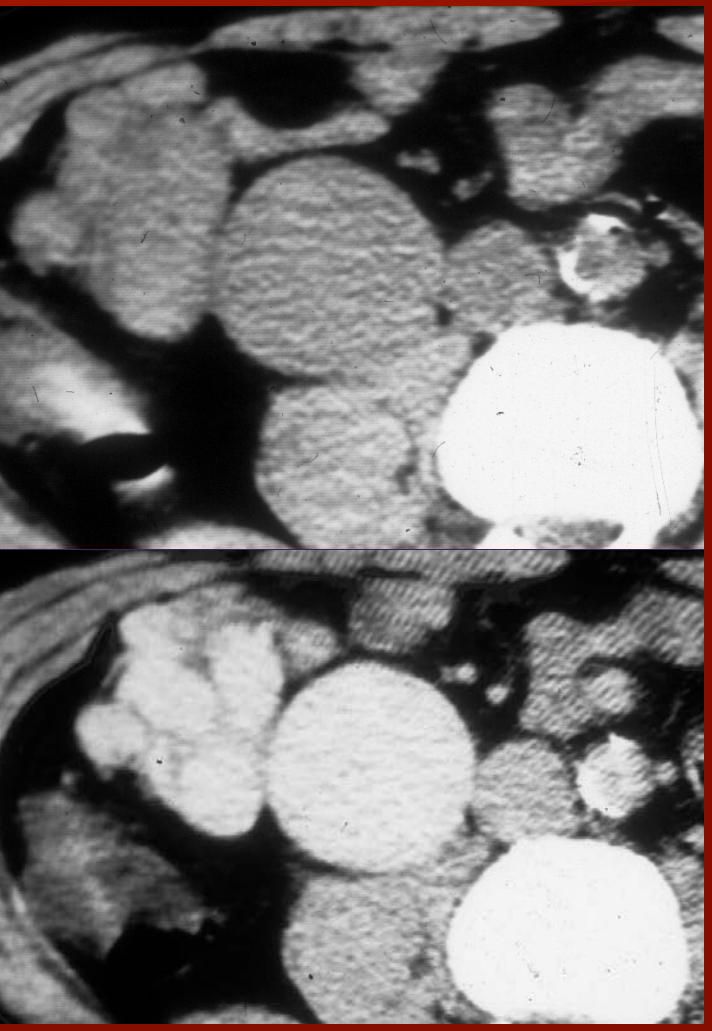


Important:

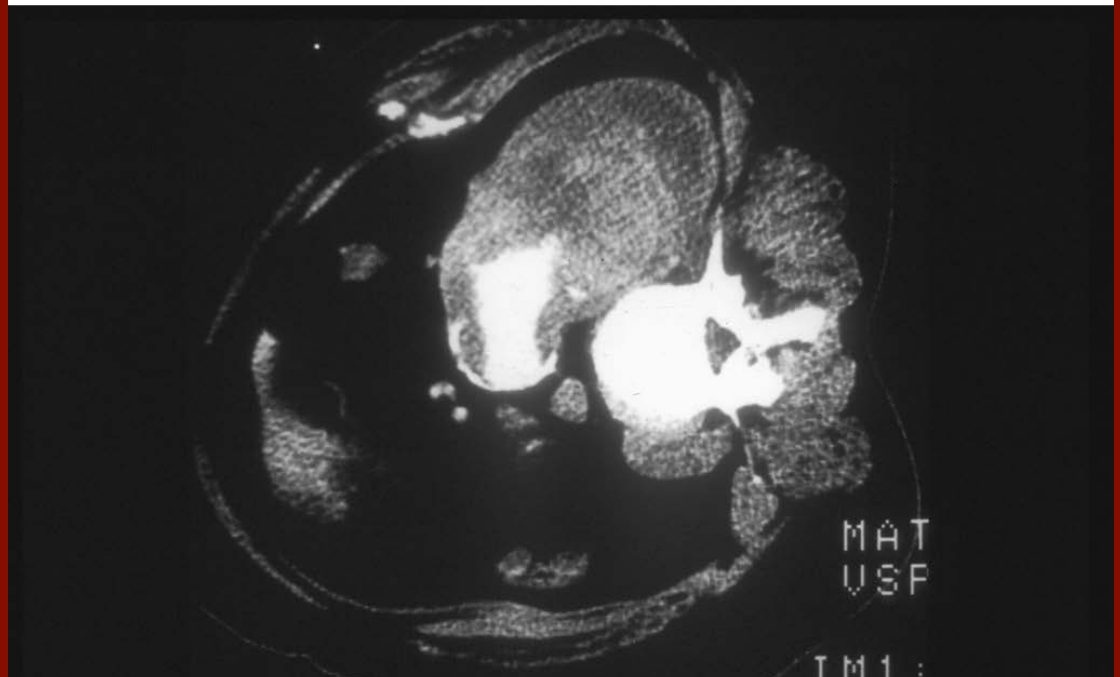
Always check for changes or flaws

Configuration of end affects the yield of the tissue sample

Large retroperitoneal varix simulating LN; schedule BX cancelled




99
BODY
THK 5
A


MAT
VSP

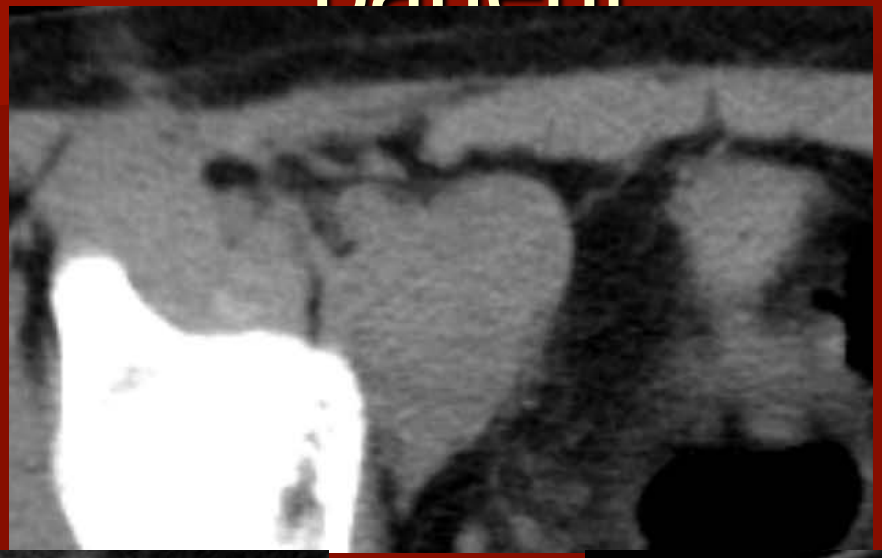
Methods to Resolve Anticoagulation

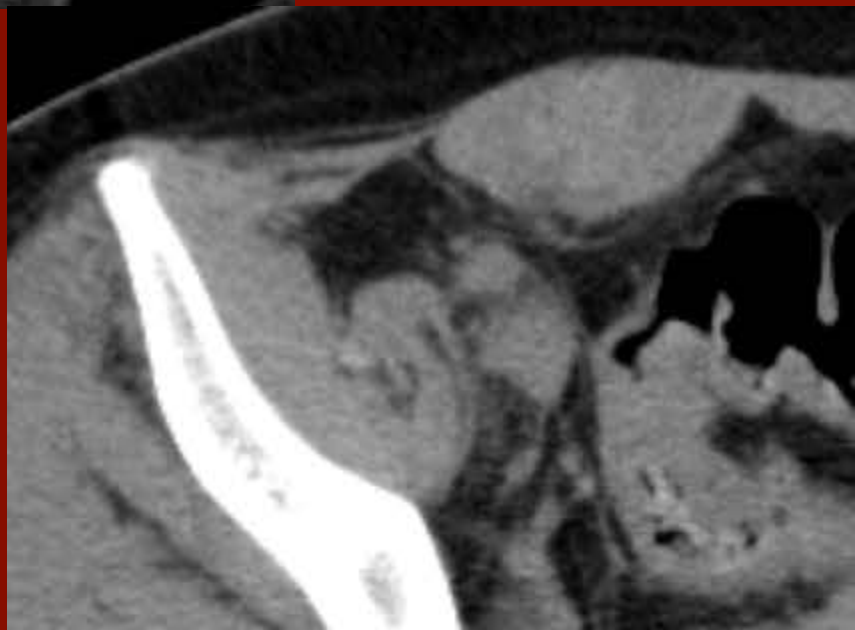
- Stop medication: ASA-7 days, ibuprofen and like drugs 24 hours, Coumadin check PT, Lovanox- ????
- Uremia- administer DDAVP, makes platelets sticky
- Systemic injection of blood products
- Local closure of biopsy site: 1)pre emptive injection of blood products 2)mechanical closure, coil and thrombin preferred some use gelfoam

Pre emptive treatment for coagulopathic patients-injecting blood product in pathway

- If INR abnormal, inject ffp in pathway, with xylocaine, after xylocaine, at completion
- Low platelets, inject platelets, etc
- Lovinox inject ffp, etc
- Hemophiliac,inject factor VIII
- Creates local collection of missing product, with very high concentration

If stab wound continues to bleed check and recheck lab record,ask patient





Pre emptive treatment for coagulopathic patients-injecting blood product in pathway

- If INR abnormal, inject ffp in pathway, with xylocaine, after xylocaine, at completion
- Low platelets, inject platelets, etc
- Lovinox inject ffp, etc
- Hemophiliac,inject factor VIII
- Creates local collection of missing product, with very high concentration

LIBE (locally injected blood elements) Technique

- 1)After selection of target and entrance site and antiseptic preparation, local anesthetic injected through entire pathway from skin into organ
- 2)Local anesthetic/50% blood product injected in and along pathway down to and into organ. When needle fully inserted, “back fill” during needle removal with 15 cc of 100% FFP or platelets
- 3)Re inject with needle from skin to organ with 100% blood element.

Rabbit model, JVIR, 2012- Dr.Wilkins

Body weight, Whole Blood Clotting Time (WBCT), and Prothrombin Time (PT) †

	Body Wt (Kg)	WBCT (sec)	PT (min)
Untreated Control Pigs (n=3)	32.3 +/- 3.0	270.8 +/- 33.8	10.9 +/- 0.3
Coumadin-treated Pigs (n=5)	24.6 +/- 1.1	614.9 +/- 109.4	44.3 +/- 9.0
Aspirin-treated Pigs (n=4)	25.1 +/- 1.4	326.5 +/- 27	11.1 +/- 0.1

Effect of instillation of saline, FFP, and platelets on post-biopsy blood loss in the liver †

	Control Biopsy	Saline	FFP	Platelets
Untreated Control Pigs (n=3)	4.8 +/- 0.83	3.90 +/- 1.6	1.76 +/- 0.43 *	1.03 +/- 0.56 *
Coumadin-treated Pigs (n=5)	3.68 +/- 0.53	3.76 +/- 0.83	1.10 +/- 0.33 *	0.69 +/- 0.11 *
Aspirin-treated Pigs (n=4)	4.55 +/- 1.34	4.14 +/- 1.06	1.03 +/- 0.22 *	0.86 +/- 0.16 *

Preliminary results Randomized Prospective comparison system correction versus LIBE (26 cases)

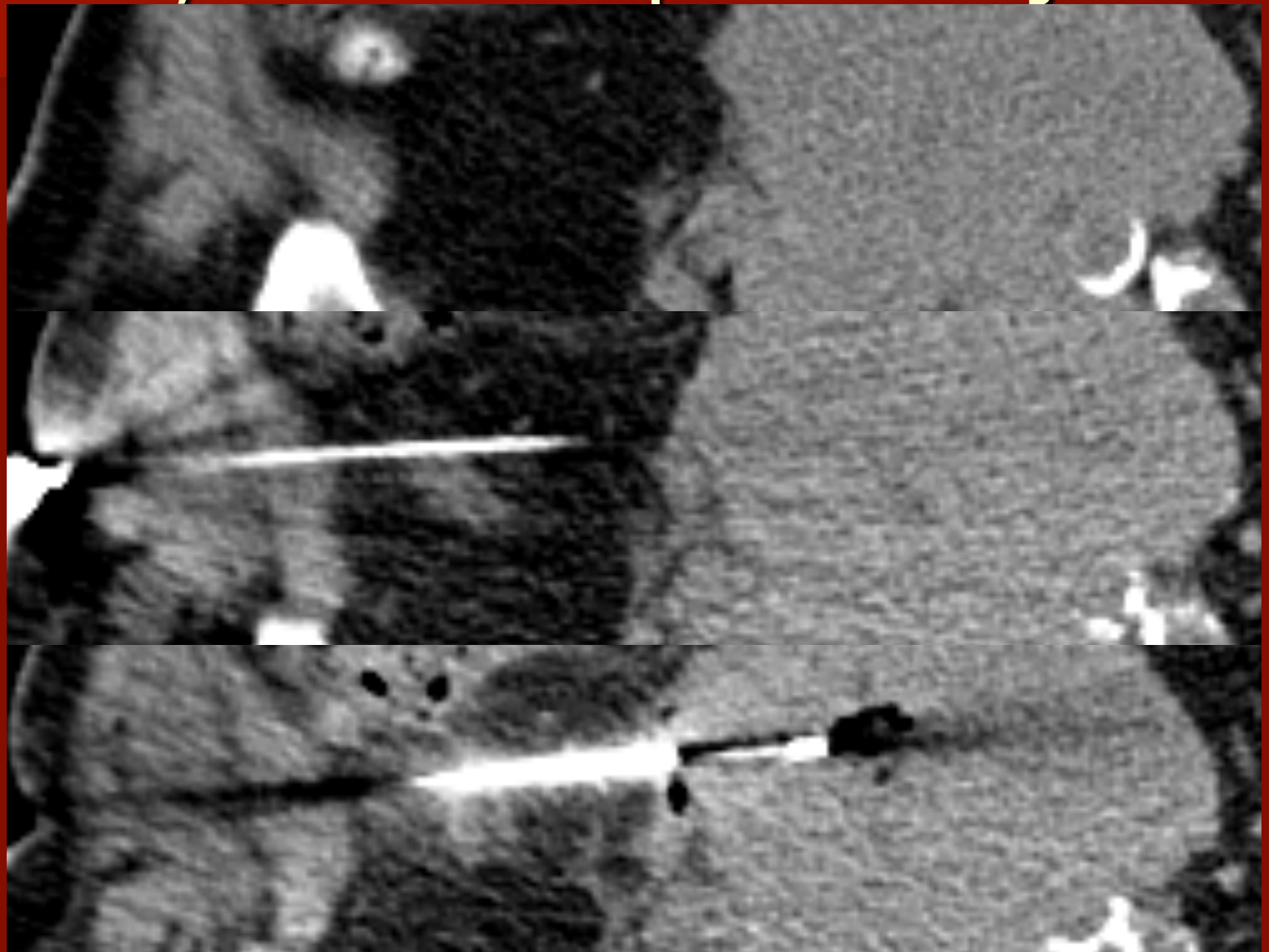
- Time interval between procedure request and performance: systemic 30 hours, LIBE 8 hours
- Amount of blood product used: systemic average 8 units, LIBE less than 1 unit
- Complications: 1)no bleeding either group

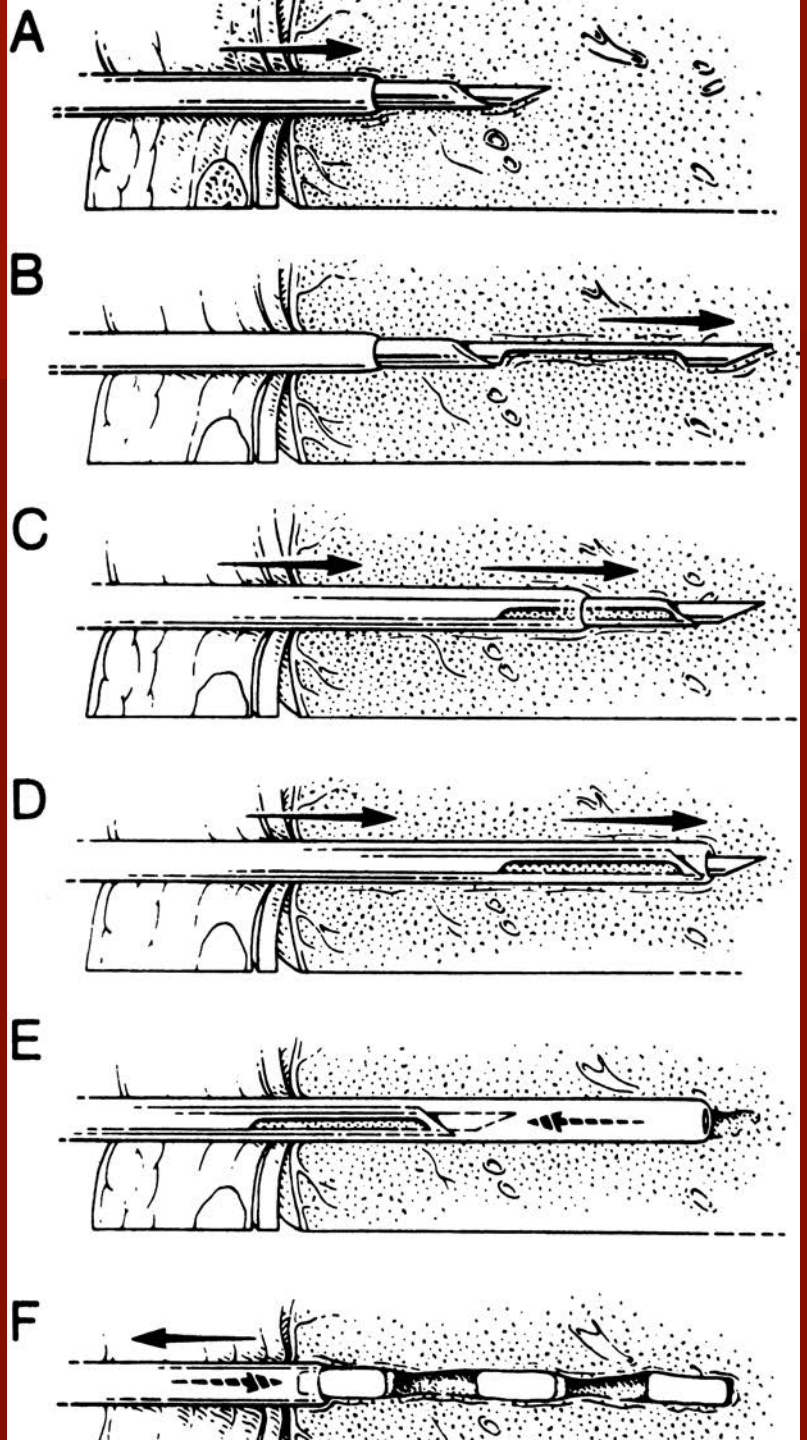
  2)one anaphylactic/idiosyncratic-system

  3)congestive heart failure-systemic

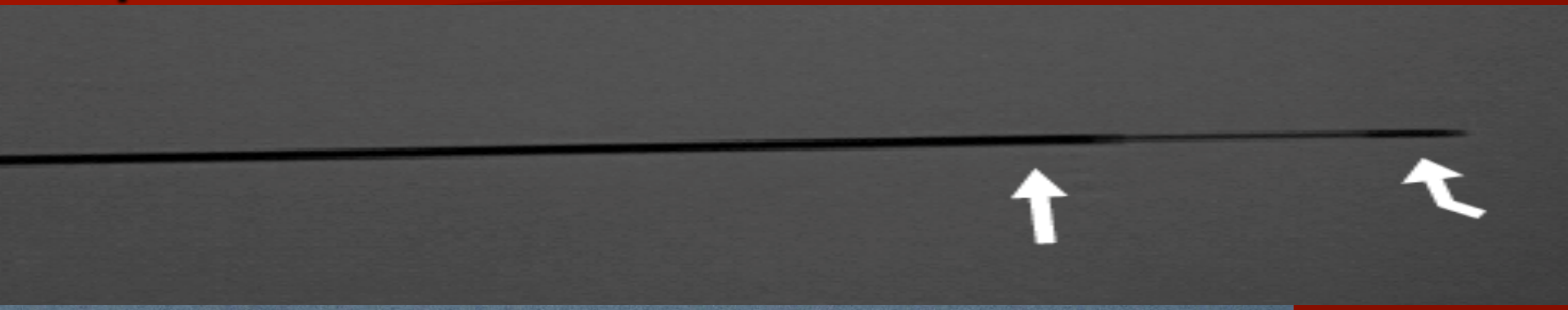
Not FDA approved but consistent with Belmont

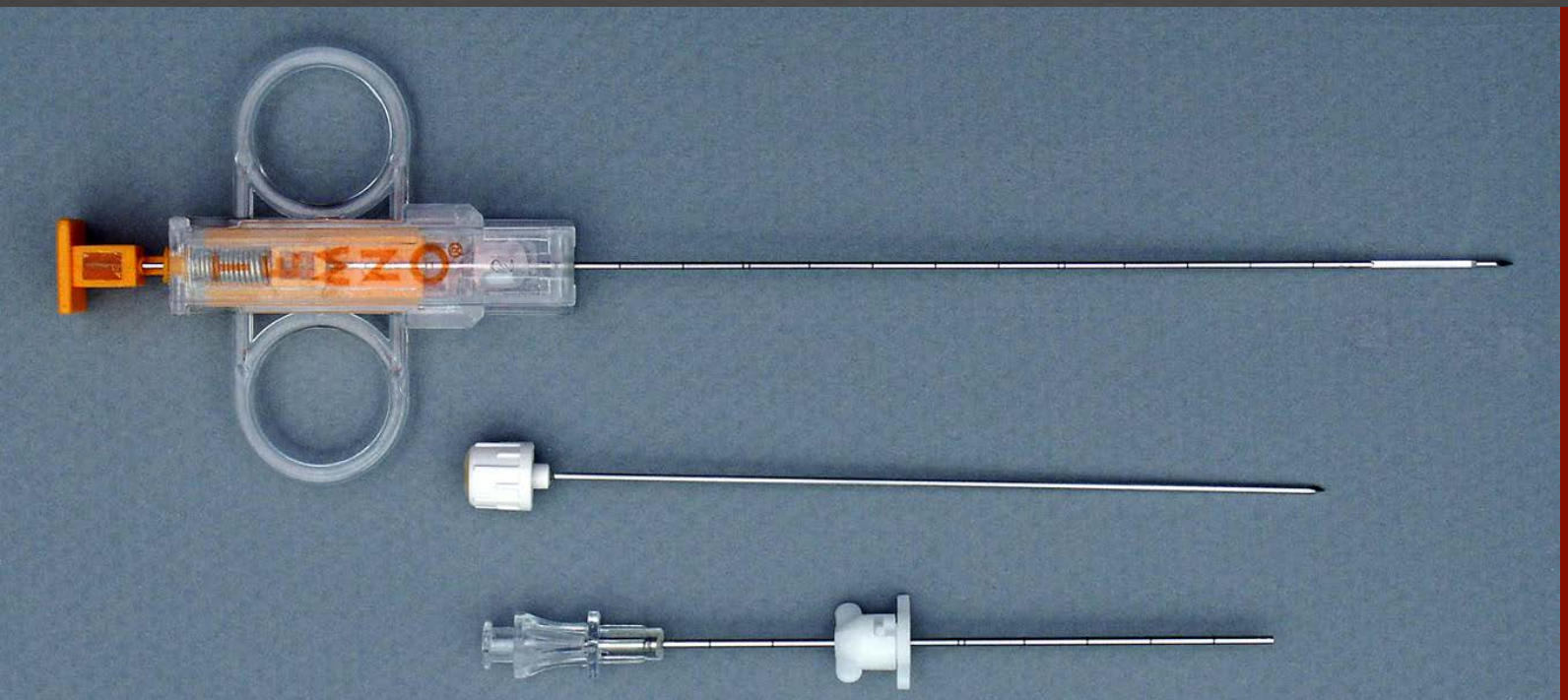
Patient with 10K platelets, cutting bx, after local platelet injection



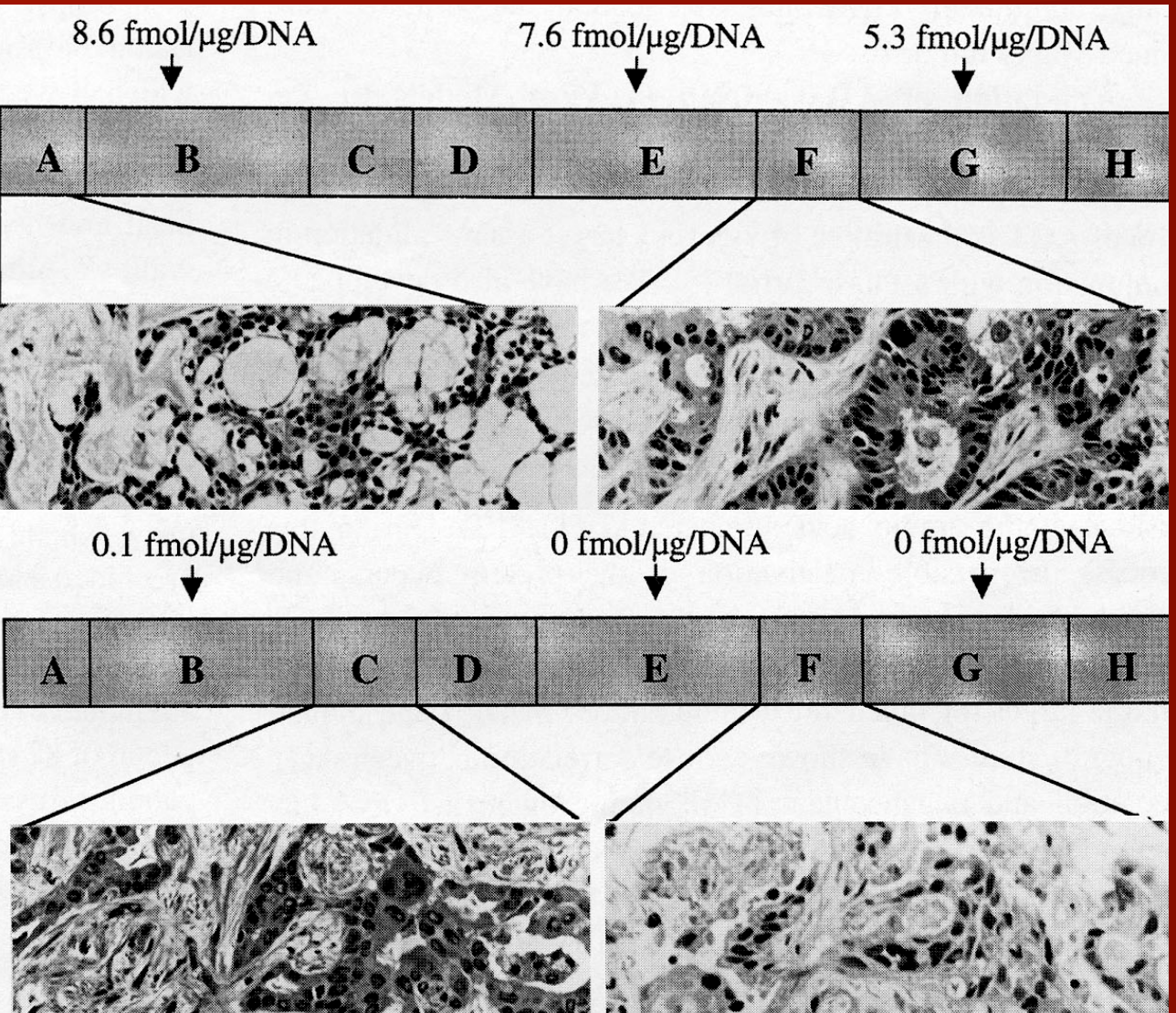

A
B
C
D
E
F

Prudent to use coaxial system:prevents tumor seeding and permits hemostatic closure with coil



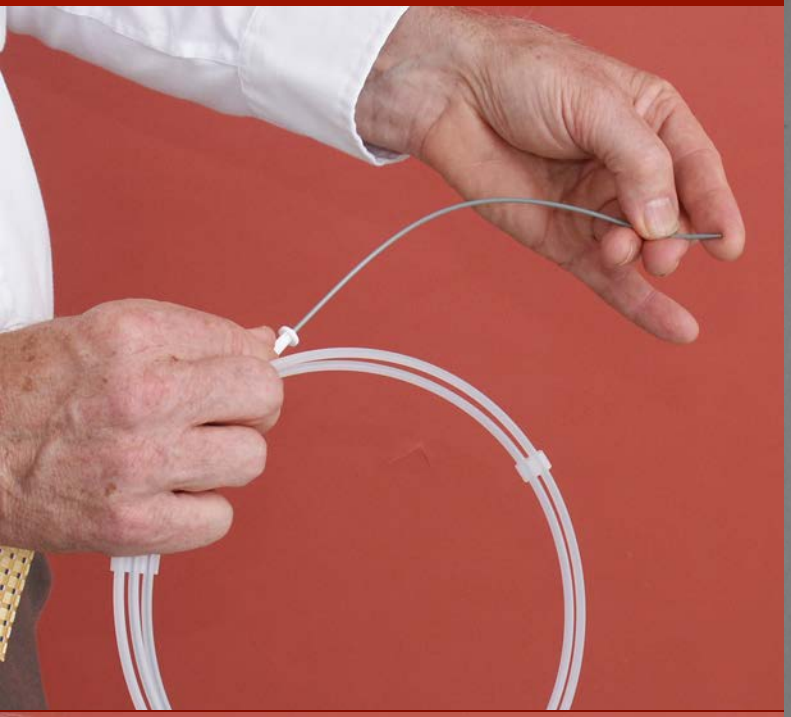


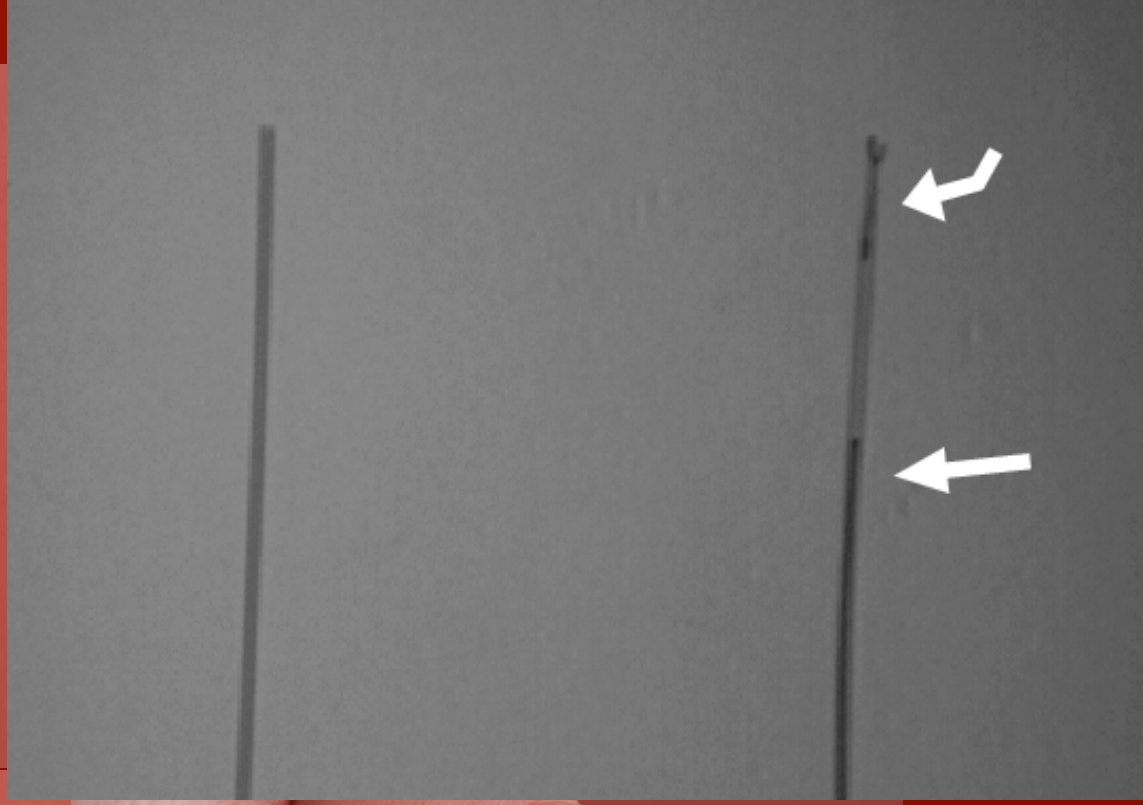
Action of chemotherapy assessed with microchemistry assay of tissue directly



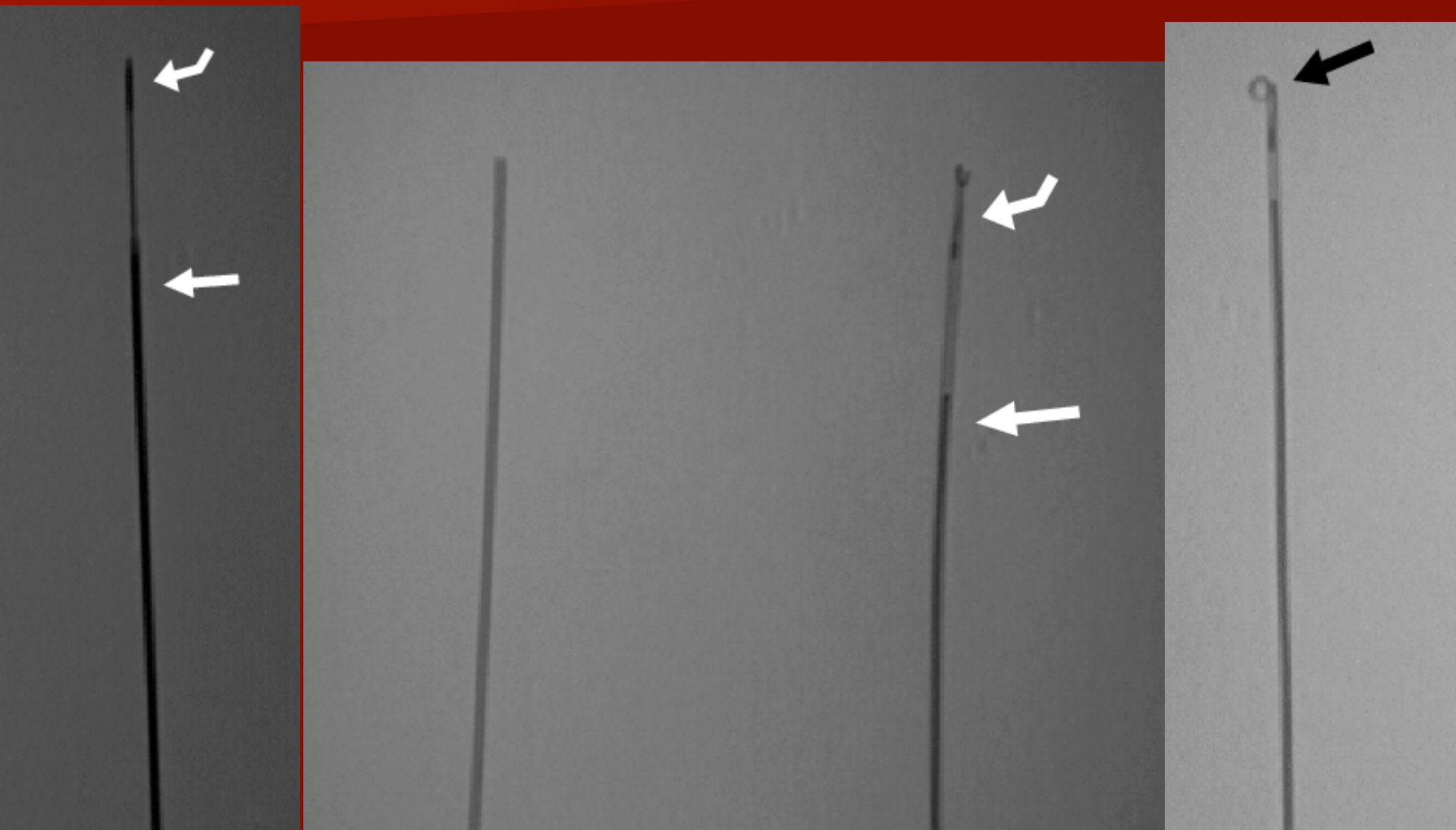
AGT activity pre TMZ

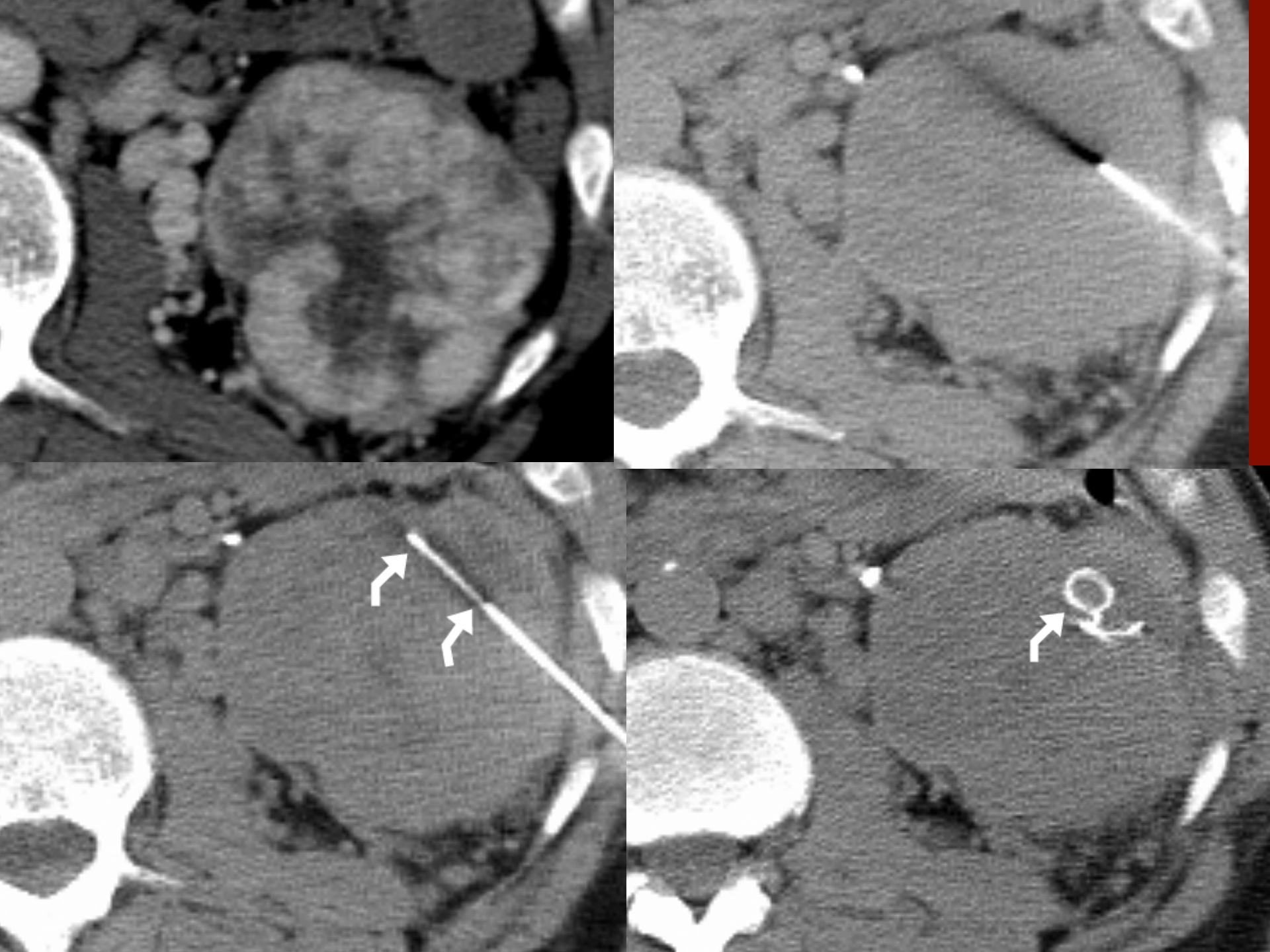
AGT activity post TMZ



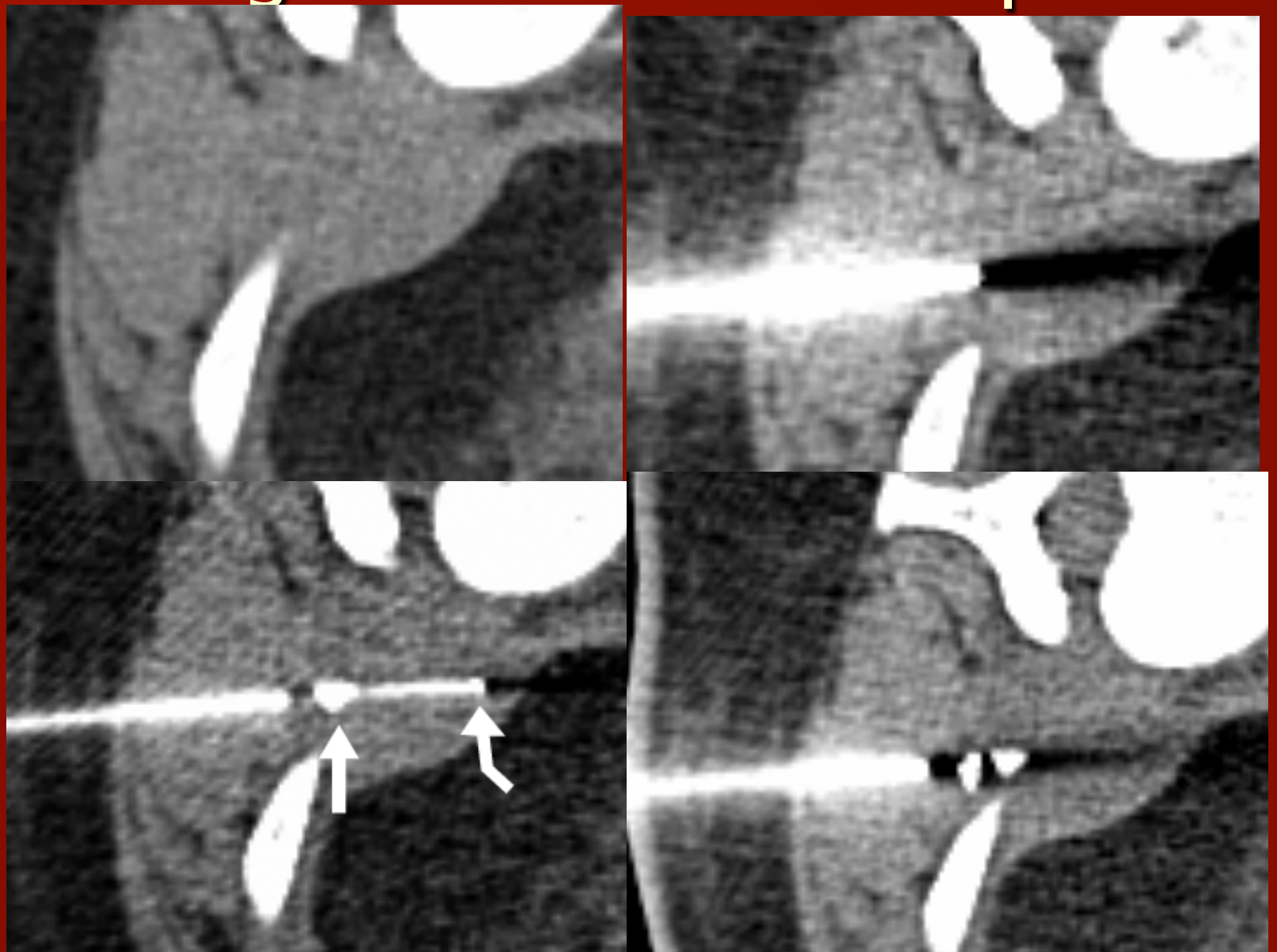


Load coil and thrombin in dilators ahead of time, cutting needle used, coil inserted



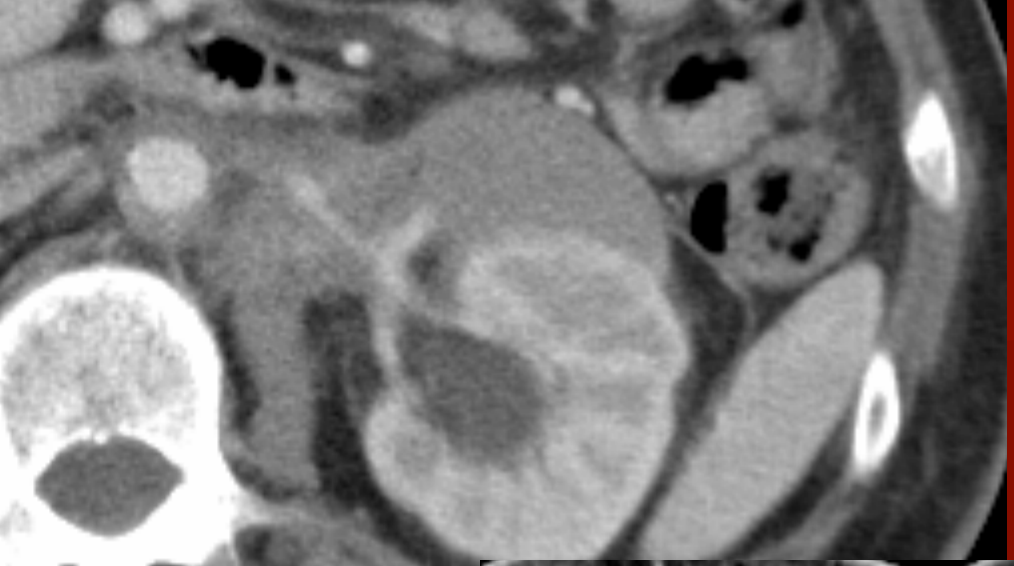


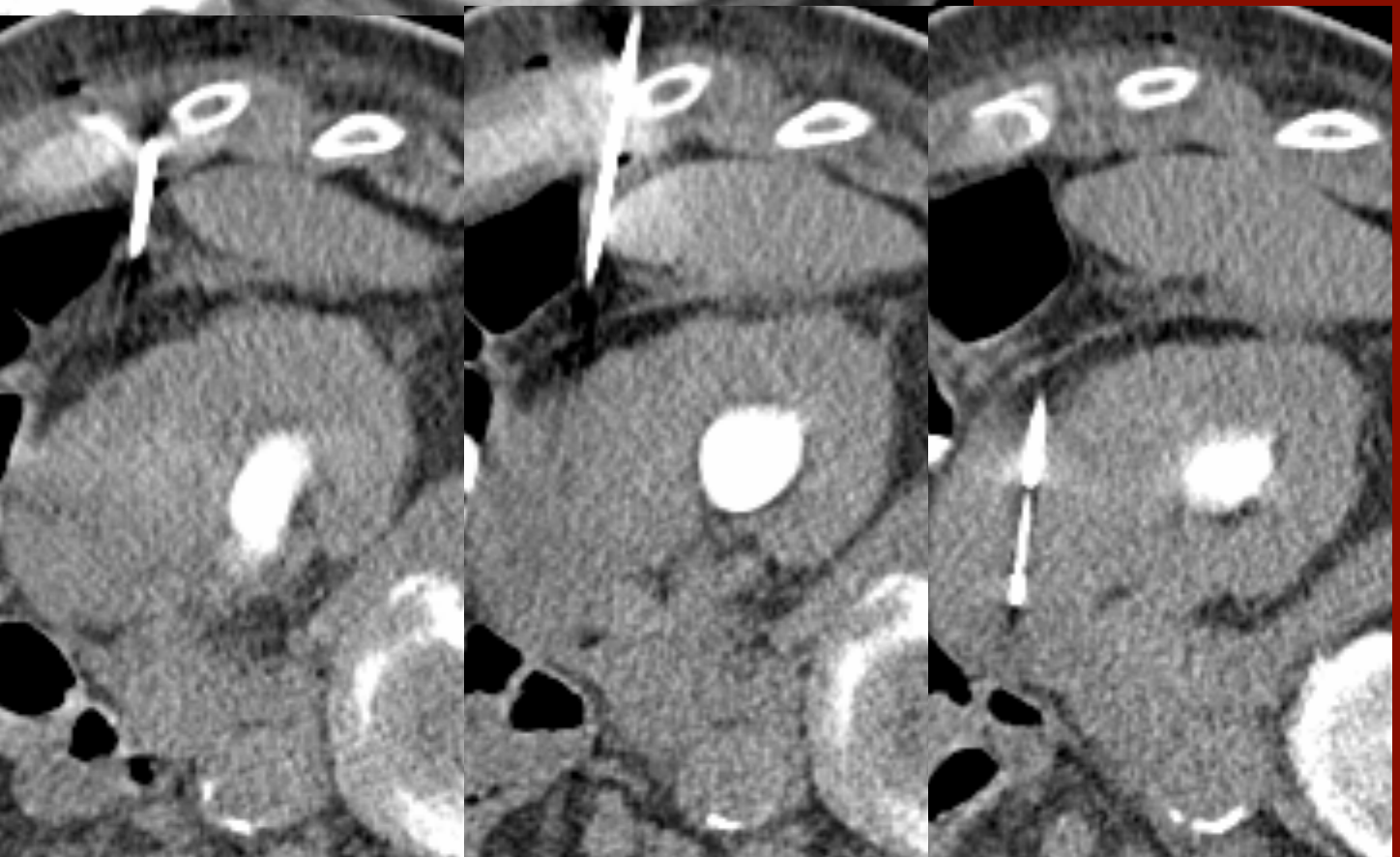
Unexpected bleeding can be managed with cannula in place



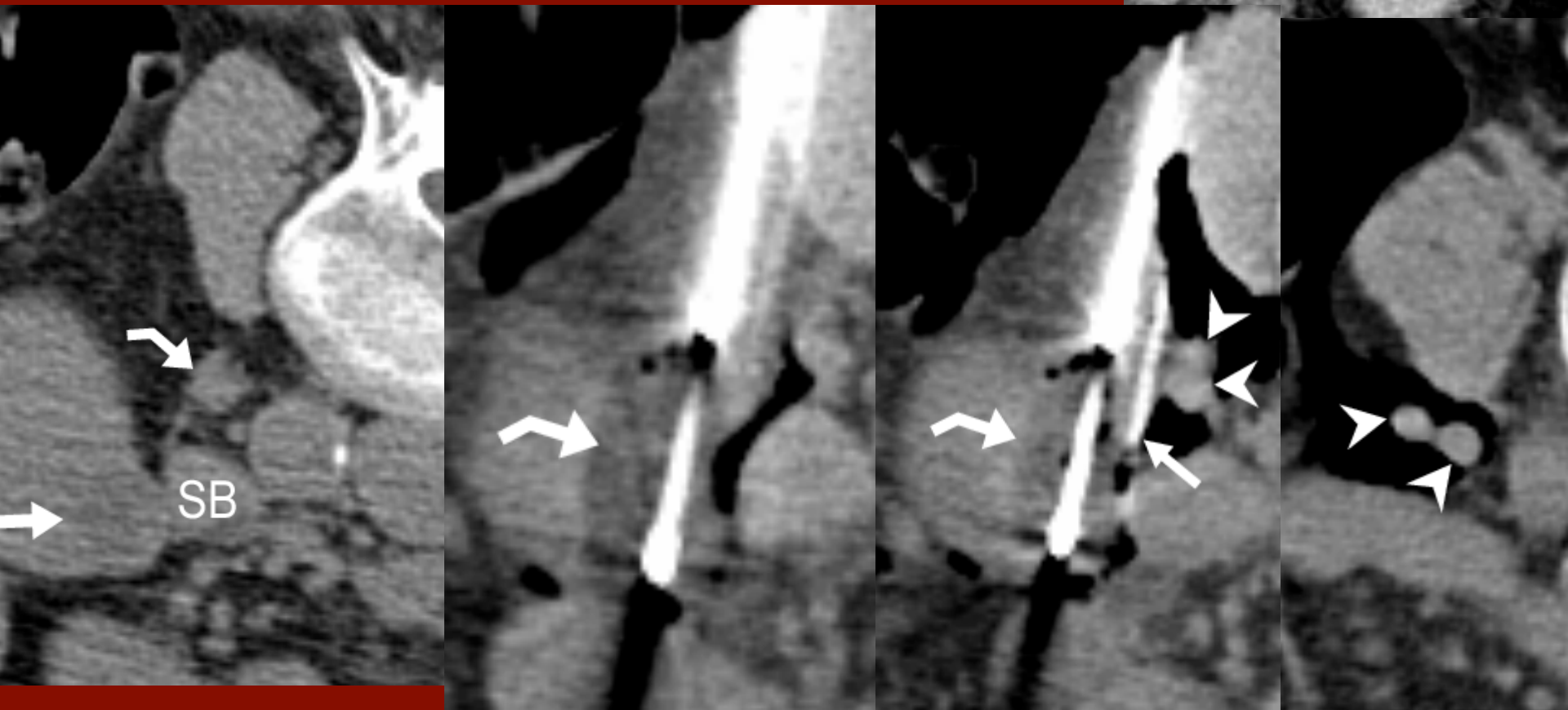
Pneumodissection

- Feasibility tested with CO2 but room air works as well without issues, except one. Air resorbs slowly so residual can give erroneous impression of perforation.
- Used for biopsy, ablations, and fiducial markers.
- Ablations well suited because air is insulator as compared to fluids

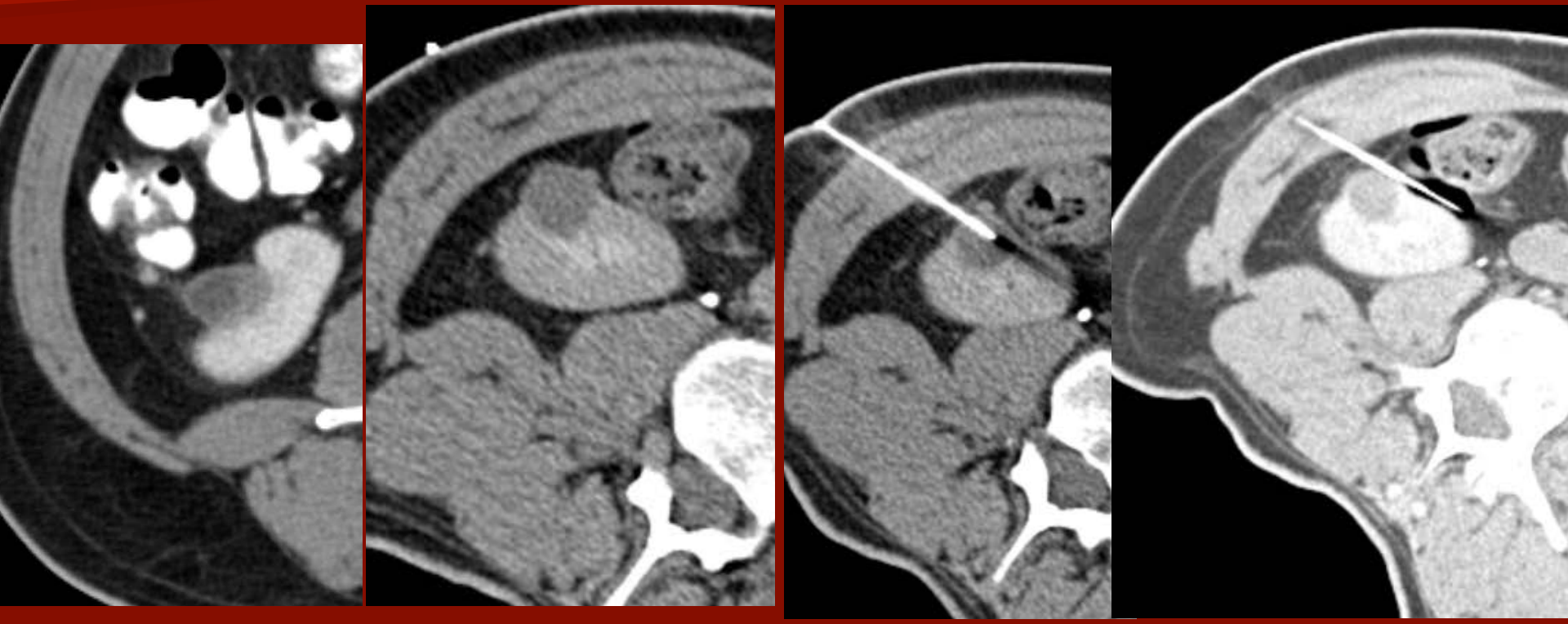




4.With thermoablation fluid or air can be used an insulator:air is better but requires more volume



Air used to protect appendix for renal cryo

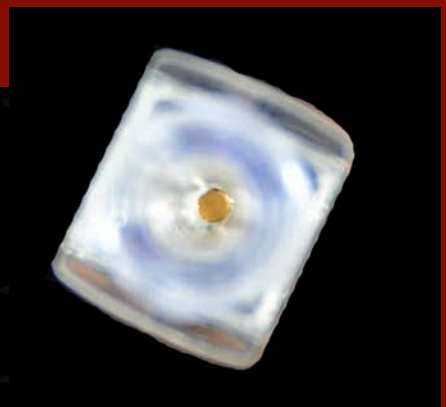


Air protect appendix continued

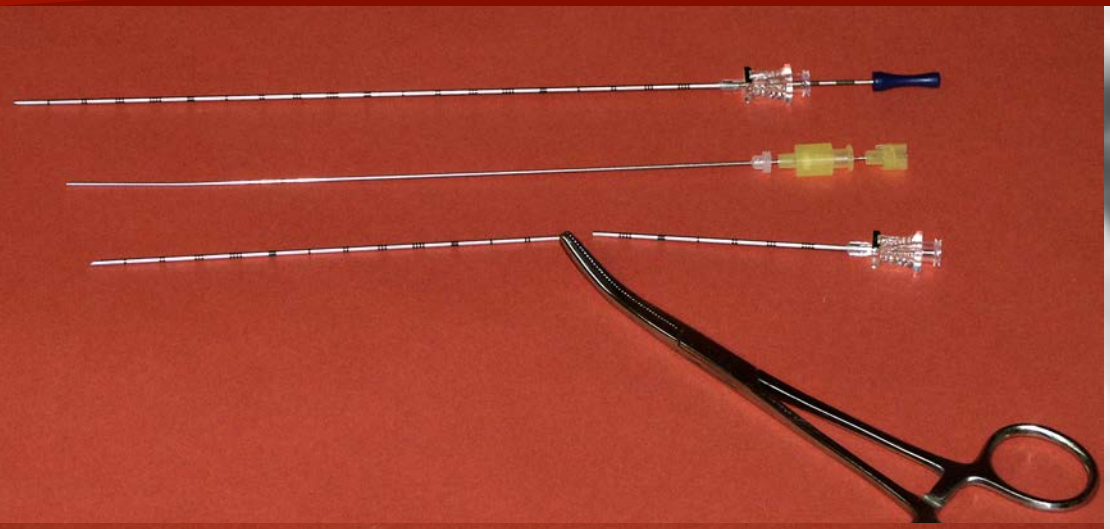
Fiducial Markers for Cyberknife "gold seeds implanted to guide computer modulated radiation therapy"

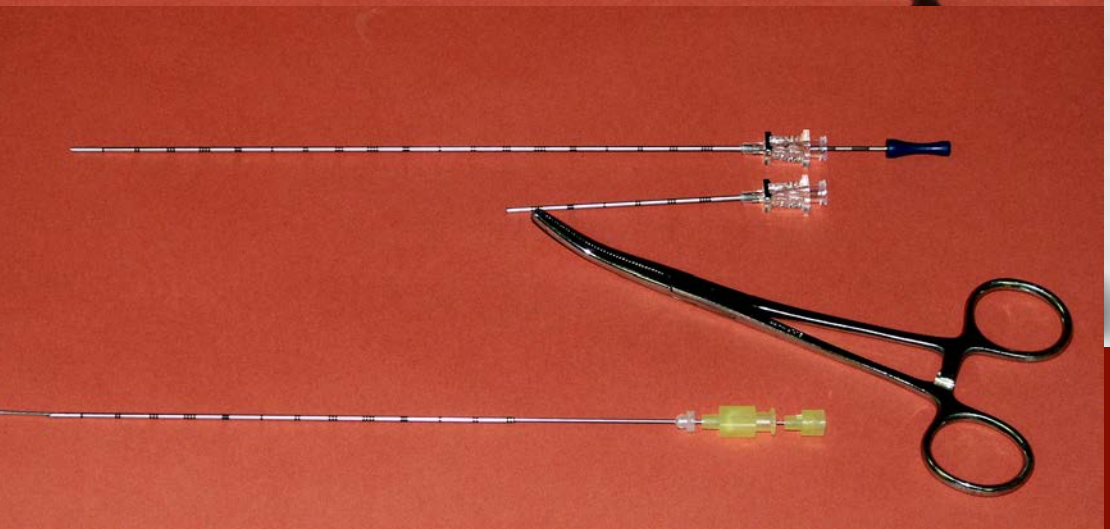
Fiducial Placement simplified by using single site and cannula for multiple placements

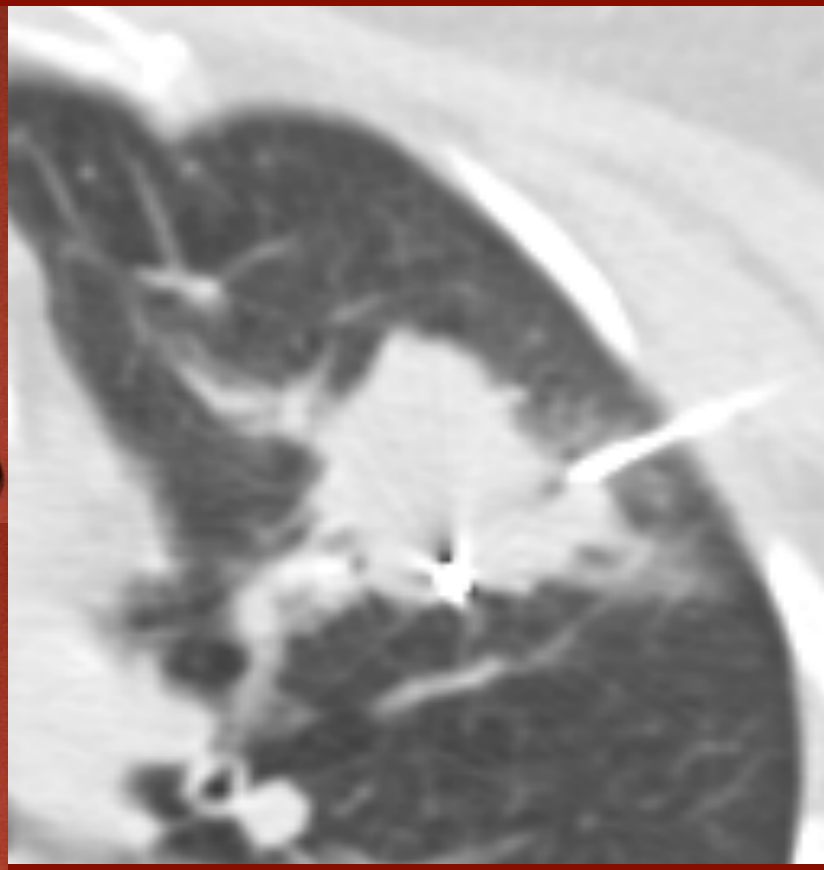
Reloading In Place cannula



If biopsy is also necessary can use fiducial cannula for guidance.Break off brittle needle, and insert needle







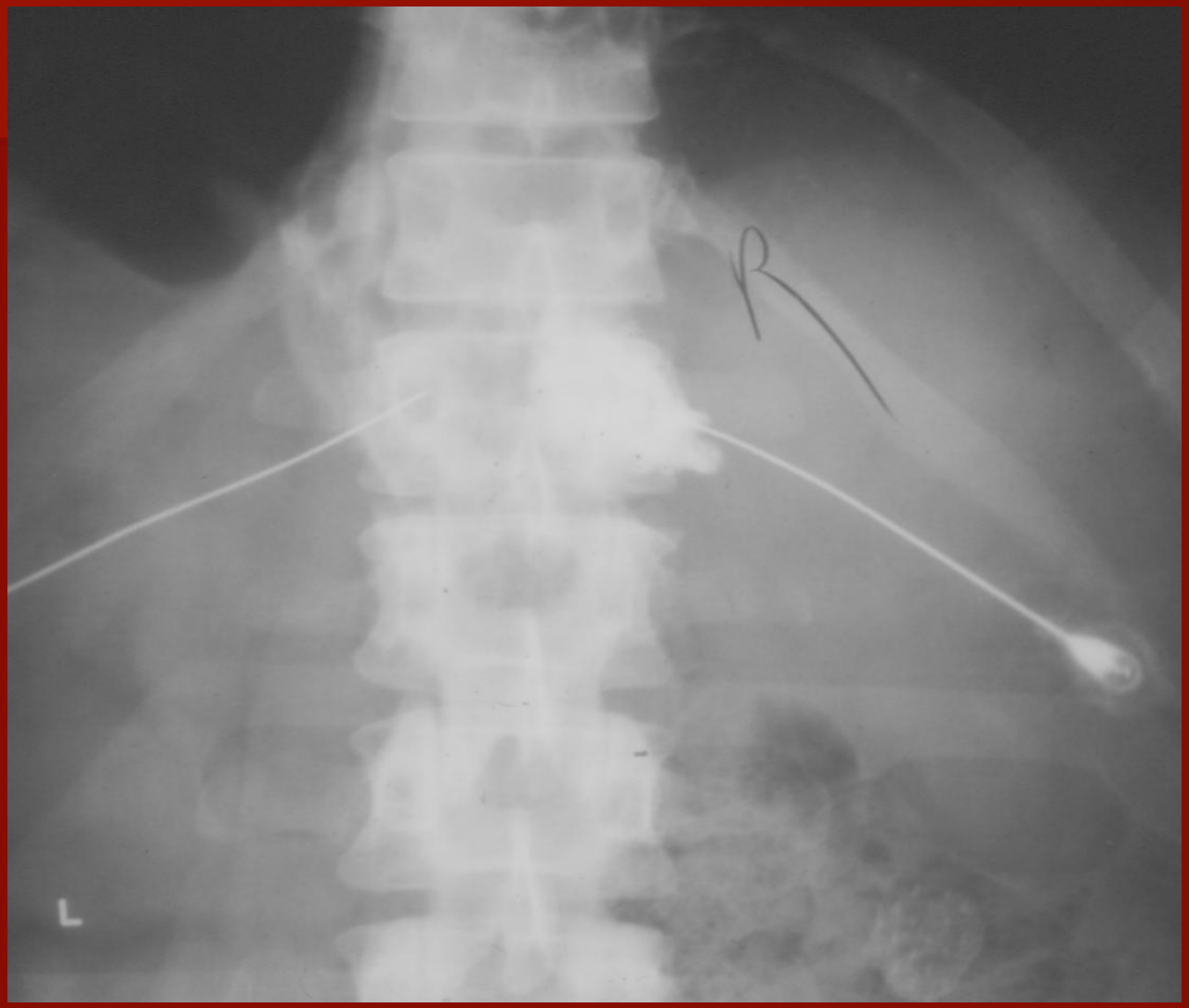
Celiac Nerve Block

- Procedure performed to relieve severe abdominal pain due to malignancy. Celiac plexus is nerve center
- Numerous permutations over many years:blind procedure, fluoroscopic guided, CT guided posterior, CT guided anterior, transaortic
- Early injected 50cc bilateral phenol, later 50cc Ethanol, recent CT 20 cc ethanol
- Recent radiofrequency but newest and BEST is cryoablation

Celiac Nerve Blocks:Old Approaches and New Concepts

John R. Haaga M.D.,F.A.C.R.

Fluoroscopic Celiac Block

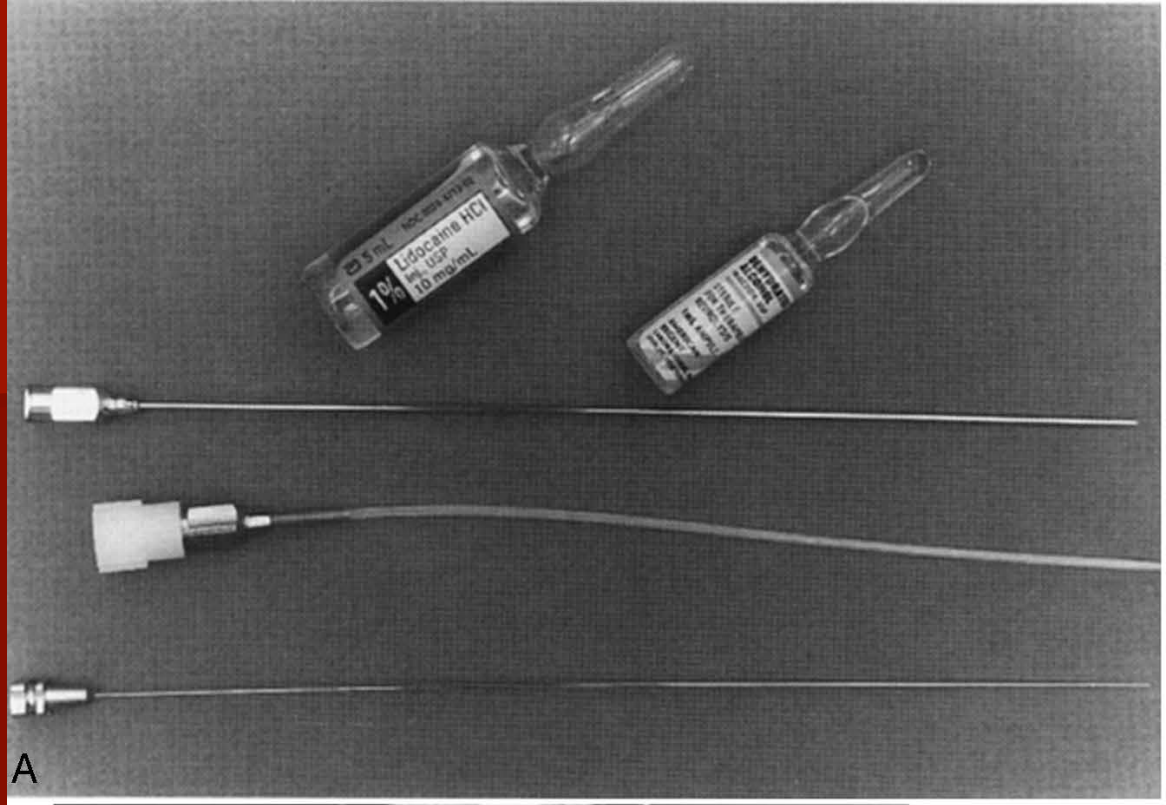


Techniques of Blockade

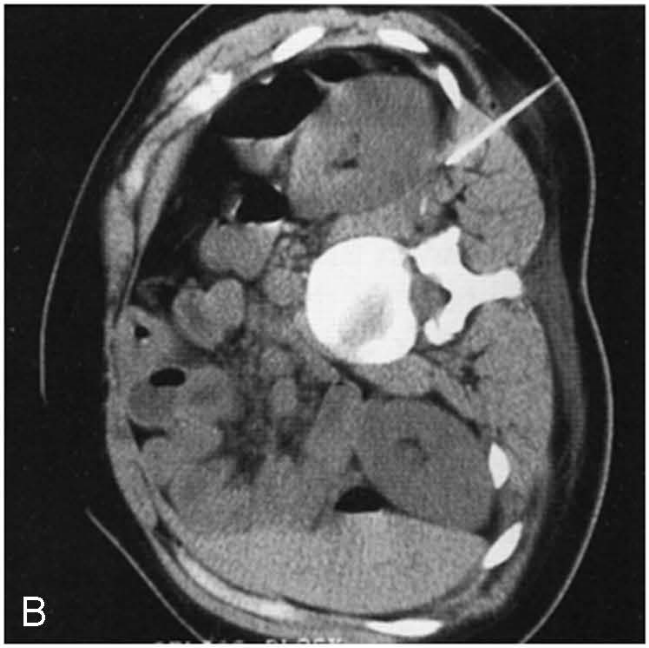
- Posterior (retrocural or transcural)
- Posterior (transaortic)
- Anterior (transvisceral)


90T

CT-guided Celiac Block
Anterior Approach

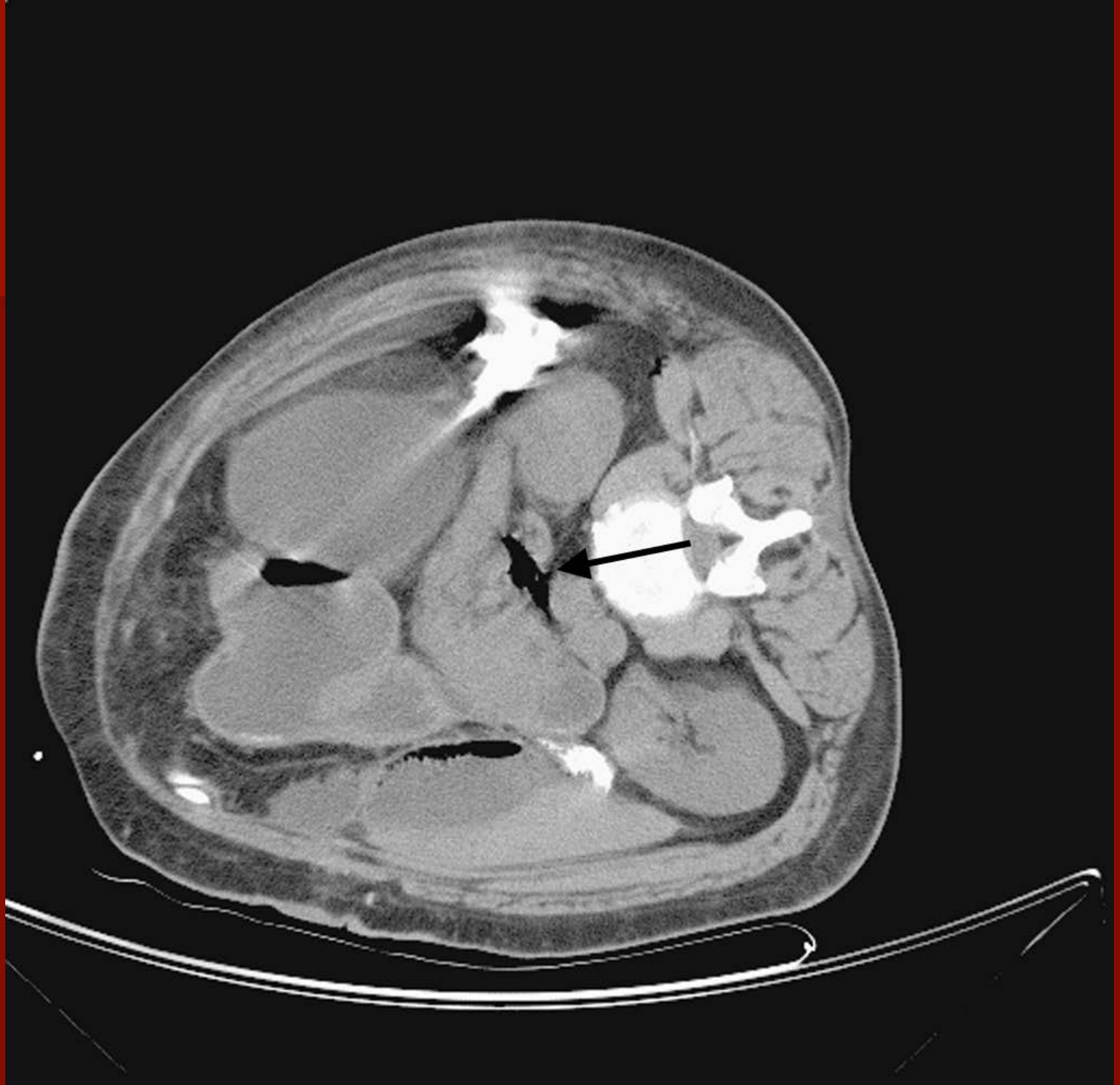


A


B


C


D



Correlation Between Grade of tumor and Pain Relief,Akhan et al, AJR,1997;168;p1565

- Twenty five cases-extension graded I, II, III,IV
- I-fat planes intact, II>50% intact, III> %invaded, IV>fat planes totally invaded
- Pain graded 0-+3 (+3 less pain) stated differently O means no pain relief

Results-pain after block

- Grade I: +3 in 4/4
- Grade II: +3 in 3/12, +2 in 6/12, +1 in 3/12
- Grade II: +2 in 2/6, +1 in 3/6, 0 in 1/6
- Grade IV: 0 in 3/3

- Bottom line more invasion, less relief
- Two patients with Grade IV,leaked to thorax

CWRU / UH Approach with Radiofrequency

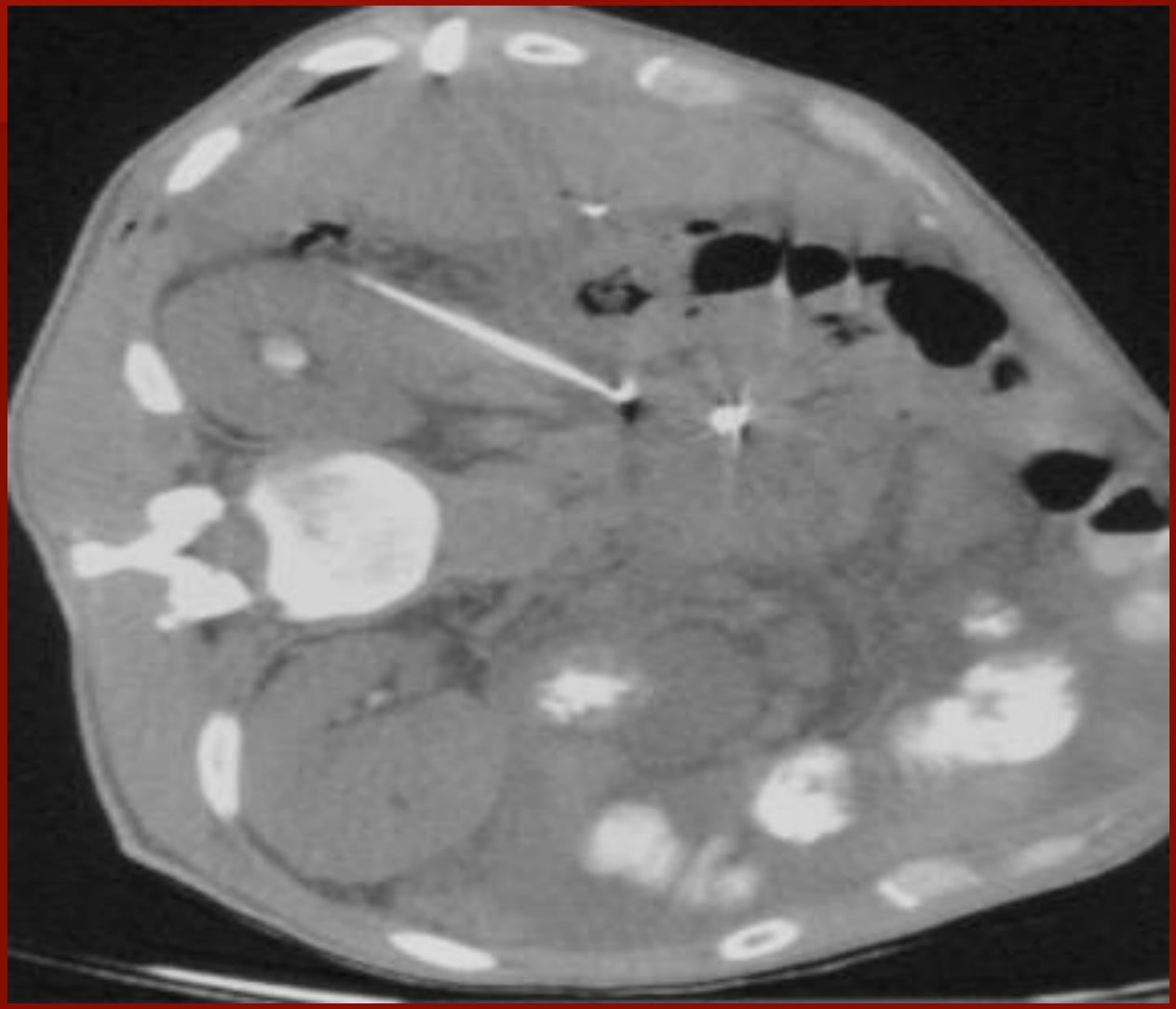
- Radionics RF Generator
- 18 gauge monopolar RF probe
- RF current to heat tissue to 90^0 C
- Duration determined by algorithm

Patient 1

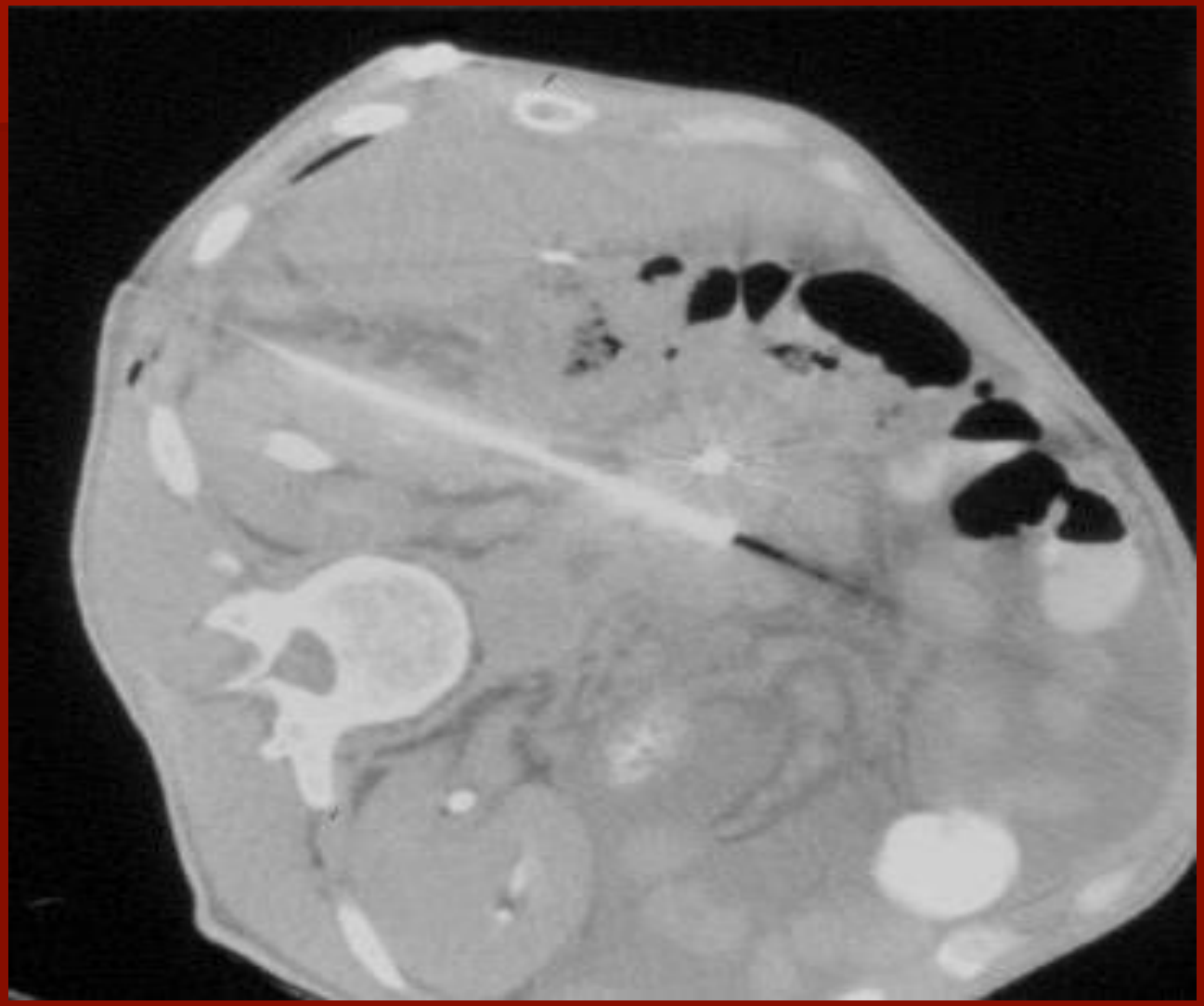
41 year old man recurrent pancreatico-biliary carcinoma

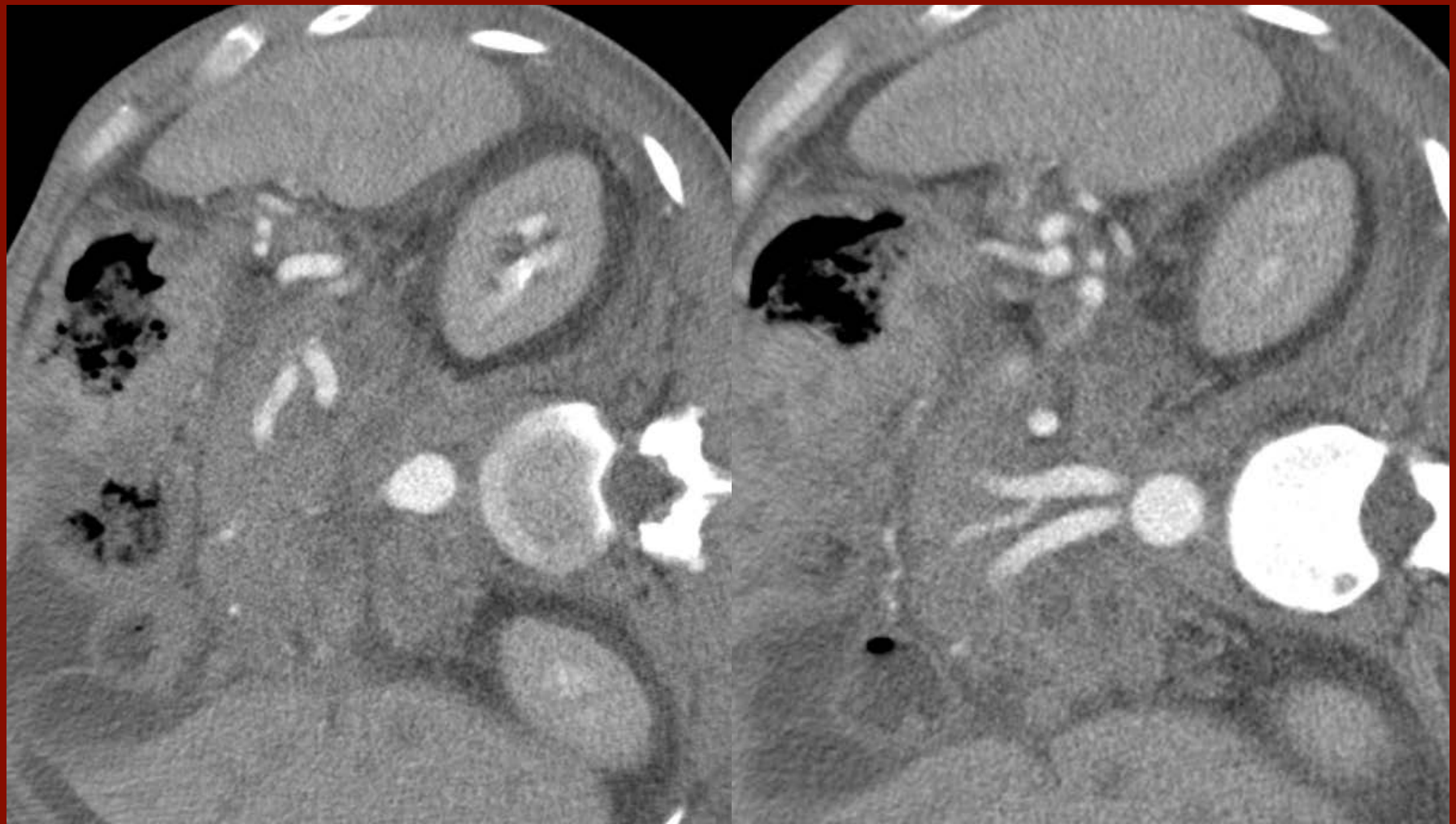
- Whipple procedure 4 years previously
- Severe, deep epigastric pain despite opioids
- Excellent pain relief with RF
- Elimination of oral opioid requirement

41 y/o man s/p Whipple procedure

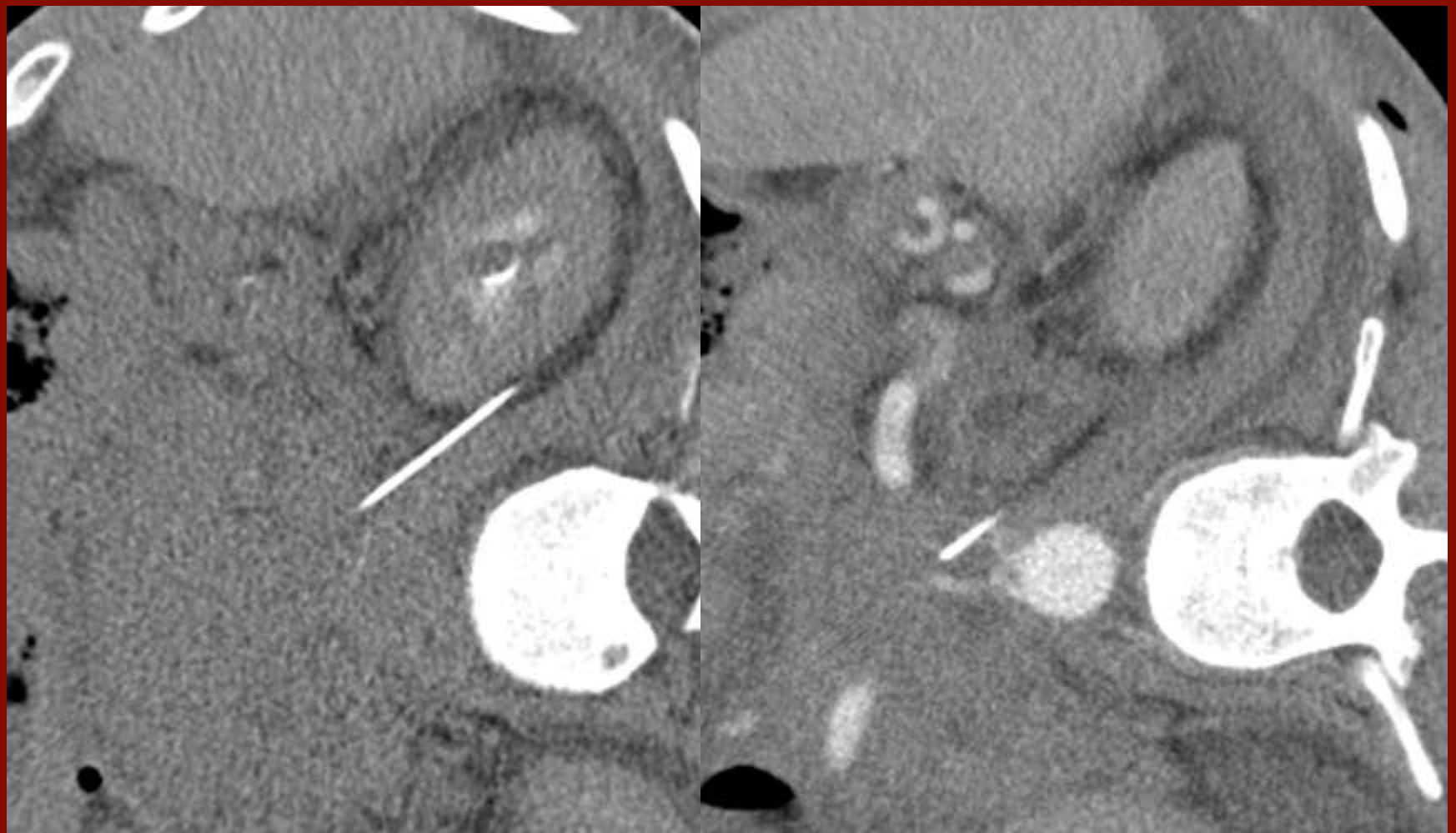


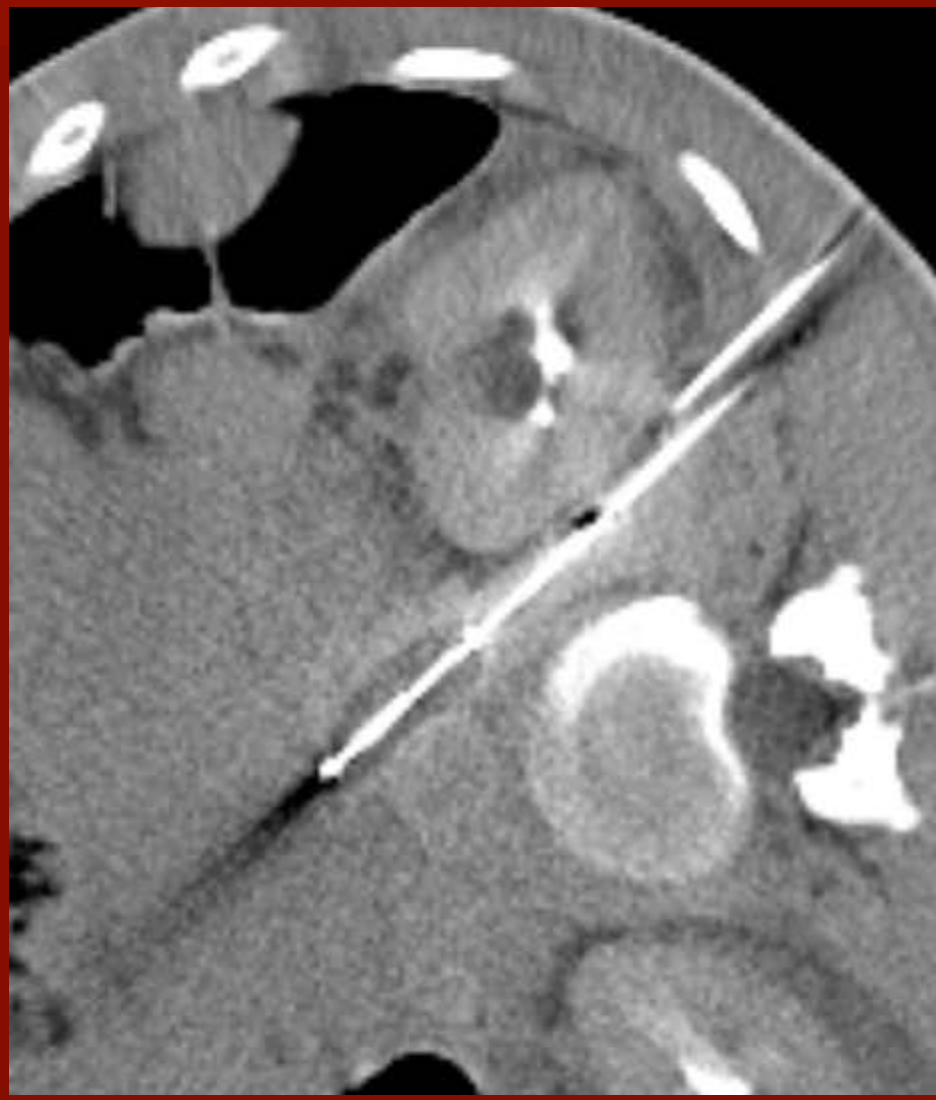
41 y/o man s/p Whipple procedure



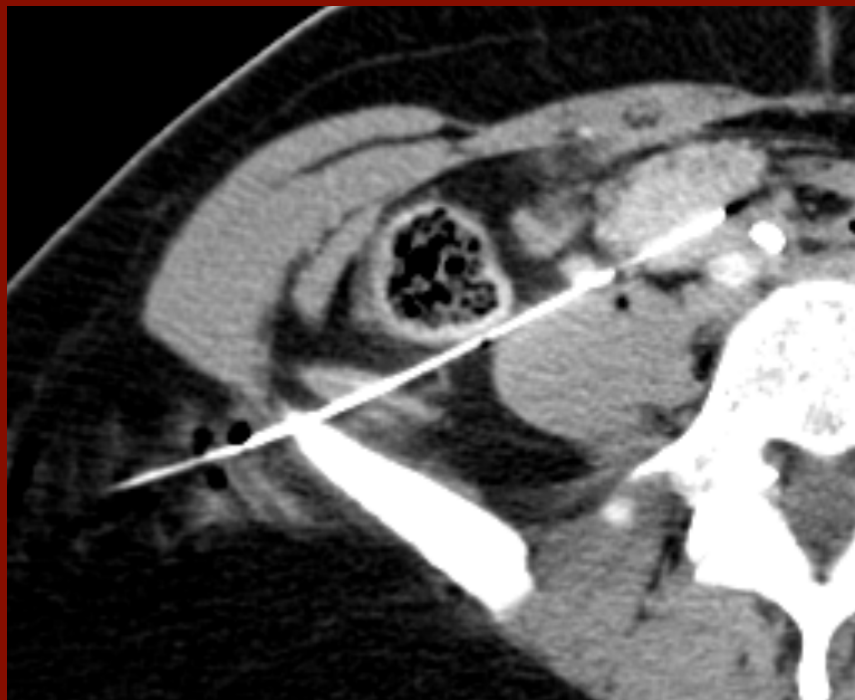


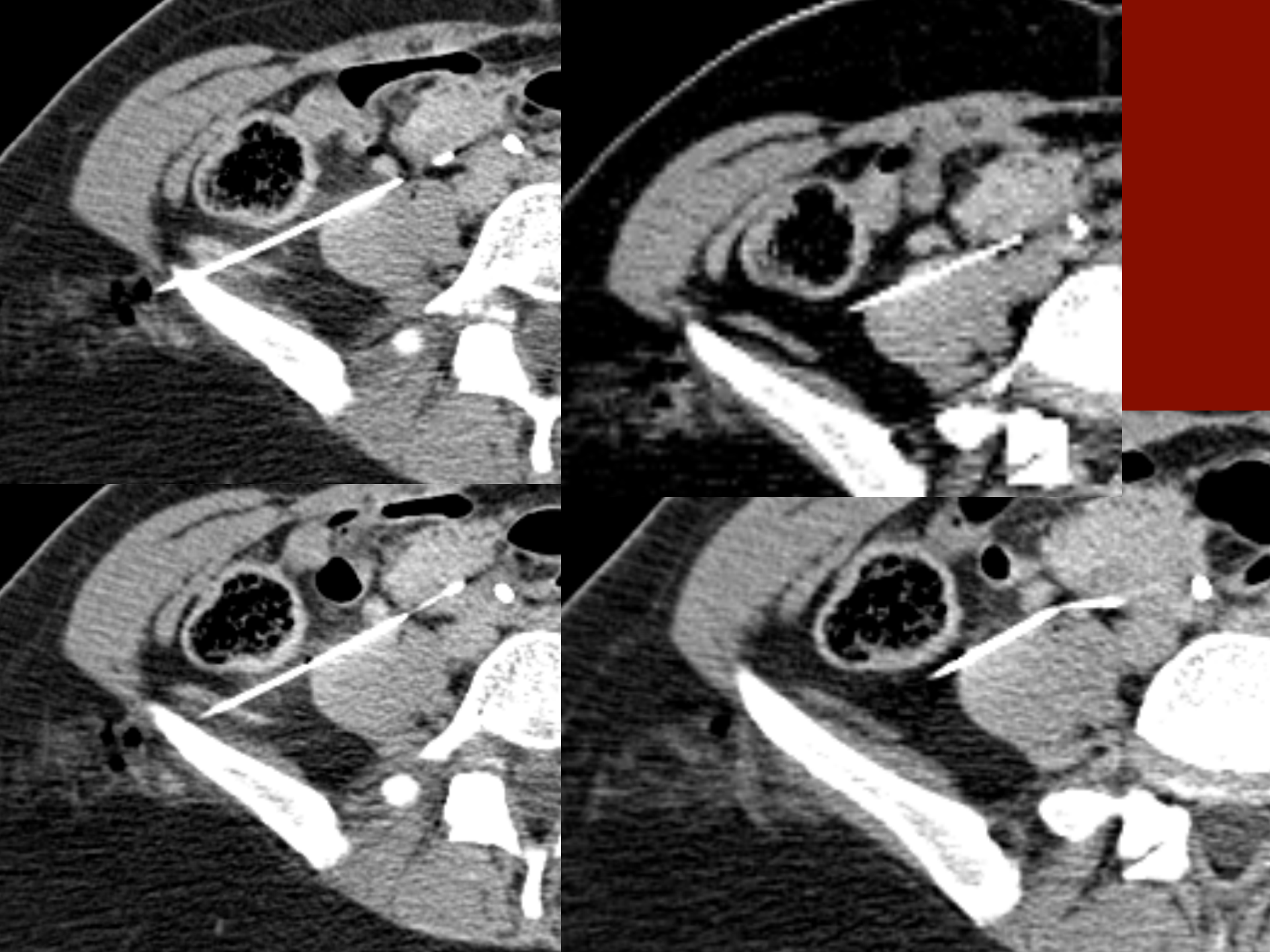
With dense tumor infiltration, cannot see margin of vessels, use needle as reference marker

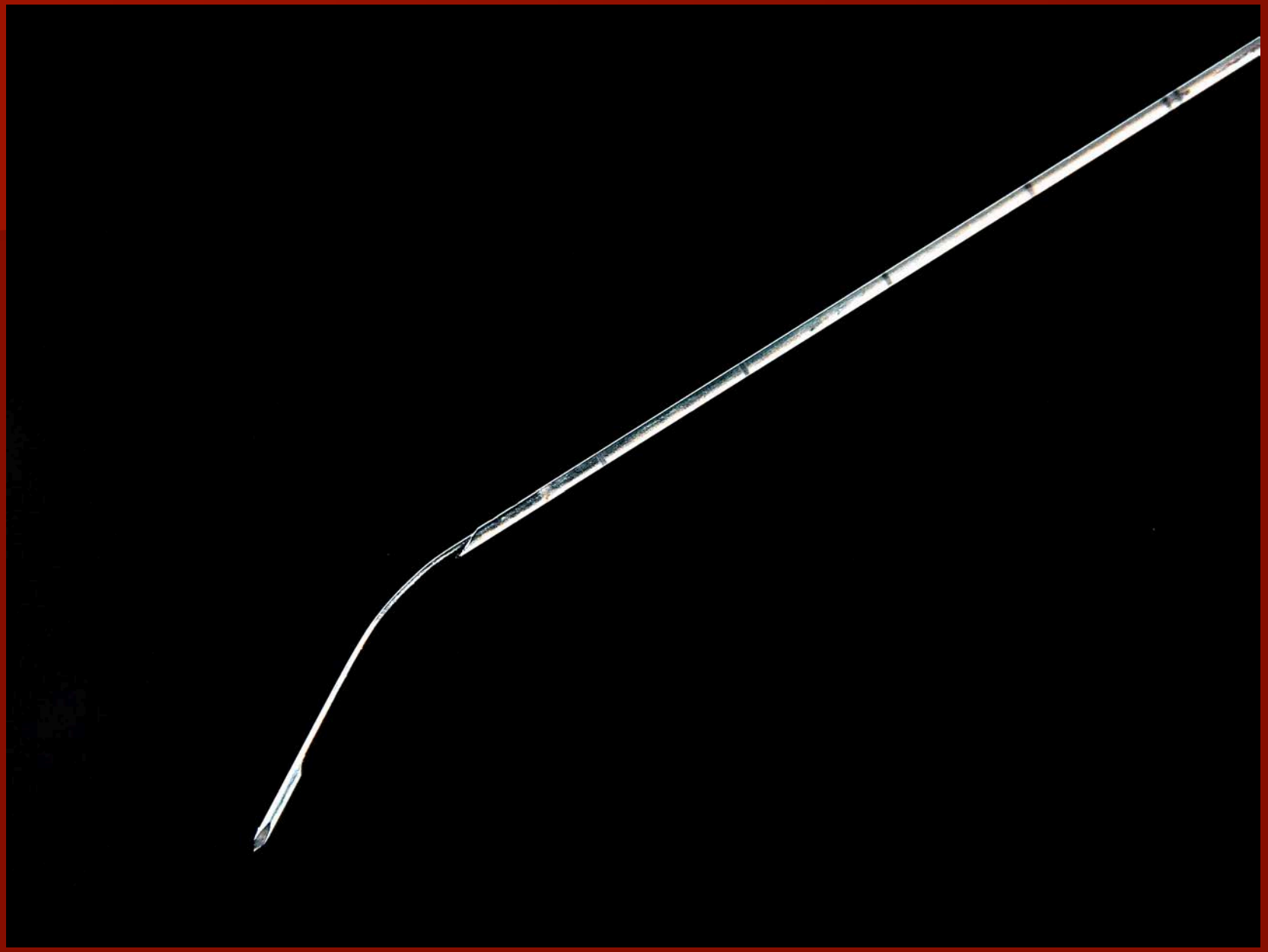




On first impression using cryo around vessels would seem dangerous but massive blood flow in aorta heat source

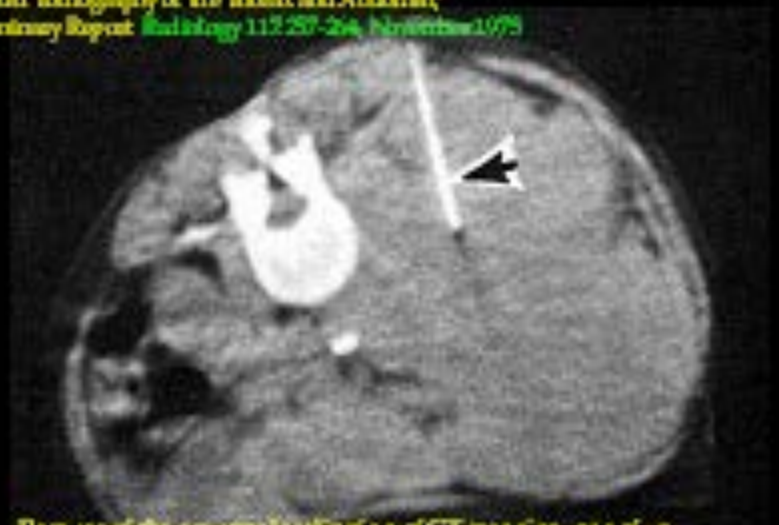






First CT BX and Abscess Drain performed on 2 min Technicare Scanner 1975

Ralph J. Alfidi, MD, John Haaga M.D, et al:
Computed Tomography of the Thorax and Abdomen;
A Preliminary Report Radiology 113:257-264, November1975



Because of the accurate localization of CT scanning, one of us, John Haaga, has proposed the use of the CT scan for percutaneous

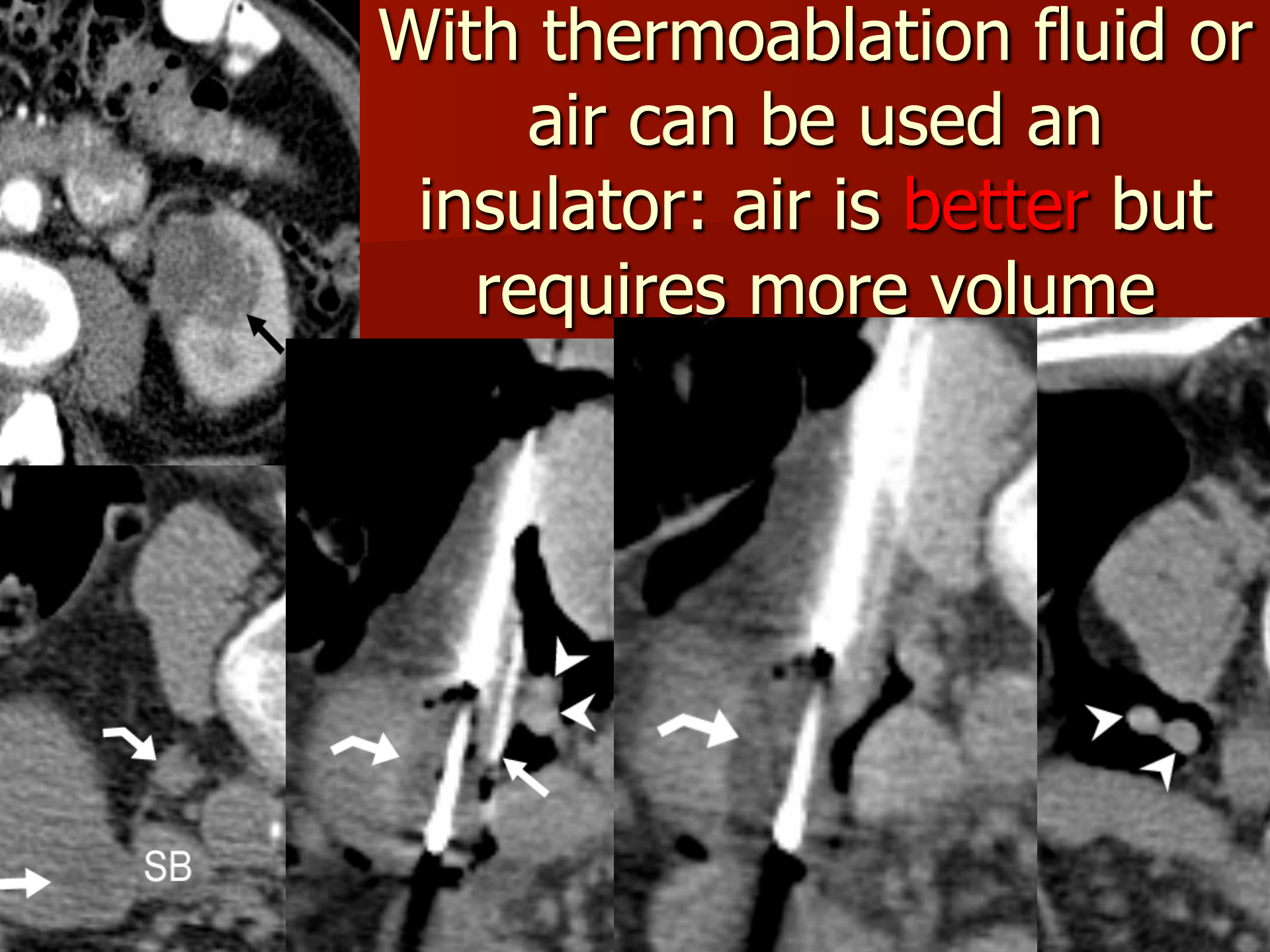
1.Pre emptive treatment for coagulopathic patients-injecting blood product in pathway

- If INR abnormal, inject ffp in pathway three ways: 1)mixed with xylocaine 2)after xylocaine 3)at end of precedure if cannula used
- Low platelets, inject platelets, etc
- Lovinox inject ffp, etc
- Hemophiliac,inject factor VIII
- Creates local collection of missing product, with very high concentration

Multipurpose Coaxial Cannula

- Large caliber for instruments, side port needle for lidocaine injection, multiple four quadrant sampling, hemostasis as needed, premptive or closure by coil when bleeding occurs
- Typical approach is to administer lidocaine with small needle and then insert biopsy device
- Permits single placement cannula for local anesthesia, multiple biopsies, wound closure.


TEMNO
Evolution™
1 CLICK = 10MM NOTCH
2 CLICK = 20MM NOTCH


With thermoablation fluid or air can be used an insulator: air is better but requires more volume
SB

New tissue analyses

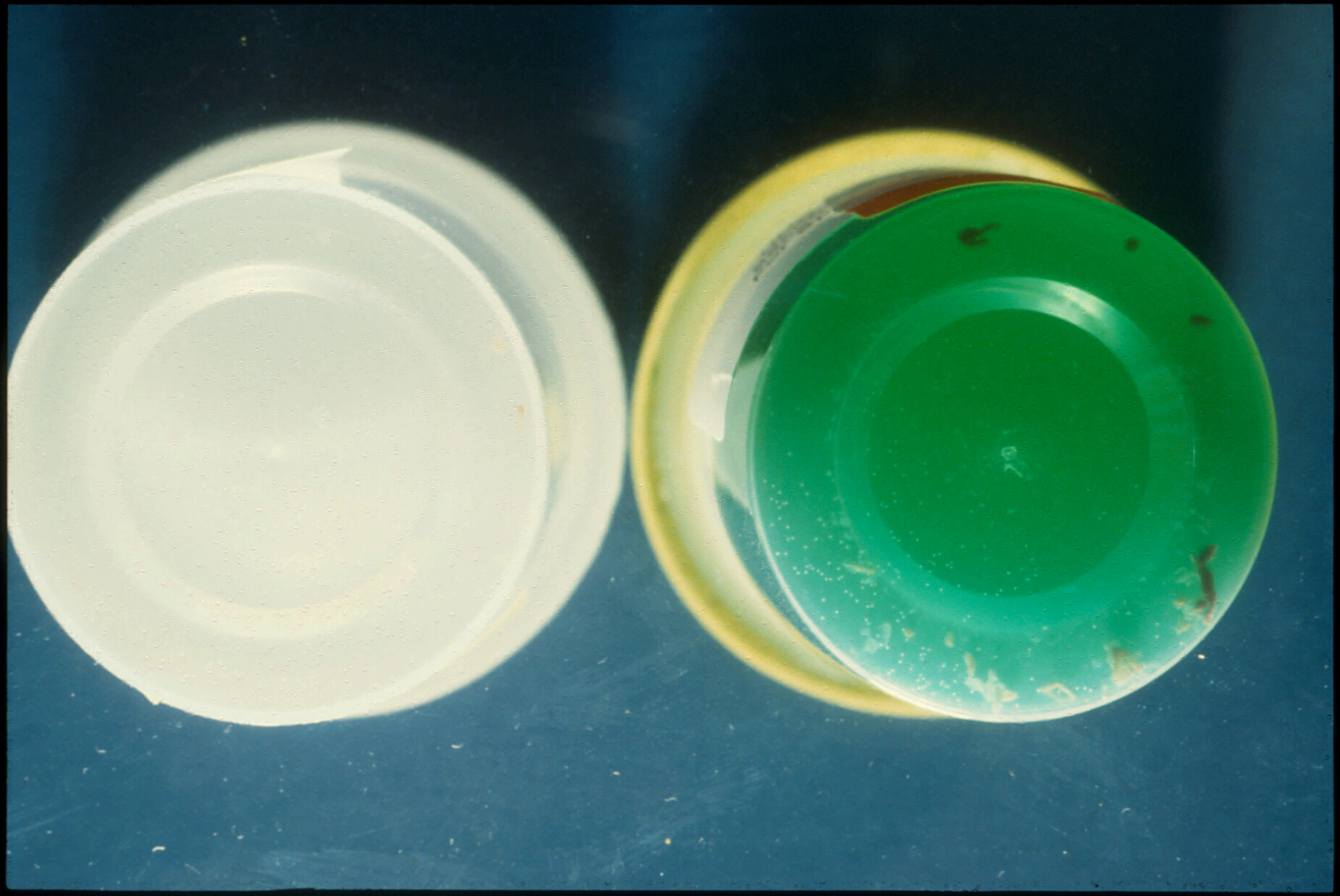
- Flow cytometry
- Gene arrays
- New frontier for radiology is exploitation of biomarkers which affect PET or MRI. Immunohistochemical stains for innumerable biomarkers
- Great promise for correlation of MRI diffusion to be correlated with biomarkers. Especially waste markers related to angiogenesis, glycolysis, carbonic anhydrases, lactate transporters and aquaporins

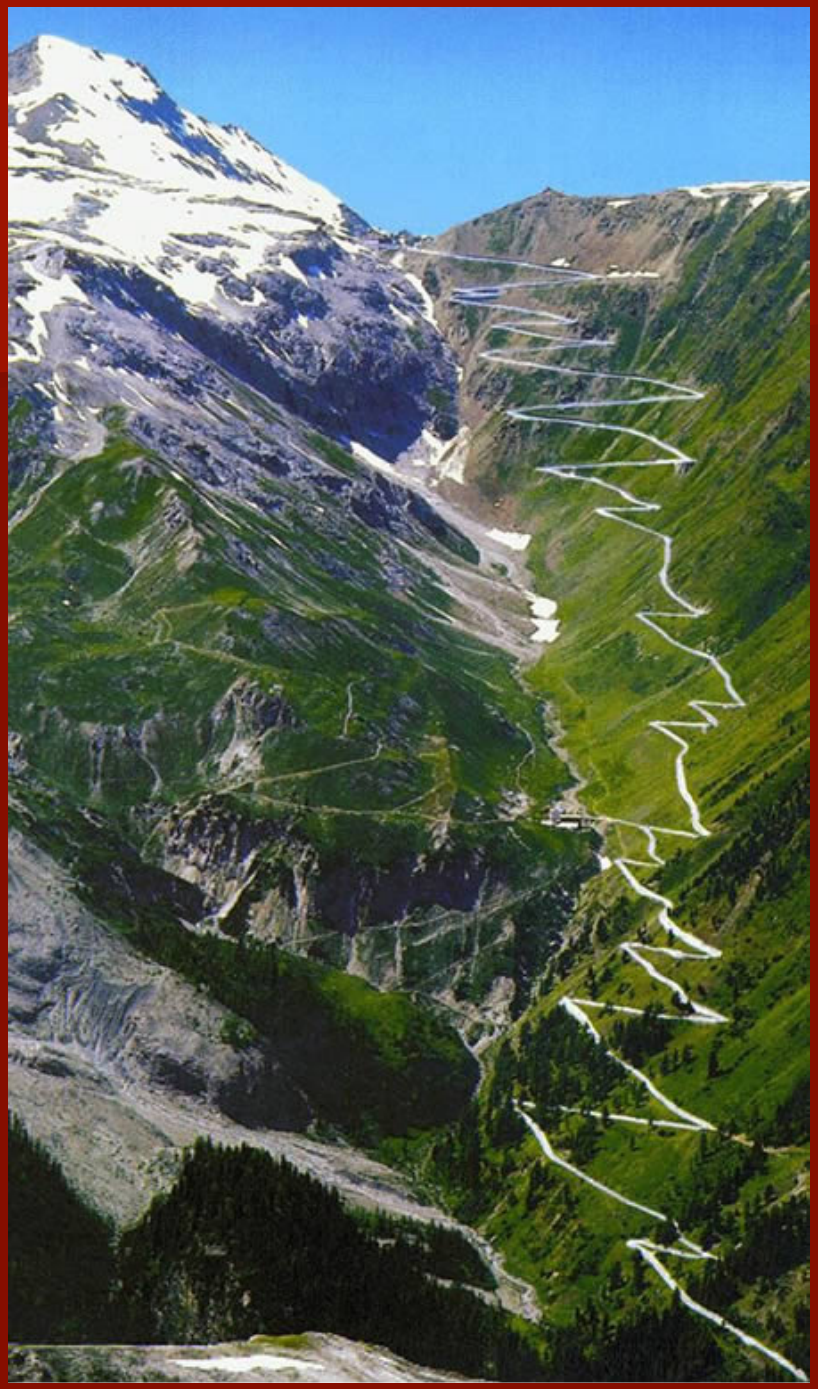
Procedures “borrowed” by others or abandoned

- Non infected Pseudocyst drainages
- Cecostomies
- Pancreas biopsies in head
- Percutaneous pancreatic duct cannulation
- Nerve block vagus at jugular foramen
- Electrode placement in glossal nerve,apnea

Various factors affect role of CT

- Many procedures initiated with CT because greater visualization but moved to US or MRI because of gained expertise
- Technology revolution with different needles manual, automated, end cutting , side cutting
- Improvement of tissue evaluation altered need for tissue cores, flow cytometry, genes, BUT more is tissue is still better, e.g. gene signatures
- Coagulopathic patients , CT and Techniques





Stelvio Pass, Italy, at 2757 m (9045 feet), highest paved mountain pass in Eastern Alps. Drive carefully to not fall off edge. (courtesy Dr. B.Marincek)

CT Bx has taken us to new heights. Important to be on the edge doing difficult cases but must avoid complications and not to fall off the edge

Table of Key Statistics for DNA Assays - Liver Tissue Needle Biopsies							
Type of Statistic		μg DNA/ ml		mg protein/ ml		μg DNA/ mg protein	
Descriptive Statistics by Needle Gauge							
Needle Gauge	Number	Mean Value	Standard Deviation	Mean Value	Standard Deviation	Mean Value	Standard Deviation
14 ga	17	40.38	10.29	0.86	0.19	47.28	7.94
18 ga	16	12.18	3.84	0.16	0.07	77.96	18.83
20 ga	16	5.86	1.58	0.06	0.01	103.89	17.22

Plecha DM, Goodwin D, Rowland DY, Varnes ME, ***Haaga JR****. Effect of needle size on bleeding and tissue recovery. Radiology 1997; 204:101-104*

Prevent bleeding

- Do contrast bolus at site before biopsy, individual vessels or hypervascularity
- Check coagulation studies INR 1.3, platelets 50K, “poor man’s bleeding time” watch skin knick
- Avoid using cutting needle in cases increased vascularity unless PREPARED
- If abnormal INR or low platelets inject product in pathway preceding procedure or systemic
- If bleeding starts after biopsy, replace stylet..relax, prepare hemostatic method, then insert coils with thrombin;

"Personalized care from gene array" Biopsy sample adequate BUT tumors are NOT genetically homogen.

- "Intratumor heterogenity and branched evolution" NEJM, 2012
- "Kidney cancer: Bad news for personalized therapy" Nat Rev Urol, 2012
- "Tumor heterogeneity:Darwin's Finches", Nat Rev Clin Oncolo, 2012
- NEED FOR NEW BIOPSY TECHNIQUES to get multiple cores and prevent bleeding

Over the years many contributors to CT guided Procedures and others

Haaga et al, introduced CT aspiration Bx, cutting Bx, Fluid/abscess drainage,Nerve Block

Other US physicians P.Sheedy -Mayo Clinic; Joe Ferrucci, J. Wittenberg- Mass General; B.Jeffries-Univ San Fran.

Magnusson A, CT guidance device

P. Lingren, Automated cutting needle