

Renal Tumors with cavoatrial extension (long term results)

P. G. Dedeilias

Cardiovascular and Thoracic Surgery

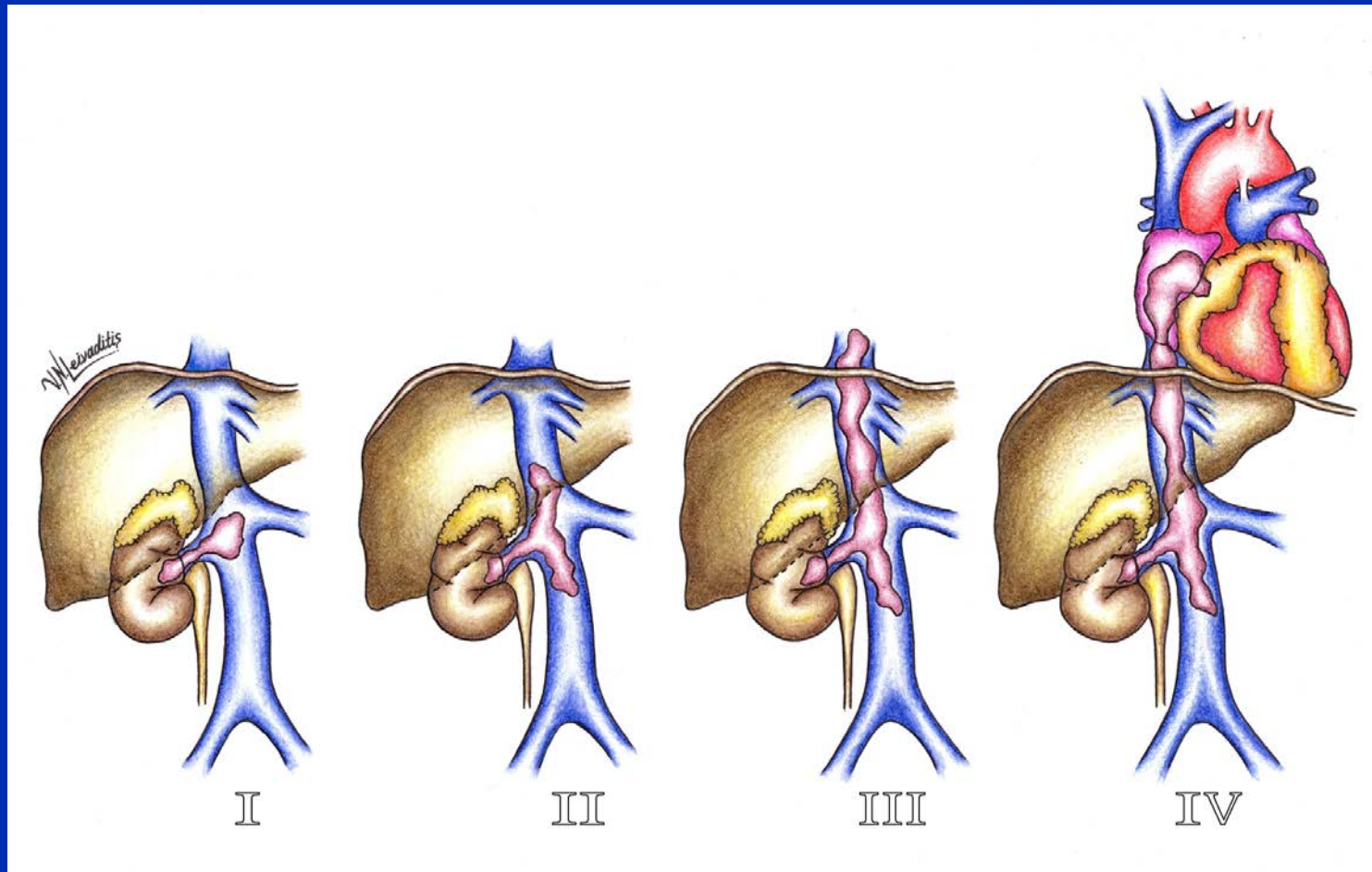
Department

EVANGELISMOS HOSPITAL

GENERAL INFO

- Type of tumors: Wilms, ureteric tumors, adrenal Ca
- Inferior Vena Cava involvement: 5-15%
Mazzola A et al : Ann Thorac Surg 2007
- Extension to Cardiac Cavities: 1%
Lubahn J et al : Thorac Cardiovasc Surg 2017
- Most Frequent type of tumor: Renal Cell Cancer. Represents 85% of all renal tumors – Tendency to involve IVC : 4-10% *Wieder et al : J Urol 2009*
- Radical Resection with compl. Chemotherapy or/and radiotherapy: 5 year survival rate: 30-72% *Curti BD et al: JAMA 2010*
- Immediate relief from symptoms
- Mortality Rate: 2.7-13% *B. Chiappini et al, J Thorac Cardiovasc Surg, 2012*

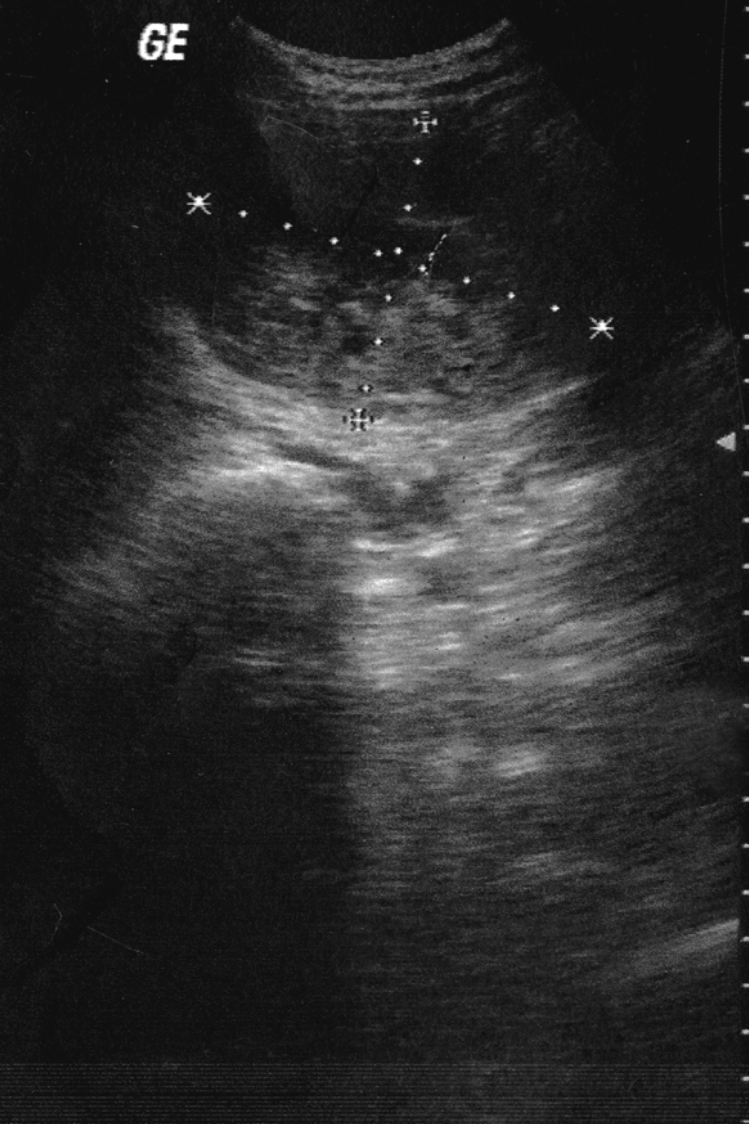
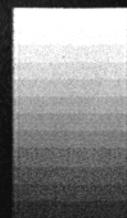
Staging of Renal Tumors with Cavoatrial Extension



Sweeney P, Wood CG, Pisters LL, et al: Surgical management of renal cell carcinoma associated with complex inferior vena caval thrombi. Urol Oncol 2003;21:327-333.

GE

GE



CN0
24cm24
60DR60
78G78

RT KIDNEY

* 66.1mm

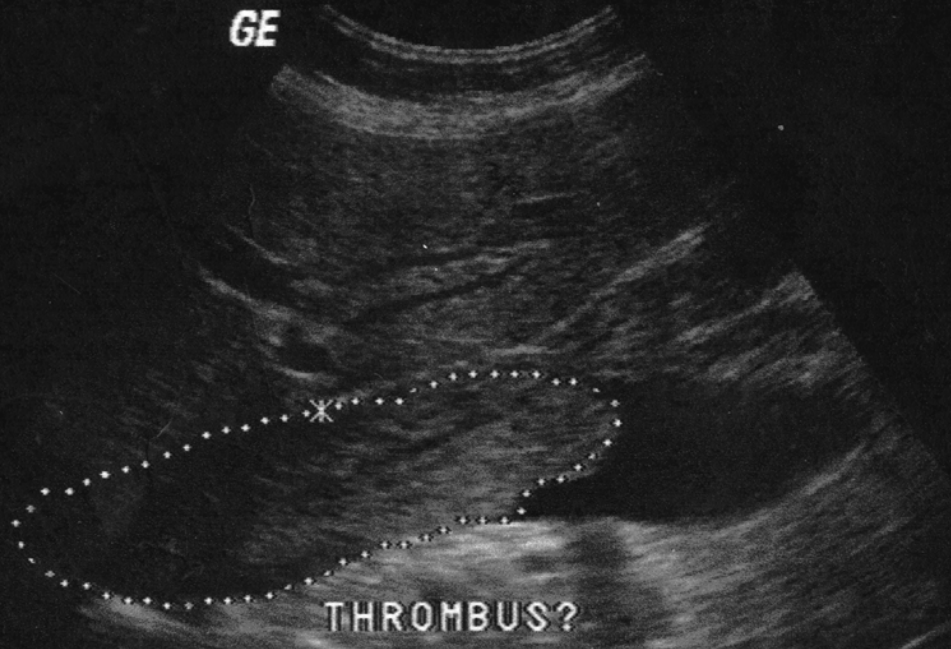
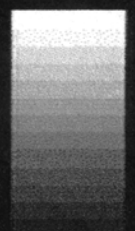
* 90.2mm

+ 66.0mm

MI=0.6

ICON

GE



THROMBUS?

IVC

CN0
24cm
DR60
G 78

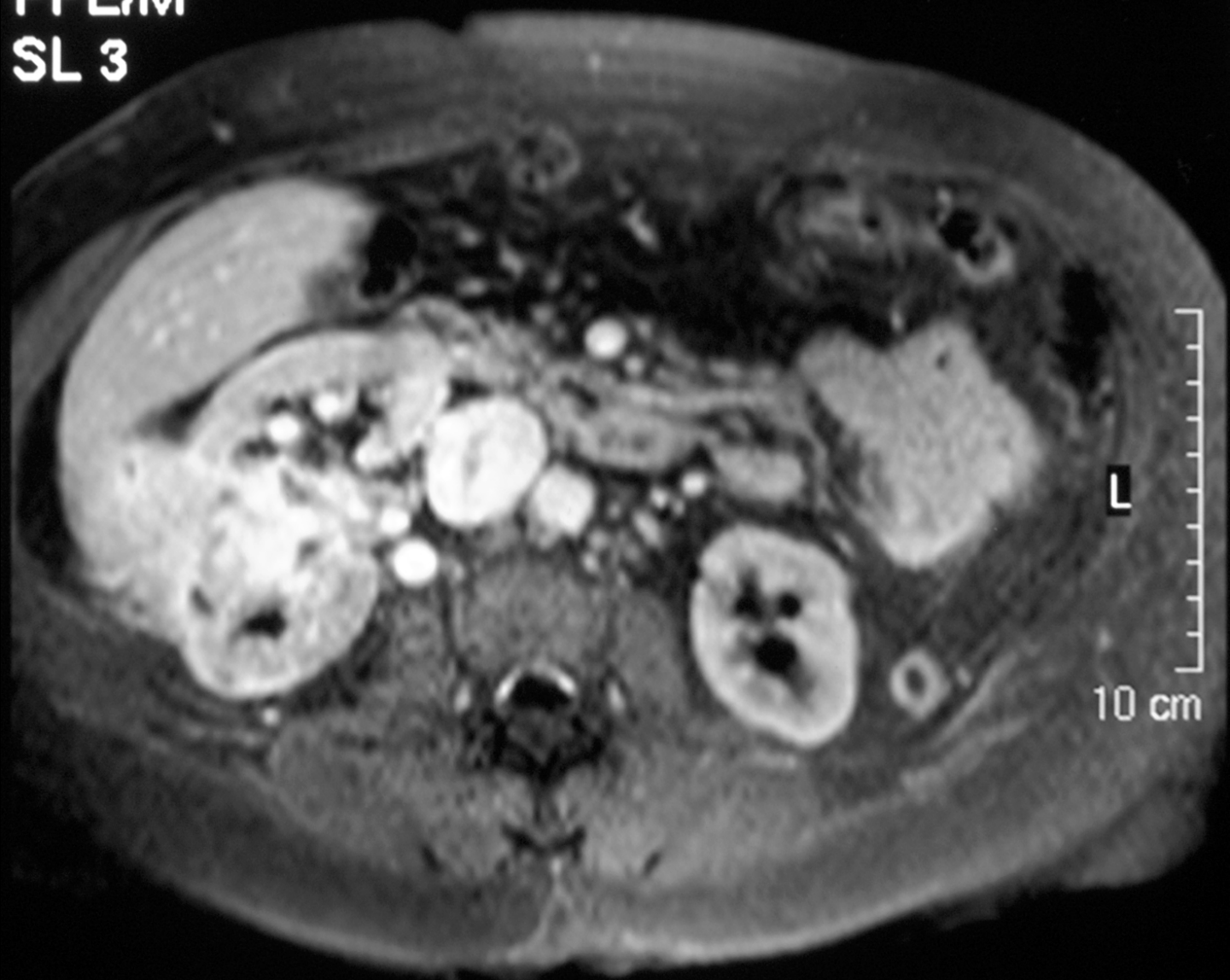
* 275mm

* 34.75cm²



Sc 16
FFE/M
SL 3

A



10 cm

FH -63 feet

Sc 16
FFE/M
SL 8

A



10 cm

FH -15 feet

Sc 16
FFE/M
SL 14

A



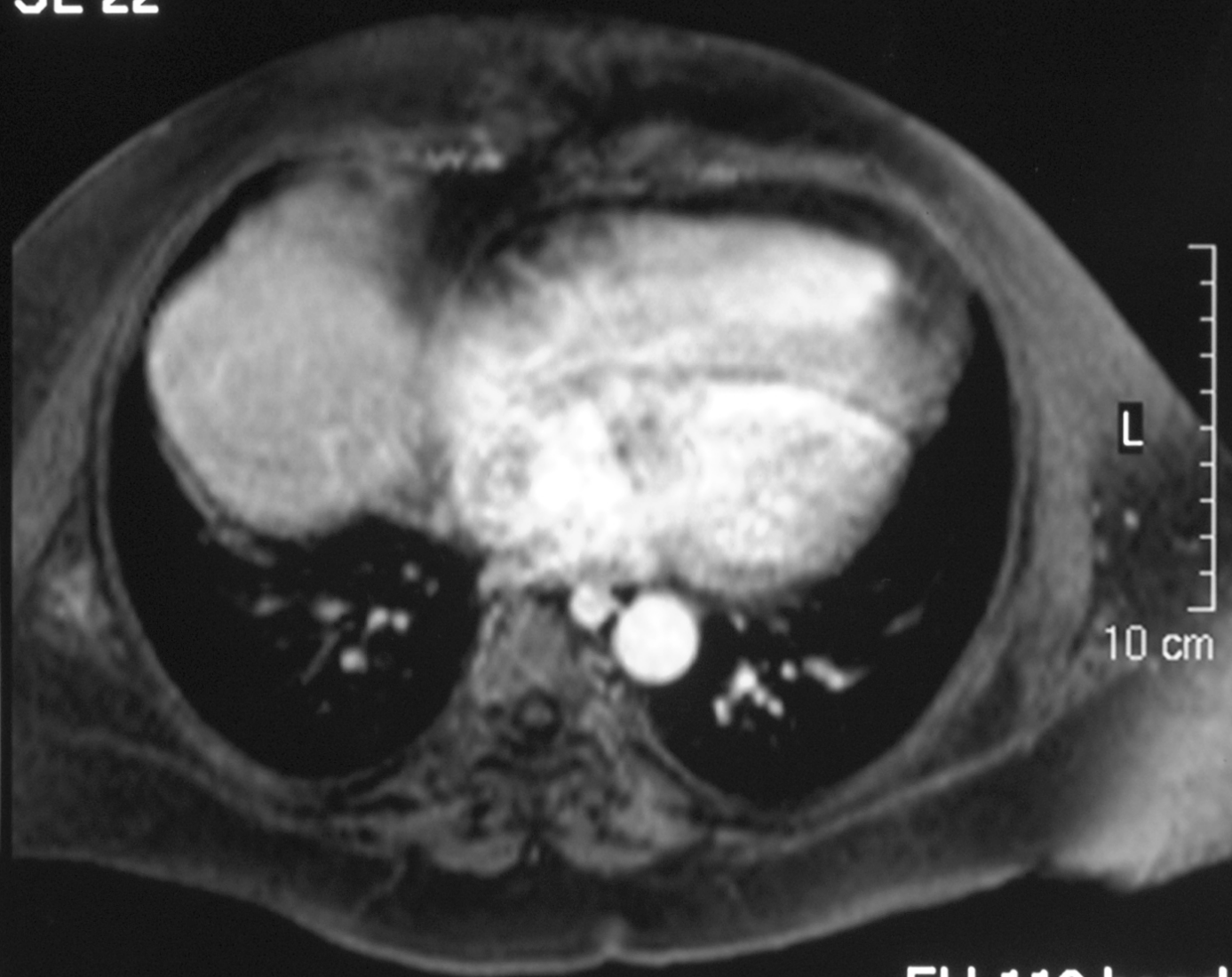
L

10 cm

FH 42 head

Sc 16
FFE/M
SL 22

A

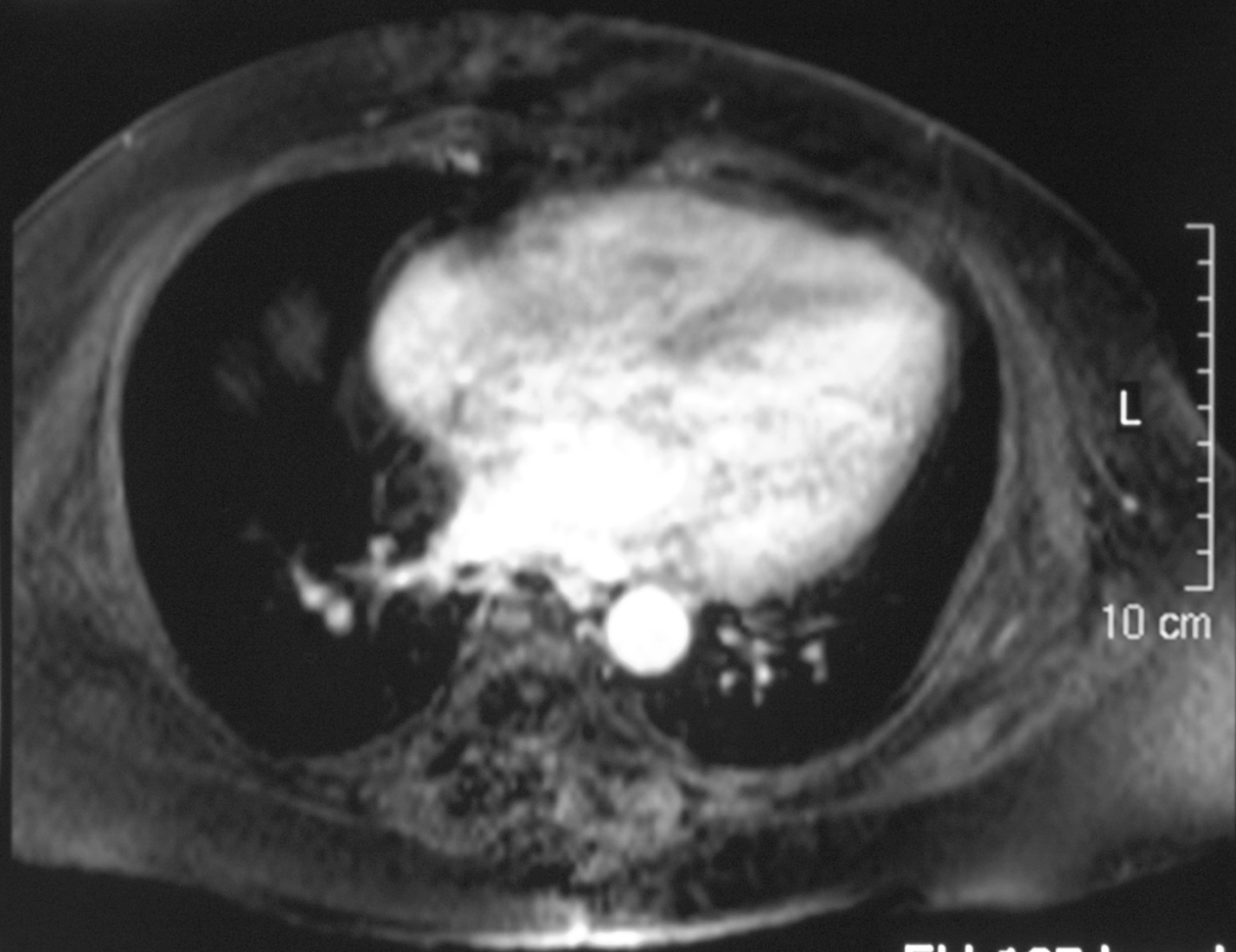


10 cm

FH 118 head

Sc 16
FFE/M
SL 24

A



L
10 cm

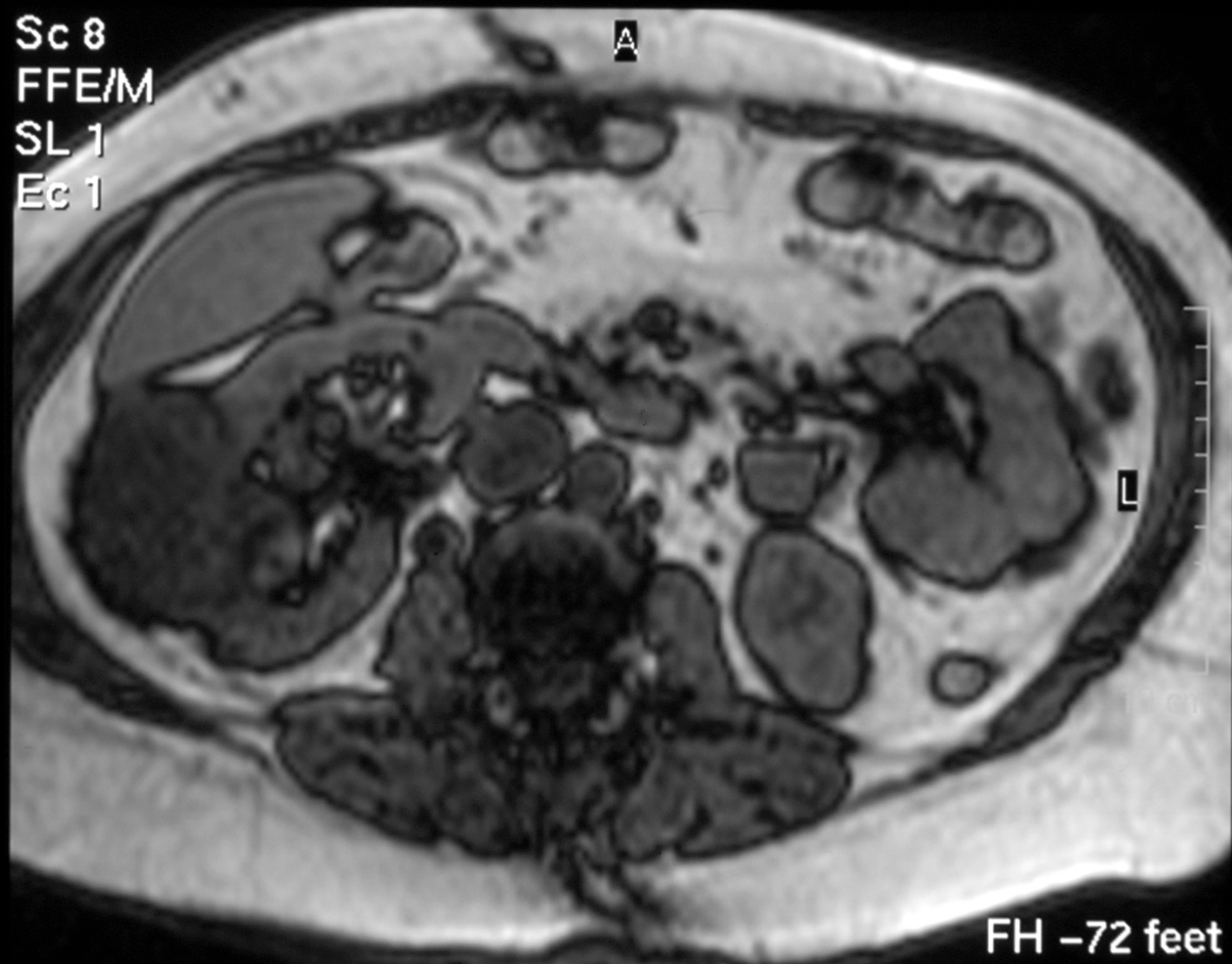
FH 137 head

Sc 8
FFE/M
SL 1
Ec 1

A

L

FH -72 feet



Sc 8
FFE/M
SL 7
Ec 1



FH -19 feet

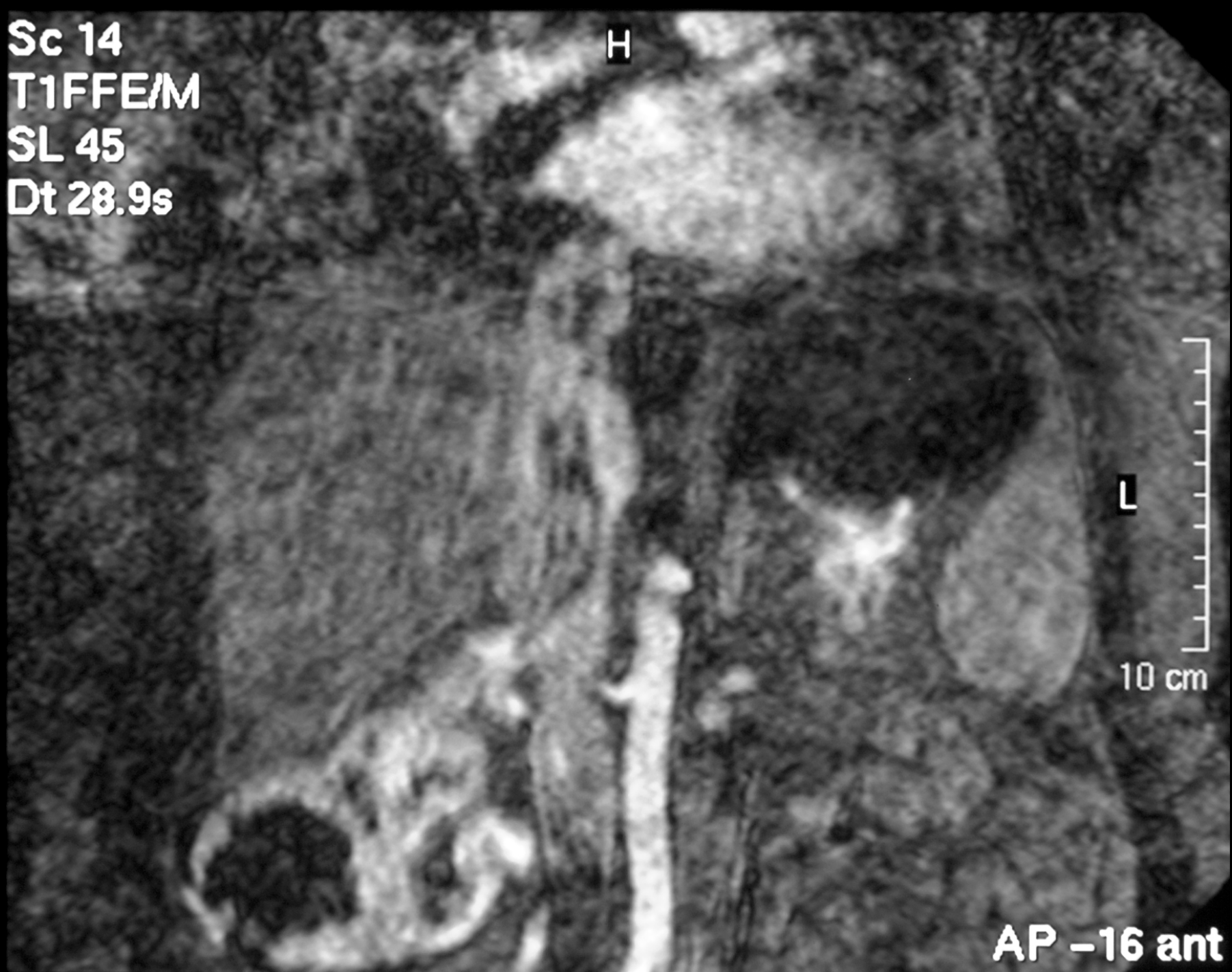
Sc 14
T1FFE/M
SL 45
Dt 28.9s

H

L

10 cm

AP -16 ant



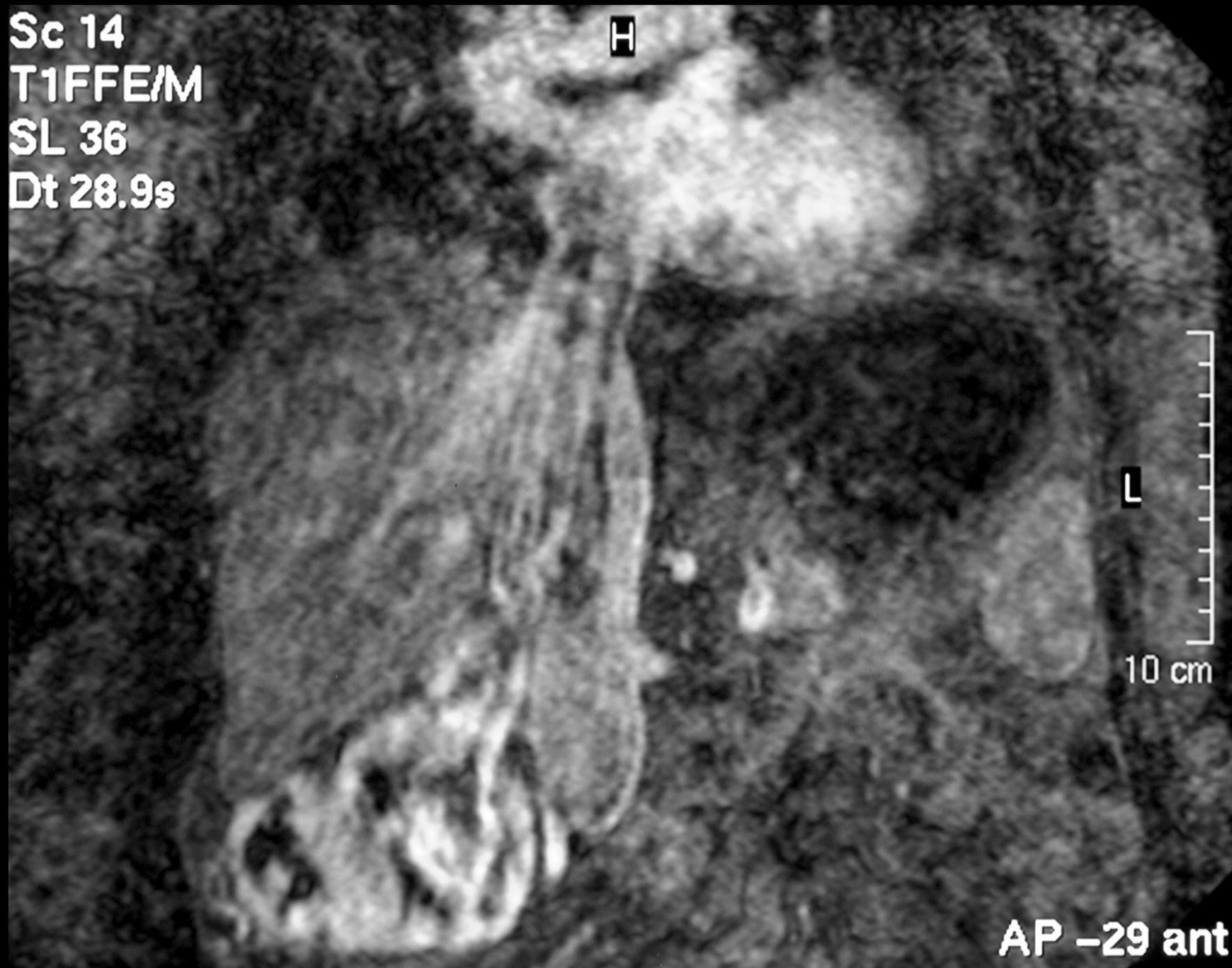
Sc 14
T1FFE/M
SL 36
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H

L

10 cm

AP -29 ant



Sc 14
T1FFE/M
SL 45
Dt 28.9s

H

L

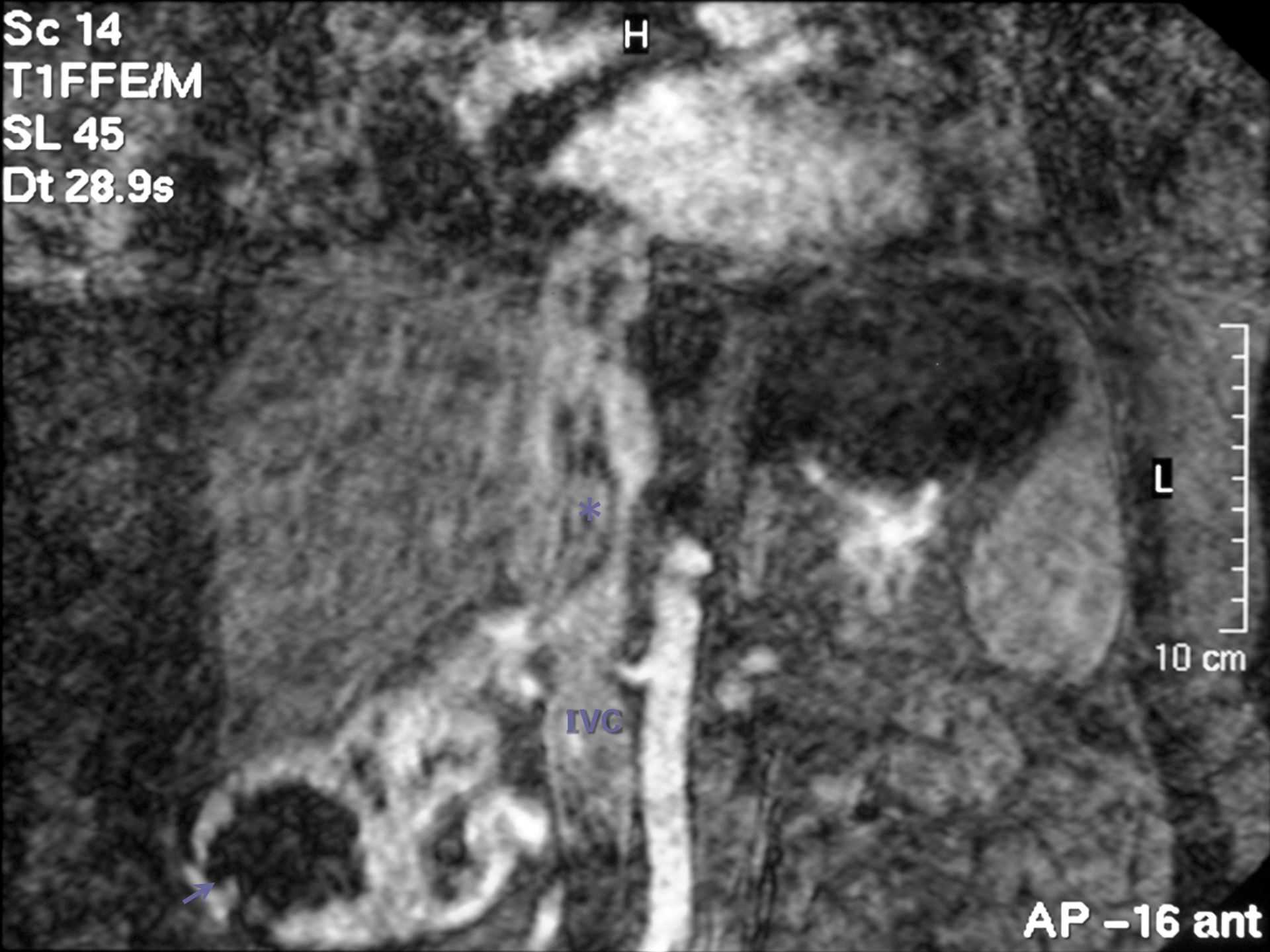
10 cm

IVC

*



AP -16 ant



HiSpeed SYS#CT

A 183 ATTIKON HOSPITAL 2nd DEP OF RAD

Ex: 7084

Se: 3

MPERDOUSI AGELIKI

SN S400.00

F 50 ACT44

Im: 61

21 Sep 2005

DFOV 45.0cm

512

STND

MF:1.1

R

1

9

2

L

2

1

7

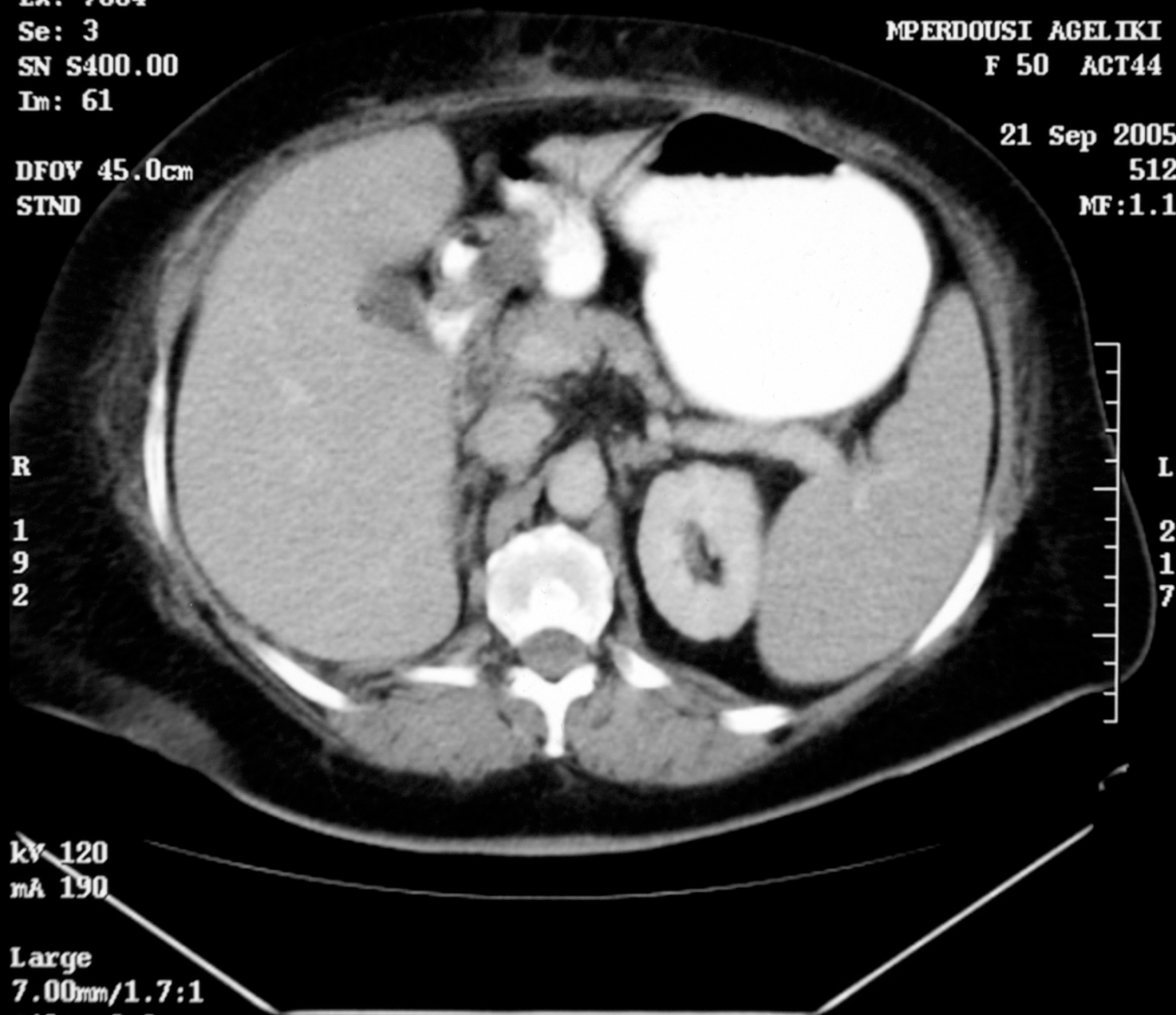
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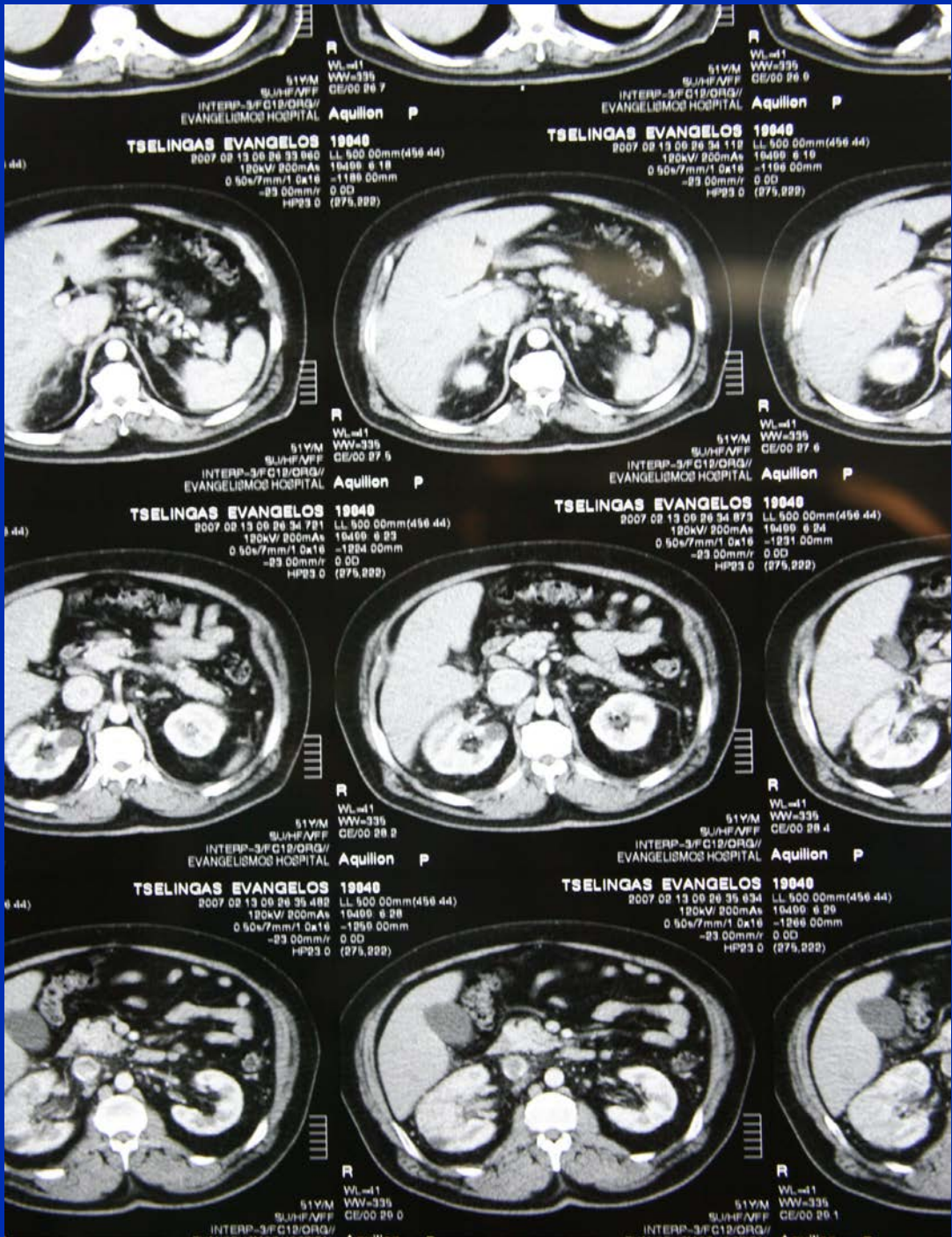
mA 190

Large

7.00mm/1.7:1

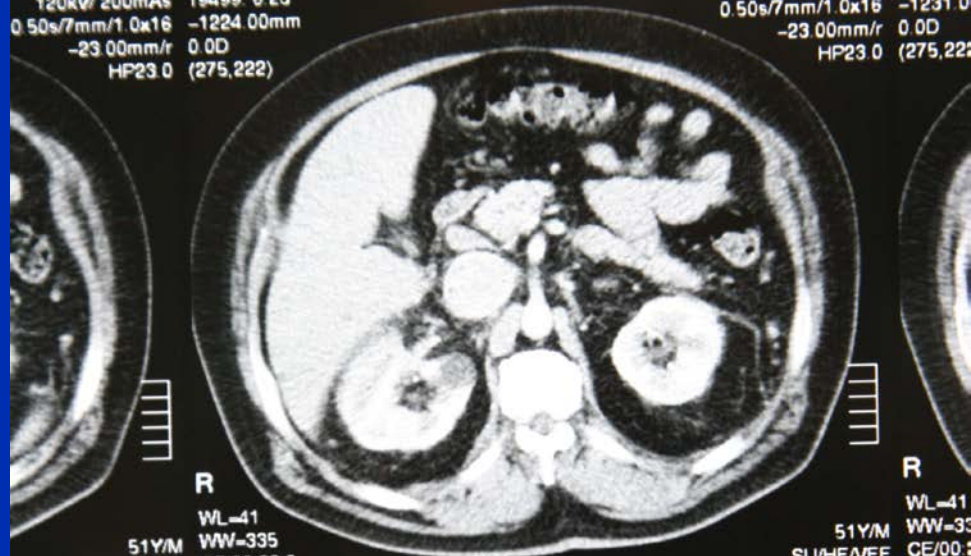
Tilt: 0.0





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120kV/ 200mAs 19499: 6.23
0.50s/7mm/1.0x16 -1224.00mm
-23.00mm/r 0.0D
HP23.0 (275,222)

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-23.00mm/r 0.0D
HP23.0 (275,222)



R
WL-41
51Y/M WW-335
SU/HF/VFF CE/00:28.2
INTERP-3/FC12/ORG//
EVANGELISMOS HOSPITAL

R
WL-41
51Y/M WW-335
SU/HF/VFF CE/00:
INTERP-3/FC12/ORG//
EVANGELISMOS HOSPITAL

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HP23.0 (275,222)

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-23.00mm/r 0.0D
HP23.0 (275,2



R
WL-41
51Y/M WW-335
SU/HF/VFF CE/00:29.0
INTERP-3/FC12/ORG//
EVANGELISMOS HOSPITAL

R
WL-41
51Y/M WW-335
SU/HF/VFF CE/00:
INTERP-3/FC12/ORG//
EVANGELISMOS HOSPITAL

GELOS 19848
 26.34 873 LL:500.00mm(456.44)
 # 200mAs 19499: 6.24
 1m/1.0x16 -1231.00mm
 13.00mm/r 0.00
 HP23.0 (275,222)

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 -23.00mm/r 0.00
 HP23.0 (275,222)



R
 WL-41
 51Y/M WW-335
 SL/HF/MFF CE/00 28.4
 FC12/ORG//
 S HOSPITAL

R
 WL-41
 51Y/M WW-335
 SL/HF/MFF CE/00 28.5
 INTERP-3/FC12/ORG//
 EVANGELISMOS HOSPITAL

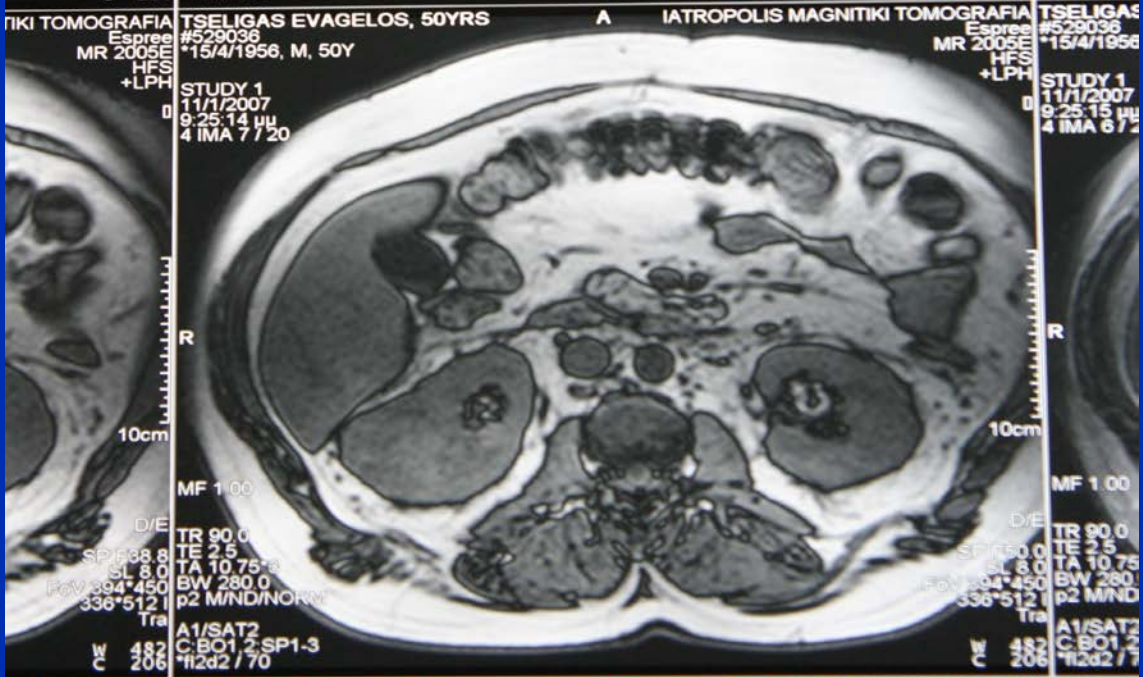
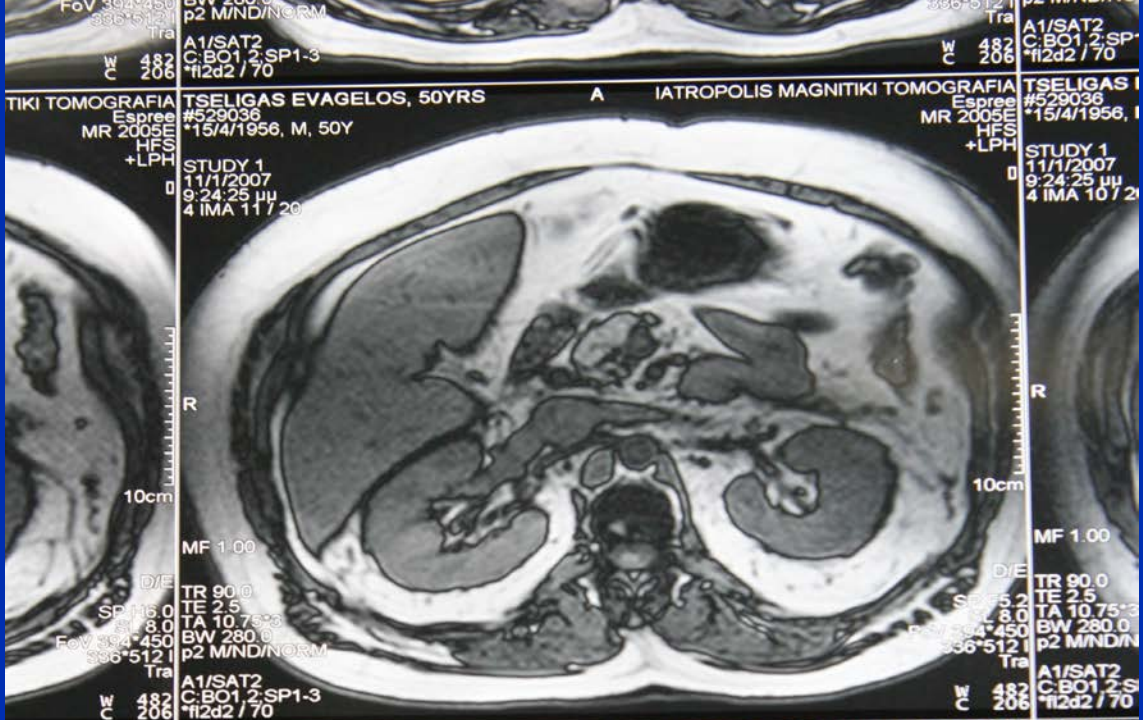
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 9.26 35 634 LL:500.00mm(456.44)
 kV/ 200mAs 19499: 6.29
 7mm/1.0x16 -1266.00mm
 -23.00mm/r 0.00
 HP23.0 (275,222)

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 0.50s/7mm/1.0x16 -1273.00mm
 -23.00mm/r 0.00
 HP23.0 (275,222)



R
 WL-41
 51Y/M WW-335
 SL/HF/MFF CE/00 28.4
 FC12/ORG//
 S HOSPITAL

R
 WL-41
 51Y/M WW-335
 SL/HF/MFF CE/00 28.5
 INTERP-3/FC12/ORG//
 EVANGELISMOS HOSPITAL



KI TOMOGRAFIA
 Espree #529036
 MR 2005E
 HF
 +LPH
 STUDY 1
 11/1/2007
 9:25:15 μμ
 4 IMA 67 / 2

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 Espree #529036
 MR 2005E
 HF
 +LPH
 STUDY 1
 11/1/2007
 9:25:15 μμ
 4 IMA 67 / 2

TSELIGAS EVAGELOS, 50YRS
 #529036
 *15/4/1956, M, 50Y
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 TE 2.5
 SP 16.0
 SL 8.0
 TA 10.75°
 BW 280.0
 FoV 394*450
 336*512
 p2 MND/NORM
 Tra A1/SAT2
 W 482 C 206
 C:BO1,2,SP1-3
 *f12d2 / 70

SL 6.0
FoV 450*450
306*512 |
Tra

2-SP1-4
763
GAS EVAGELOS, 50YRS
16
956, M, 50Y

A IATROPOLIS MAGNITIKI TOMOGRAFIA

1
07
11
57 17



62*20
15.0
NORM

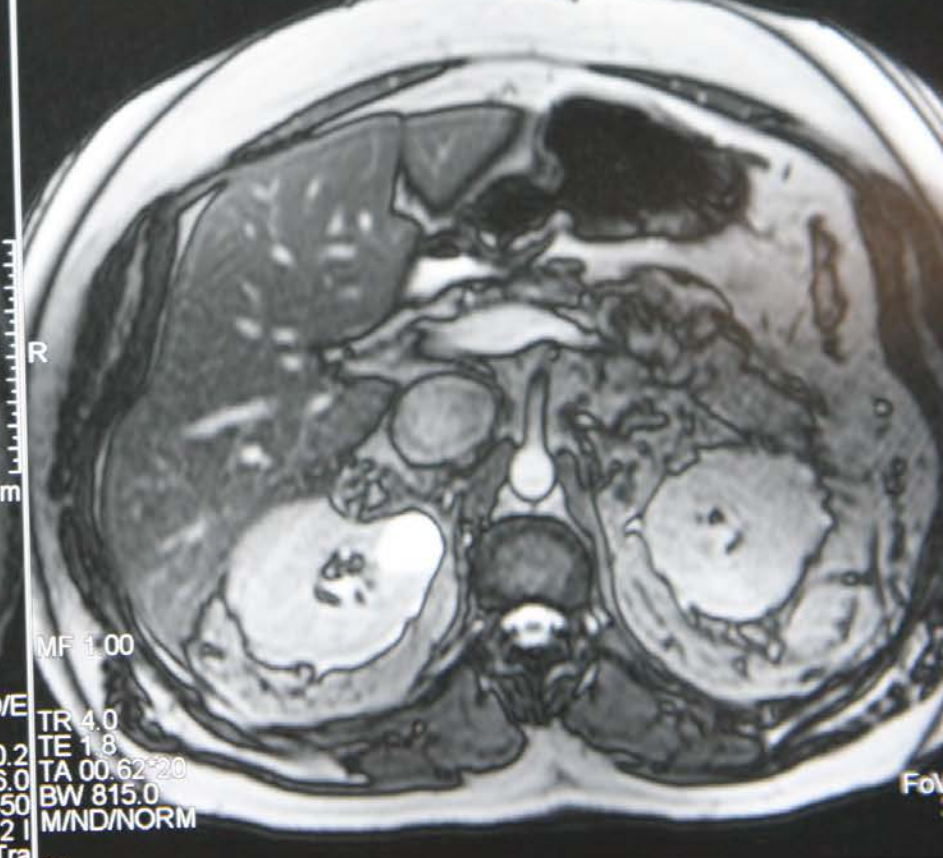
W 649
C 289
Espree
MR 2005E
HFS
+LPH

SL 6.0
FoV 450*450
306*512 |
Tra

A1
C:BO1.2:SP1-4
*trf2d1 / 63
TSELIGAS EVAGELOS, 50YRS
#529036
*15/4/1956, M, 50Y

A IATROPOLIS MAGNITIKI TOMOGRAFIA

STUDY 1
11/1/2007
9:33:50 mu
14 IMA 4 / 17



MF 1.00
D/E
SP H20.2
SL 6.0
FoV 450*450
306*512 |
Tra

TR 4.0
TE 1.8
TA 00.62*20
BW 815.0
M/ND/NORM

FoV
3

S EVAGELOS, 50YRS
6, M, 50Y

A IATROPOLIS MAGNITIKI TOMOGRAFIA

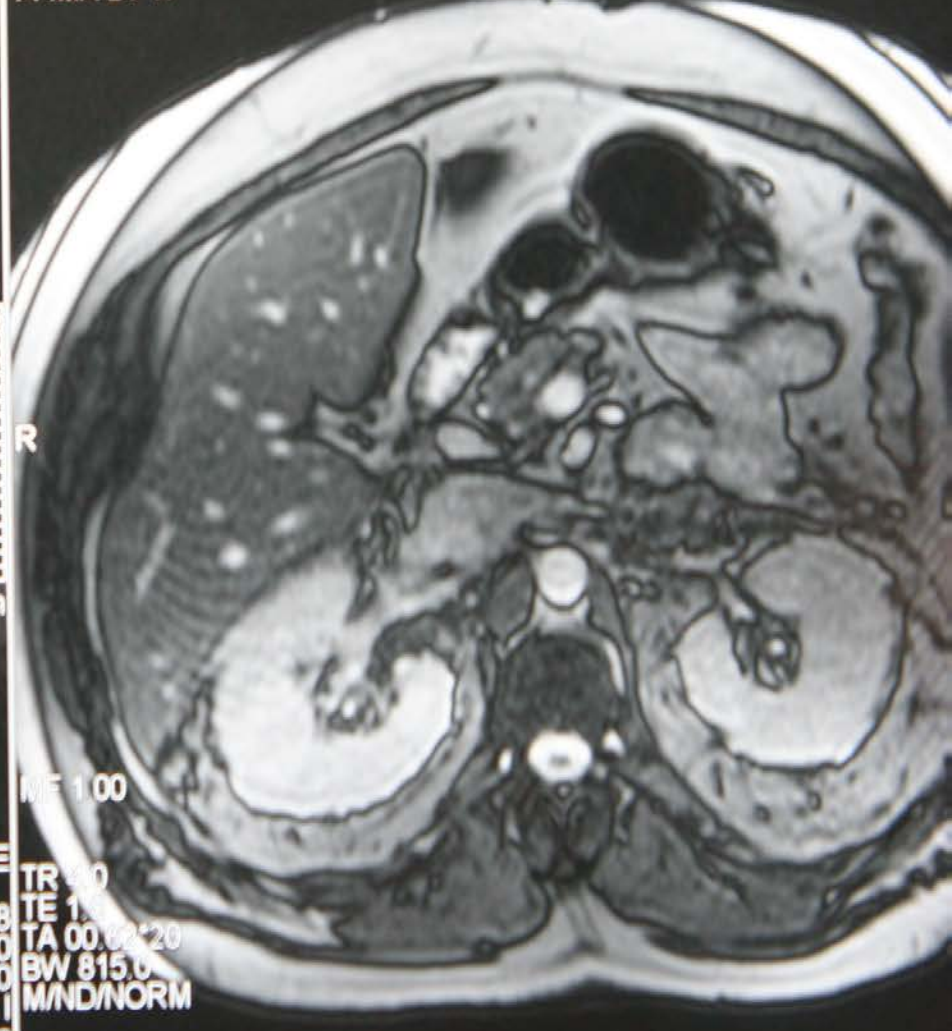
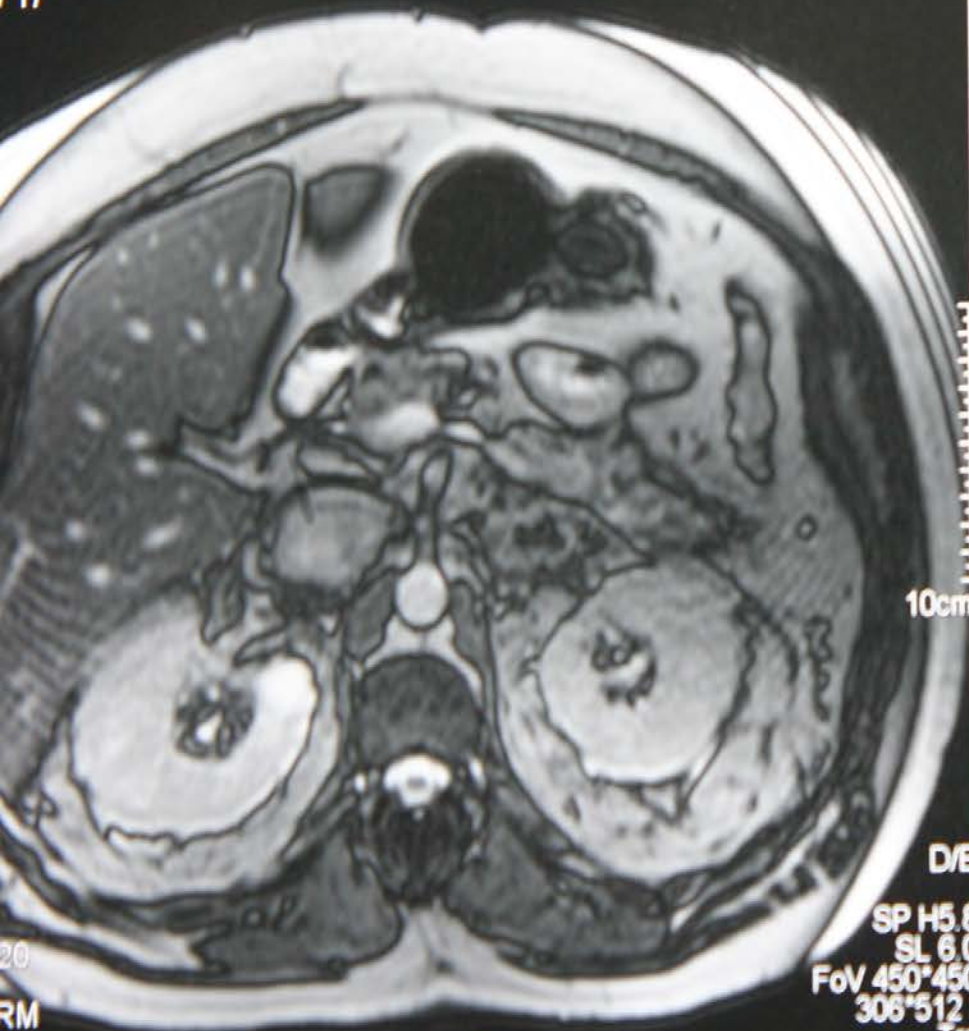
TSELIGAS EVAGELOS, 50YRS

A IATROPOLIS MAGNITIKI TOMOGRAFIA

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HFS
+LPH

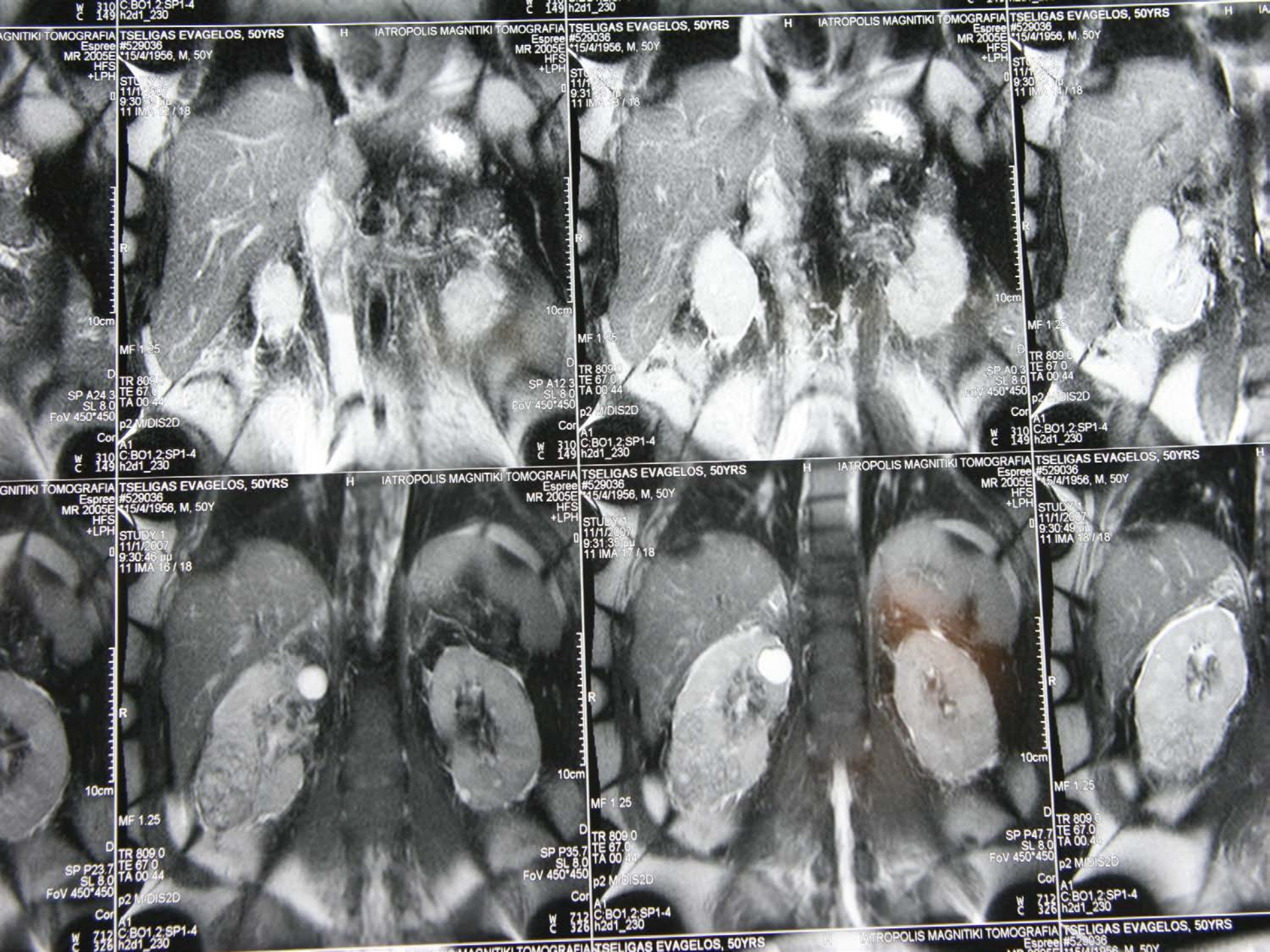
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11/1/2007
9:33:49 μμ
14 IMA 2 / 17

17



10cm
ME 100
D/E TR 30
SP H5.8 TE 15
SL 6.0 TA 00.00*20
FoV 450*450 BW 815.0
306*512 | M/ND/NORM
Tra
A1
W 742 C:BO1,2:SP1-4
C 336 *tf2d1 / 63

20
RM
SP1-4



W 310 C 149 C:BO1_2.SP1-4 h2d1_230

H IATROPOLIS MAGNITIKI TOMOGRAFIA TSELIGAS EVAGELOS, 50YRS

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STUDY 1 11/1/2007 9:30:38 pp 11 IMA 12 / 18

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H IATROPOLIS MAGNITIKI TOMOGRAFIA TSELIGAS EVAGELOS, 50YRS

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Espreo #529036 MR 2005E HFS +LPH

STUDY 1 11/1/2007 9:30:46 pp 11 IMA 16 / 18

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H IATROPOLIS MAGNITIKI TOMOGRAFIA TSELIGAS EVAGELOS, 50YRS

Espreo #529036 MR 2005E HFS +LPH

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H IATROPOLIS MAGNITIKI TOMOGRAFIA TSELIGAS EVAGELOS, 50YRS

Espreo #529036 MR 2005E HFS +LPH

STUDY 1 11/1/2007 9:30:49 pp 11 IMA 18 / 18

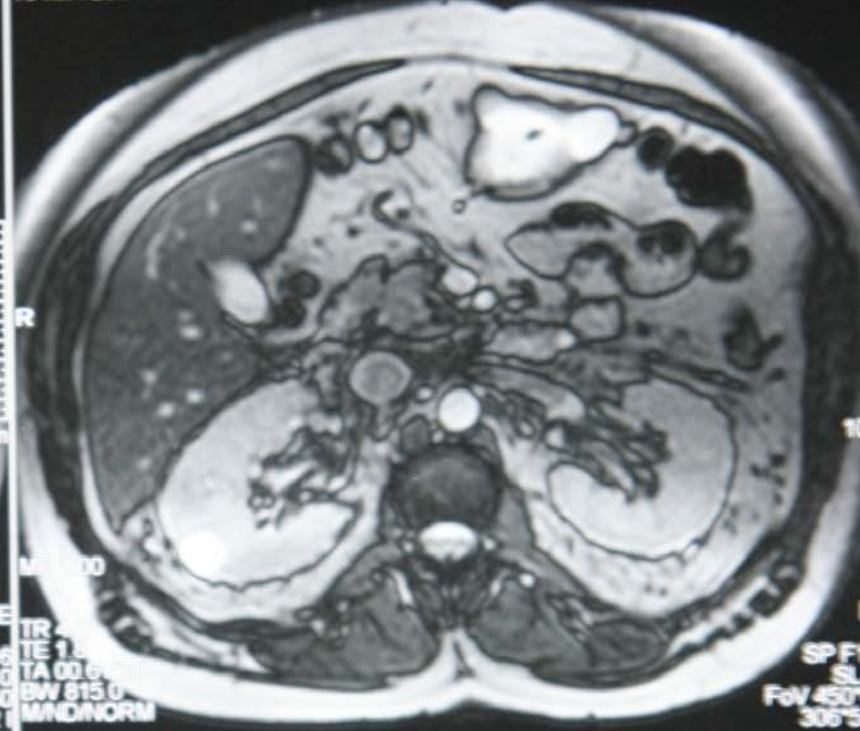
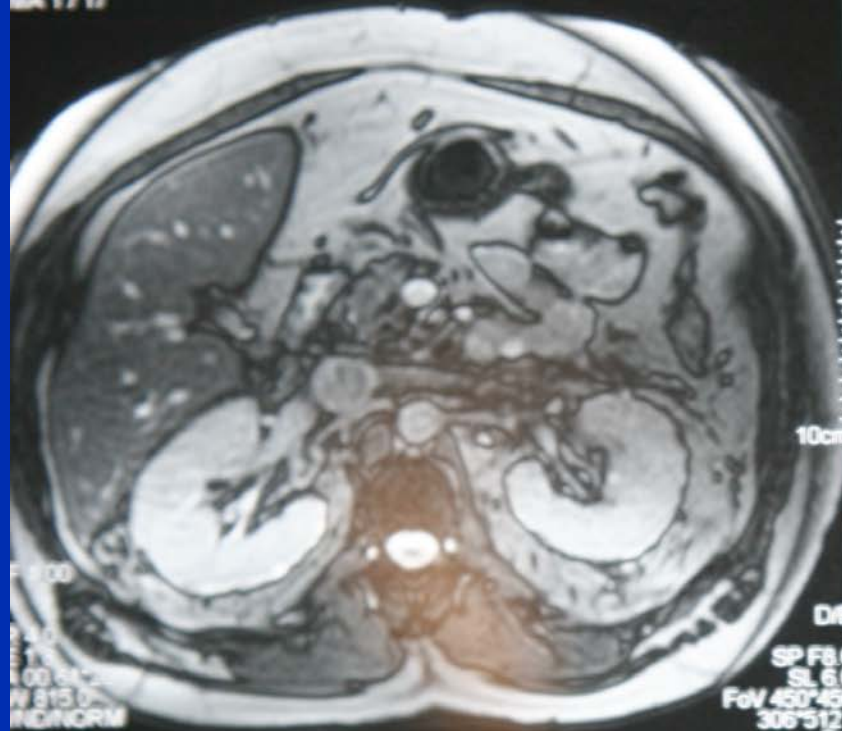
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4/19/06, M, 50Y

STY 1
11/1/2007
9:34:45 AM
16 IMA 20 / 14

HF
+LPH

STY 1
11/1/2007
9:34:45 AM
16 IMA 20 / 14



F 100

SP F 100
SL 6.0
FoV 450*450
MINDINORM

TR 2.0
TE 1.5
TA 00.6
BW 615.0
MINDINORM

SP F 100
SL 6.0
FoV 450*450
MINDINORM

BO1.2.SP1-4
10/21/03

W 693
C 316

C BO1.2.SP1-4
10/21/03

SELIGAS EVAGELOS, 50YRS
#529036
15/4/1956, M, 50Y

A IATROPOLIS MAGNITIKI TOMOGRAFIA
Espree
MR 2005E

TSELIGAS EVAGELOS, 50YRS
#529036
15/4/1956, M, 50Y

A IATROPOLIS MAGNITIKI TOMOGRAFIA
Espree
MR 2005E

STY 1
11/1/2007
9:34:44 AM
16 IMA 16 / 14

STY 1
11/1/2007
9:34:44 AM
16 IMA 16 / 14



STUDY 1
11/1/2007
9:43:41 μμ
18 IMA 29 / 44

R
10cm

MF 1.00
D
SP F1.3 TR 6.0
SL 4.0 TE 2.9
FoV 450*450 TA 22.84
154*256 p2 M/ND/NORM
Tra
A1/SAT2/FS
C:BO1.2;SP1-4
W 588
C 259 *ti3d1 / 10

20 ML DOTAREM IV

ORM
S
P1-4



11/1/2007
9:43:41 μμ
18 IMA 28 / 44

R
10cm

MF 1.00
D
SP F5.3 TR 6.0
SL 4.0 TE 2.9
FoV 450*450 TA 22.84
154*256 p2 M/ND/NORM
Tra
A1/SAT2/FS
C:BO1.2;SP1-4
W 570
C 251 *ti3d1 / 10

20 ML DOTAREM IV

20 ML DOTAREM IV



TSELIGAS EVAGELOS, 50YRS
Espre #529036
MR 2005E
*15/4/1956, M, 50Y

STUDY 1
11/1/2007
9:43:41 μμ
18 IMA 24 / 44

R
10cm

MF 1.00
D
SP F21.3 TR 6.0
SL 4.0 TE 2.9
FoV 450*450 TA 22.84
154*256 p2 M/ND/NORM
Tra

AIATROPOLIS MAGNITIKI TOMOGRAFIA

S EVAGELOS, 50YRS

I, M, 50Y



TSELIGAS EVAGELOS, 50YRS
Espre #529036
MR 2005E
*15/4/1956, M, 50Y

STUDY 1
11/1/2007
9:43:41 μμ
18 IMA 23 / 44

R
10cm

MF 1.00
D
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SL 4.0 TE 2.9
FoV 450*450 TA 22.84
154*256 p2 M/ND/NORM
Tra
A1/SAT2/FS

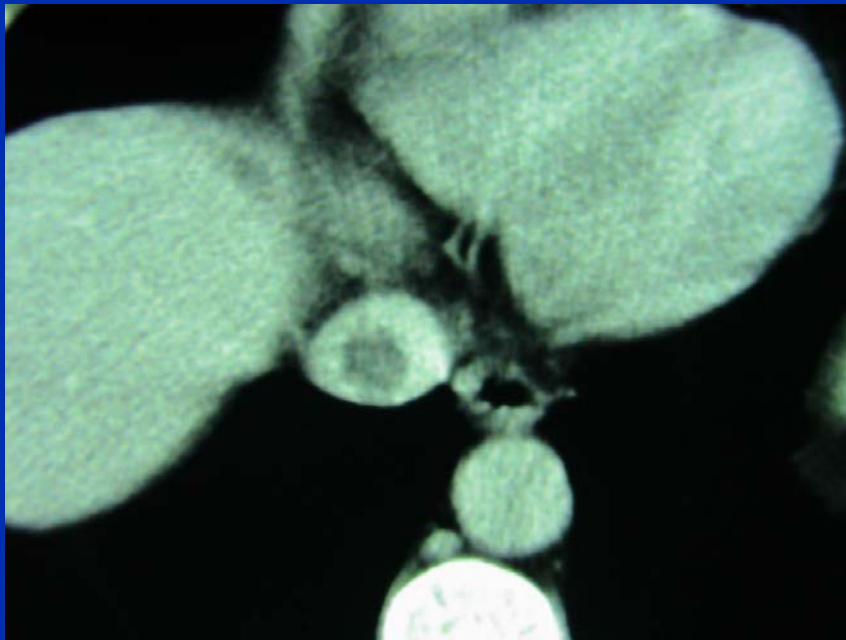
AIATROPOLIS MAGNITIKI TOMOGRAFIA

TSELIGAS EVAGELOS, 50YRS

AIATROPOLIS M

20 ML DOTAREM IV

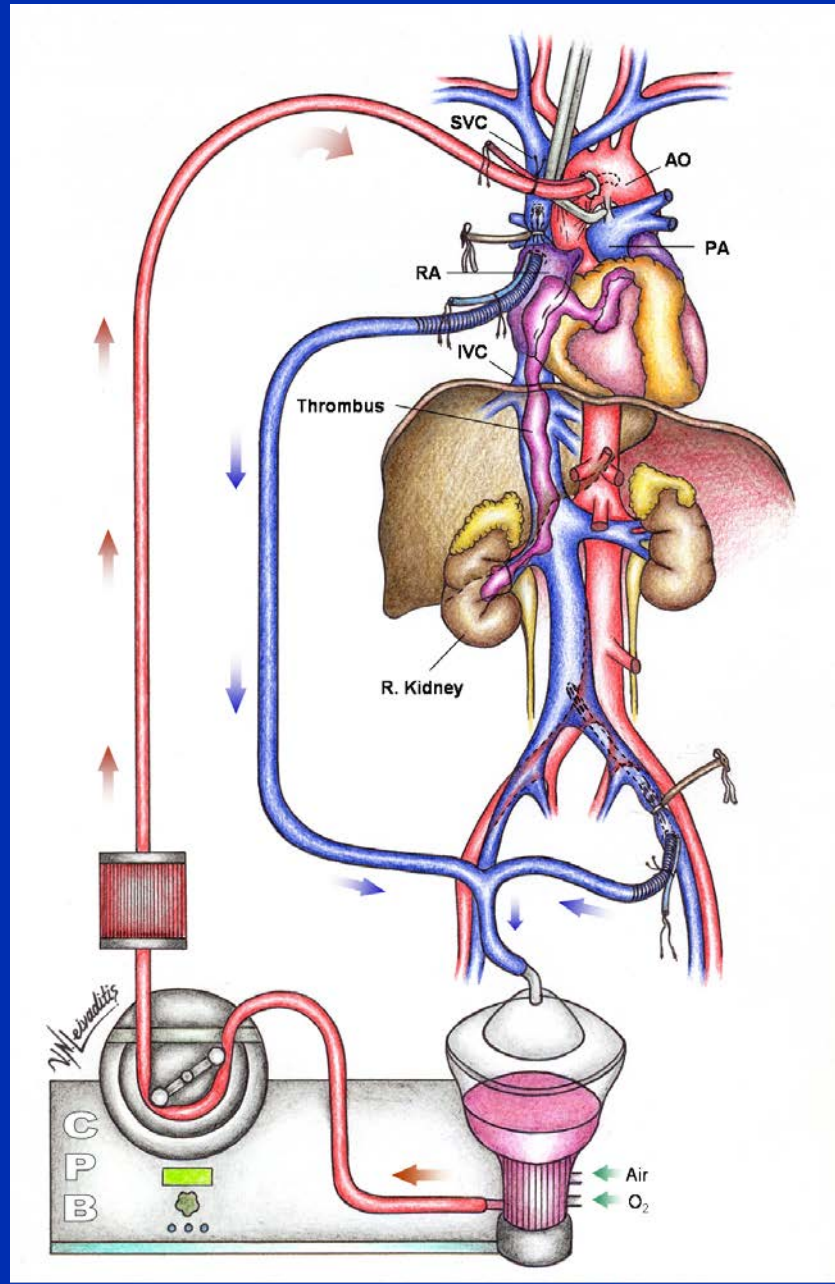
CT of tumor-thrombus entering the cardiac cavities



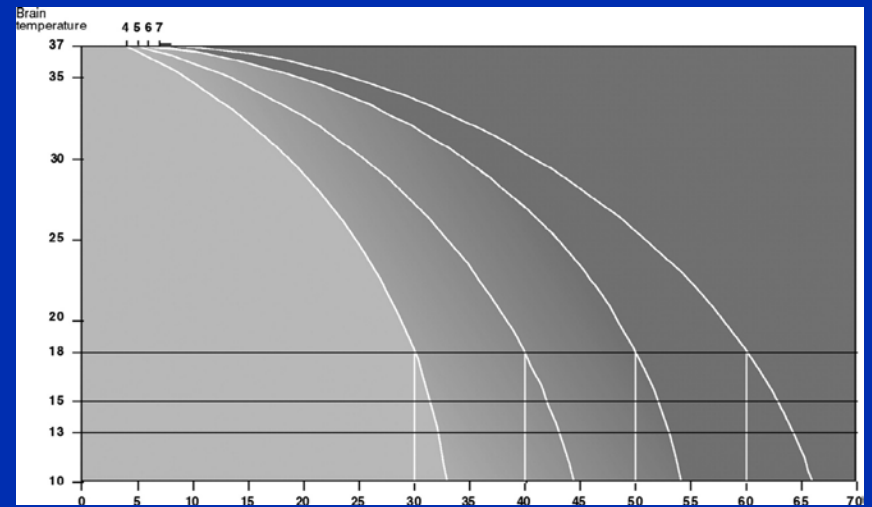
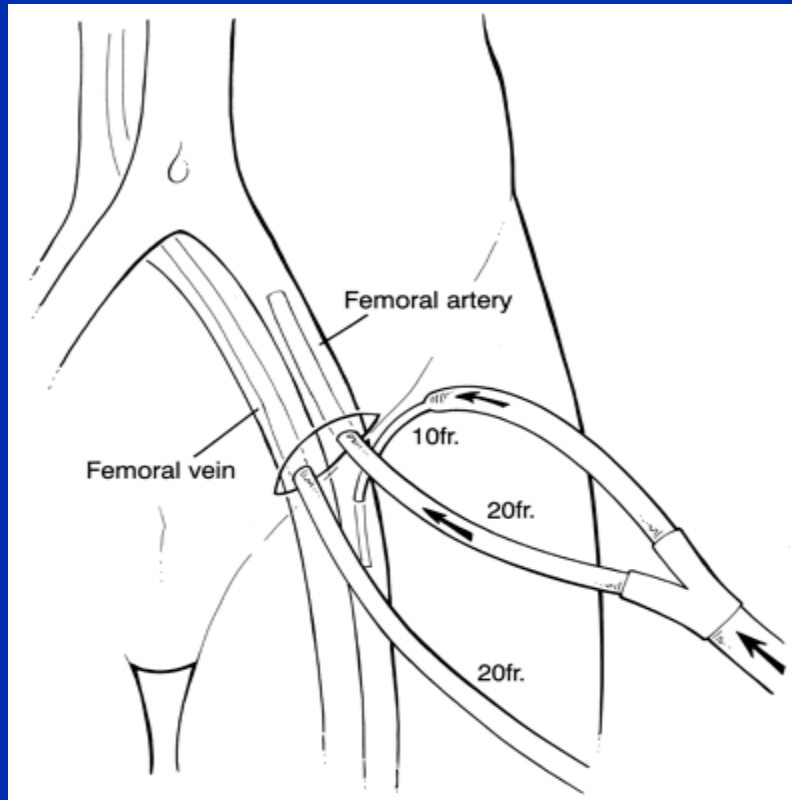
SURGICAL TECHNIC

1. Connection with the extracorporeal circulation.
Median sternotomy. 2 venous cannuli. The first one in the SVC & transfixed. The 2nd in the opposite femoral vein.
2. Abdominal incision. (Chevron)
3. Exposure of the kidney and IVC under CPB and simultaneous body cooling to 16° C.
4. Right atriotomy under circulatory arrest and mobilization of the tumor from within.
5. Incision of the IVC and en block resection of the kidney with the tumor along with its extension. Repair of IVC +/- pericardial patch.
6. Rewarming – haemostasis – closure.

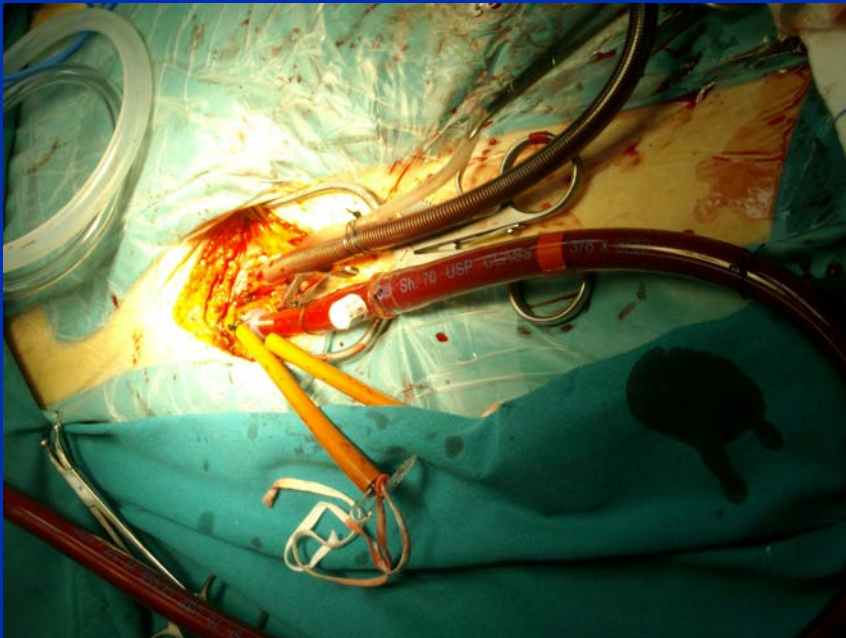
Extracorporeal Circulation System



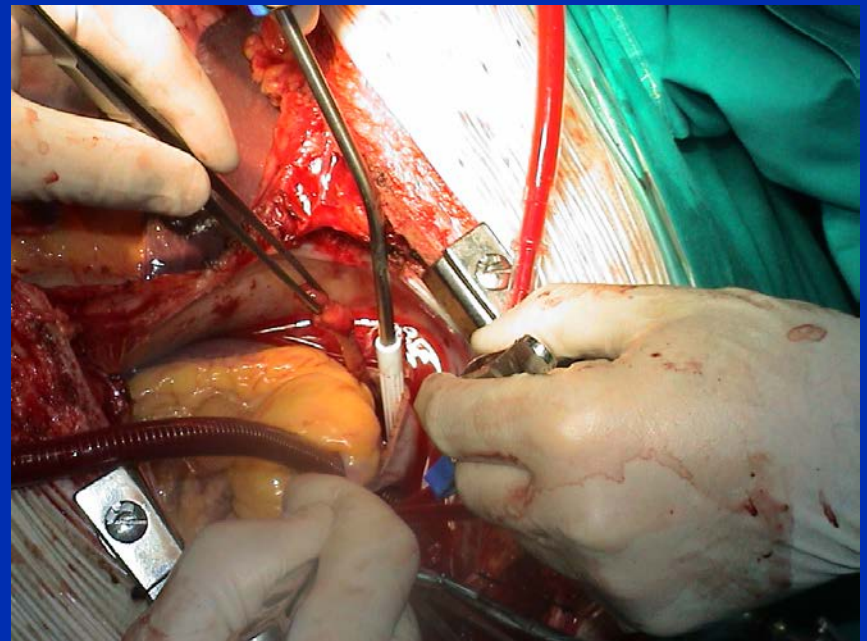
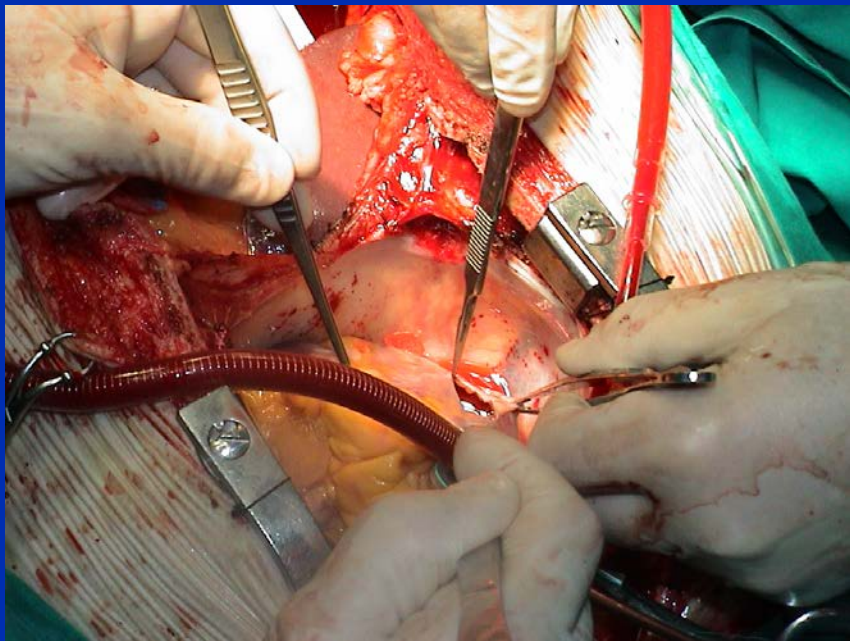
Femoro-femoral bypass



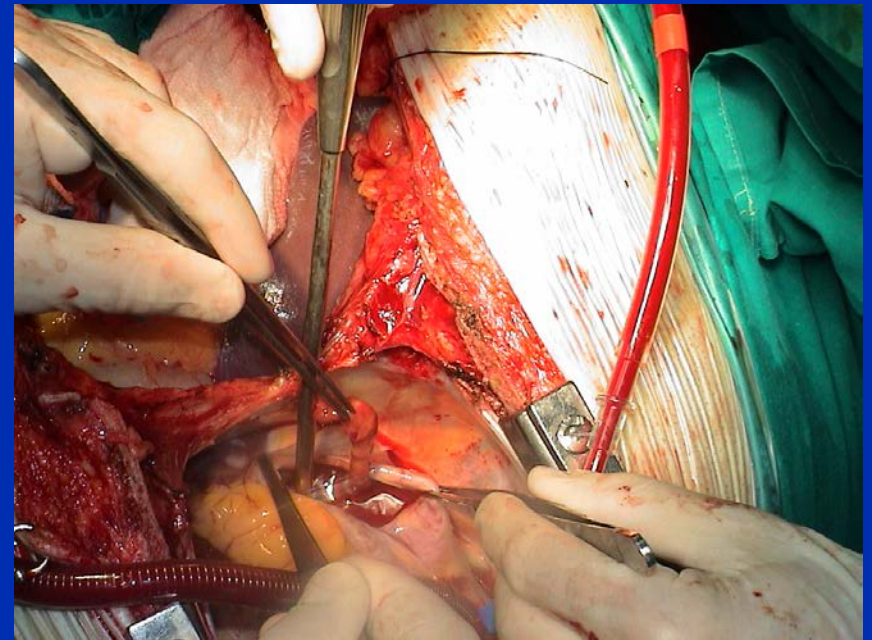
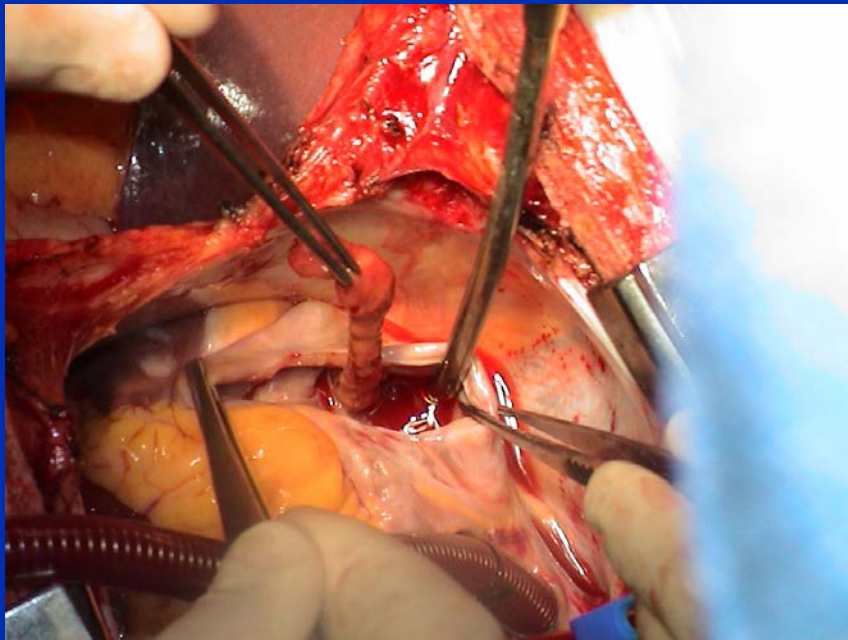
Femoro-femoral bypass



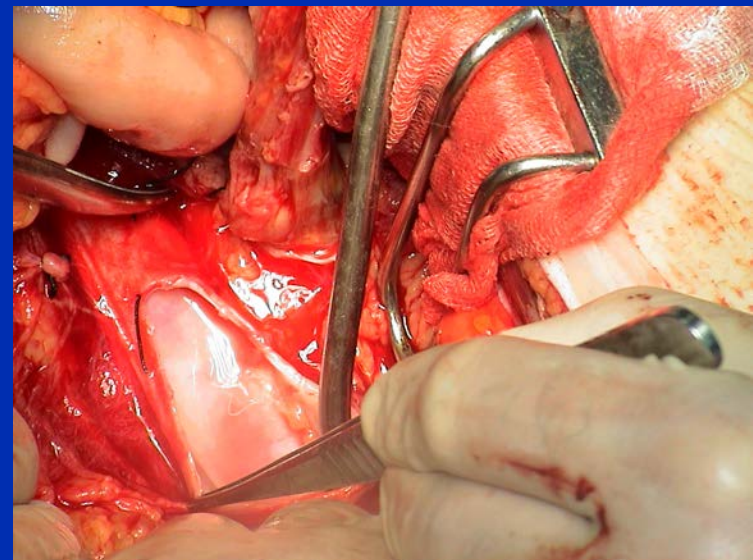
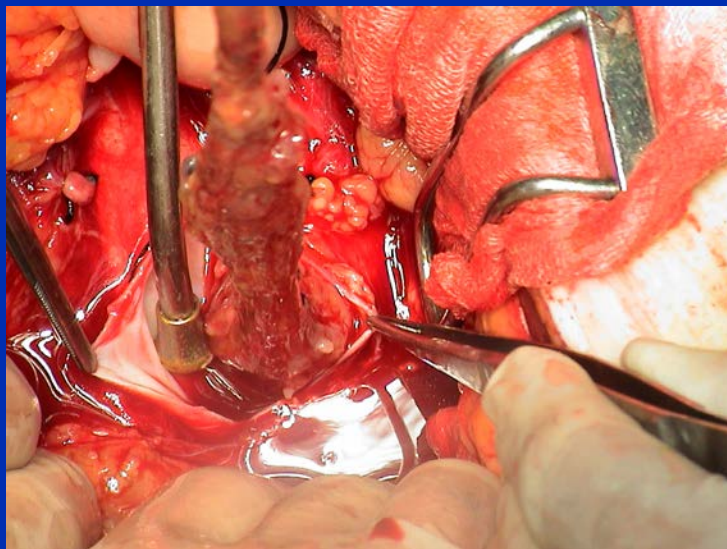
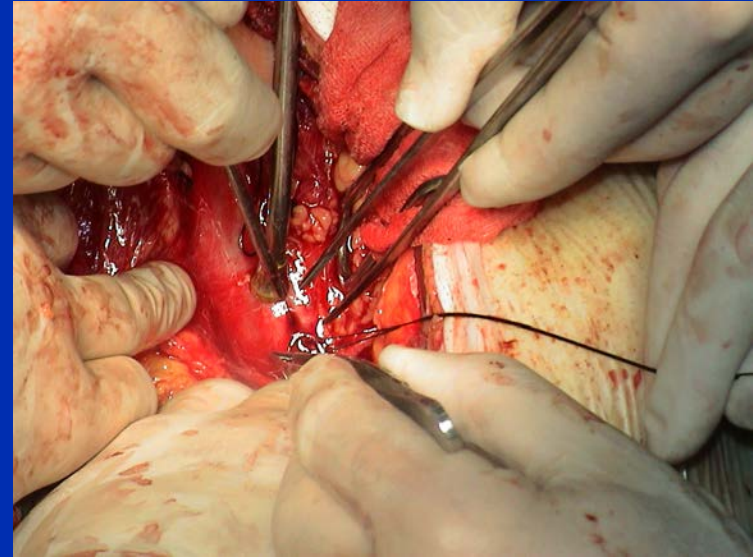
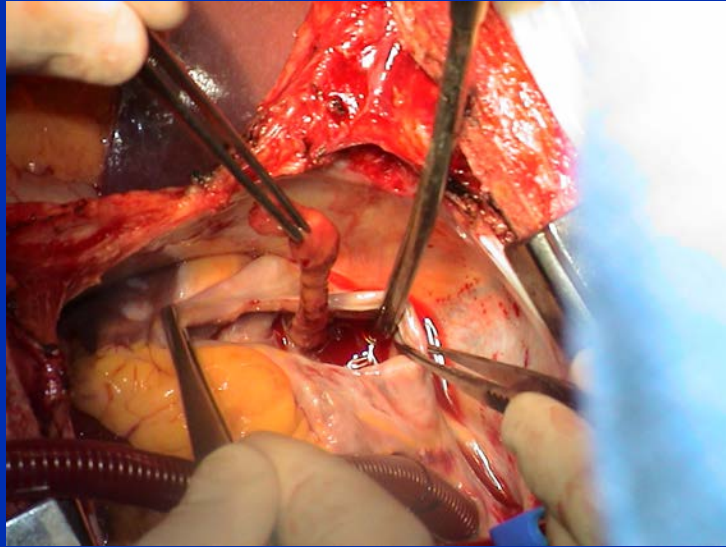
Surgical Technic



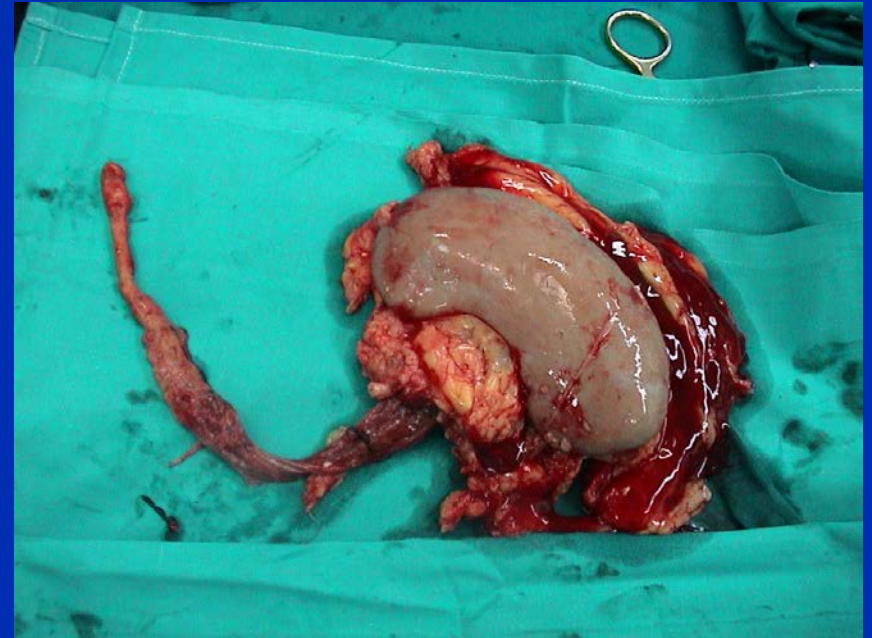
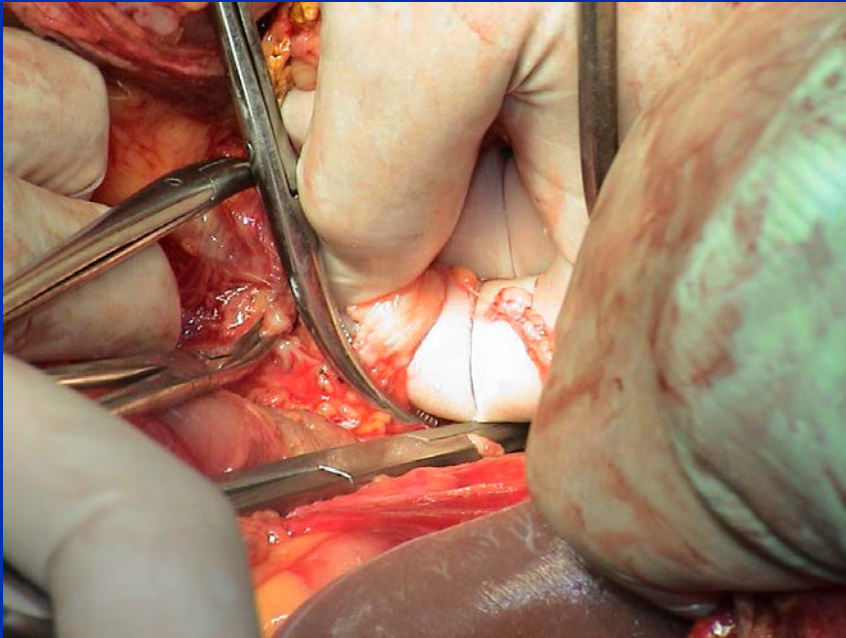
Surgical Technic-II

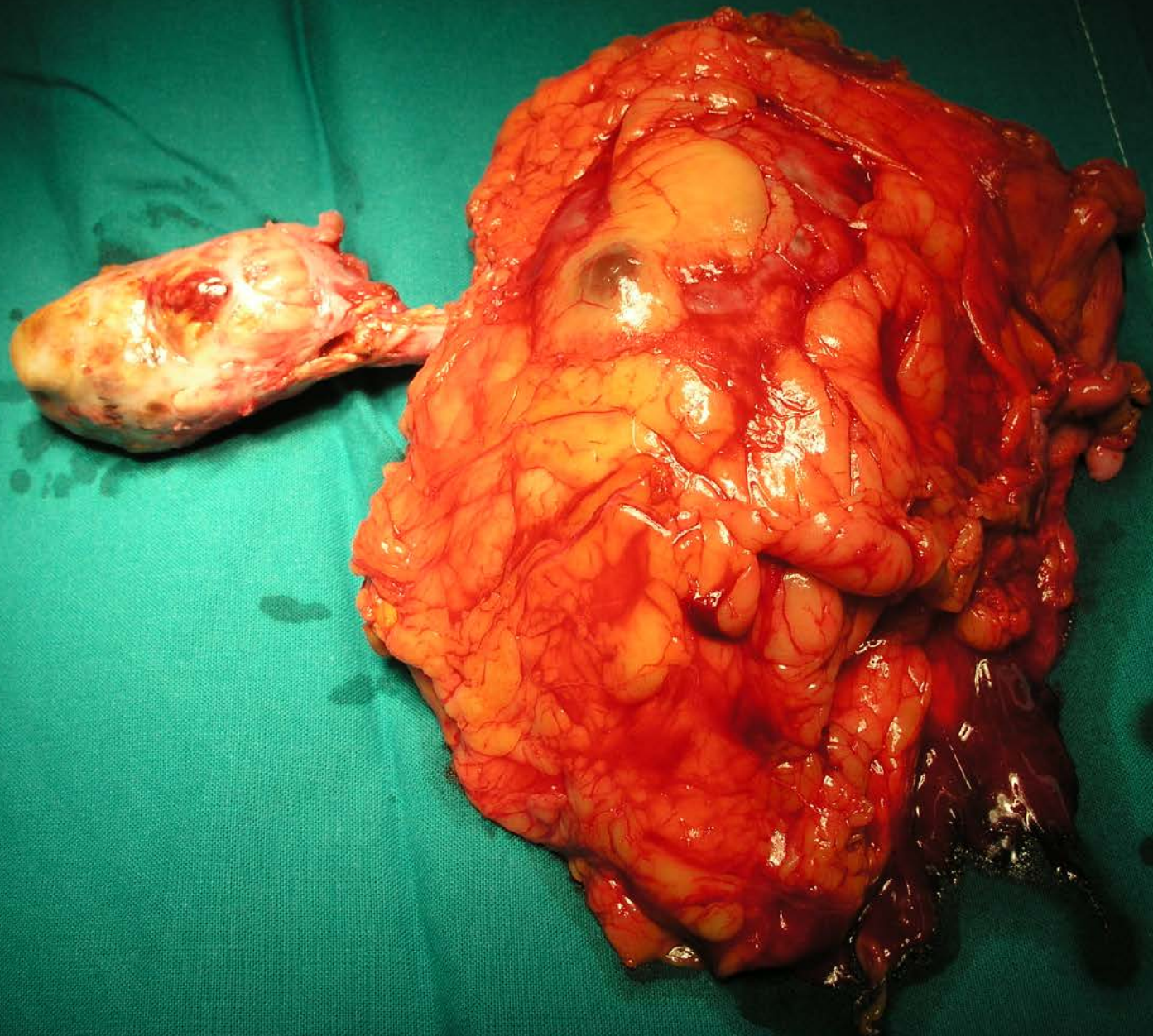


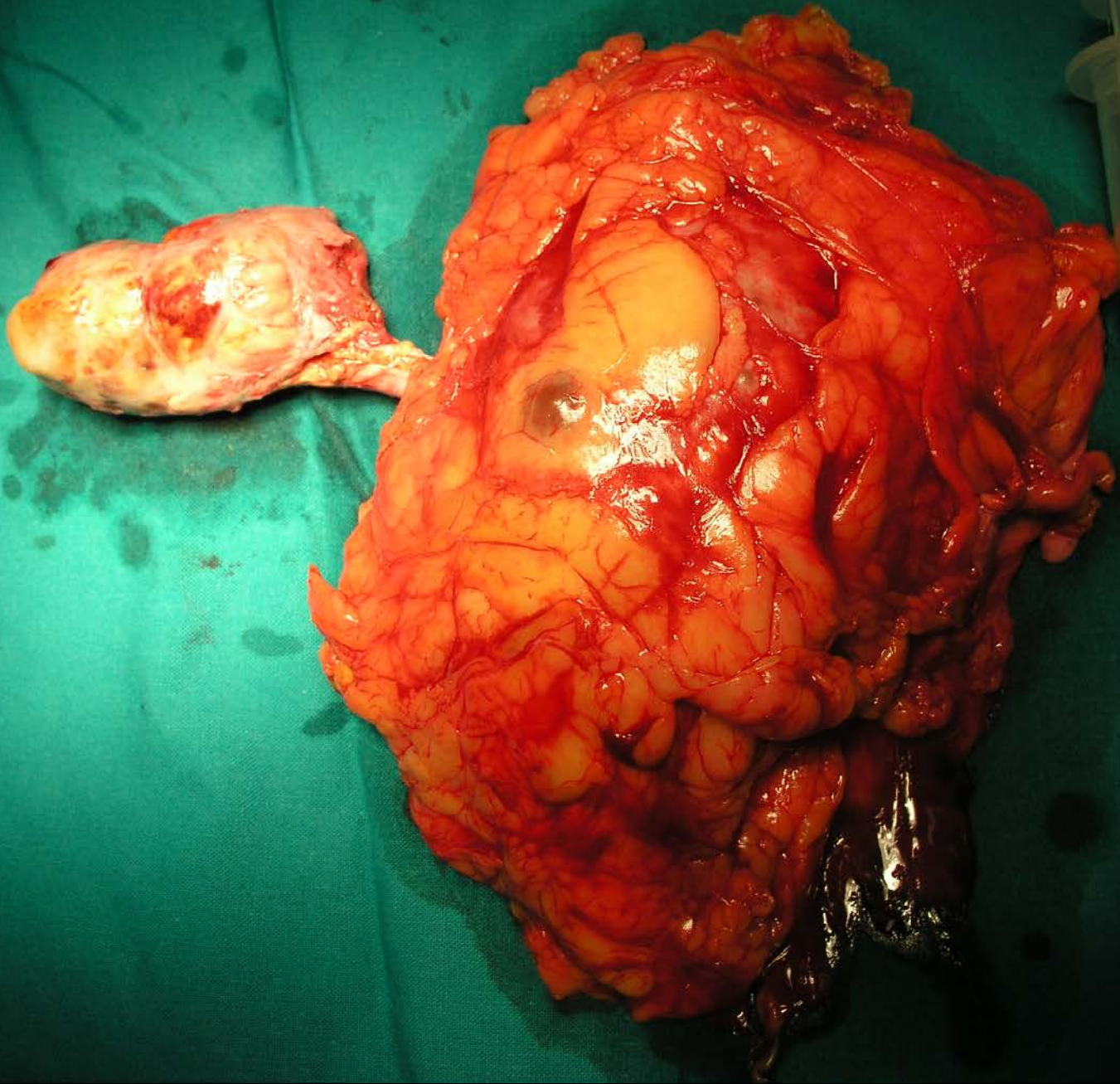
Surgical Technic-III

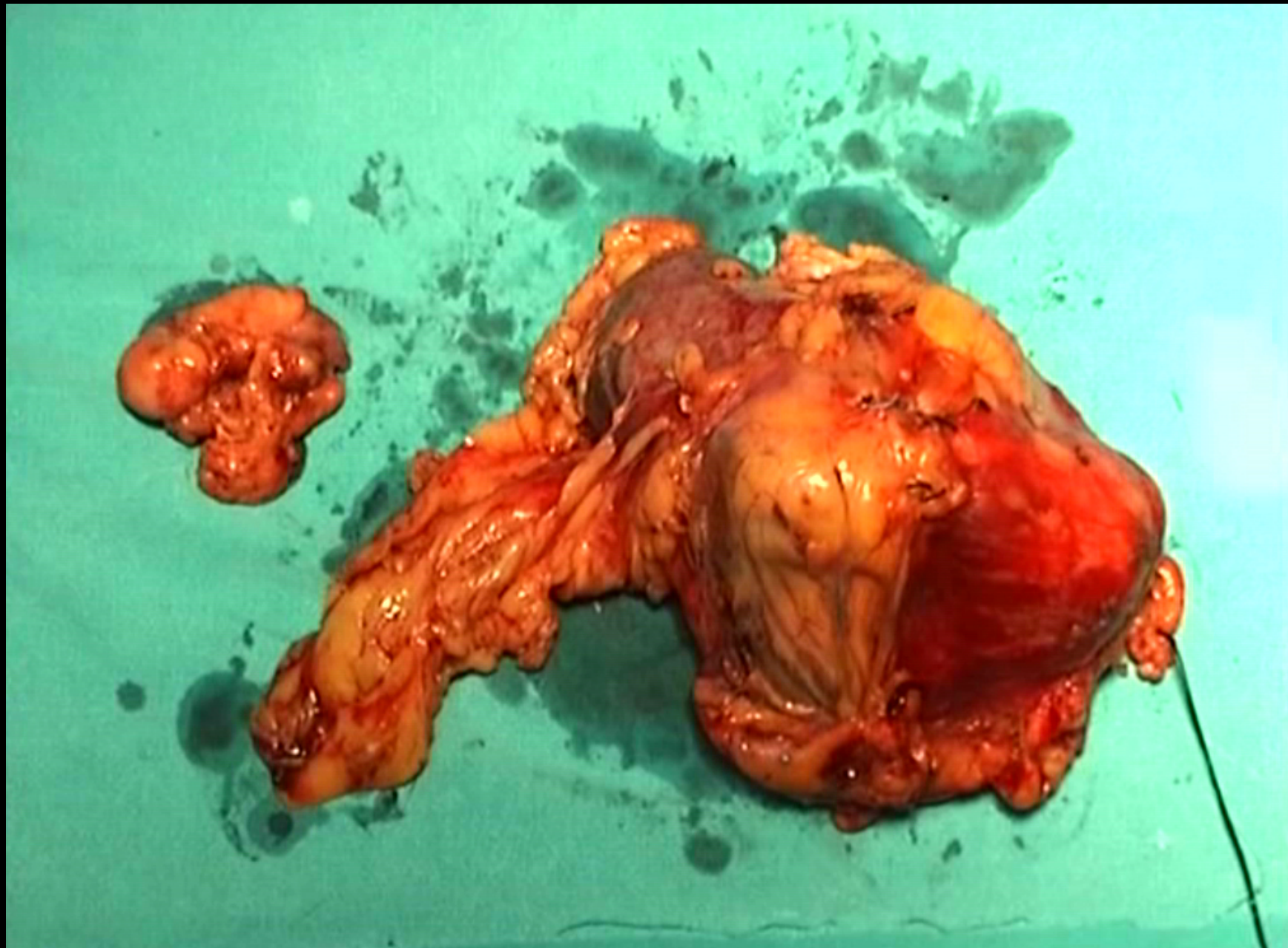


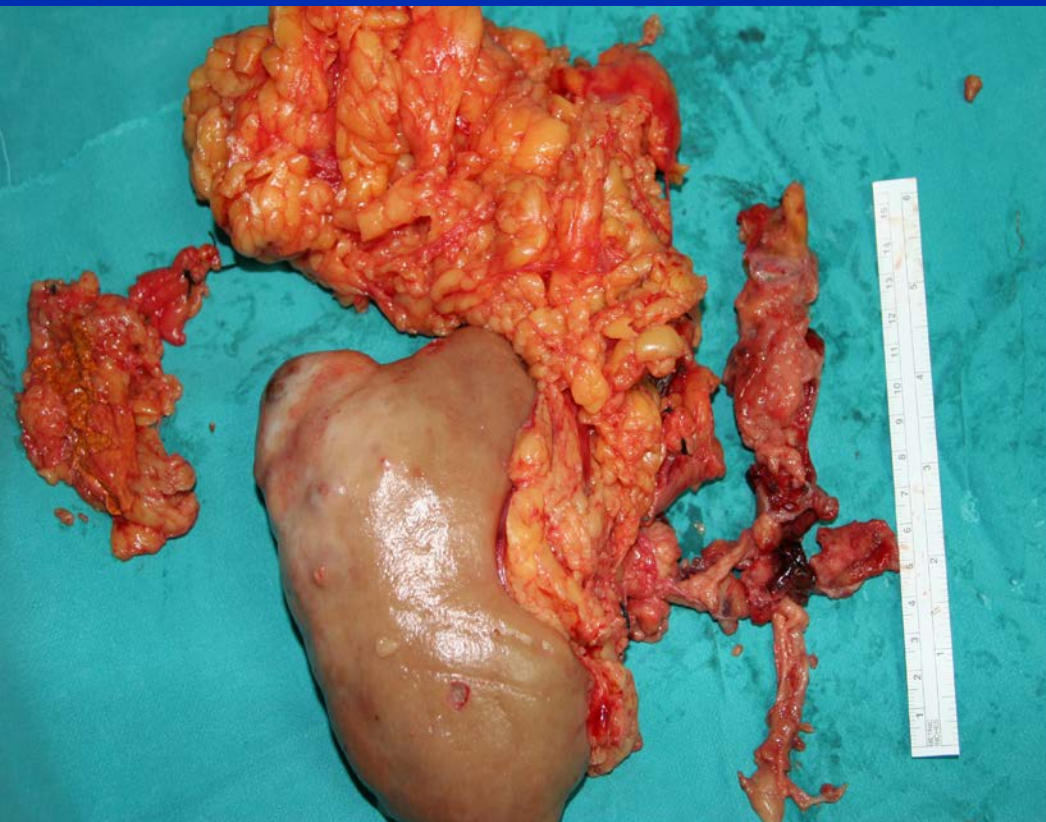
Surgical Technic-IV







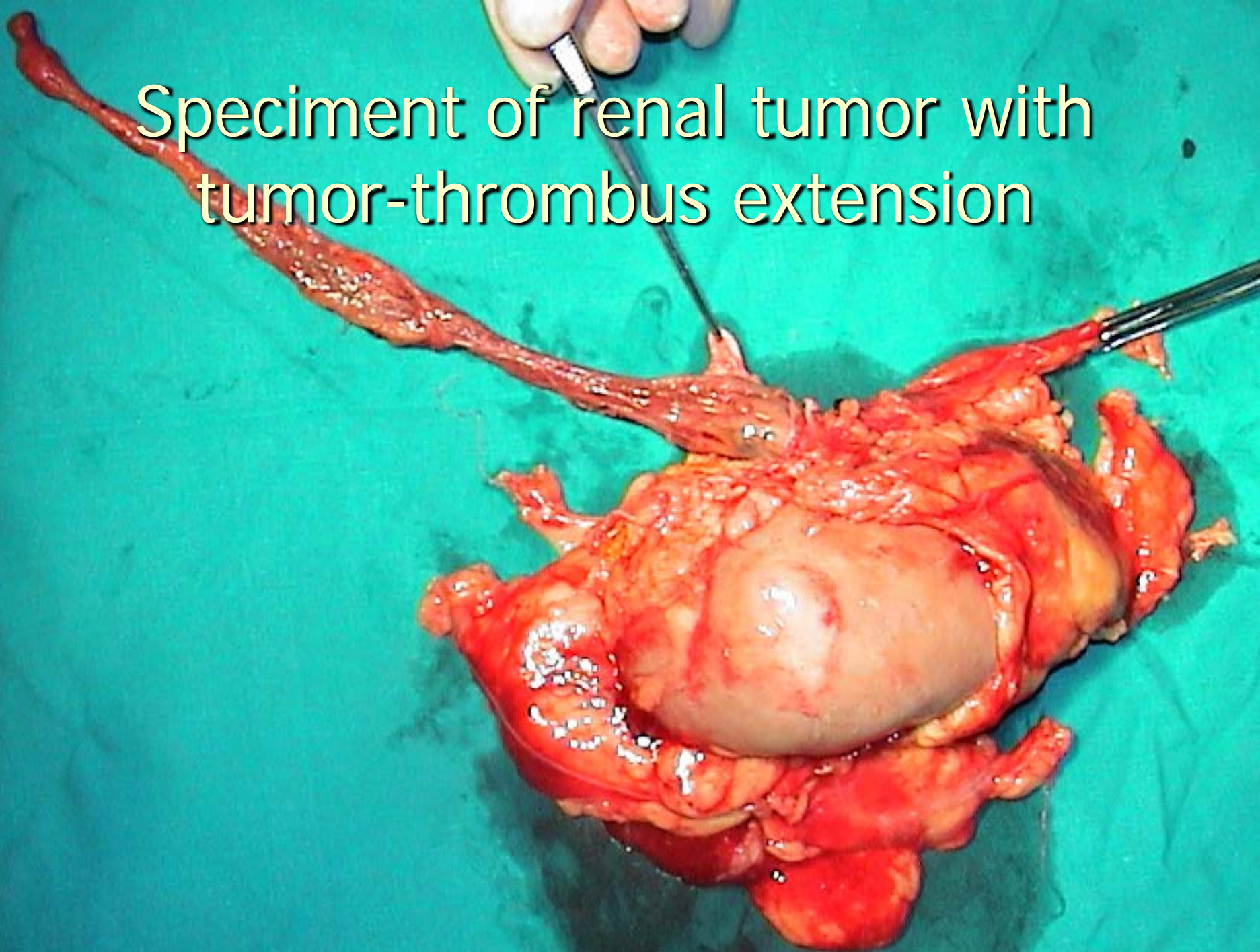








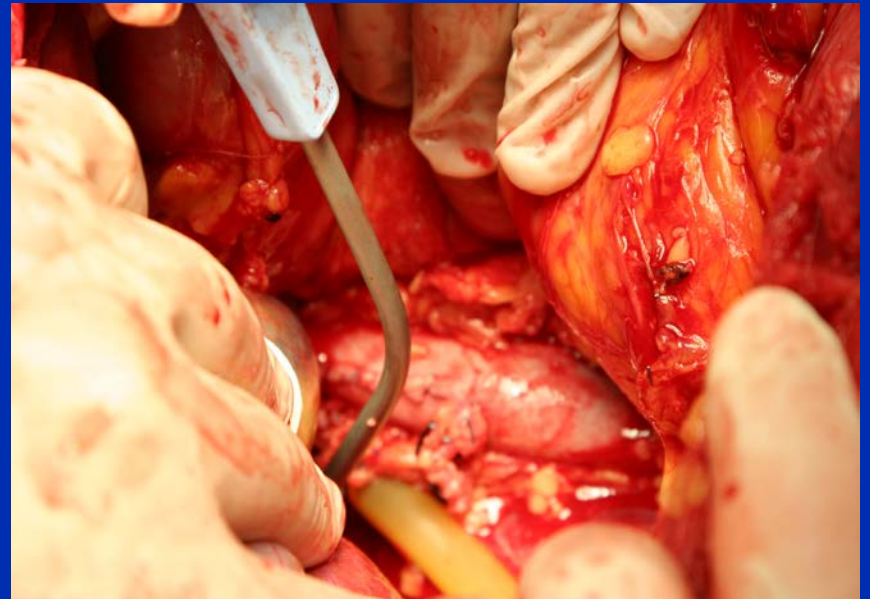
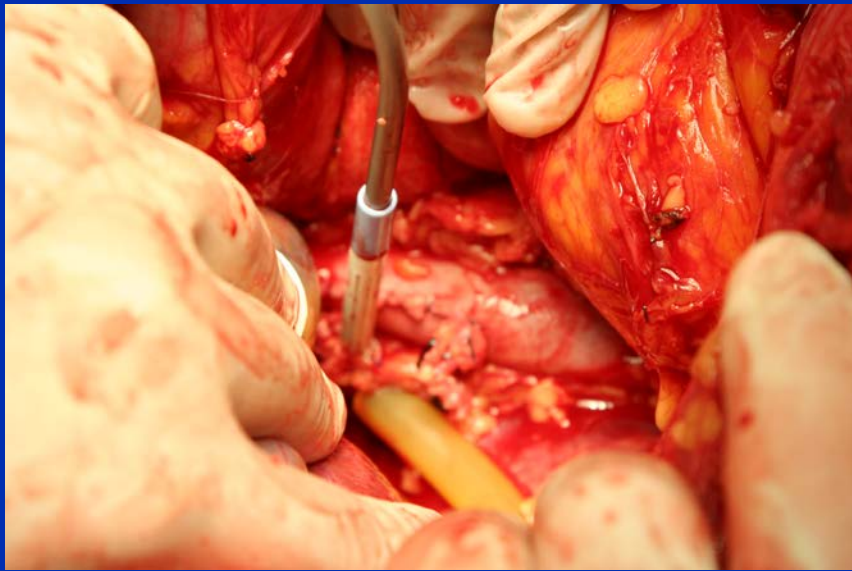
Specimen of renal tumor with tumor-thrombus extension



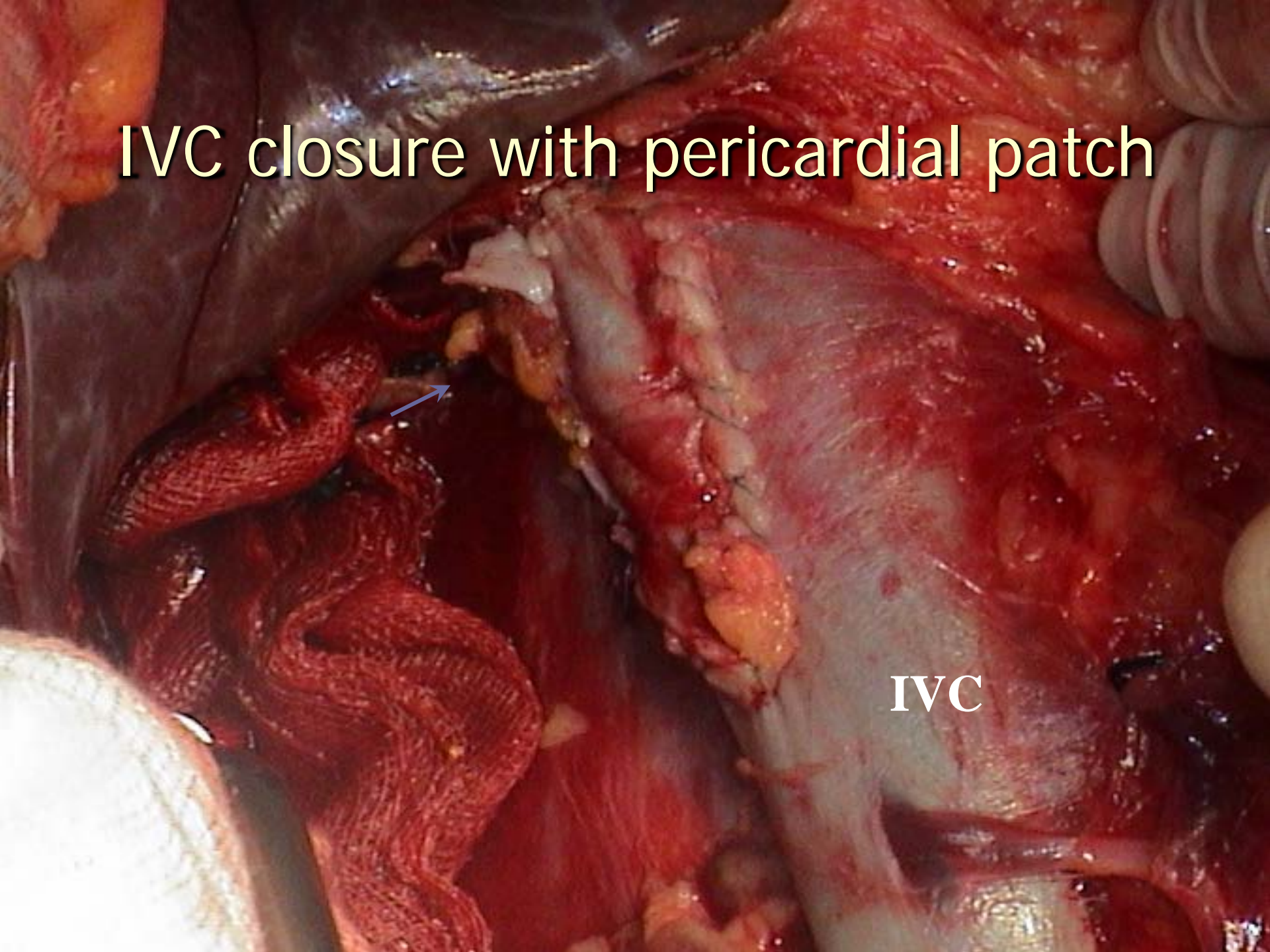
Speciment -11



Repair of IVC



IVC closure with pericardial patch



IVC

Material of Evangelismos General Hospital-1

	1	2	3	4	5	6	7	8	9	10	11	12	13
Age	71	65	68	69	66	70	55	65	72	65	66	70	65
Sex	M	M	F	M	M	M	F	F	M	M	M	M	F
Symptoms	Hemat uria	Dyspno ea	Hema turia	Leg edema	Hemat uria	Hemat uria	Hemat uria	Hema turia	Hema turia	Hemat uria	Hemat uria	Hemat uria	Hema turia
Histology	RCC	RCC	RCC	RCC	RCC	RCC	RCC	RCC	RCC	RCC	RCC	RCC	RCC
Lymph node involvement	+	-	+	-	-	+	-	+	+	+	+	-	-
Metastases	-	-	-	-	-	-	-	-	-	-	-	-	-
Stage (preop CT, US, BS, +/- MR)	IV	III	IV	IV	II	III	IV	IV	IV	III	IV	IV	IV

Material of Evangelismos General Hospital-2

	14	15	16	17	18	19	20	21	22	23	24	MEAN
Age	67	55	45	76	67	62	64	71	64	69	72	65.35
Sex	M	F	M	F	M	M	F	M	M	M	M	17 M 7 F
Symptoms	Hematuria	Arrhythmia	Hematuria	Hematuria	Dyspnoea	Hematuria	Arrhythmia	Leg oedema	Hematuria	Hematuria	Hematuria	Hematuria 18/24
Histology	RCC	RCC	RCC 2x	Adr. Adeno Ca	RCC	Adr. Adeno Ca	RCC	RCC	RCC	RCC	RCC	RCC 22/24
Lymph node involvement	—	—	+	+	—	+	—	—	+	—	—	Lymph node inv. 10/24
Metastases	-	-	-	+	-	+	-	-	-	-	-	Metastases 2/24
Stage (preop CT, US, BS, +/- MR)	III	IV	III	IV	IV	IV	IV	III	IV	IV	IV	IV : 17/24

Material of Evangelismos General Hospital-1

	1	2	3	4	5	6	7	8	9	10	11	12	13	
<i>Bypass time (min)</i>	198	173	212	200	164	181	169	213	203	198	196	201	247	
<i>Arrest time</i>	24	14	19	24	28	22	34	24	22	18	19	22	28	
<i>Atrial tumor-thrombus</i>	V	-	V	V	-	-	V	V	-	V	V	V	V	
<i>Complete resection</i>	V	V	V	V	V	V	V	V	V	V	V	V	V	
<i>Hypothermia (16°C)</i>	V	V	V	V	V	V	V	V	V	V	V	V	V	
<i>Complications</i>	-	-	-	-	-	Pancreatitis	-	-	-	-	-	-	-	
<i>Hospital stay</i>	9	8	12	9	14	65	18	22	20	18	22	12	24	
<i>Follow-up(months)</i>	102	172	94	69	49	2	24	43	11	11	23	45	34	

Material of Evangelismos General Hospital-2

	14	15	16	17	18	19	20	21	22	23	24	Mean
Bypass time (min)	198	187	190	206	178	167	209	154	182	145	154	187.5
Arrest time	24	35	46	37	24	25	35	0	24	0	0	27 min
Atrial tumor-thrombus	V	V	-	V	V	V	V	V	V	V	V	
Complete resection	V	V	V	V AT	V	V AT	V	V	V	V	V	
Hypothermia (16°C)	V	V	V	V	V	V	V	-	V	-	-	Hypothermic arrest 21/24
Complications	-	-	-	-	-	-	-	-	-	SEVERE BLEEDING In h death	-	
Hospital stay	9	14	0	18	16	45	31	14	16	0	12	20
Follow-up(months)	14	16	0	12	16	14	24	16	12	0	6	25.5

RESULTS (24 pts, SUMMER 2018)

Surgical Mortality : 2

Postoperative Blood Loss (ml): 1100-2350 ml
mean:1600 ml

Bypass Time (min) : 145-212 (mean:187,7 min)

Total Circulatory Arrest (min) : (13-46 mean:27 min)

ICU stay : 1-36 ημέρες

Hospital Stay : 8-65 ημέρες

Follow-up: 457 Months or 35 months /patient

One patient died 39 months following surgery due to car accident. One patient has been lost from follow-up.

Adrenal adenoCa and left sided Renal Ca behaved more aggressively in terms of recurrence.

Deep Hypothermia and Circulatory Arrest in the Surgical Management of Renal Tumors with Cavoatrial Extension

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ABSTRACT *Background:* The inferior vena cava (IVC) is involved in almost 5% to 10% of renal tumors. Their intraluminal extension to the cardiac cavities occurs with a tumor-thrombus formation at a percentage of 1%. The aim of this study is to present the principles of "radical" management that should be targeted to excision of the kidney together with the cavoatrial tumor-thrombus. *Material:* From 2003 through 2008, we treated six patients with renal-cell carcinoma involving the IVC and/or the right cardiac chambers. The main symptoms leading to the diagnosis were hematuria, dyspnea, or lower limb edema. The extension of the tumor was type IV in three cases, type III in two, and type II in one case. *Method:* Extracorporeal circulation combined with a short period of hypothermic circulatory arrest was the method used. Radical nephrectomy combined with cavotomy and atriotomy was performed to an "en-block" extirpation of the tumor-thrombus and allowed oncologic surgical clearance of the disease. *Results:* There was no operative death. The mean postoperative course duration was 11 days, apart from one obese patient who presented postoperative pancreatitis and died on the 44th postoperative day due to respiratory failure. During the cumulative postoperative follow-up of 171 months the patients remain free of recurrence. *Conclusions:* The use of extracorporeal circulation and deep hypothermic circulatory arrest provides a good method for radical excision of renal carcinomas involving the IVC with satisfactory morbidity and long-term survival results. Cooperation of urologists and cardiac surgeons is necessary for this type of operation. doi: 10.1111/j.1540-8191.2009.00887.x (*J Card Surg* ****;**-**-**)

Ευχαριστώ



thank you!