Frontiers of Radiosurgery

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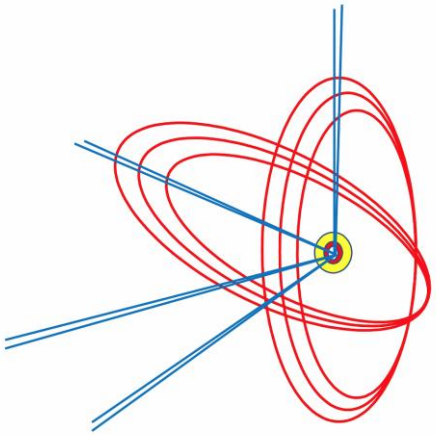

MEDANTA RADIOSURGERY

SBRT for Portal Vein Tumor Thrombus (PVTT): Paving the way for liver transplant

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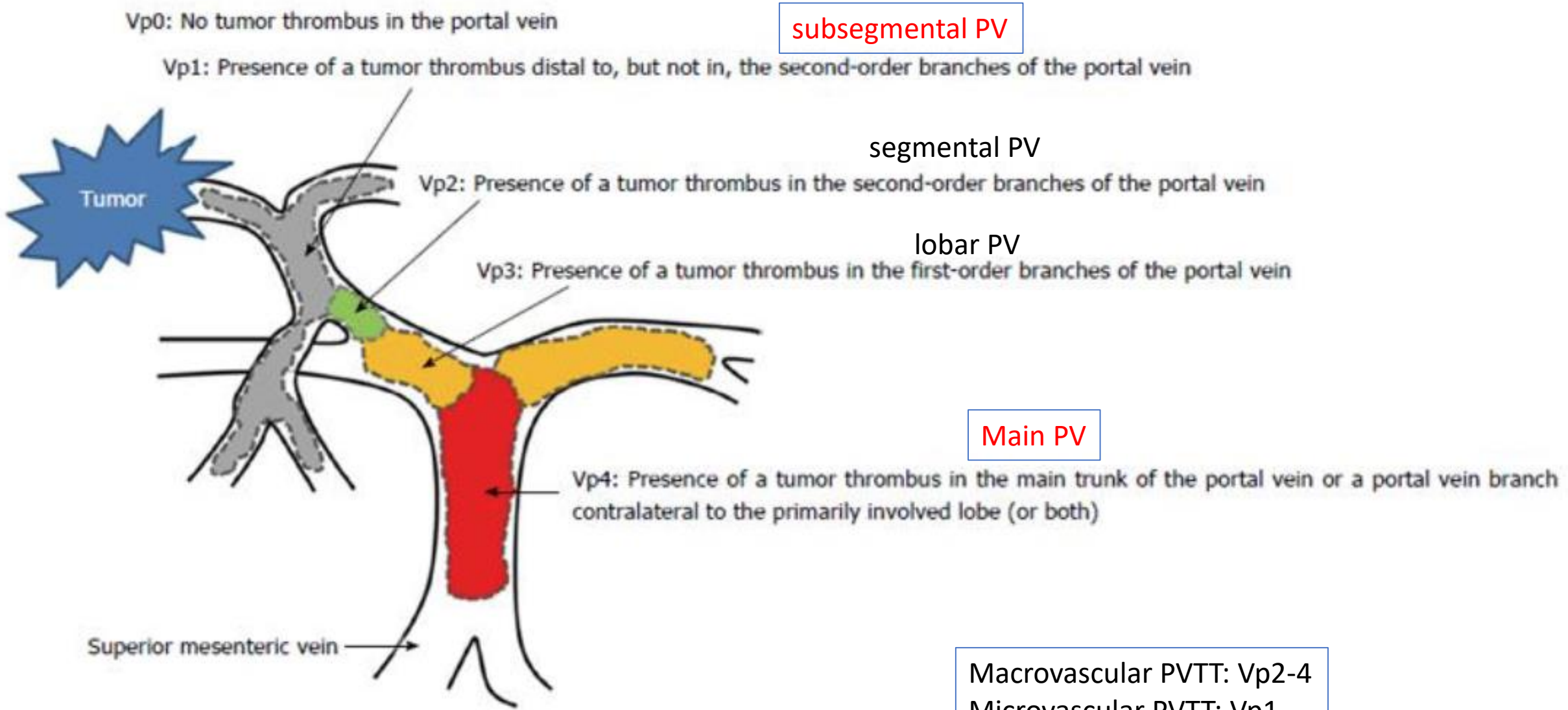
- HCC - One of the **leading cause** of cancer mortality (6th m/c).
- LTx has optimal results ONLY in well-selected candidates (Milan criteria)

- 70% HCC detected in advanced-stage disease .
- 35% -detected with Portal vein tumor thrombus (PVTT)
  - LTx NOT RECOMMENDED– high failure rates.
  - No standard therapies exist (TACE- Contraindicated; TARE- Ineffective)
  - Offered only palliative treatment→ dismal outcome

- Downstaging of PVTT with SBRT has the potential to improve outcomes by improving LTx results.



subsegmental PV

segmental PV

lobar PV

Main PV

Macrovascular PVTT: Vp2-4
Microvascular PVTT: Vp1

Classification for hepatocellular carcinoma with portal vein tumor thrombosis

Purpose

- Evaluate the downstaging role of SBRT for PVTT in inoperable cases .

  --Rate of PVTT response: disappearance of enhancement/ PET activity/ recanulization.

  --Amenability to liver transplant (conversion rates).

Materials & Methods

- Retrospective review of Nonmetastatic HCC
- Initially unfit for LTx due to PVTT.
- Downstaging with SBRT to PVTT attempted.

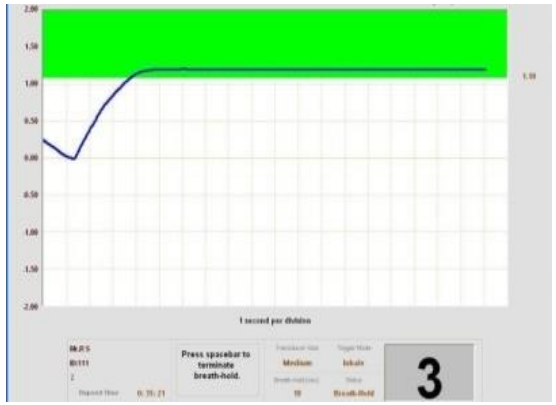
- We present analysis of 123. (104-curative; 19-Pall:poor GC, N/L<700, BED <75)

Motion management with ABC

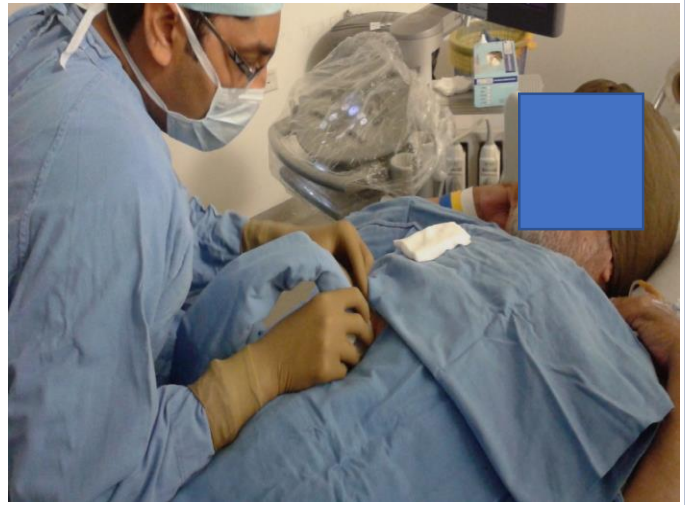
CK- fiducial tracking & Synchrony

SBRT ABC on Linac

Concept:
stable target : less margin
ABC:
Calculated breath-hold
allows organ sparing



SBRT : CK



Concept:
Pin point accuracy with tumor tracking
Free breathing with synchrony gating

Constraints for organs at risk

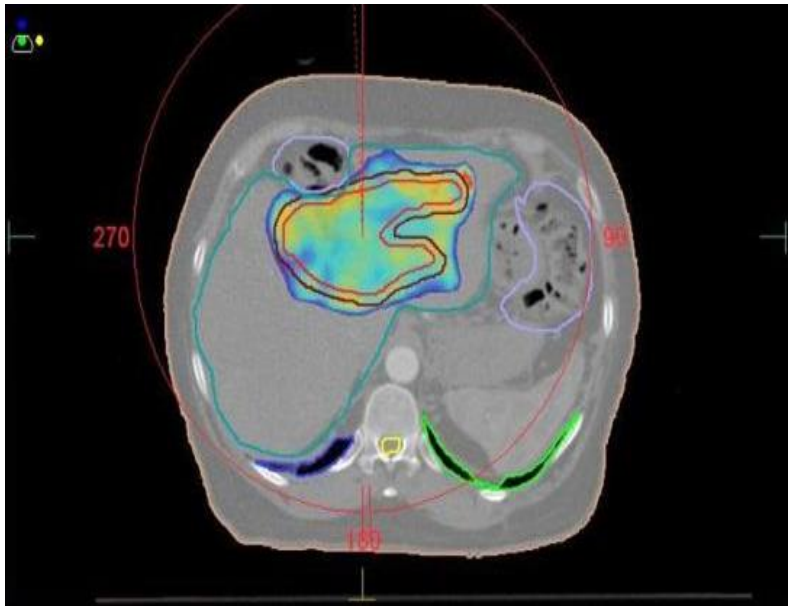
Planning:
Multiphasic RTP CECT done
Dynamic MRI also done

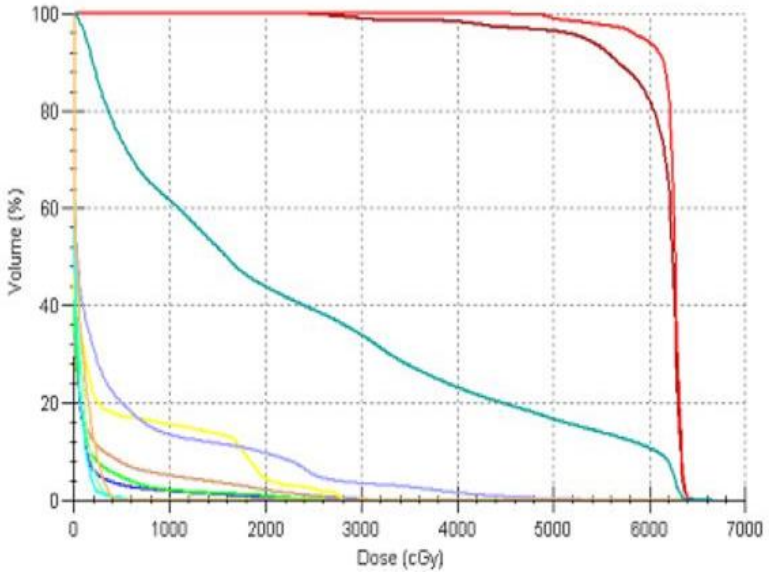
Contouring:
GTV-PVTT:
Arterial enhancing and PV washout area
MRI also used.
PTV: GTV+ 5 to 7mm margin.

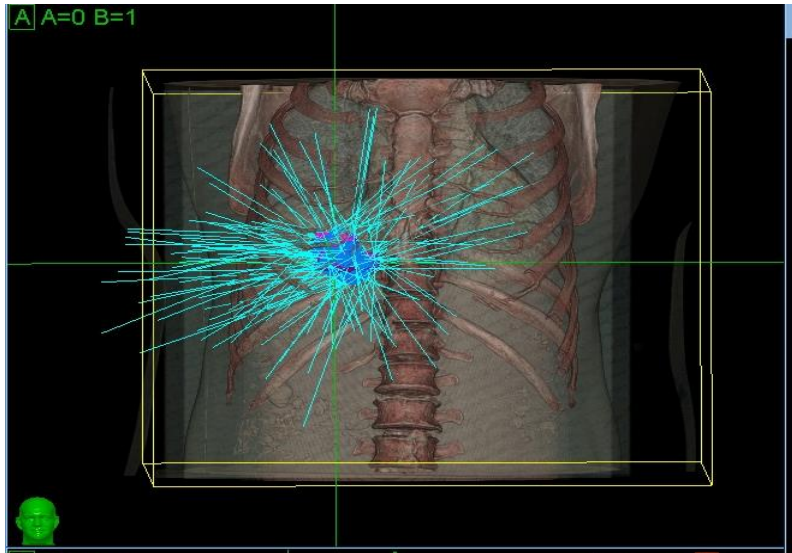
Critical OAR:
Duodenum
Bowel
Stomach
Normal Liver

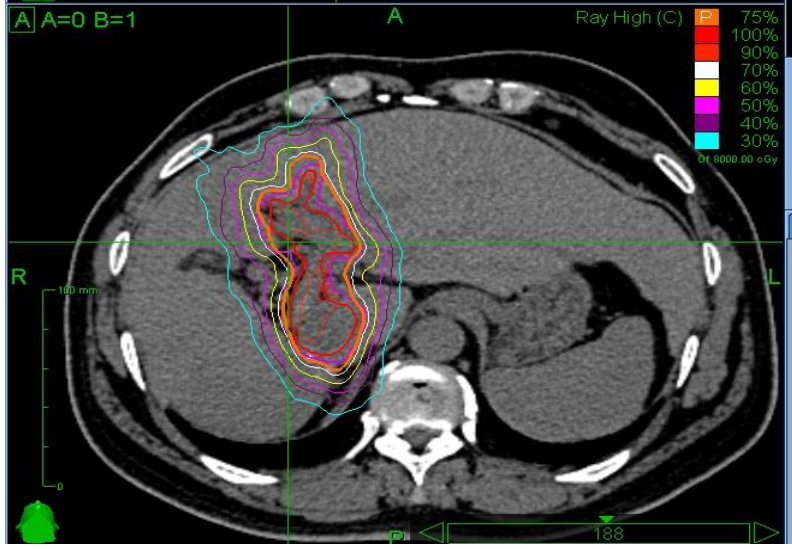
Organ	Constraints
Uninvolved Liver	V5 < 50%, V7 < 30%, V15 < 700 cc spared mean liver dose <10-12 Gy
Rt. Kidney	V15 < 35%
Small Bowel Duodenum	max dose <30Gy Max dose(.03cc) <32 5cc dose <18
Spinal Cord	max dose < 18Gy

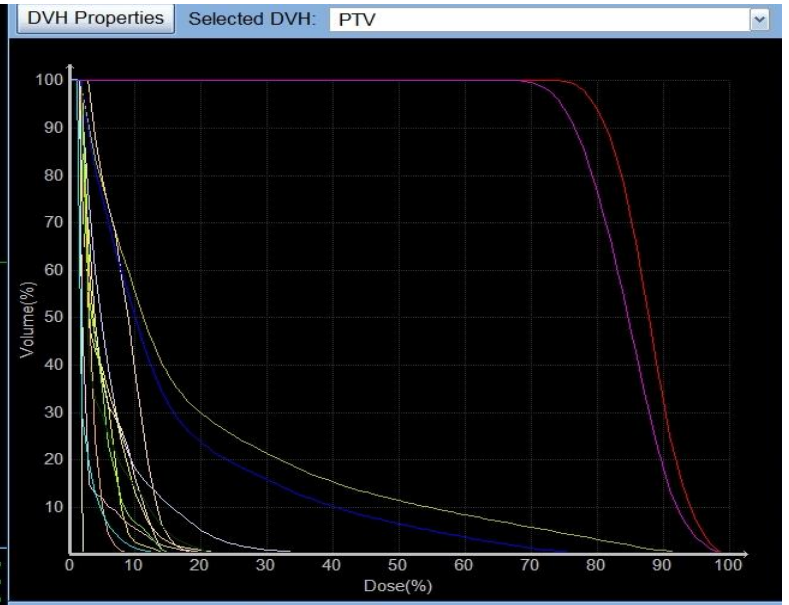
- PET-CECT @ 6-8 weeks – post SBRT.
- Patients underwent LTx only after **disappearance of PVTT enhancement/ PET activity**











Nodes	72	Total MU	68235.53
Beams	151	Min MU	34.50
Max Dose (cGy)	8000.00	Max MU	804.71

Estimated Treatment Time Per Fraction (minutes) 65

Dose Statistics Table | Dx Vx Values | Plan Information

	Active Plan
Prescription (%, Dose cGy)	75%, 6000.00 cGy
Dose Calculation Algorithm	Ray-Tracing
Dose Calculation Resolution	Ray High
Number of Fractions	5
Treatment Anatomy	body
Template Path Set	1path_body
Tracking Method	Synchrony
InTempo Imaging	Off
Collimator Type	Iris
Collimators Used (mm)	12.50mm, 30.00mm, 60.00mm

Results:

Age	38-67yrs	Mean: 53yrs
Gender	M:F=68 %:32%	
CTP	A	71 %
	B	29%
Liver Pathology	Hep B	26%
	Hep C	47%
	ALD	18%
	NASH	9%
Baseline AFP	<400ng/Ml	74%
	>400ng/Ml	26%
Intent	Curative	84.5% (104/123)
	Palliative	15.5%(19/123)
Dose (BED)	$<75_{10}$	15.5%(19/123)
	$>75Gy_{10}$	88%(108/123)

Results:

Location of PVTT	
Vp1	18 (14.6%)
Vp2	23(18.7%)
Vp3	34(27.6%)
Vp4	48(39%)

Technique	
Cyberknife	99(80%)
ABC	24(20%)

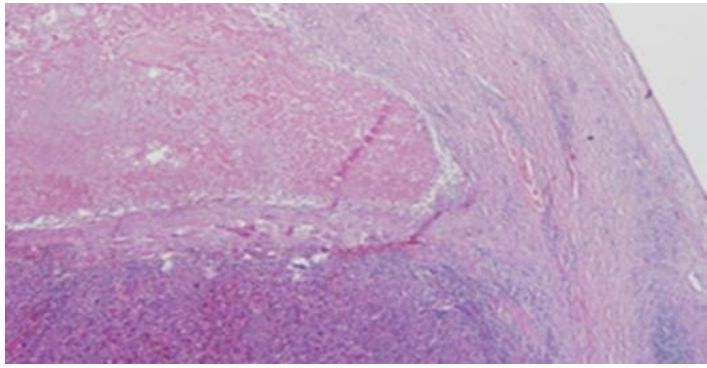
Most common dose Fractionation	60Gy/5Fx
Dose (Median, Range)	50Gy (25Gy-70Gy)
Fractionation (Median, Range)	5 (3-10)
BED 10 (Mean, Range)	100Gy (31-132Gy10)

Response after SBRT	
Any Radiological response	89/123 (72%)
Decrease in Enhancement	80/123(65%)
Recanilization of PV	27/123(33%)
Decrease in FDG avidity (SUV Max) > 75%	69/123(56%)
Pts having all the 3 responses	25/123 (20%)
Pts having atleast 2 responses	60/123 (48%)

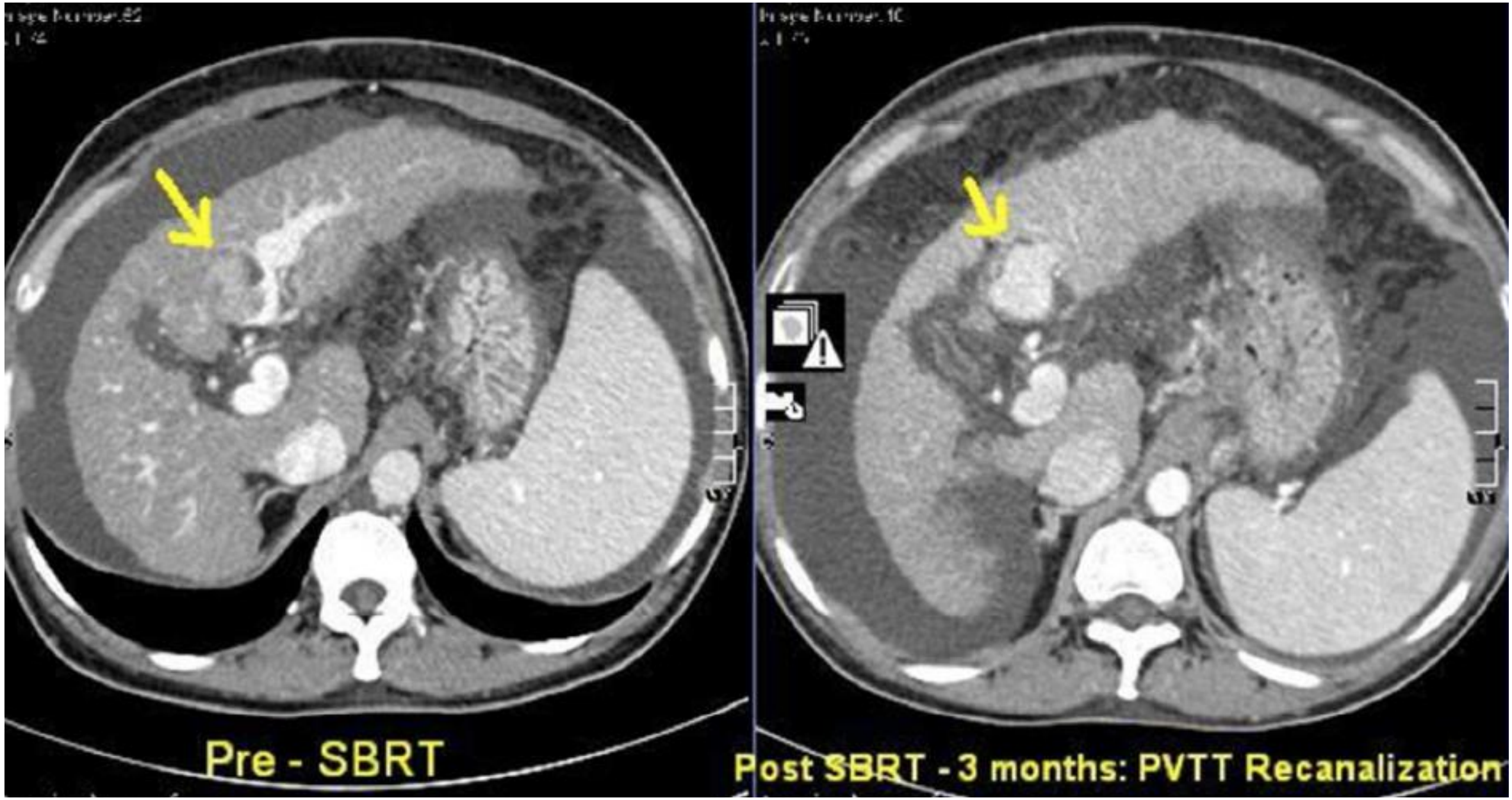
Curative group: At the time of analyses, 30 /104(29%) underwent curative transplant.

24 month survival in Transplanted patients: 26/30 (87%)

- Histopathology of Explant PVTT:
  - Microvascular invasion **in 80%--** DOWNSTAGES WITH SBRT
  - Macrovascular invasion in 20%
  - Tumor necrosis (>50%) was seen in 50% cases.



COAGULATIVE NECROSIS


Pre - SBRT
Post SBRT - 3 months: PVTT Recanalization

Conclusion:

- LTx Conversion rate of **29%** and 2 yr OS **of 87%** in LTx patients: highly promising.
- We concluded that outcomes in HCC PVTT cases can be improved by introducing SBRT .
- Thus SBRT to PVTT merits attention for its potential role in inoperable HCC .

Thankyou