

宫颈癌IMRT计划设计

河北医科大学第四医院

刘丹

靶区范围



- **GTV**为腹主动脉旁可见的淋巴结
- **CTV**包括阴道残端，盆腔淋巴结引流区和腹主动脉旁淋巴引流区

处方剂量



- **PGTV>V: 59.92Gy/28次**
- **PCTV&CTV: 50.4Gy/28次**

目标函数（靶区）

- **59.92Gy 包绕95%以上的PGTV**
- **59.92Gy 包绕100%的GTV**
- **PGTVDmax<59.92Gy*107%,
PGTVDmin>59.92Gy*98%,
PGTVDmean<59.92Gy*105%**

目标函数（靶区）

- 50.4Gy 包绕95%以上的PCTV
- 50.4Gy 包绕100%的CTV
- $PCTVD_{max} < 59.92Gy * 107\%$
 $PCTVD_{min} > 50.4Gy * 95\%$
- PCTV中除包括PGTV的层面外,
 $D_{max} < 50.4Gy * 110\%$
- PCTV SUB PGTV
 $D_{mean} < 50.4Gy * 105\%$

目标函数 (OAR)

- spinal cord $V_{30Gy} < 0.1cc$
- stomach $V_{15-20} < 50\%$
- Kidney R&L $V_{15-18} < 33\%$
- Liver $V_{15-20} < 33\%$
- Femoral Head R&L $V_{45-50} < 5\%$

目标函数 (OAR)

- Ileum V30-35<50%
- Small Intestine V30<40% V25<50%
- Rectum V40-45<50%
- Bladder V40-45<50%
- Rectum sub PCTV, Bladder sub PCTV
V50.4Gy<1cc

计划设计

Pinnacle 8.0m

- **Step and shoot**
- **DMPO**

SEIMENS ONCOR

- 1, 2, 3, 4: Ring
- NT:Body-PCTV-1,2,3,4
- Spinal Cord-0.5
- Small Intestion-PCTV
Small Intestion+PCTV
- Bladder-PCTV
Bladder+PCTV
- Rectum-PCTV
Rectum+PCTV

laser
iso

Add Point
Delete Point...

Name

Lateral	Ant-Post	Sup-Inf
0.14	-80.46	8.17

Diameter cm

Autoplace POI...

Set Reference Point

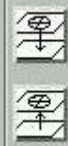
Set Inside Multiple Regions

Display Options

Color

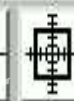
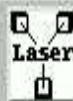
2D Display

3D Display



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File Options Localize Windows

Dose Grid
Prescrip
Dose Disp
Blocks

Trial_9f

Machine

Orientation

Collimation

Modifiers

Visualization

Dose

Current Name

FieldID

Machine

Version

Modality

Energy

Beam Type

Beam_1

oncor

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Photons

Ph_06

Step & Shoot MLC

Beam_2

oncor

2007-09-07 11:45:25

Photons

Ph_06

Step & Shoot MLC

Beam_3

oncor

2007-09-07 11:45:25

Photons

Ph_06

Step & Shoot MLC

Beam_4

oncor

2007-09-07 11:45:25

Photons

Ph_06

Step & Shoot MLC

Beam_5

oncor

2007-09-07 11:45:25

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Ph_06

Step & Shoot MLC

Beam_6

oncor

2007-09-07 11:45:25

Photons

Ph_06

Step & Shoot MLC

Beam_7

oncor

2007-09-07 11:45:25

Photons

Ph_06

Step & Shoot MLC

Beam_8

oncor

2007-09-07 11:45:25

Photons

Ph_06

Step & Shoot MLC

Beam_9

oncor

2007-09-07 11:45:25

Photons

Ph_06

Step & Shoot MLC



Trial_9f

Machine

Orientation

Collimation

Modifiers

Visualization

Dose

Current Name	Couch	Gantry Start	Gantry Stop	Isocenter	SAD (cm)	Start SSD (cm)	Localization System	
Beam_1	0.0	0.0	0.0	iso	100.0	89.67	Laser	Valid
Beam_2	0.0	40.0	40.0	iso	100.0	87.73	Laser	Valid
Beam_3	0.0	80.0	80.0	iso	100.0	85.13	Laser	Valid
Beam_4	0.0	120.0	120.0	iso	100.0	78.76	Laser	Valid
Beam_5	0.0	160.0	160.0	iso	100.0	89.26	Laser	Valid
Beam_6	0.0	200.0	200.0	iso	100.0	89.51	Laser	Valid
Beam_7	0.0	240.0	240.0	iso	100.0	78.75	Laser	Valid
Beam_8	0.0	280.0	280.0	iso	100.0	85.26	Laser	Valid
Beam_9	0.0	320.0	320.0	iso	100.0	87.20	Laser	Valid

Trial_9f

Machine

Orientation

Collimation

Modifiers

Visualization

Dose

Current	Name	Control Point	Collimator Angle	Circular Field Electron Cone	Collimating Jaws (cm)				
					Y2	Y1	Symmetric	X2	X1
◇	Beam_1	1	0.0	None	20.0	20.0	No No	9.6	4.5
◇	Beam_2	1	0.0	None	20.0	20.0	No No	7.8	11.0
◇	Beam_3	1	0.0	None	20.0	20.0	No No	7.4	6.9
◇	Beam_4	1	0.0	None	20.0	20.0	No No	8.1	10.4
◇	Beam_5	1	0.0	None	19.5	20.0	No No	8.6	10.4
◇	Beam_6	1	0.0	None	20.0	20.0	No No	9.8	8.2
◇	Beam_7	1	0.0	None	20.0	20.0	No No	10.5	7.8
◇	Beam_8	1	0.0	None	20.0	20.0	No No	7.0	7.6
◇	Beam_9	1	0.0	None	20.0	16.5	No No	11.0	9.0

Optimization

Conversion

Trial

Trial_9f

Beam



Optimization Type

Allow jaw motion/
Split beam?

Beam_1

DMPO

Yes

Beam_2

DMPO

Yes

Beam_3

DMPO

Yes

Beam_4

DMPO

Yes

Beam_5

DMPO

Yes

Max iterations

100

Convolution dose iteration

12

Stopping tolerance

1e-05

Apply tumor overlap fraction?

☒ Yes ☒ NoMLC delivery? ☒ Yes ☐ No

Minimum segment MUs

5

DMPO Settings

Maximum number of segments

120

Compute final dose? ☒ Yes ☐ No

Delivery Constraints

Minimum segment area

5

cm²

Beam Splitting

Overlap distance

2

cm

Leaf/jaw overlap

0.5

cm

Dismiss

Machine

oncor

Copy Machine Defaults

Help

◆	PCTV	Min Dose	☐	5040		80	0.01496
◇	PCTV-PGTV	Max Dose	☐	5800		30	0.000401669
◇	PCTV	Min DVH	☐	5150	98	90	0.00496456
◇	PCTV-PGTV	Uniform Dose	☐	5200		60	0.0925225
◇	CTV1	Min DVH	☐	5060	98	80	0
◇	PGTV	Min DVH	☐	6000	95	90	4.19581e-09
◇	PGTV	Min Dose	☐	5980		50	0.000842503
◇	PGTV	Max Dose	☐	6300		10	2.40968e-06
◇	PGTV	Uniform Dose	☐	6050		50	0.0277592
◇	GTV1	Min DVH	☐	5992	98	70	0

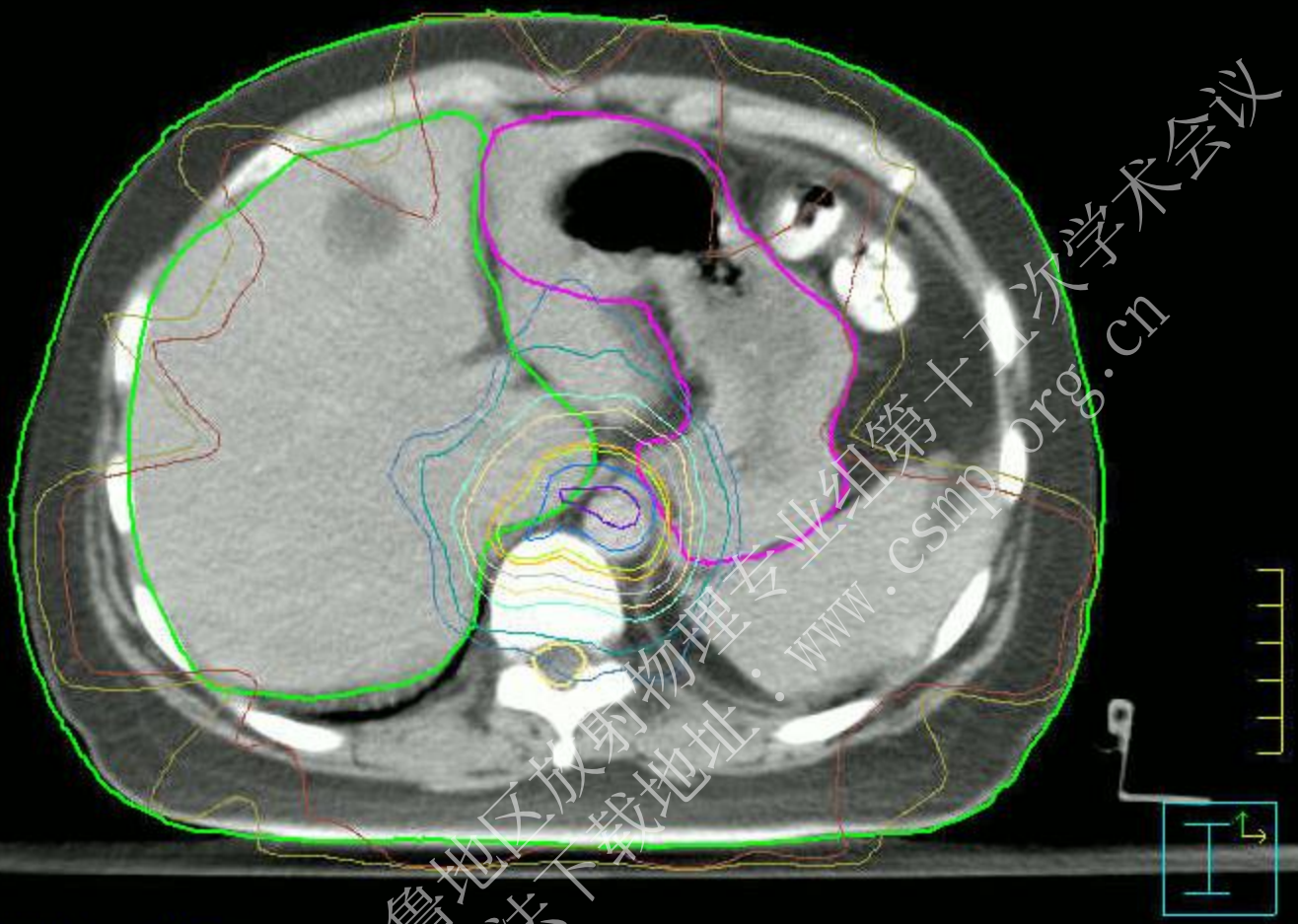
spinal cord-0.5	Max Dose		2700		20	0.0115374
Stomach	Max DVH		1500	50	5	1.83553e-05
Kidney L	Max DVH		1450	24	10	0.00677356
Kidney R	Max DVH		1450	23	10	0.00981609
Liver	Max DVH		1500	30	5	0.00183193
Femoral Head L	Max DVH		4500	4	10	6.12022e-06
Femoral Head R	Max DVH		4400	3	10	0.000130166
Small Intestine-P1	Max DVH		3000	30	15	0
Small Intestine-P1	Max DVH		2400	30	18	0.0328778
Small Intestine+P1	Max Dose		5040		10	0.0180166
Small Intestine+P1	Max Dose		5040		10	0.0180166
Rectum-PCTV	Max DVH		4000	25	15	0.0057236
Rectum+PCTV	Max Dose		5000		10	0.00852244
Bladder-PCTV	Max DVH		4000	35	10	0.00276886
Bladder+PCTV	Max Dose		5000		10	0.0169841

1	Max Dose	☐	5040		1	0.000266022
1	Max DVH	☐	4500	20	1	0.00105335
2	Max Dose	☐	4500		1	0.000322032
2	Max DVH	☐	4000	10	1	0.000241417
3	Max Dose	☐	4000		1	0.000236514
3	Max DVH	☐	3500	10	1	0.000147021
4	Max Dose	☐	3500		1	0.000715363
4	Max DVH	☐	2500	20	1	0.00114939
NT	Max Dose	☐	3000		1	0.000902058

PCTV-PGTV	Max DVH	5300	1	50	0.0155082
CTV1	Min Dose	5050		50	2.82555e-06
Bladder-PCTV	Max Dose	5000		5	0.000213403
Rectum-PCTV	Max Dose	5000		5	5.74924e-05
ROI_3	Max Dose	5350		5	0.00433769
ROI_4	Max Dose	5400		5	0.0349909
ROI_1	Max Dose	3900		1	0.00439844
ROI_2	Max Dose	3800		1	0.00643065

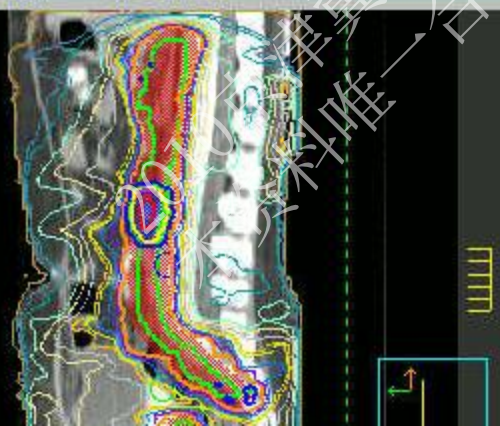
结 果

Absolute
6411.0 cGy
6306.0 cGy
6291.0 cGy
5992.0 cGy
5692.0 cGy
5544.0 cGy
5040.0 cGy
4788.0 cGy
4793.0 cGy
4536.0 cGy
4194.0 cGy
4032.0 cGy
3528.0 cGy
2996.0 cGy
2520.0 cGy
1797.0 cGy
1512.0 cGy
599.0 cGy
504.0 cGy

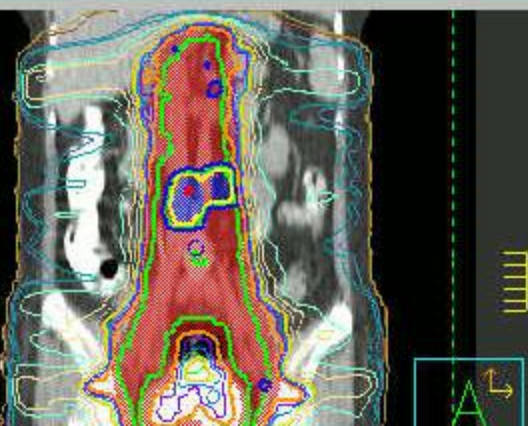


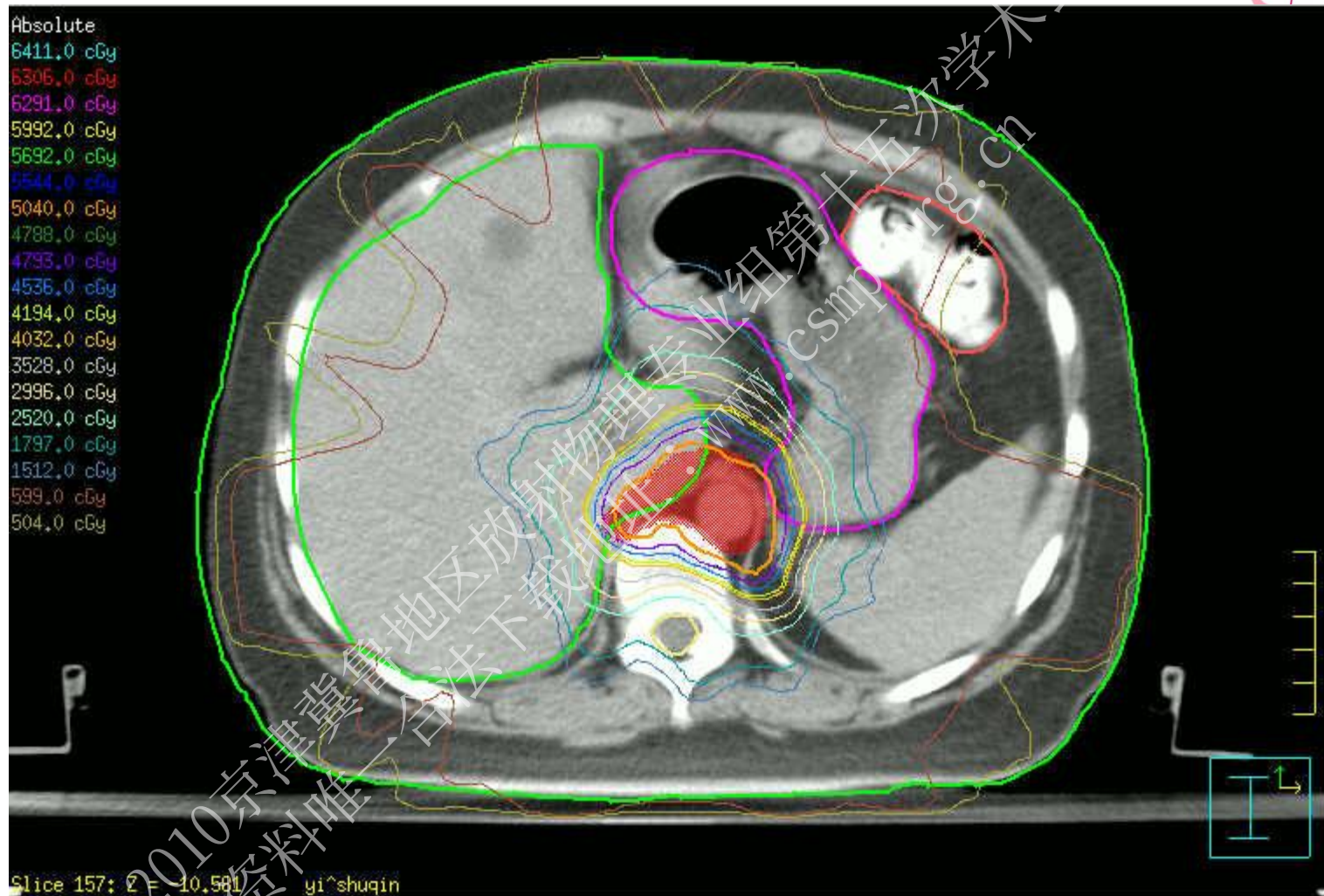
Slice 158; Z = -11.081
qi^shuqin

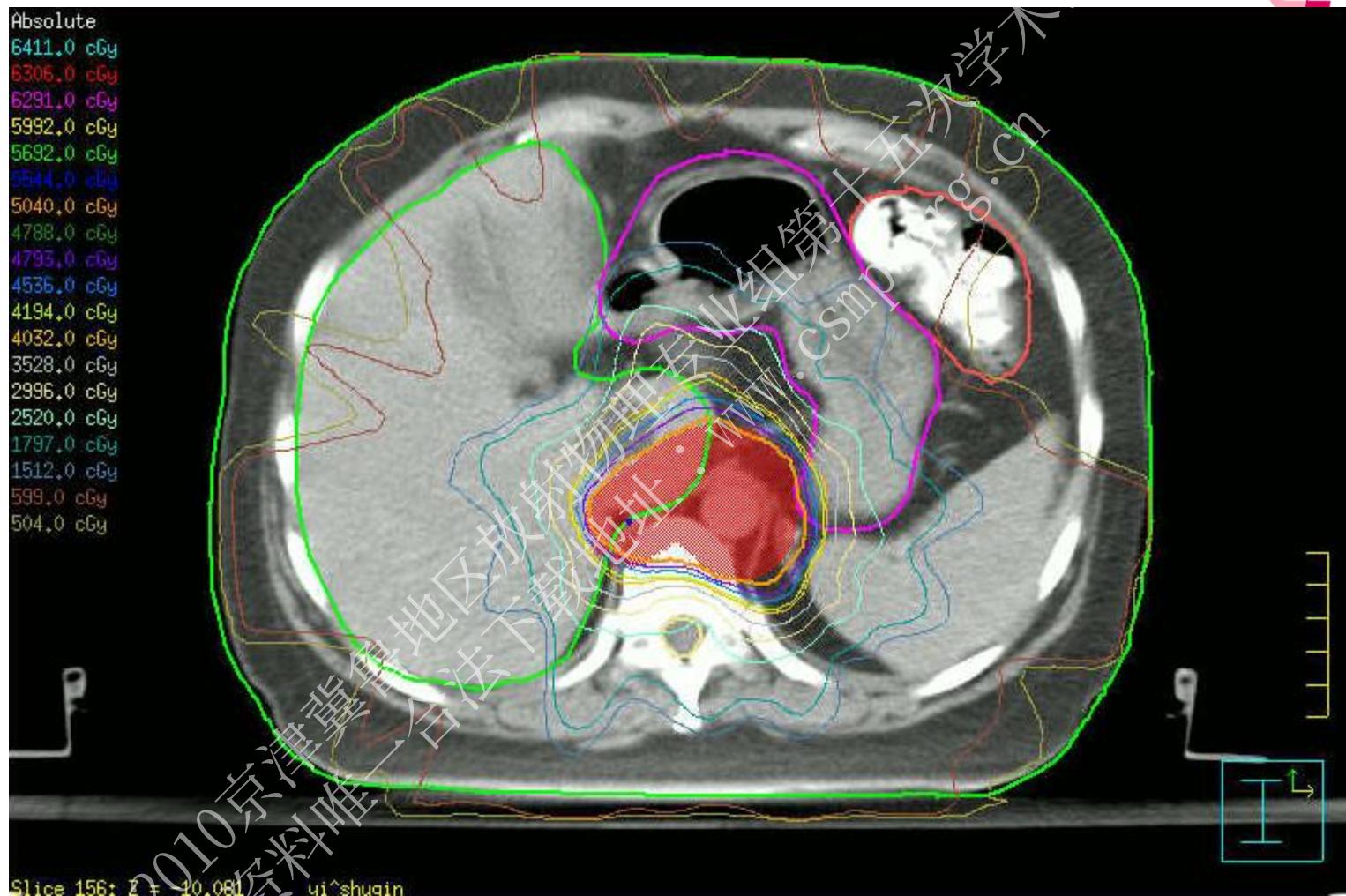
Absolute
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6306.0 cGy
6291.0 cGy
5992.0 cGy
5692.0 cGy
5544.0 cGy
5040.0 cGy
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4793.0 cGy
4536.0 cGy
4194.0 cGy
4032.0 cGy
3528.0 cGy



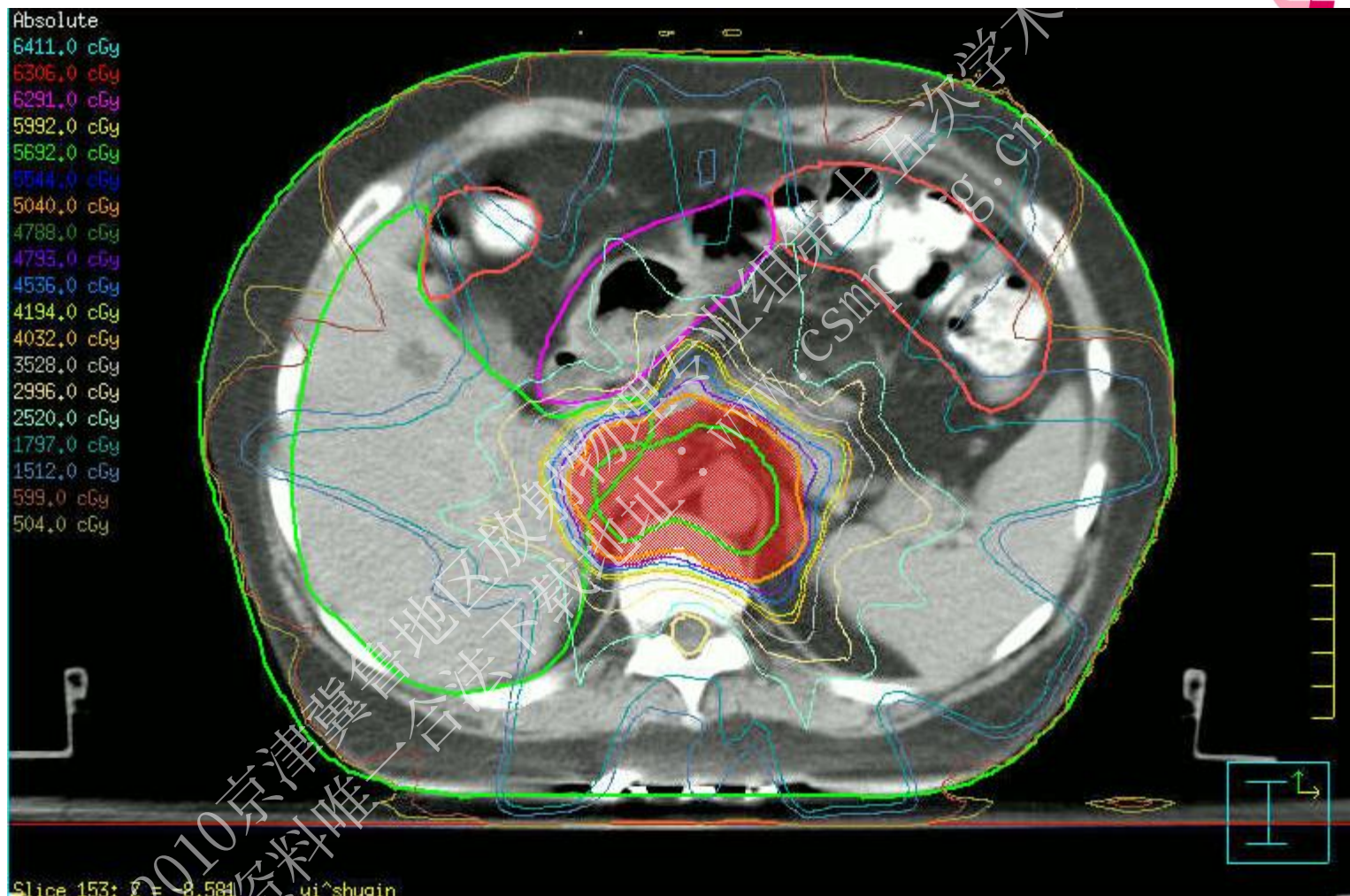
Absolute
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6306.0 cGy
6291.0 cGy
5992.0 cGy
5692.0 cGy
5544.0 cGy
5040.0 cGy
4788.0 cGy
4793.0 cGy
4536.0 cGy
4194.0 cGy
4032.0 cGy
3528.0 cGy

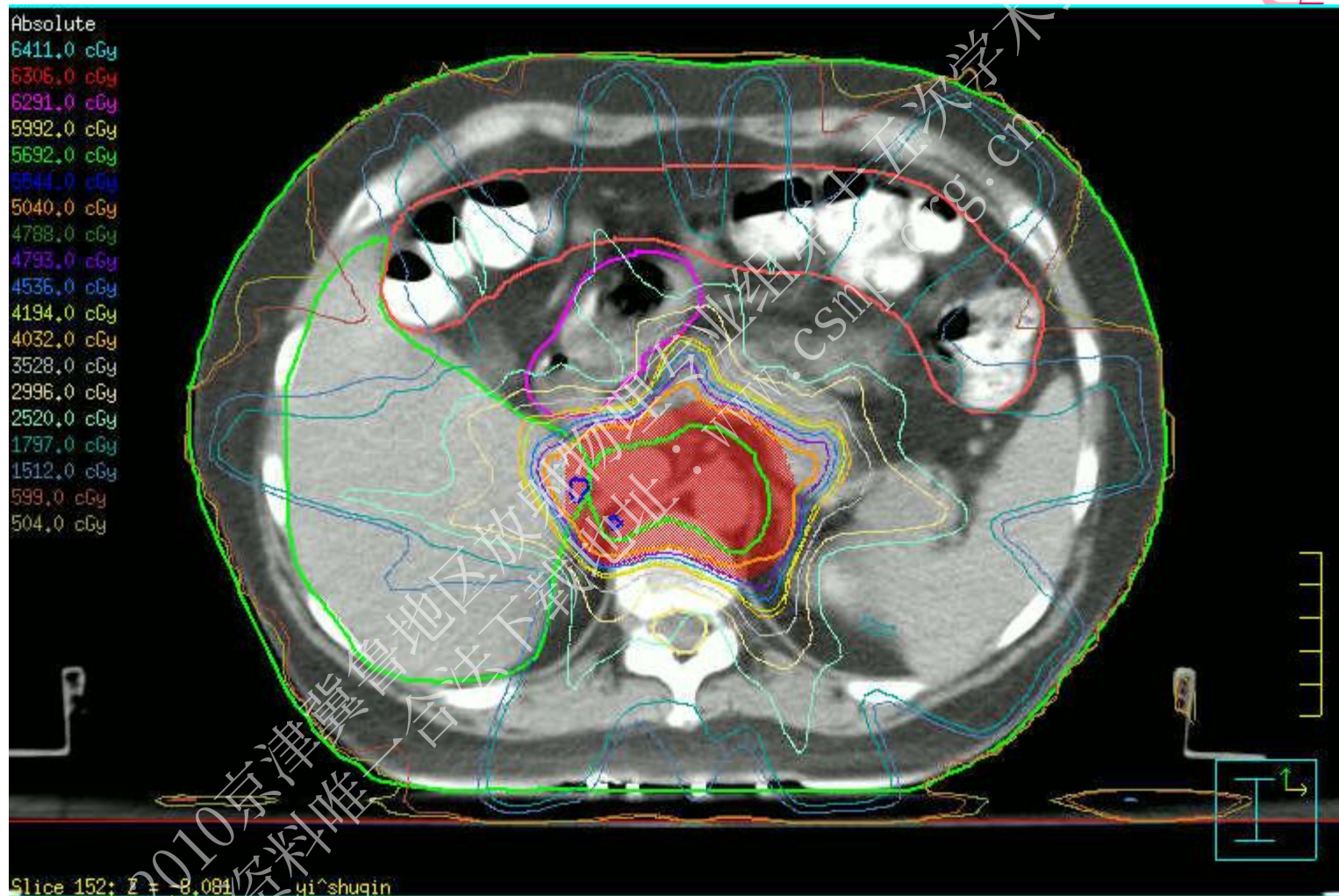




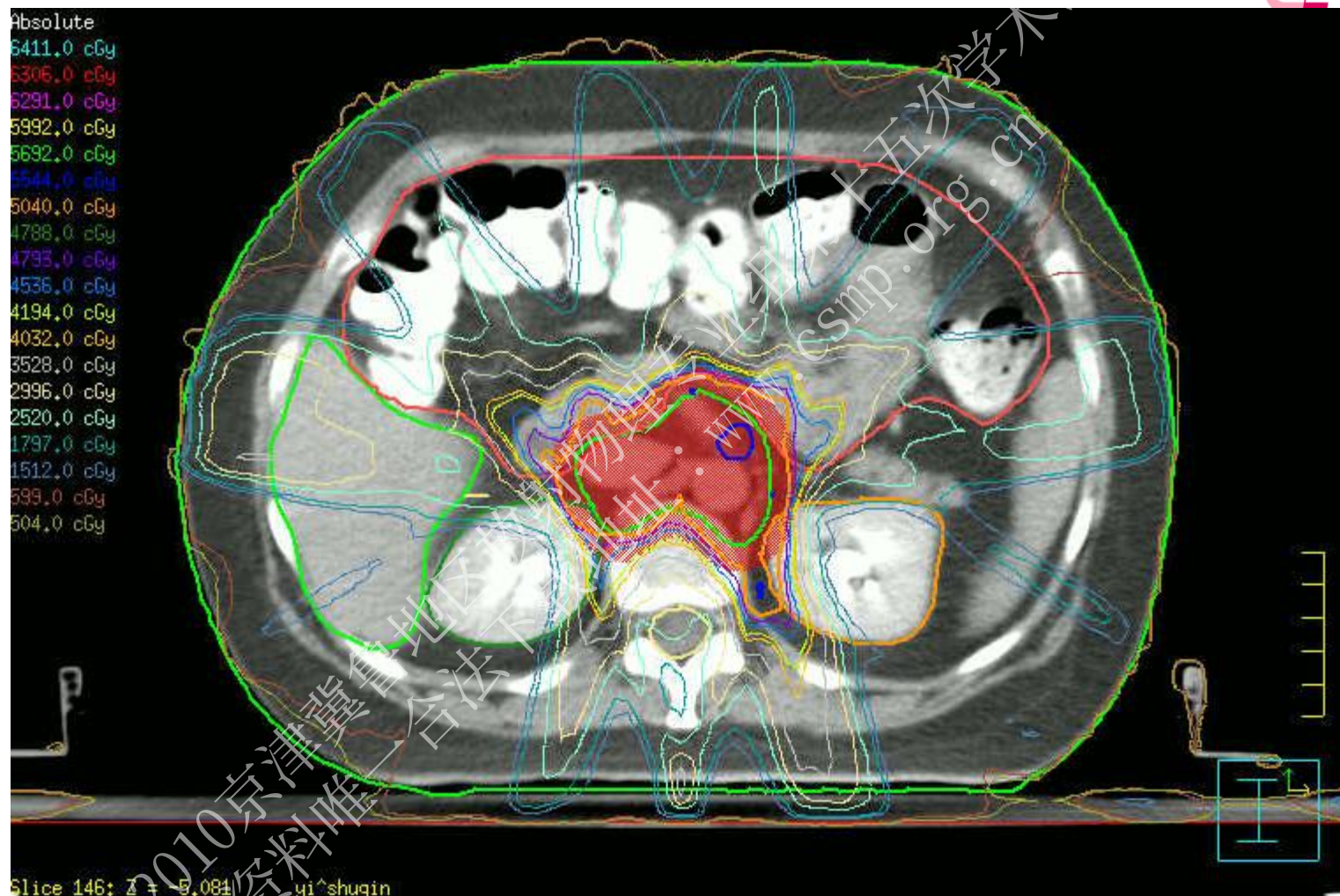


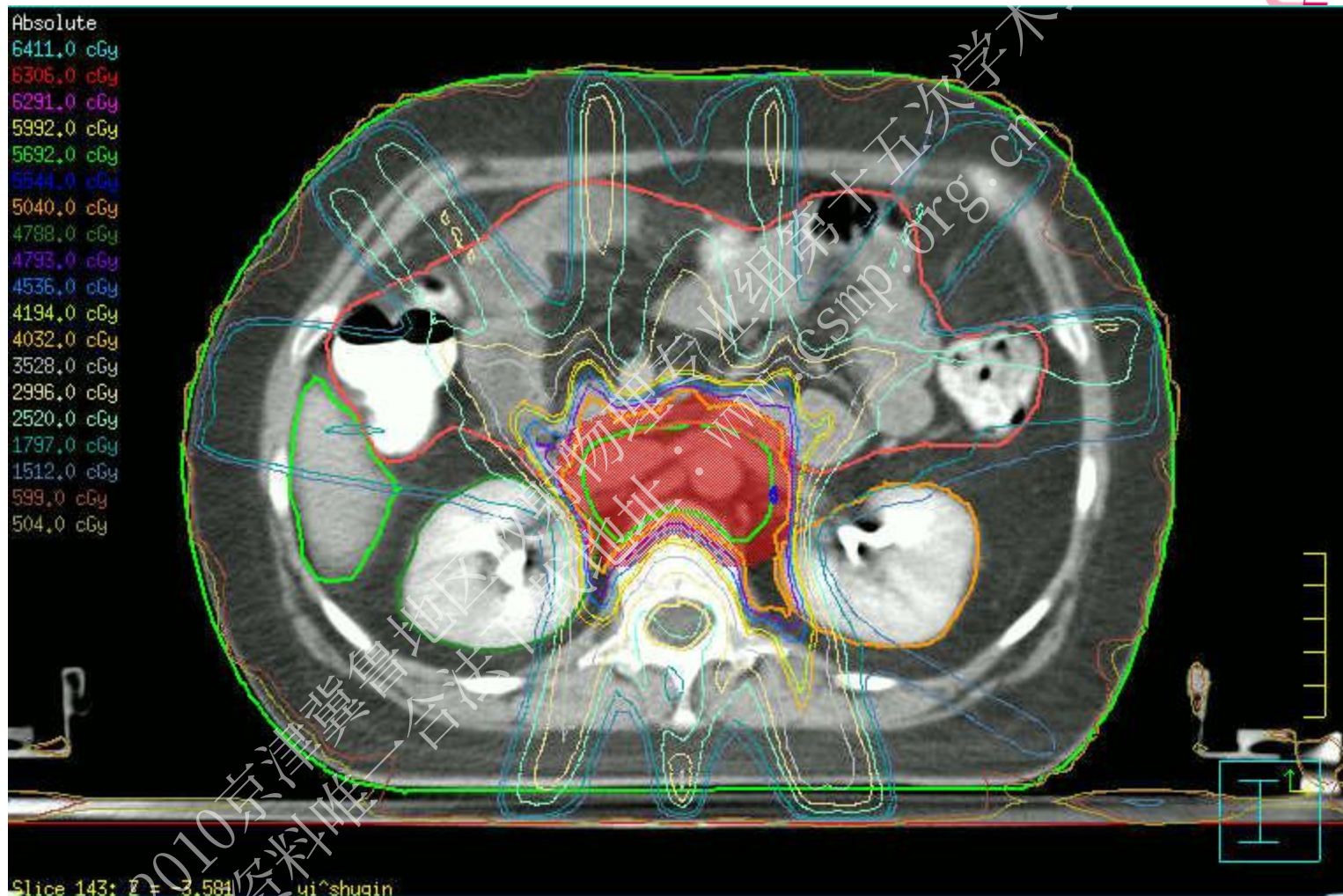
Slice 154: $\bar{x} = -9.081$ wi^shuain

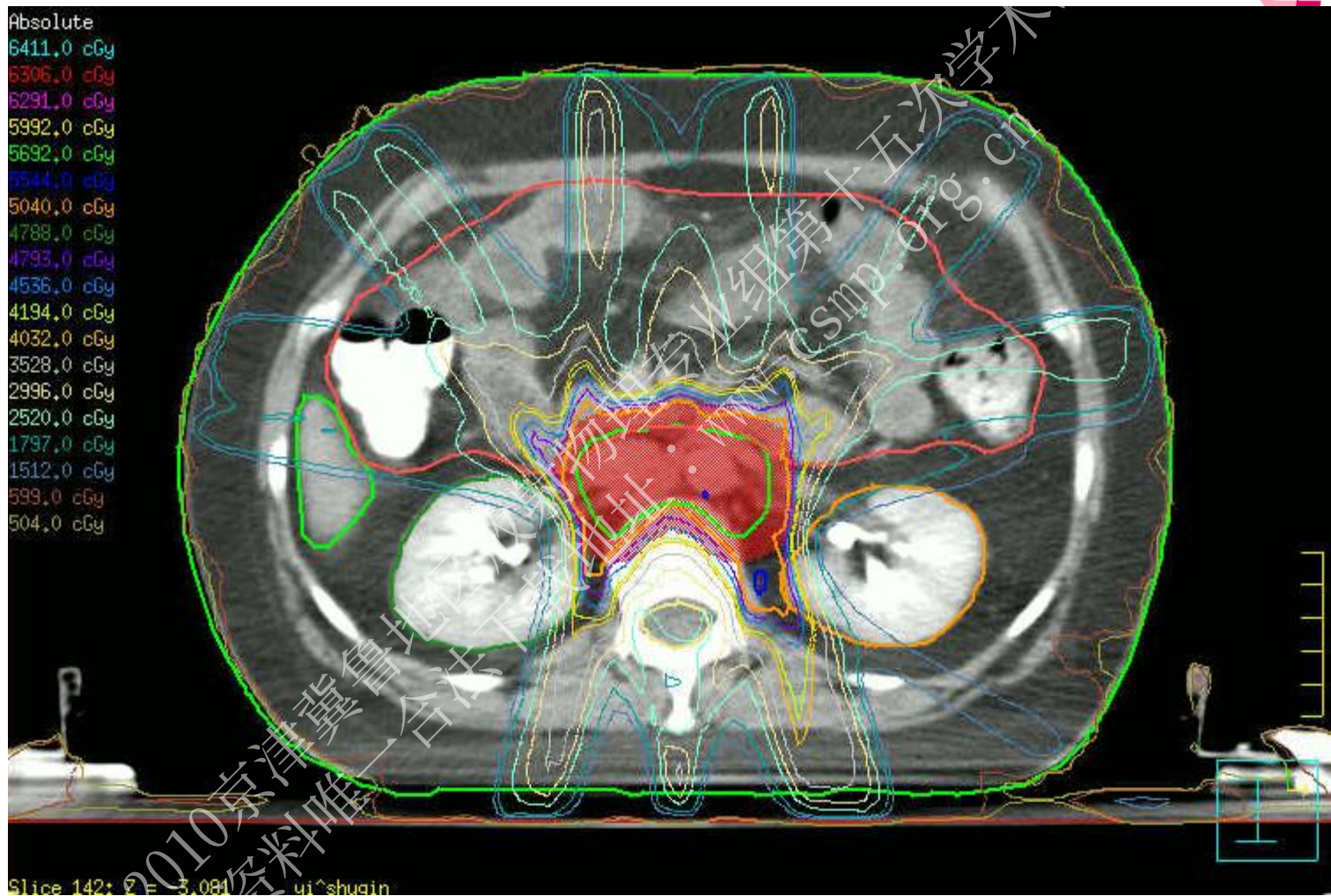


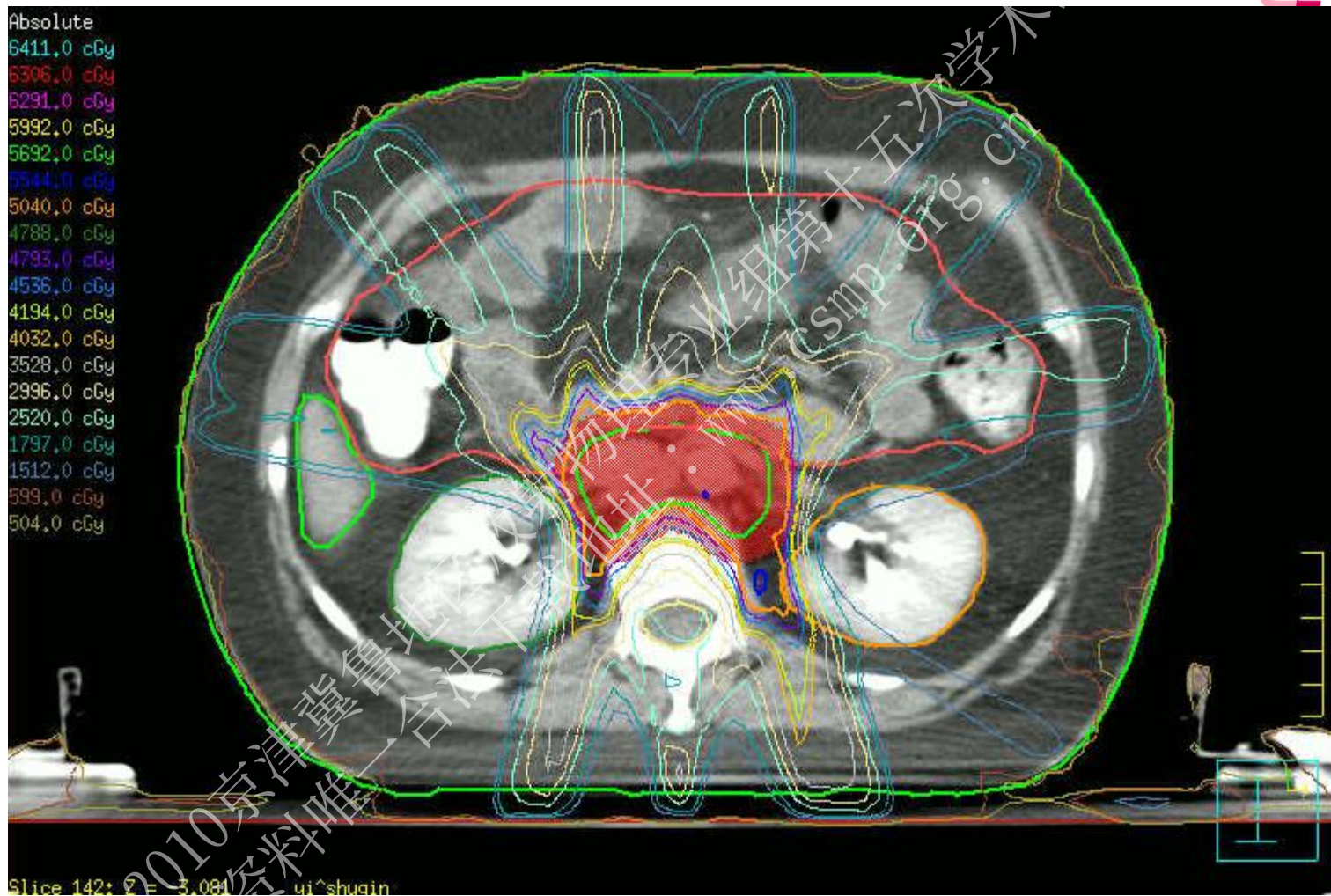


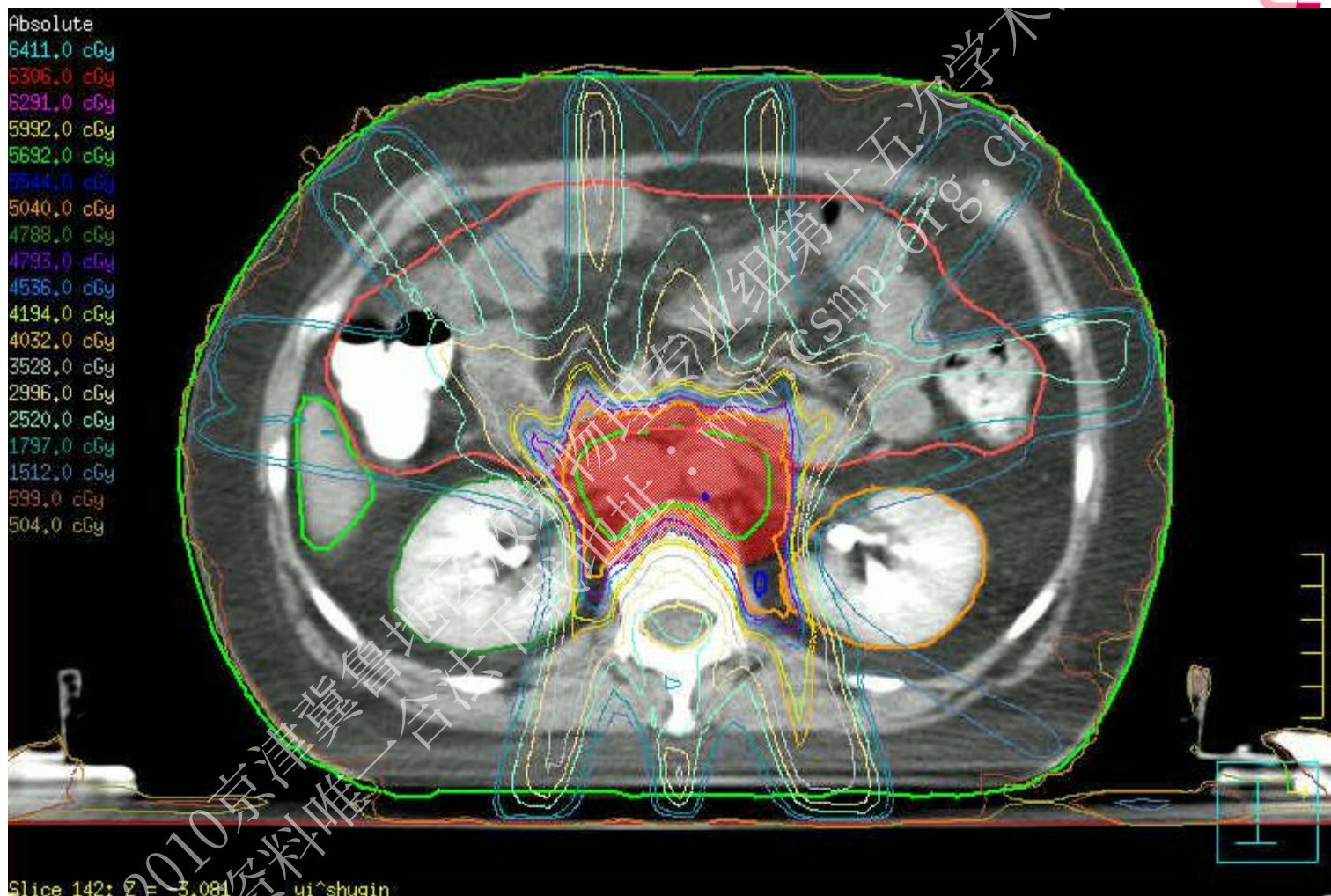


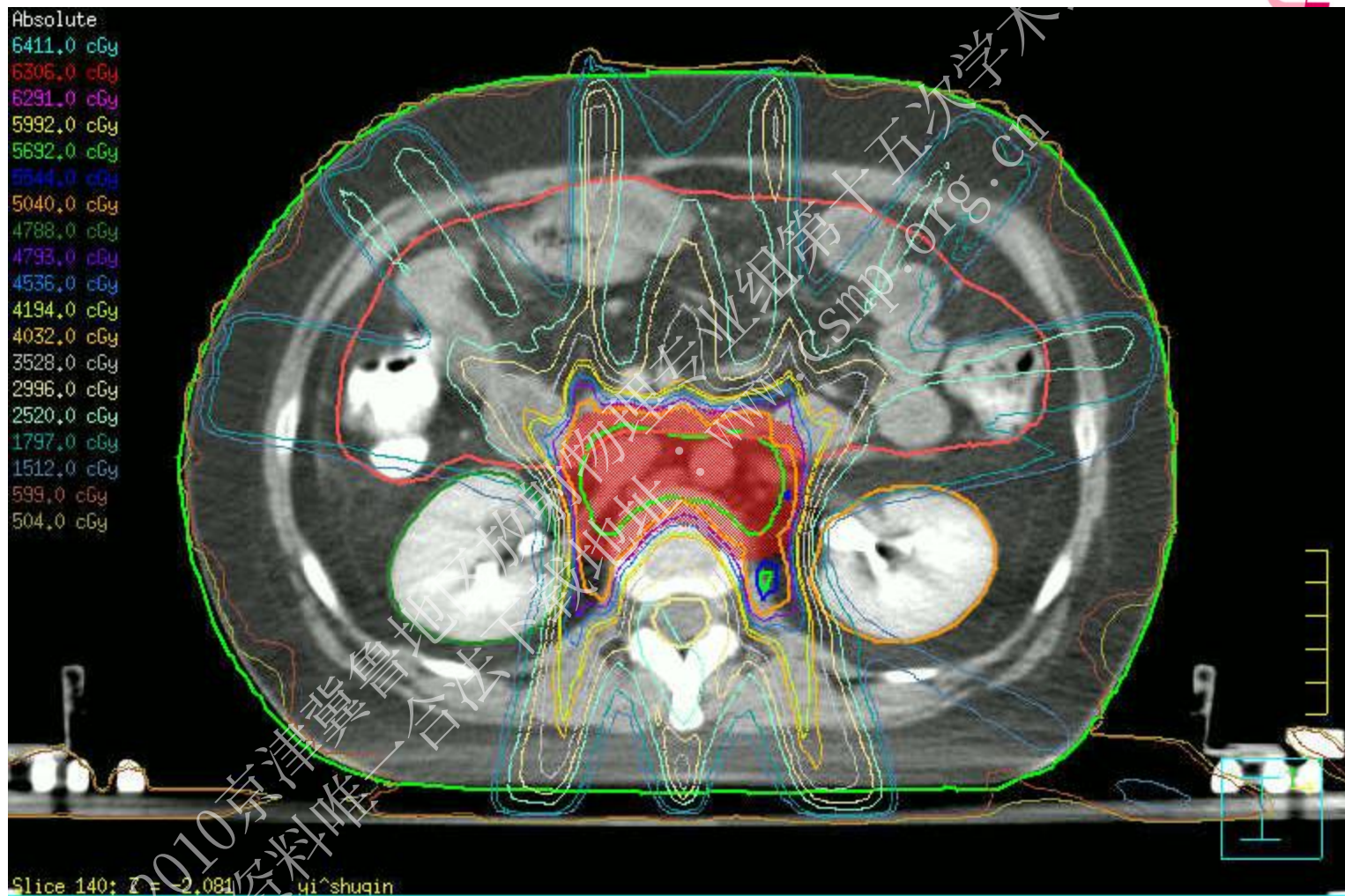


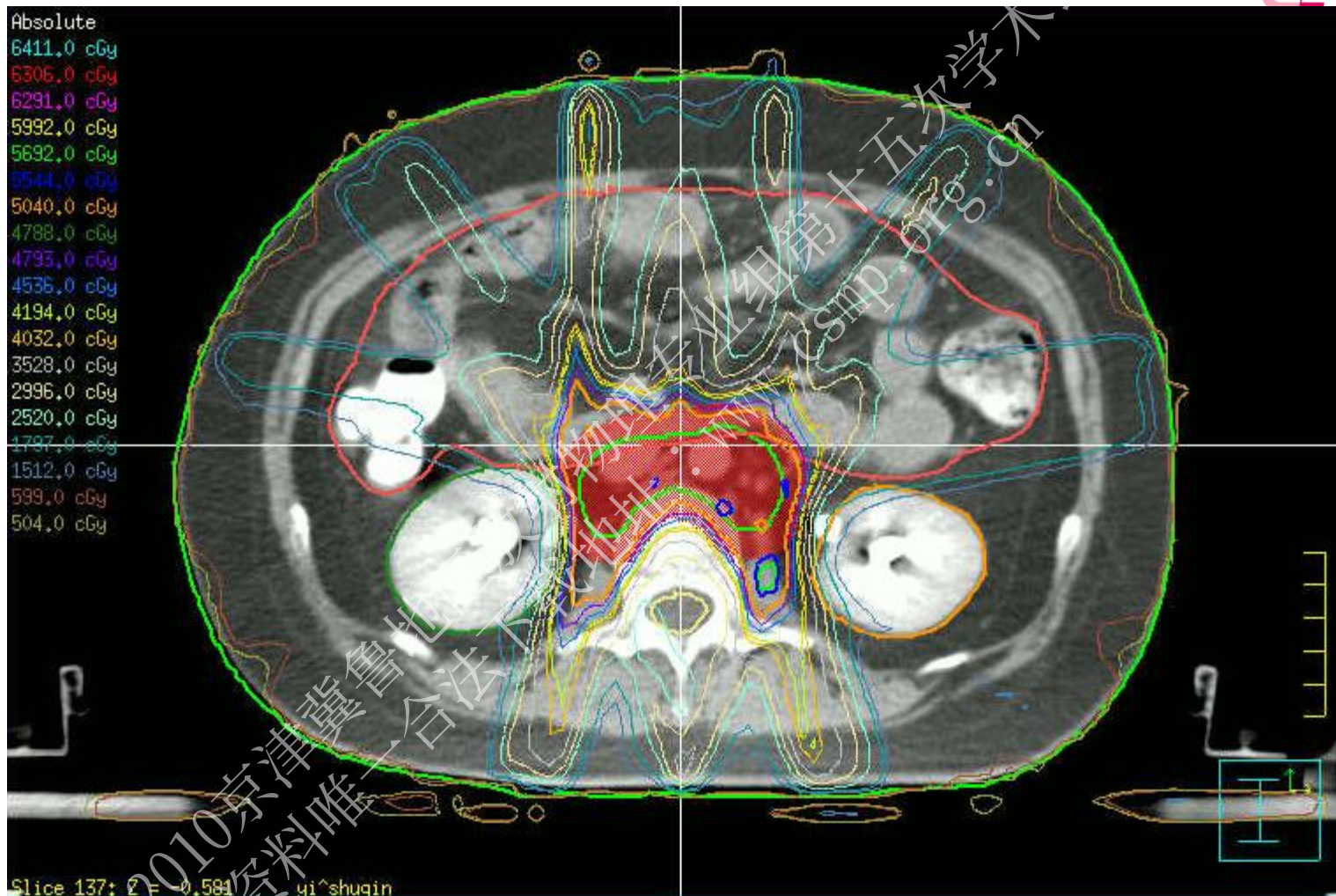


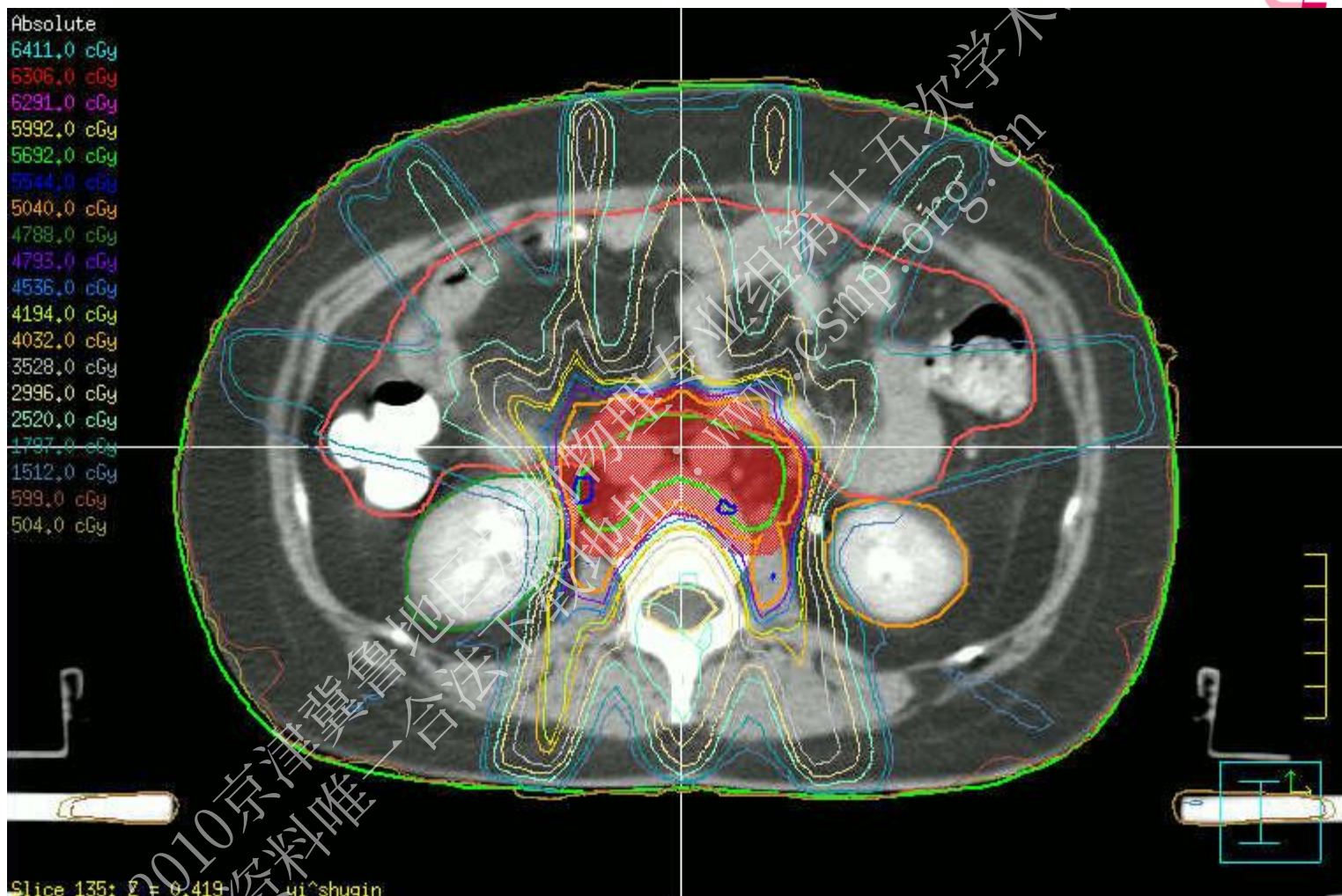






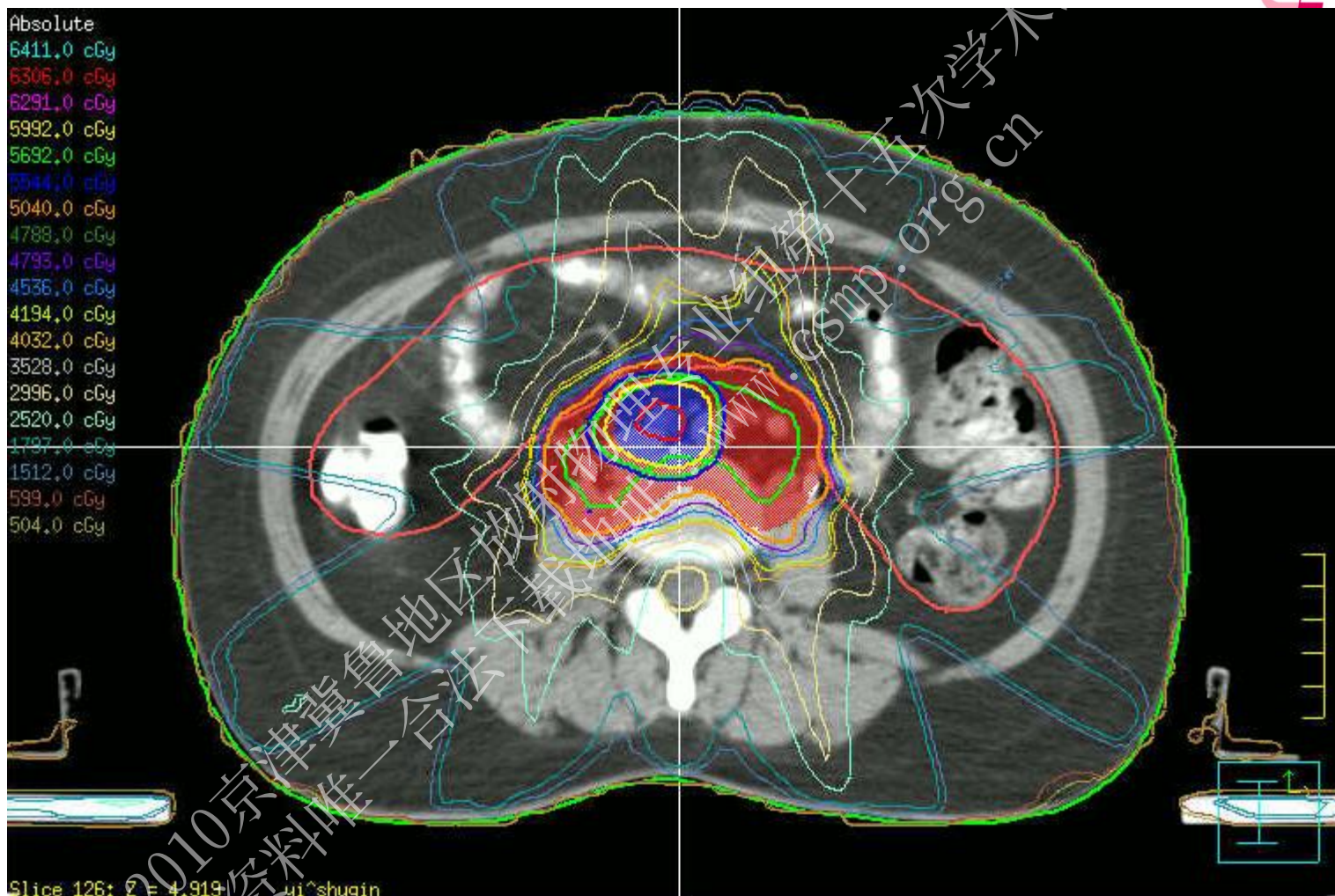


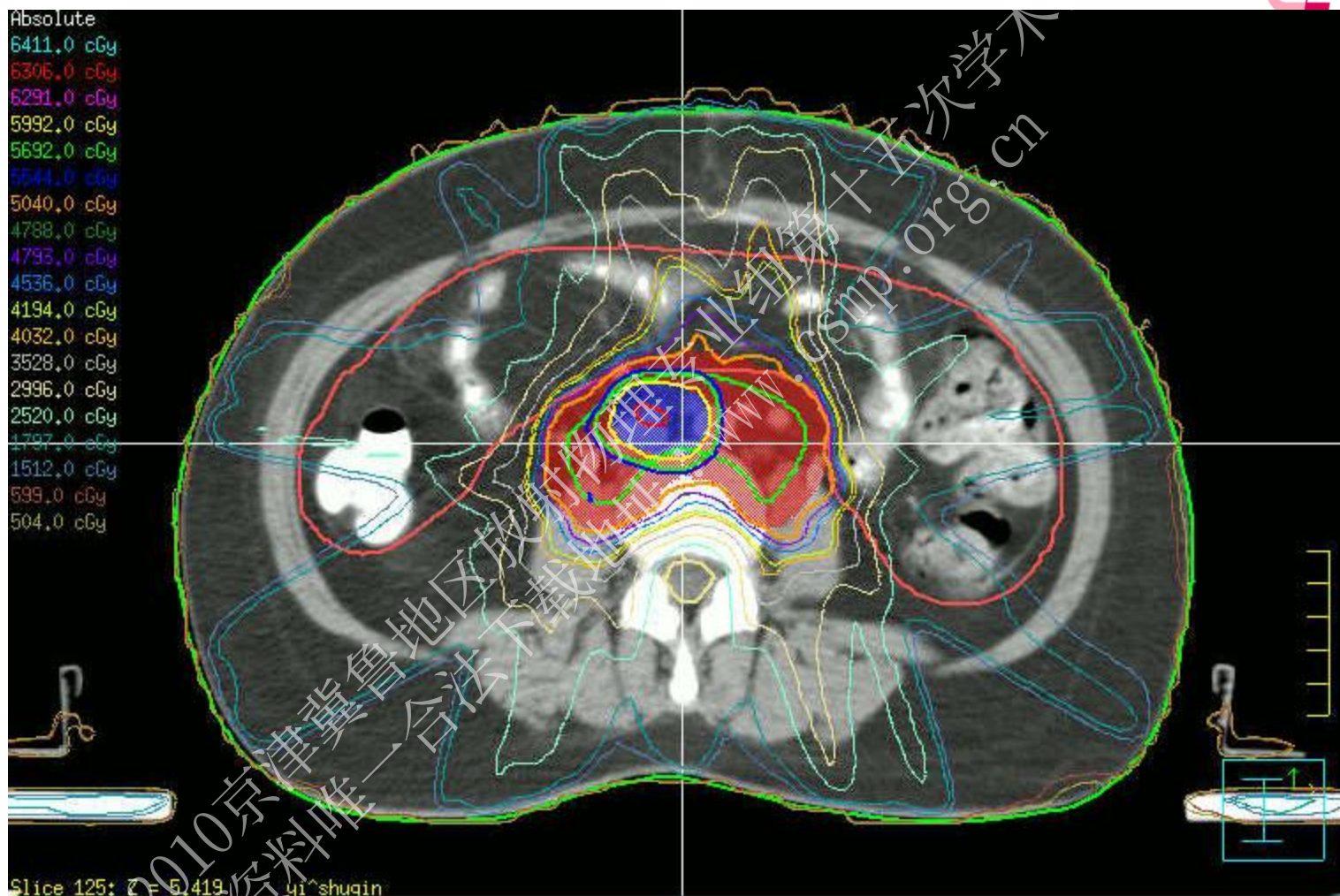


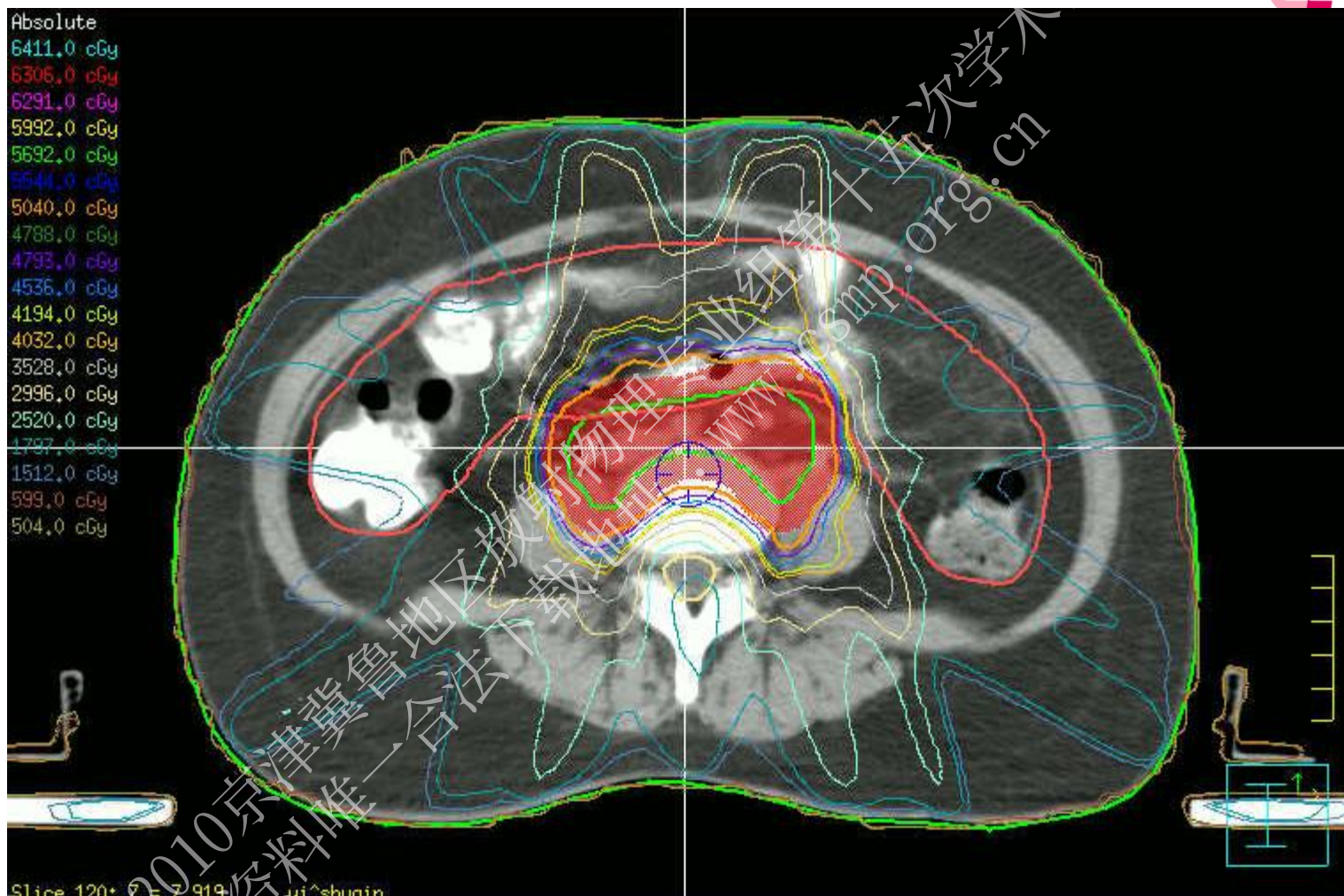


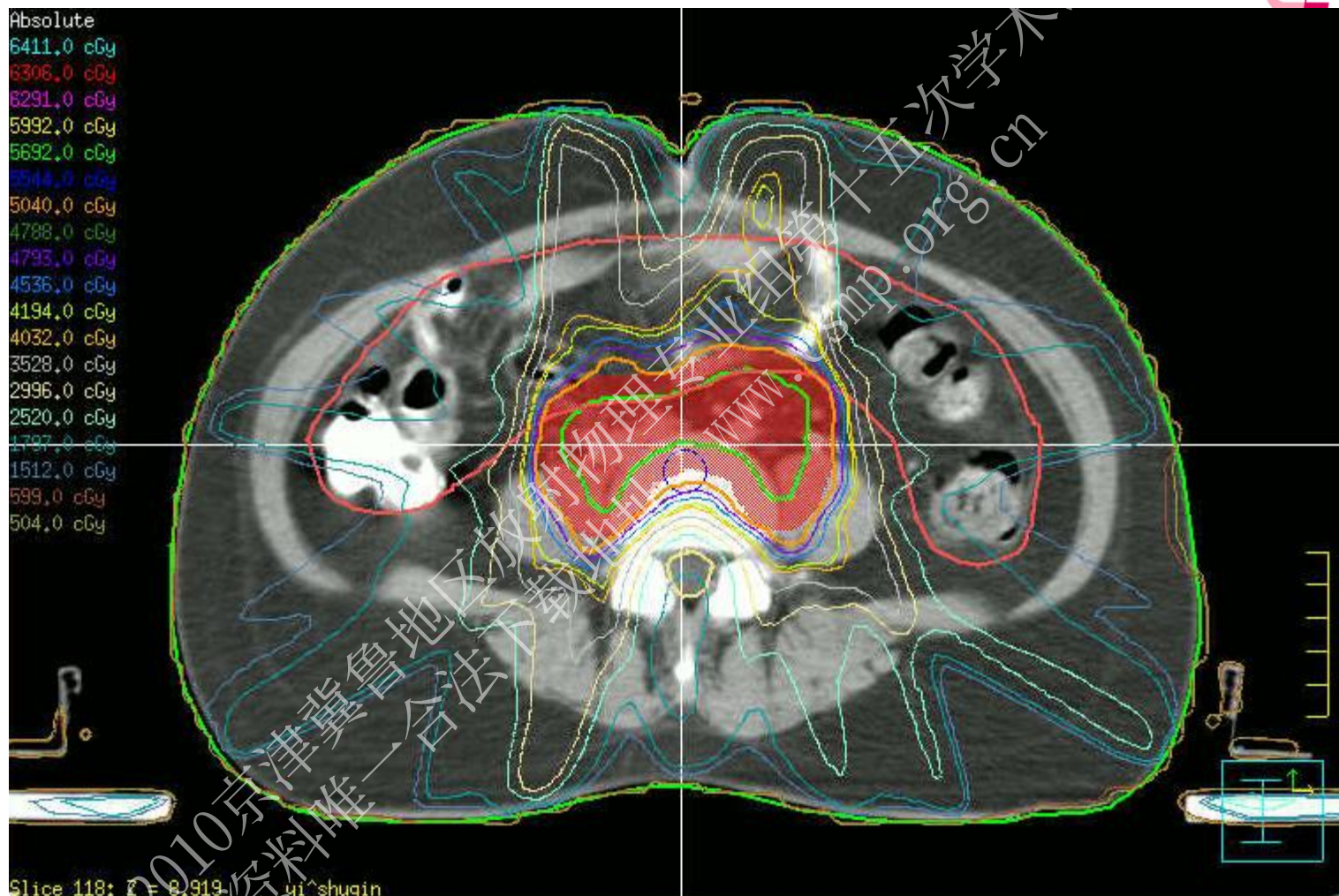
Slice 132: 7 = 1.919 wi^shugui

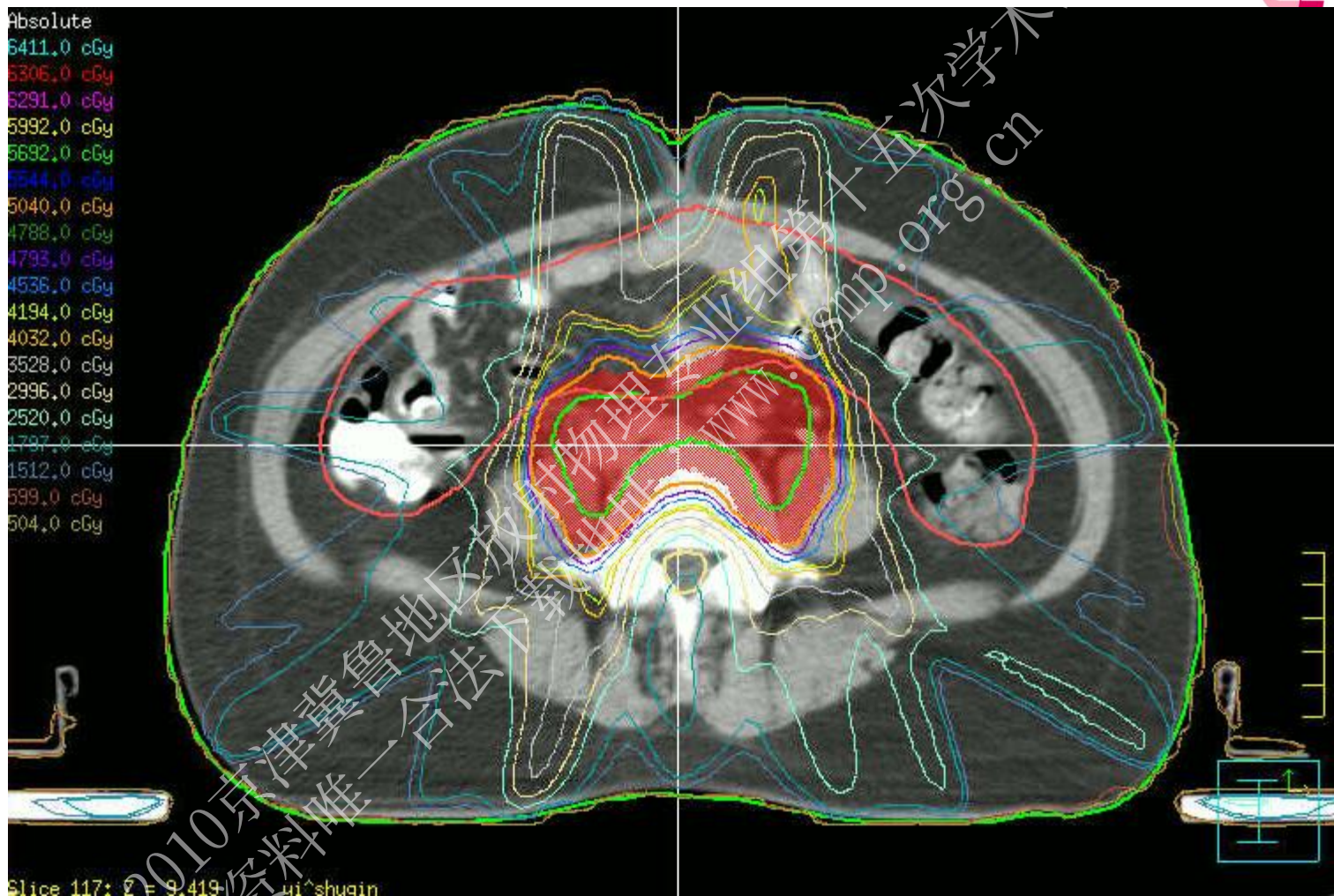
Slice 130: $Z = 2.919$ - yi^shugun

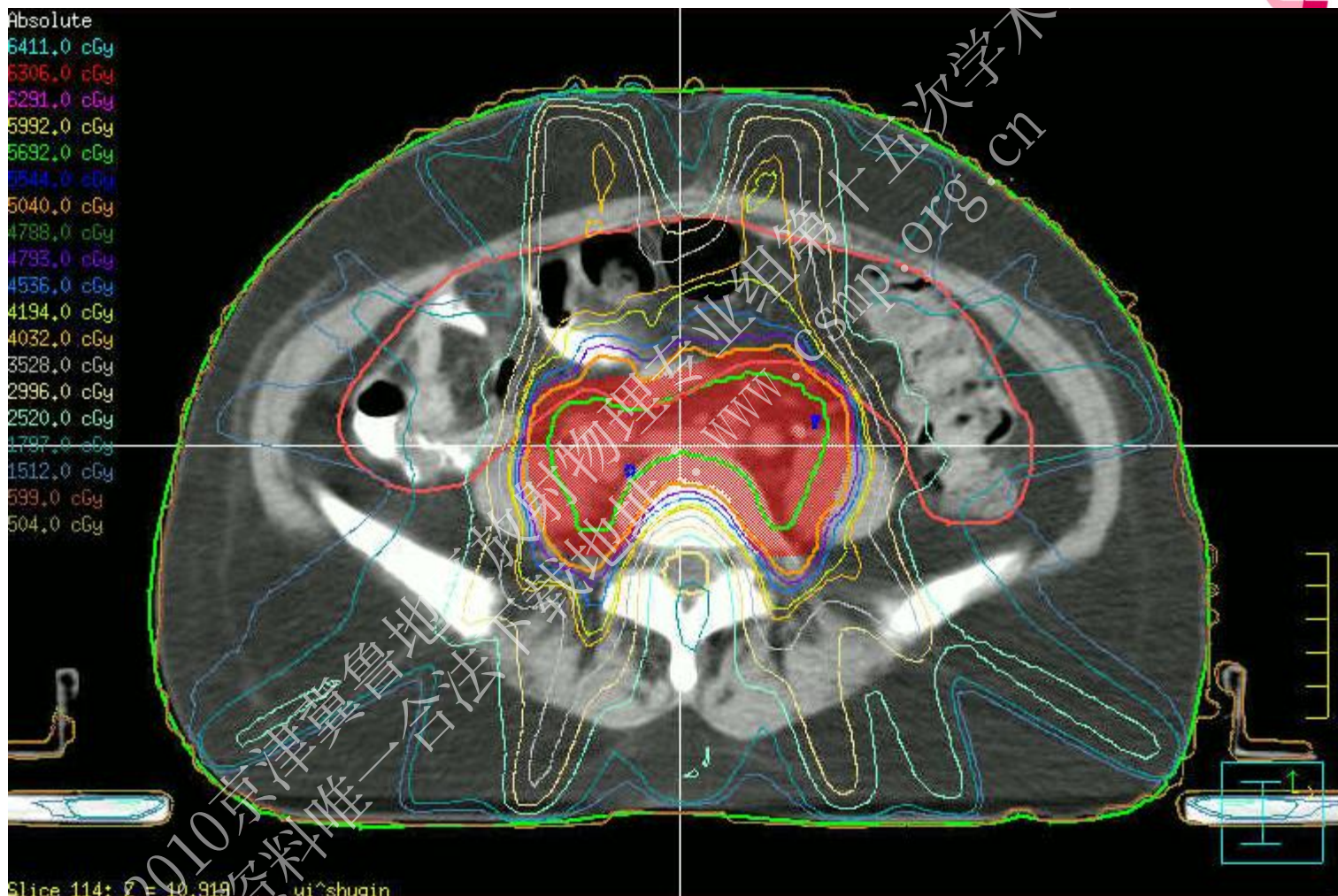


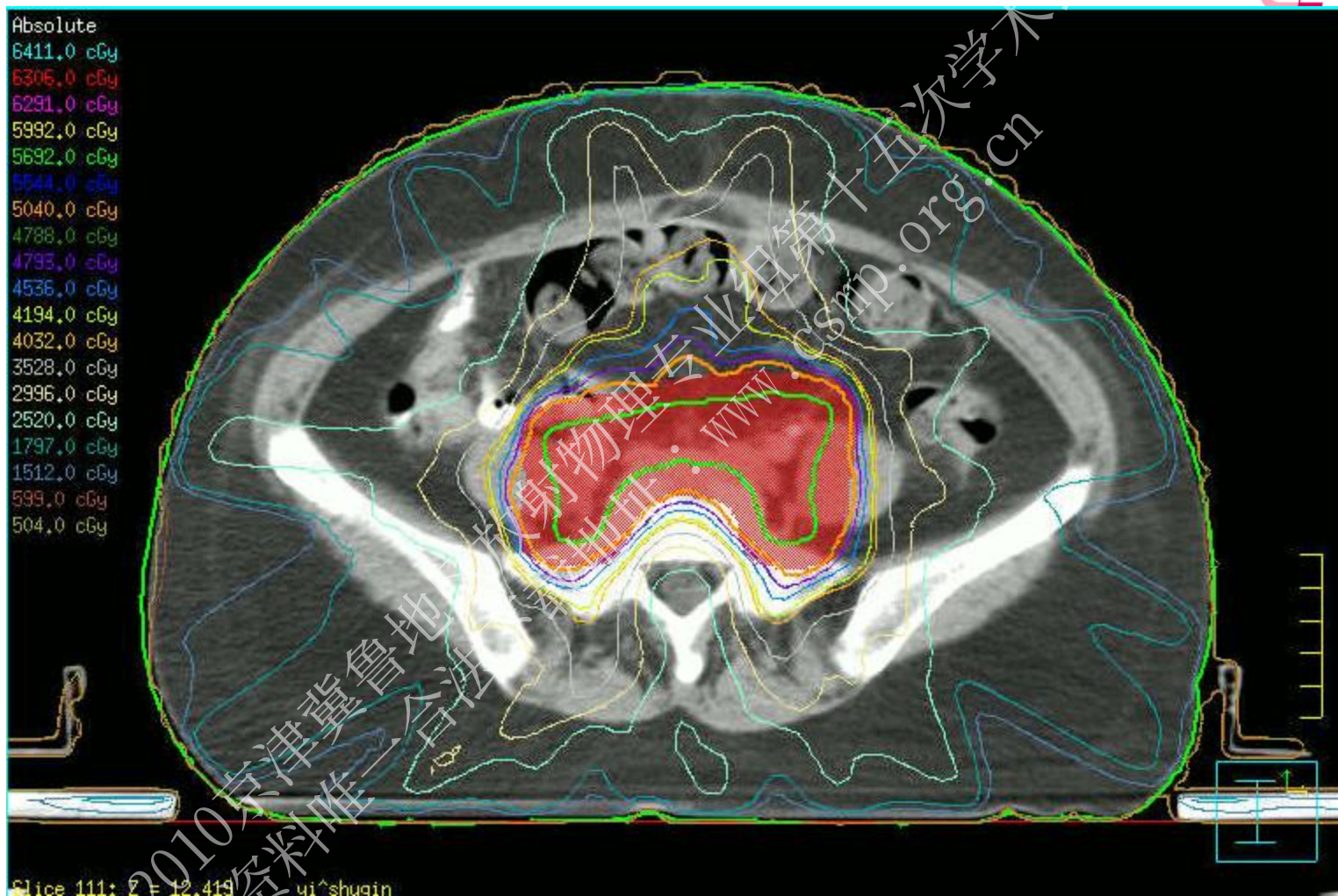


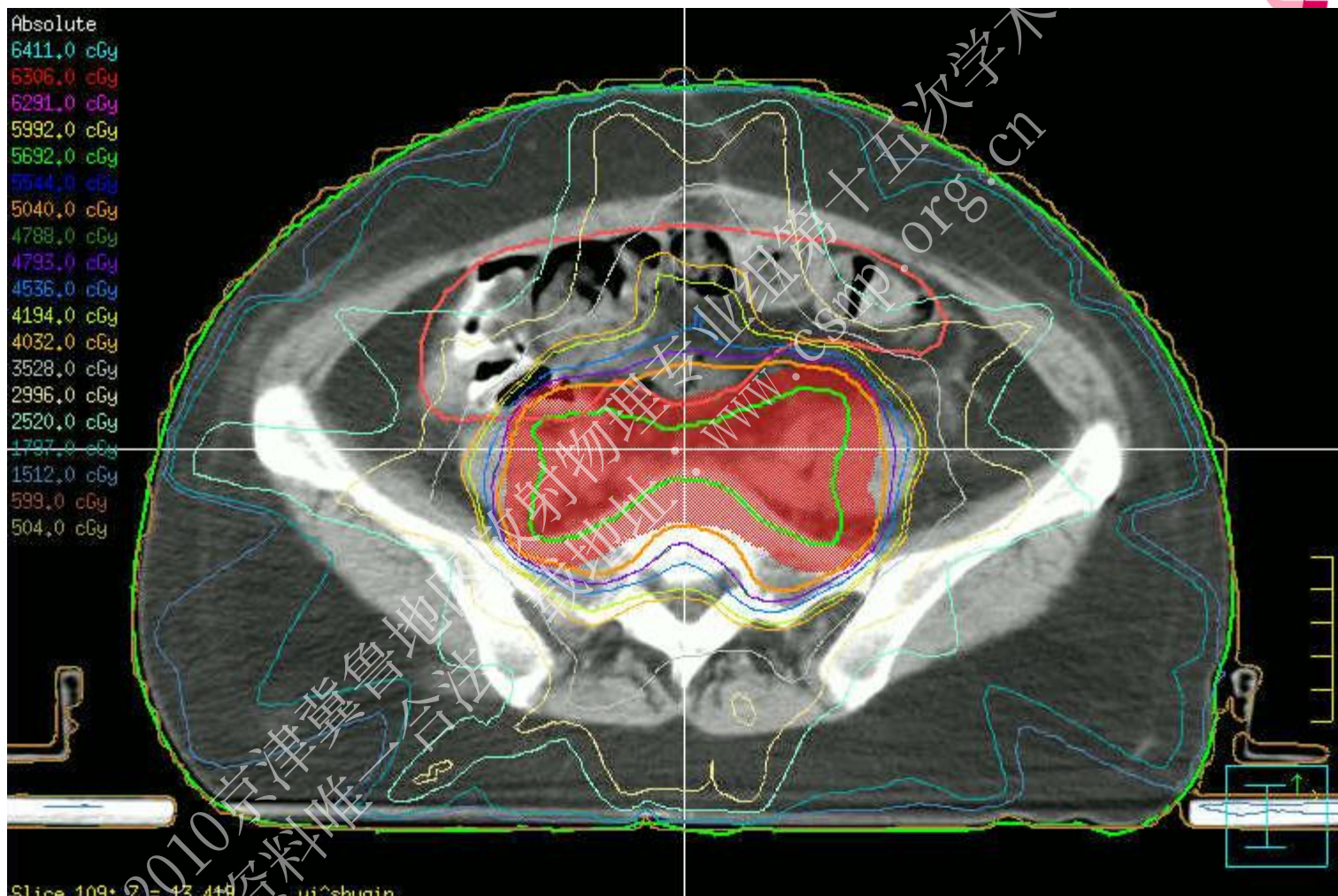


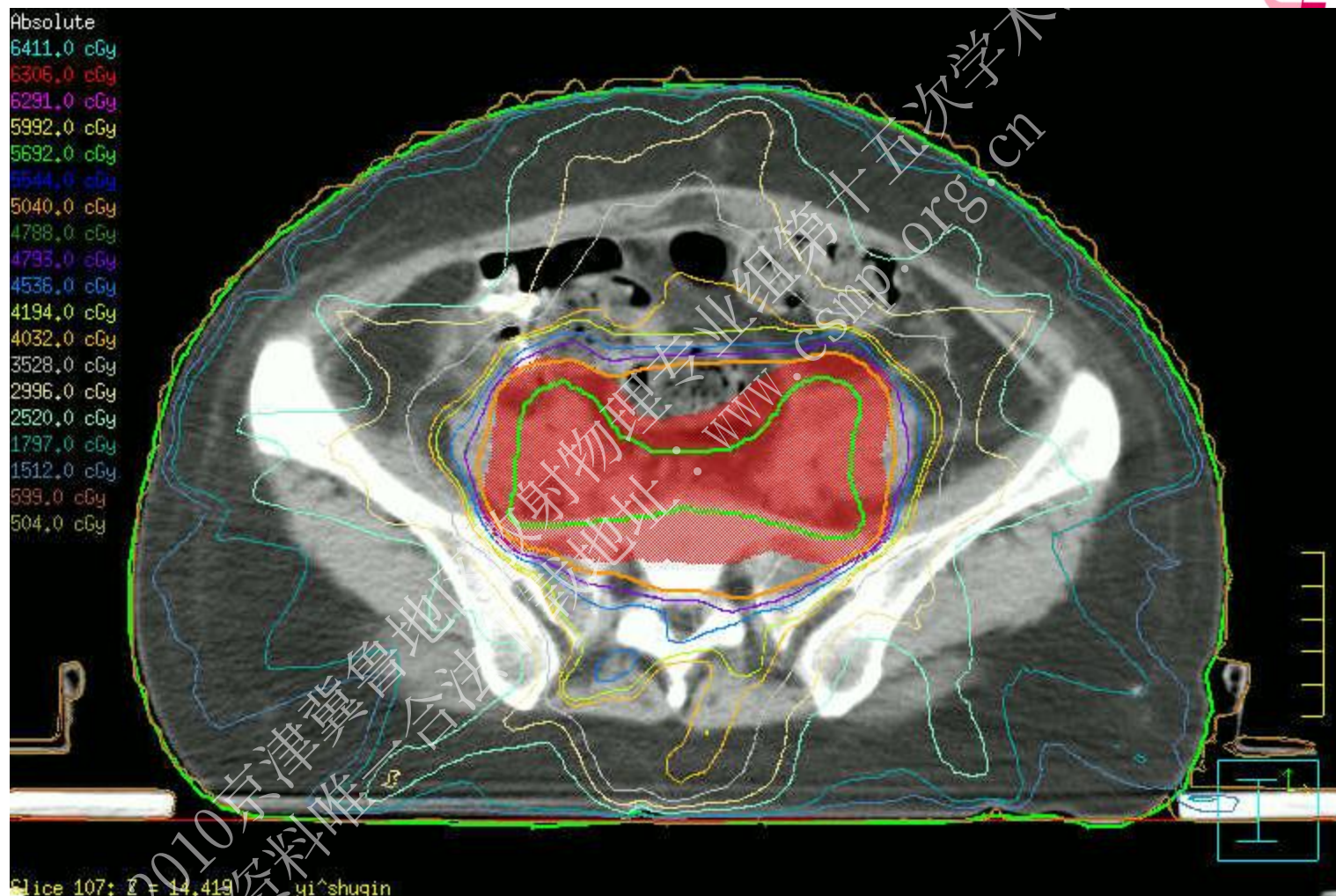


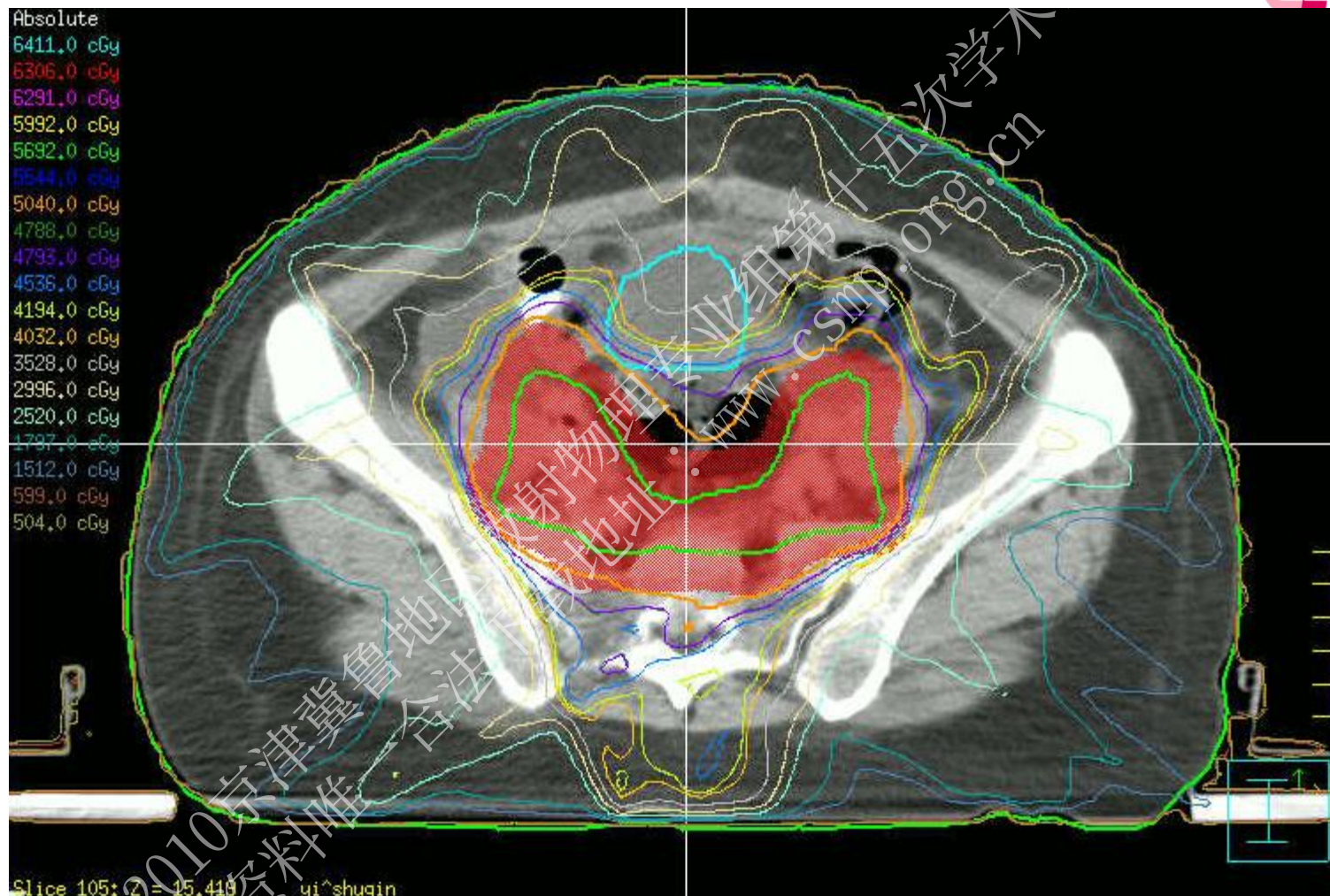


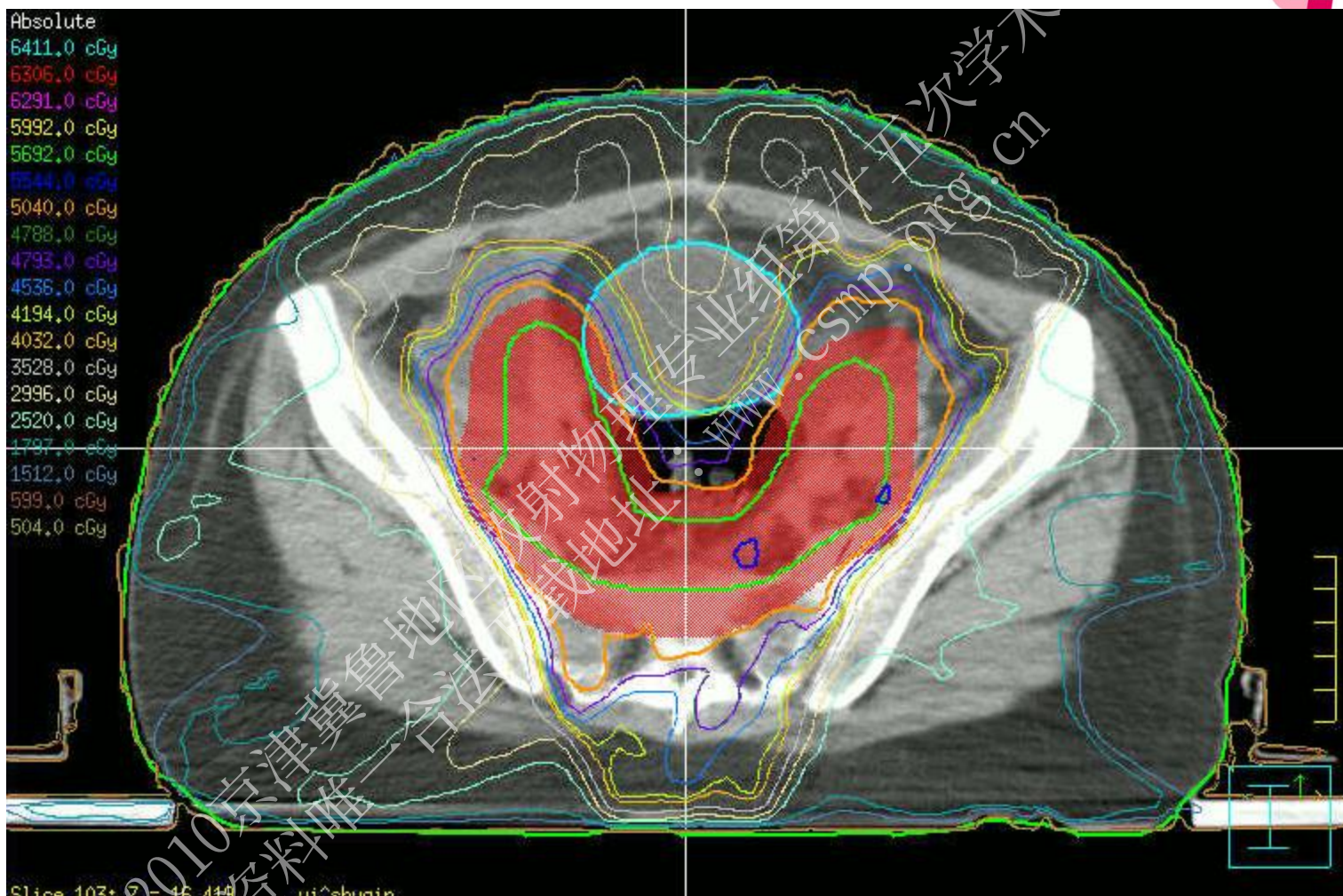




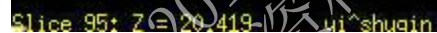


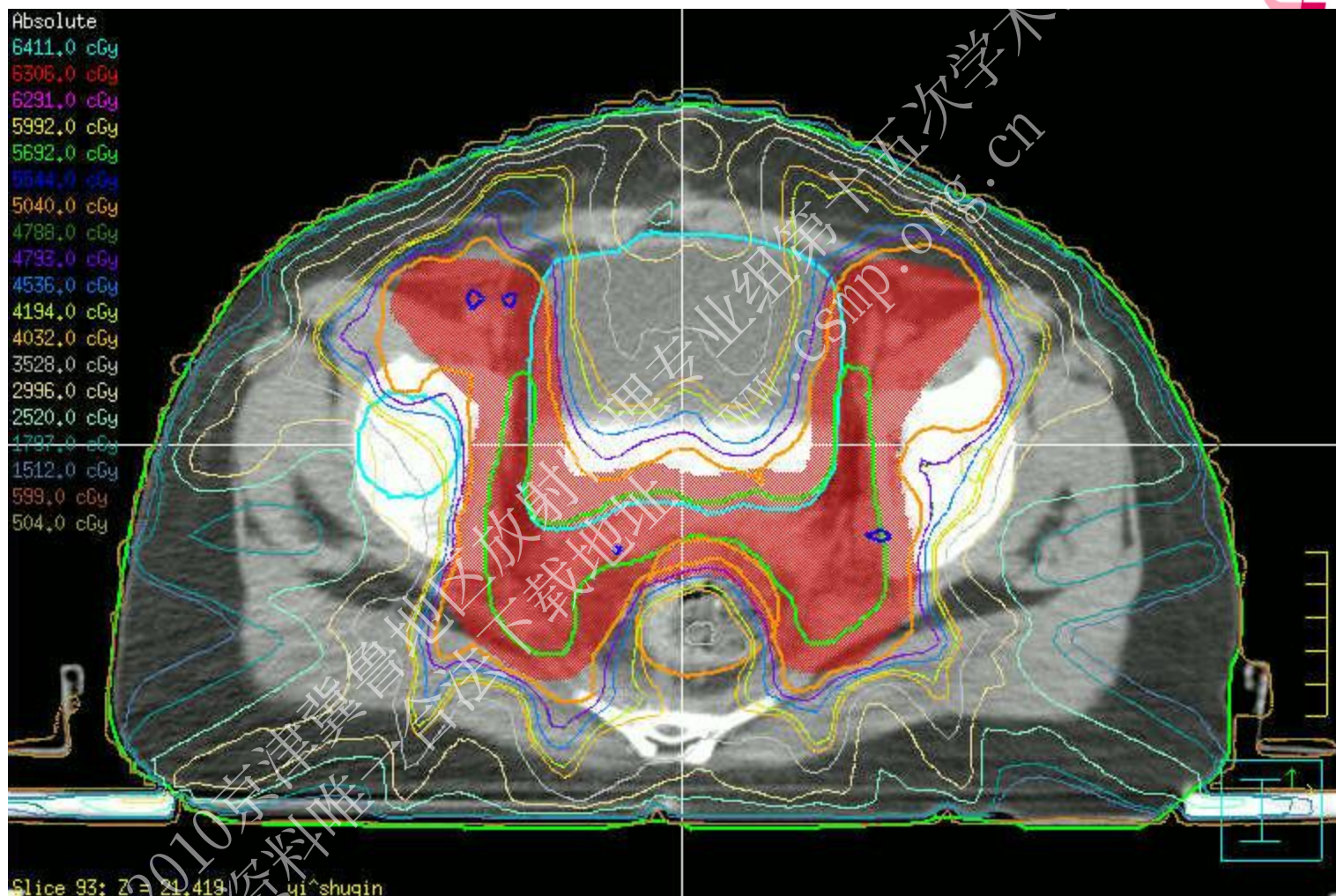


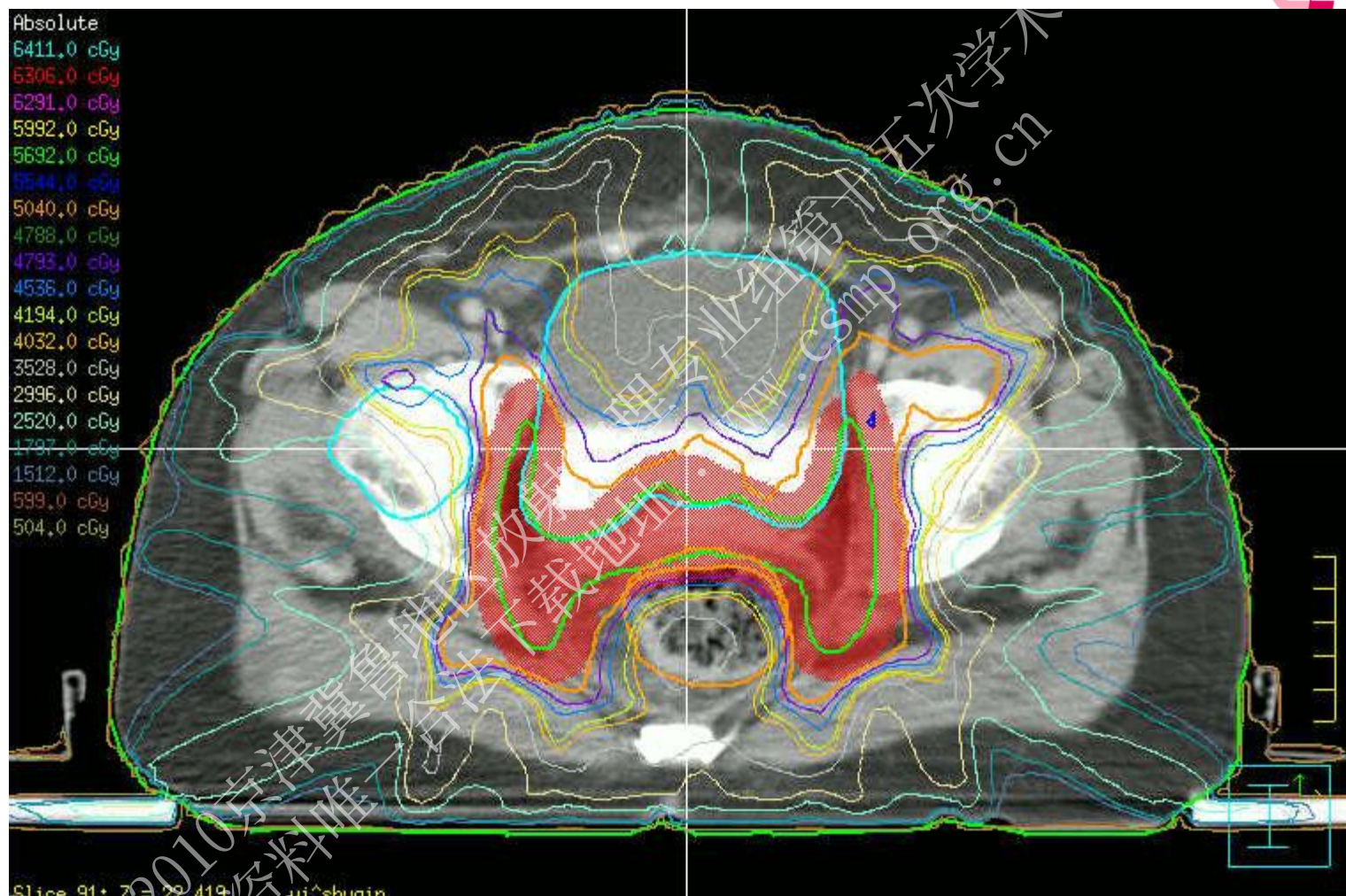


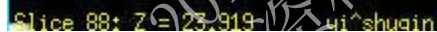


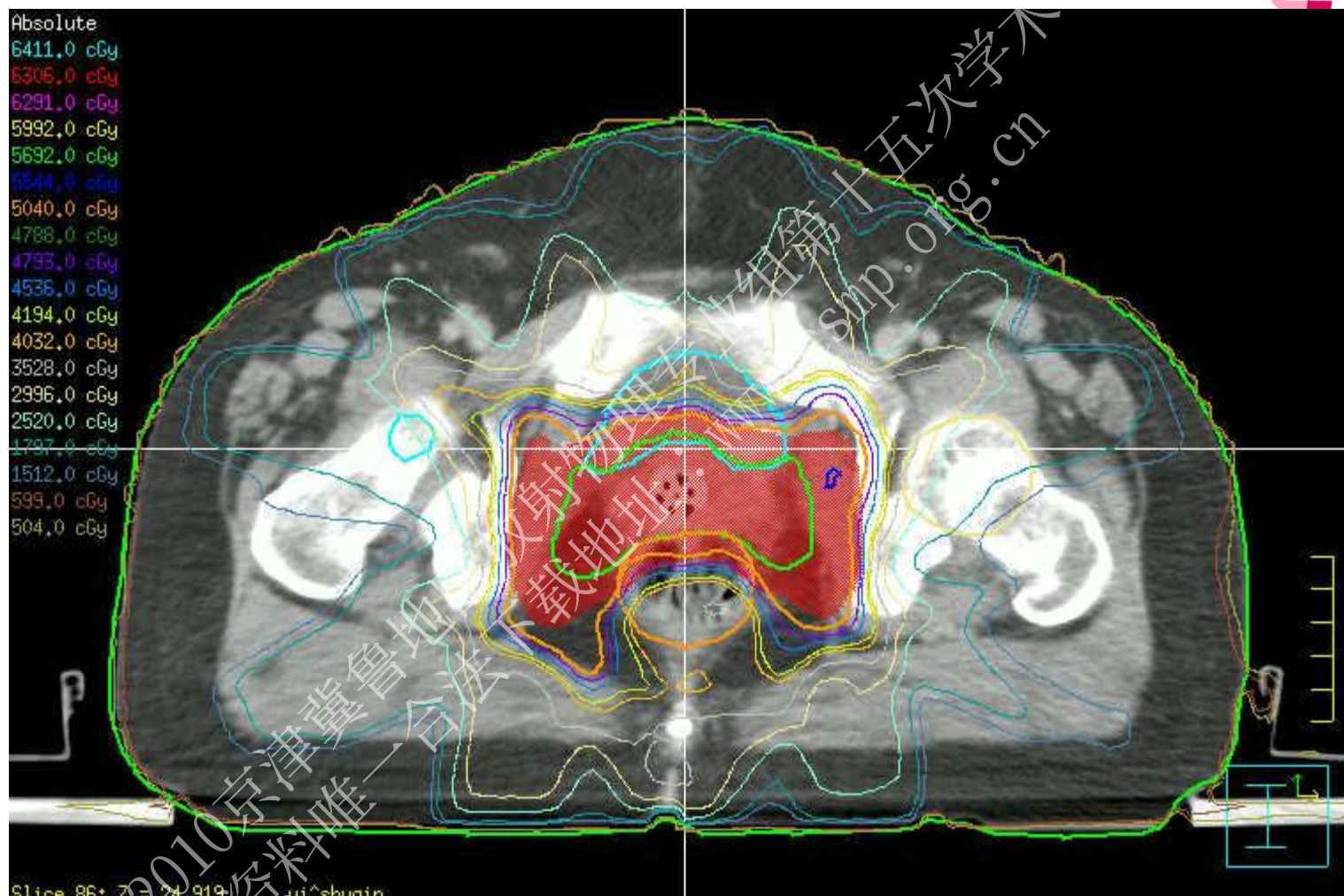


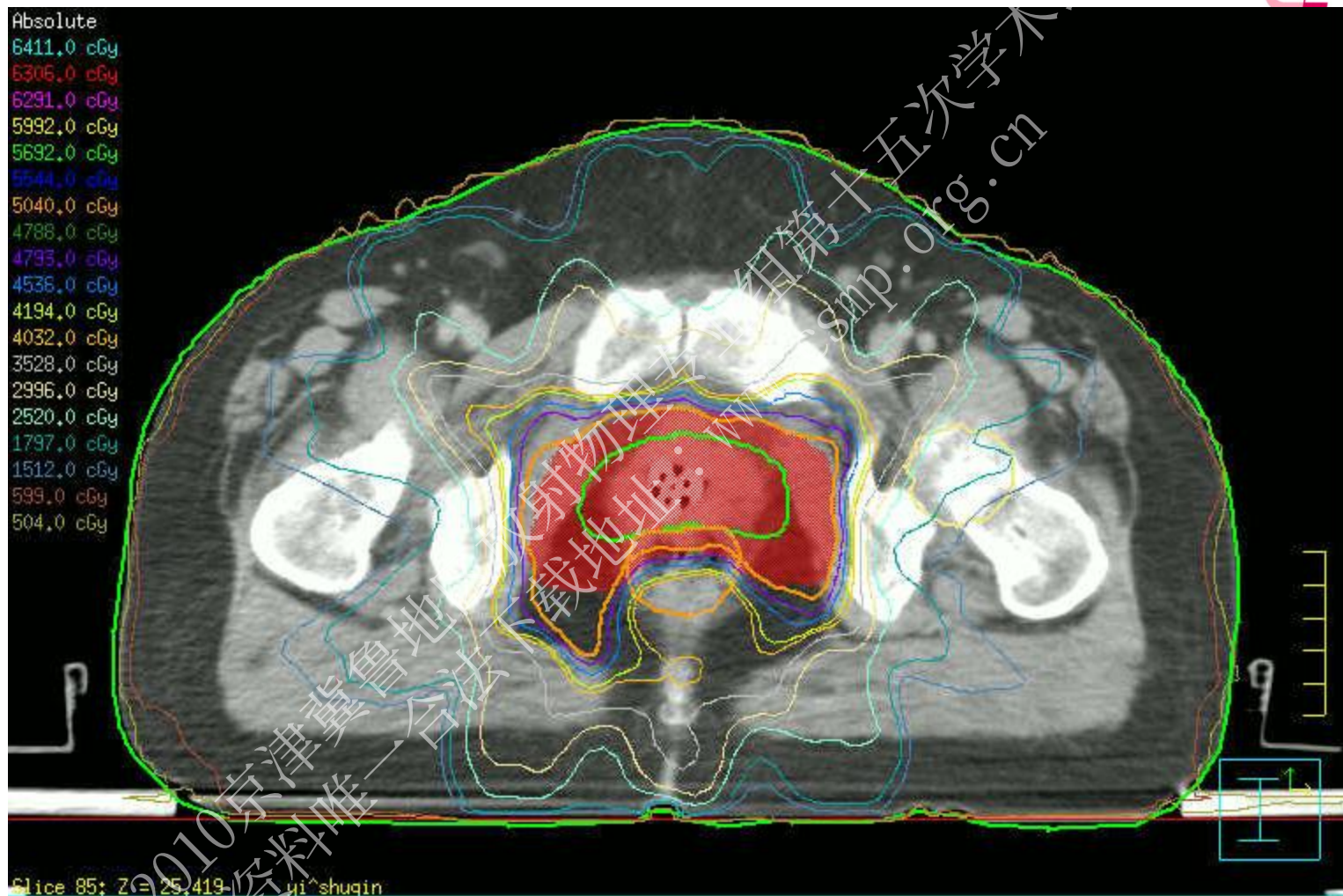


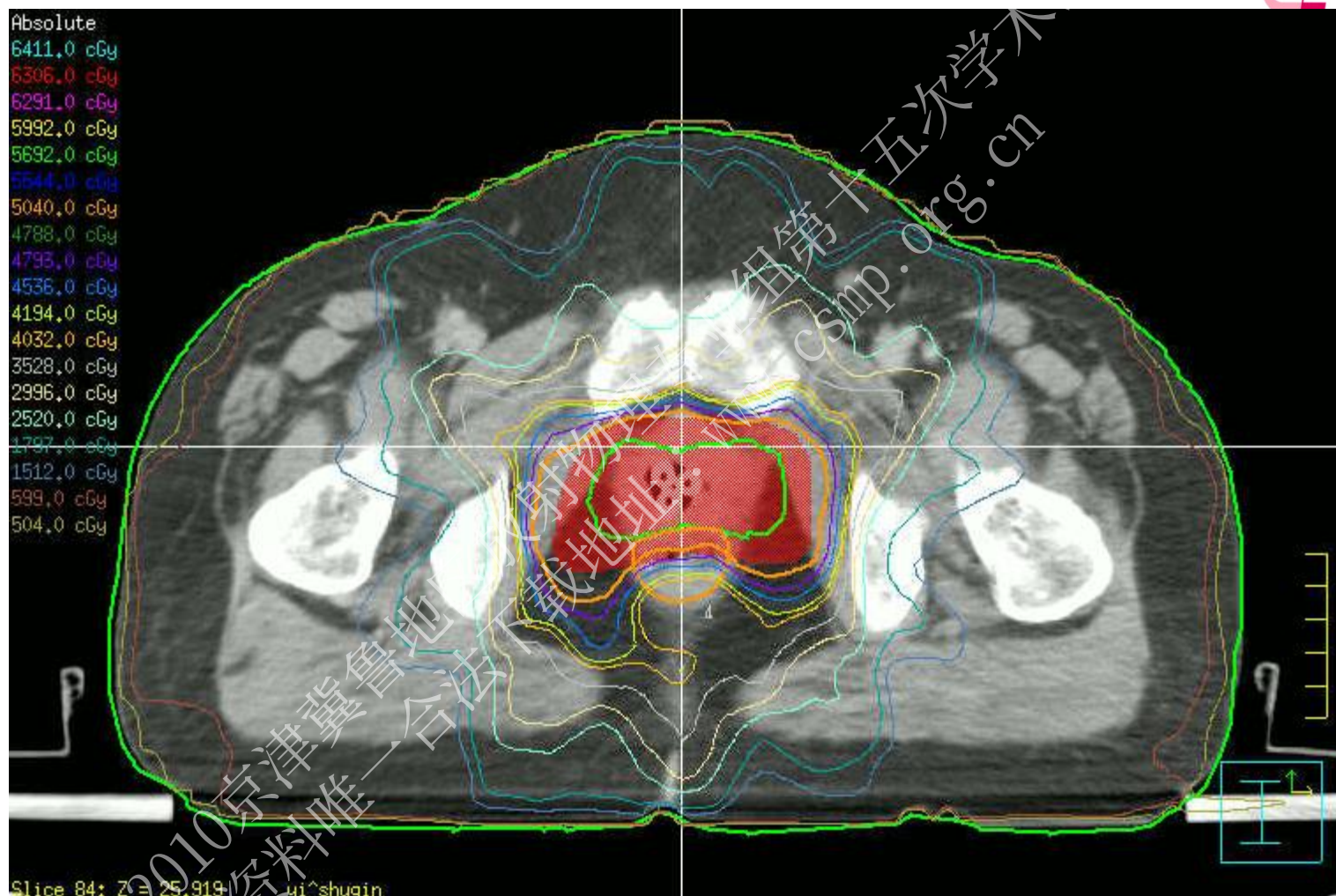


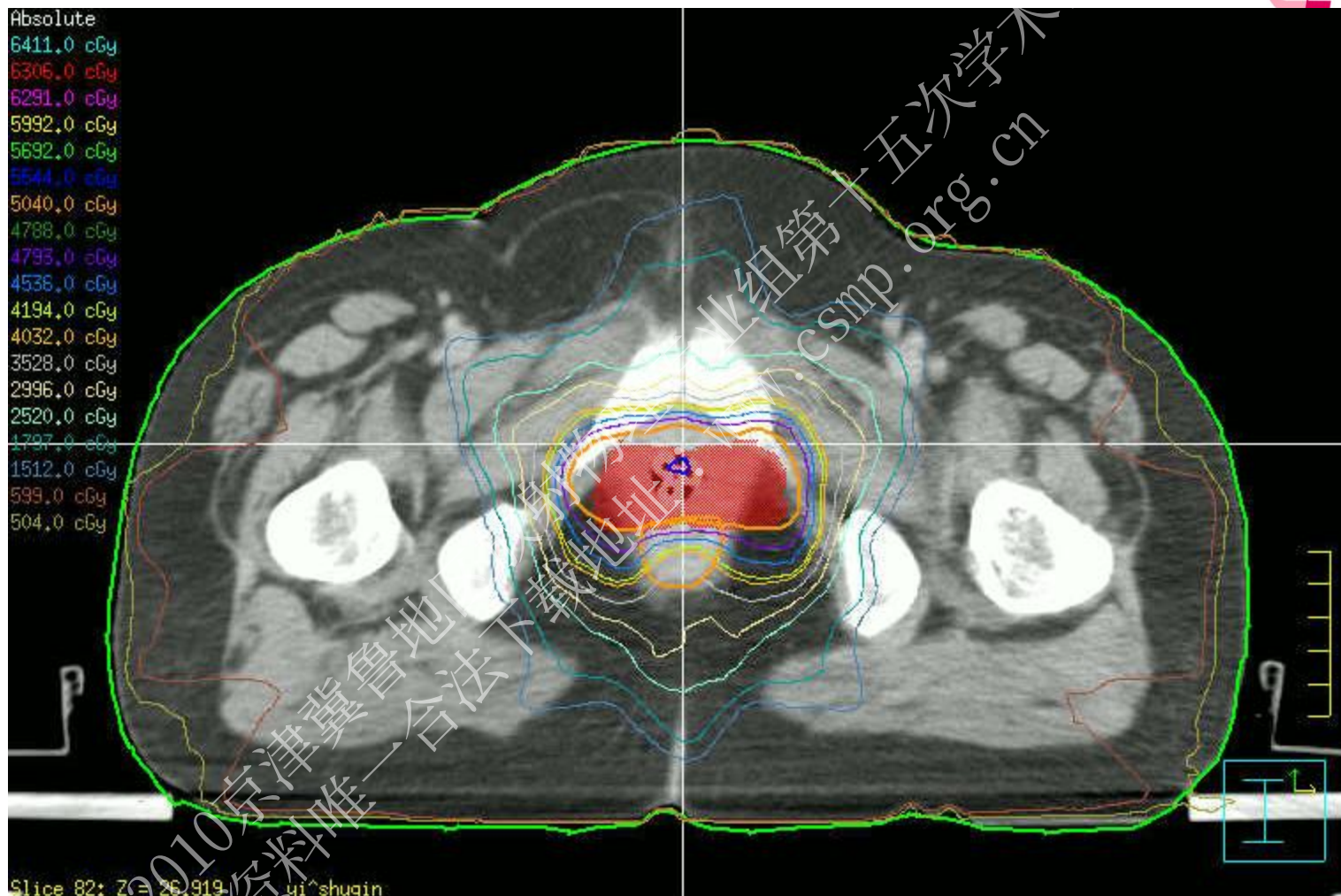


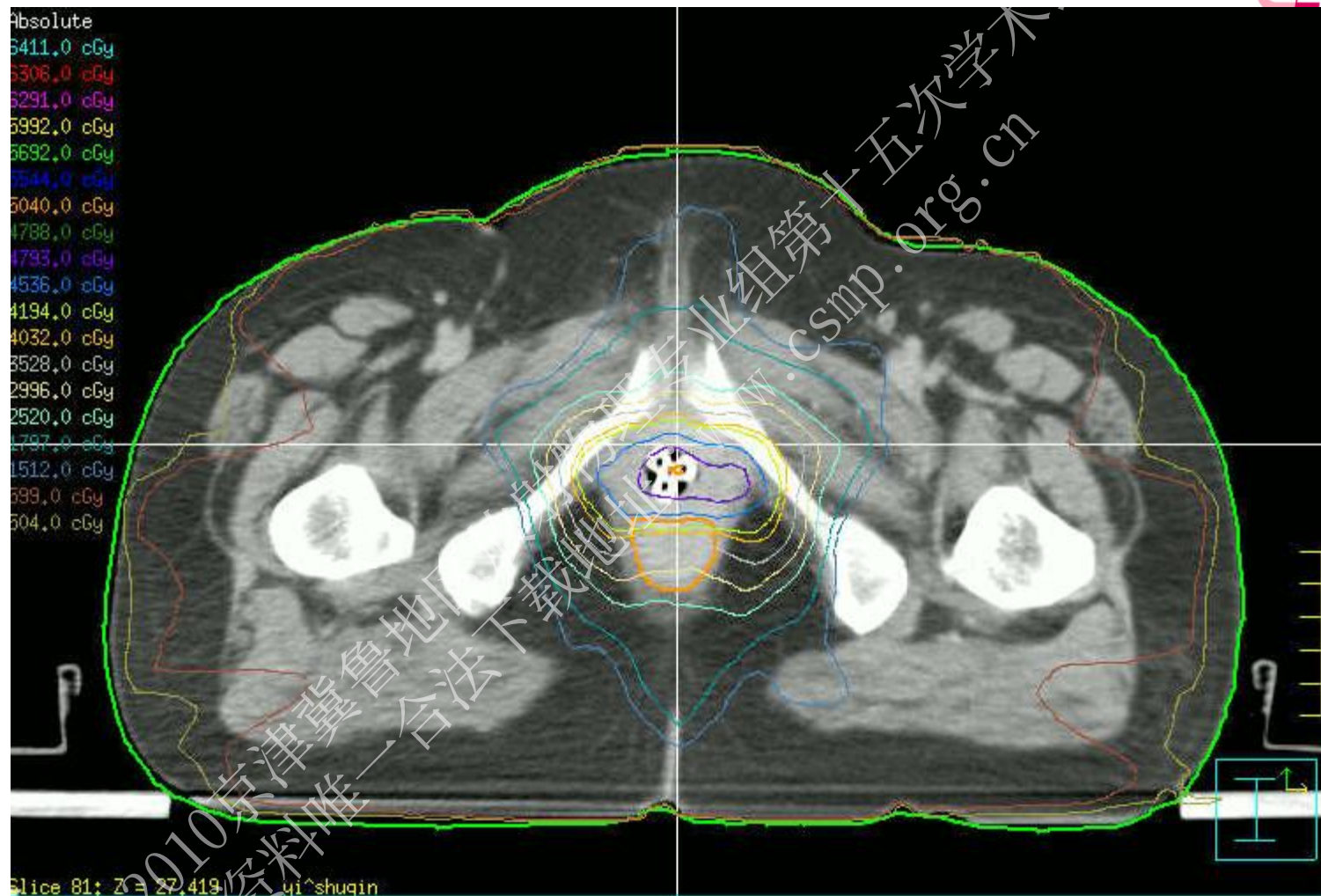


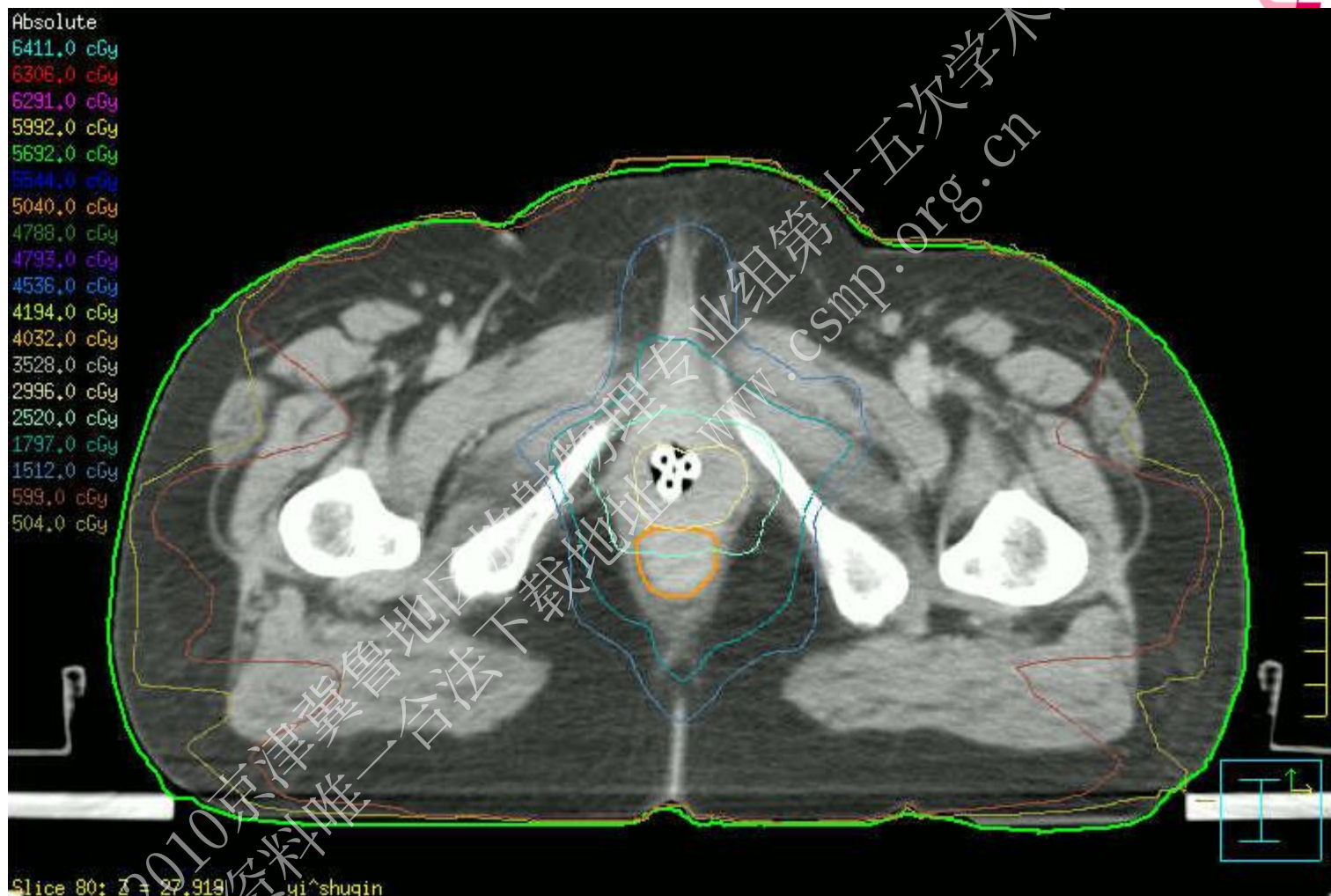


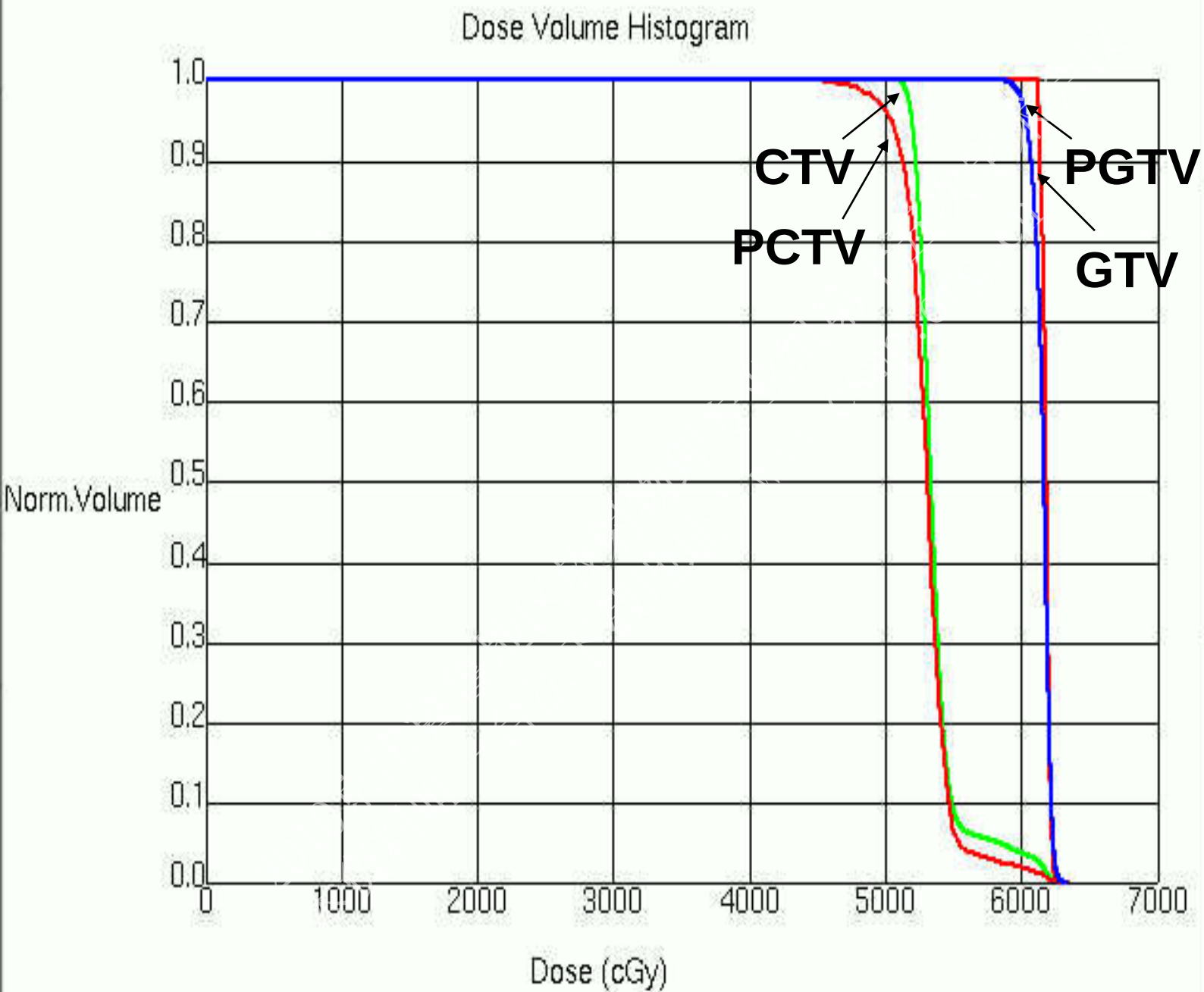


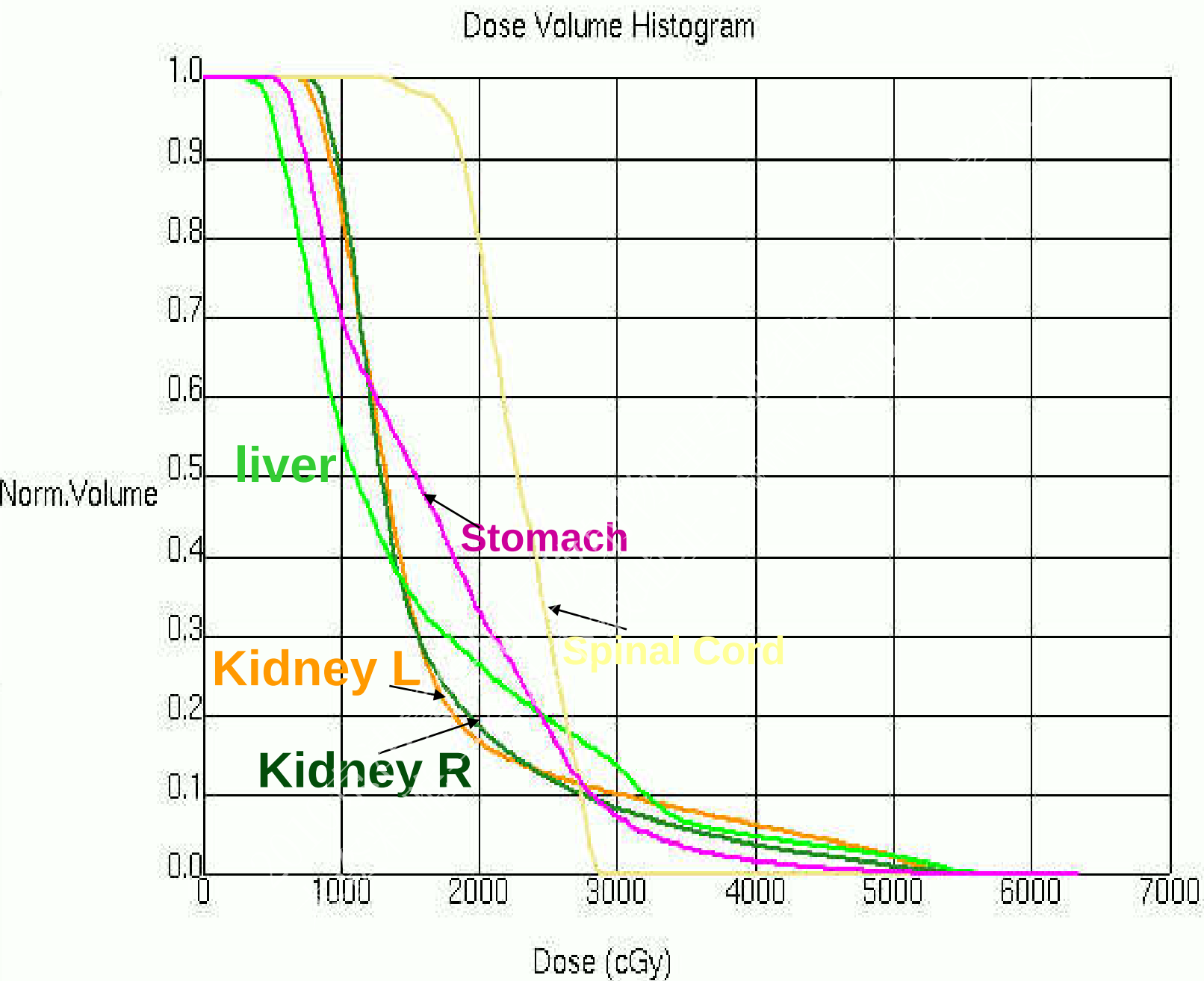


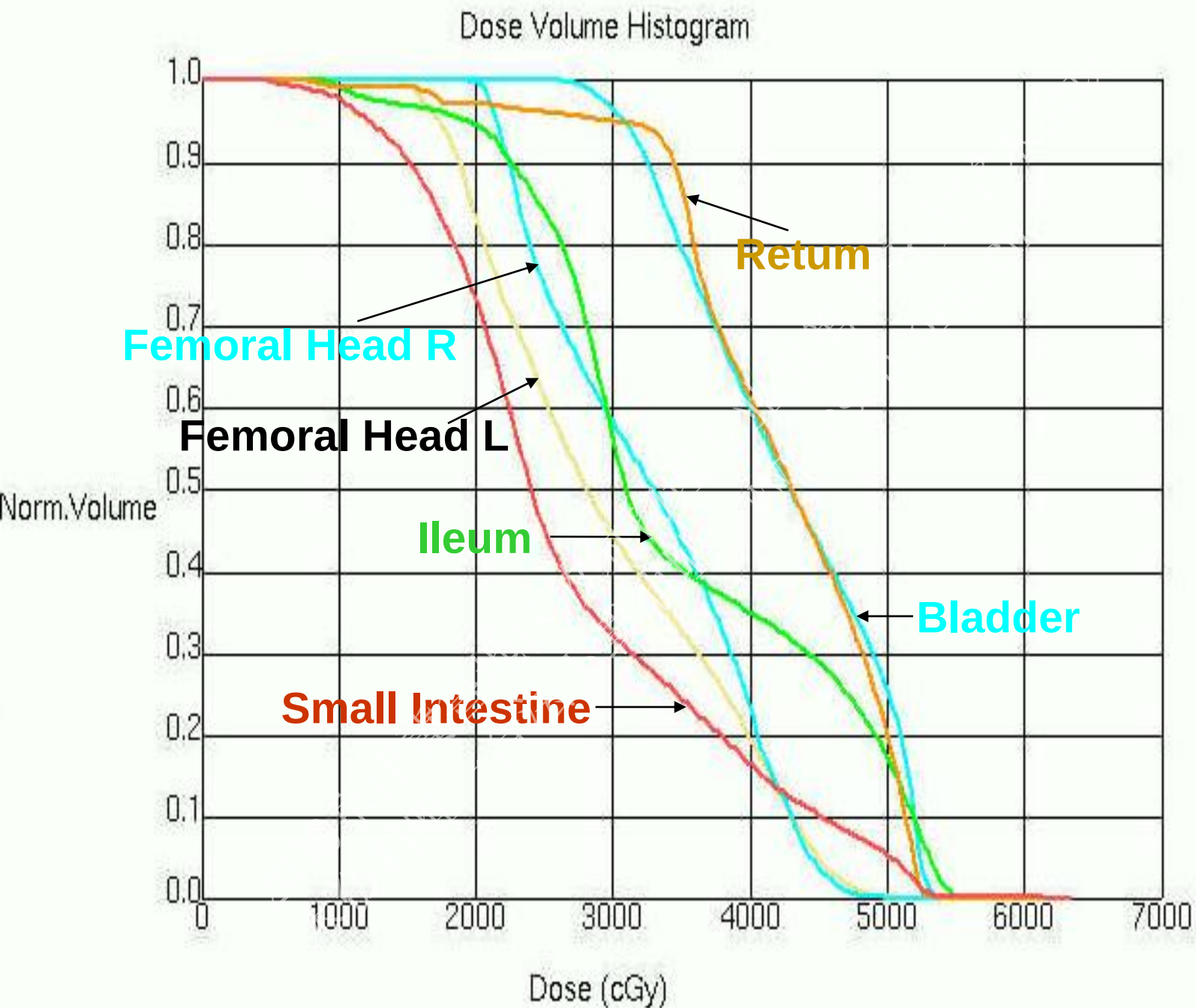












TARGET



Gy

	D95	D100	Dmin	Dmax	Dmean
GTV	——	61.10	61.24	62.52	61.83
PGTV	60.35	——	59.55	62.68	61.56
CTV	——	50.4	51.42	61.92	53.74
PCTV	50.4	——	47.88	61.52	53.05

PCTV SUB PGTV: Dmean=52.90

OARs



- Spinal Cord 0.1cc=28.60Gy
- Stomach D50=15.35Gy
- Kidney L D33=15.07Gy
- Kidney R D33=14.90Gy
- Liver D33=15.85Gy
- Femoral Head L D5=44.93Gy
- Femoral Head R D5=44.44Gy

- Ileum D50=30.90Gy
- Small Intestine D40=26.30Gy
D25=34.69Gy
- Rectum D50=43.01Gy
- Rectum sub PCTV 1cc=49.91Gy
- Bladder D50=42.89Gy
- Bladder sub PCTV
1cc=52.28Gy

Total control points for trial

119

Monitor Units:

1721



谢谢

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